Scientific Research on
Laughter Yoga

20 Top Research Studies
on Laughter Yoga Methods

The Question:

What are the effects of Laughter Yoga on stress in the workplace?

THE RESEARCH INSTITUTE

SVYASA in Bangalore India is one of the world's leading Yoga Research Organizations.

They are recognized as "Scientific & Industrial Research Organization, (SIRO)" by the Department of Scientific and Industrial Research, Ministry of Science & Technology, Government of India.

Their work includes studies on the effects of yoga on computer users, diabetes, cancer and more.

They regularly collaborate with the Indian government and institutions including the Center for Integrative Medicine at the University of California, the University of Houston Wellness Center and more. They have affiliate centers in USA, Germany, Japan Singapore, Turkey, Australia, Czech Republic and other countries.

PREVIOUS STUDIES

While countless studies have shown the beneficial effects of laughter, especially regarding stress, most of these have used humor – normally funny movies – to stimulate subjects to laughter.

This humor technique is not reliable as different people will laugh at different things on different days, so it could never be prescribed.

UNCONDITIONAL LAUGHTER

Laughter Yoga is unique in that it stimulates laughter without jokes, humor or comedy.

This leads to the same laughter that young children enjoy 300-400 times a day – we call it 'unconditional laughter'.

Normal adult laughter is 'conditional' – we only laugh if the trigger meets our conditions, for example 'is it funny?', 'is it appropriate to laugh here?', 'is it appropriate to laugh with these people?' and so on.

Conditional laughter requires humor, jokes or comedy as a trigger.

Unconditional laughter can be easily induced as required, so it can be prescribed for persons who will benefit from laughing more.
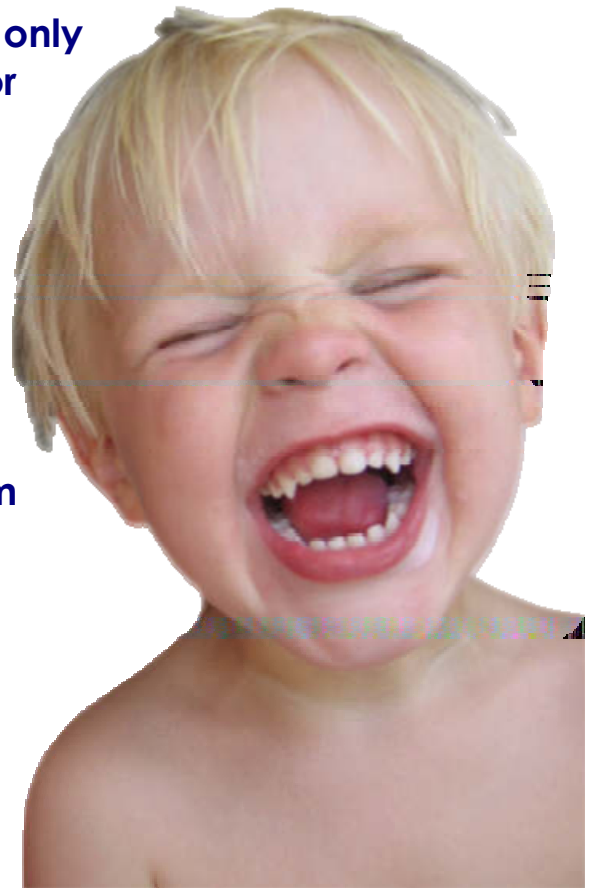
SVYASA designed a scientific study to determine the effects of Laughter Yoga on stress in the workplace.

200 participants were randomly selected from 3 Bangalore IT companies.

All were non-smokers aged 20-50 yrs with normal weight, no infections, no alcohol consumption within 4-6 days, not on medications, without high BP, diabetes or other clinical conditions, and had not previously tried or practiced Laughter Yoga.

Healthy IT Professionals

Base Line Assessment

Control Group

Laughter Yoga Group

No Intervention

Laughter Yoga Sessions

Final Assessment

Participants were divided into two groups.

One group had laughter yoga sessions every 2-3 days for 18 days, while the other group was told they would have laughter yoga sessions later.

Both groups were tested again after the laughter sessions.

The tests.

PHYSIOLOGICAL

- **Autonomic & respiratory variables by Polygraph**

BIOCHEMICAL

- **Salivary Cortisol: early morning test**

PSYCHOLOGICAL

- **PANAS: Positive & Negative Affect Scale**

- **PSS: Perceived Stress Scale**

- **TAS: Toronto Alexythemia Scale**

Tests were carried out by trained technicians and researchers at the company premises.

The Laughter Yoga.

DEEP BREATHING & STRETCHING

Prepares body for laughter yoga exercises.

CLAPPING & CHANTING

Bring out our natural child-like playfulness.

LAUGHTER YOGA

Exercises include elements of role-play and improvisation.

Many are designed to reduce stress and provide tools to deal with future stress more effectively.

Results: Heart Rate

VARIABLES	LAUGHTER YOGA GROUP			CONTROL GROUP		
	PRE	POST	CHANGE	PRE	POST	CHANGE
HEART RATE	82.15 ± 8.56	80.28 ± 8.35	-2.33%	80.28 ± 9.23	80.46 ± 9.80	0.22%
RESPIRATORY RATE	15.58 ± 3.33	16.71 ± 4.03	6.76%	15.58 ± 3.33	16.71 ± 4.03	6.76%
LOW FREQ. (n.u.)	54.79 ± 16.97	54.82 ± 18.10	0.05%	59.58 ± 18.67	58.64 ± 18.16	-1.60%
HIGH FREQ. (n.u.)	45.2 ± 16.97	45.16 ± 18.13	-0.09%	40.41 ± 18.67	41.35 ± 18.16	2.27%
RATIO LOW/HI FREQ.	1.72 ± 1.81	2.06 ± 2.7		2.5 ± 2.41	2.01 ± 1.56	

There was no significant change in low or high frequency HRV.

The group means values ± standard deviations of the autonomic and respiratory variables for laughter yoga and control groups.

After seven sessions over 18 days a downward trend in heart rate is apparent, indicating that heart rate might continue to reduce.

This indicates a relaxation from stress and could also indicate improvement in fitness levels. A longer study is required to further investigate this extremely interesting result.
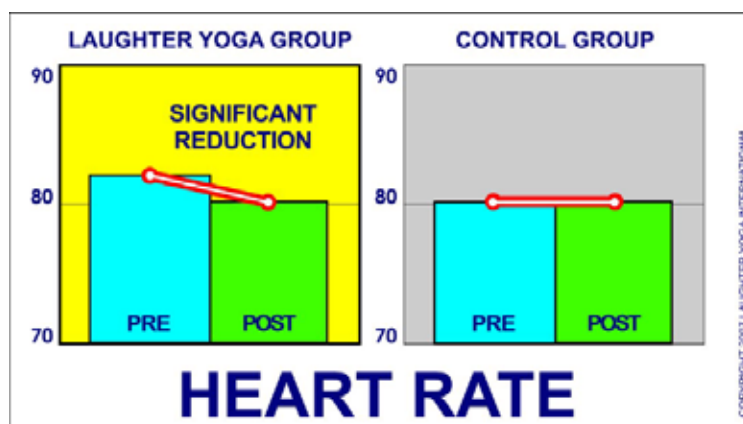
Results: Blood Pressure

BLOOD PRESSURE	LAUGHTER YOGA GROUP	CONTROL GROUP
PRE SYSTOLIC (mm/Hg)	**128.24** ±14.99	**125.89** ±13.13
POST SYSTOLIC (mmHg)	**120.78**[BC] ±14.42	**125.96**[NS] 12.80
CHANGE	**-6.18%**	**0.06%**
PRE DIASTOLIC (mm/Hg)	**82.37** ±9.18	**82.34** ±8.28
POST DIASTOLIC (mm/Hg)	**79.34**[A] ±8.64	**81.81**[NS] ±8.50ns
CHANGE	**-3.82%**	**-0.65%**

Values Mean ± SD
A P < 0.05 Paired t-test pre- compared to post intervention.
B P < 0.001 Paired t-test pre- compared to post intervention.
**C** P< 0.05 Independent t-test comparison between LY and WLC groups.
NS Not significant, mmHg= millimeter of mercury

The 6% reduction in Systolic BP is significant & suggests reduced sympathetic nervous system activity or reduced stress levels.

The 4% reduction in Diastolic BP is also significant and suggests relaxation from stress.

There was no change in the control group.

The significant reductions in BP indicate that Laughter Yoga helps reduce stress and improves ongoing stress management.
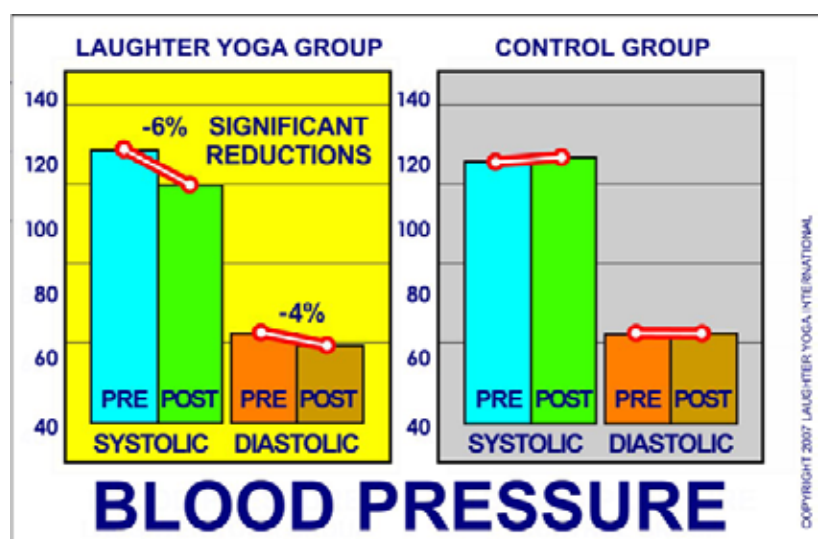
Results: Cortisol

Cortisol is a stress hormone that accurately reflects perceived stress levels. Early morning cortisol levels were measured in both groups before starting and after completing the laughter interventions.

CORTISOL	LAUGHTER YOGA GROUP	CONTROL GROUP
PRE CC$_{(\mu g/dL)}$	0.25 ± 0.14	0.24 ± 0.16
POST CC$_{(\mu g/dL)}$	0.18[A,NS] ± 0.11	0.20 ± 0.12ns
CHANGE	-28% (P<0.001)	-16.6% (P<0.190)

Values Mean ± SD
A P < 0.05 Wilcoxon signed ranks test - pre-compared to post (LY group)
NS Not significant between groups-Mann Whitney test.

There was a 28% reduction in cortisol levels in the Laughter Yoga Group and a less significant change in the control group.
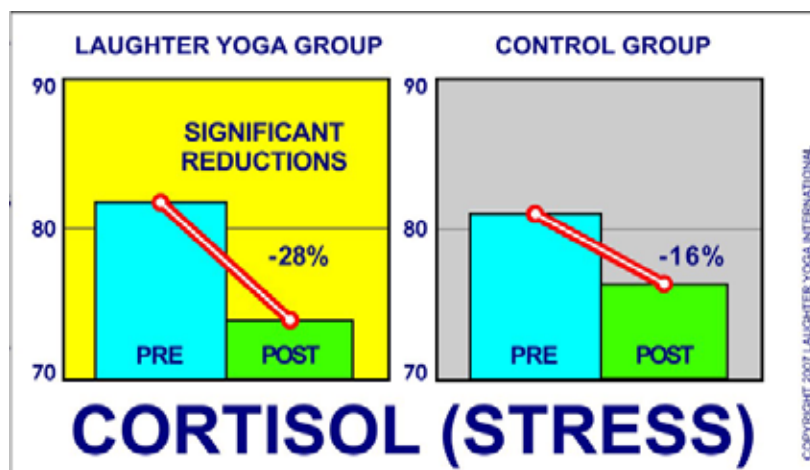
This demonstrates that Laughter Yoga is effective in reducing stress.

Results: PANAS

The PANAS (Positive Affectivity and Negative Affectivity Scale) test assesses the "emotional style" a person uses to cope with events in their life.

PANAS TEST	LAUGHTER YOGA GROUP	CONTROL GROUP
PRE POSITIVE	33.15 ±10.42	30.79 ±9.11
POST POSITIVE	38.87[B] ±9.30	32.64 ±7.69
CHANGE	17.25 %	6.0 %
PRE NEGATIVE	16.59 ±11.93	17.82 ±9.86
POST NEGATIVE	12.07[A,C] ±9.34	17.64 ±11.23
CHANGE	- 27.2 %	1.0 %

Values Mean ± SD
A $P < 0.05$ Paired t-test pre- compared to post
B $P < 0.001$ Paired t-test pre- compared to post
C $P < 0.000$ independent t test comparing LY group and WLC group
NS   Not significant, mmHg= millimeter of mercury

Negative emotions like fear, disappointment, distress, upset, sadness, guilt, nervousness, shame, and misery have decreased by 27% after the Laughter Yoga sessions.

There were no significant changes in the control group.

This strongly indicates that Laughter Yoga removes negative emotions and increases positive emotions. This results in improved communication skills, better workplace motivation and a more positive mental outlook.
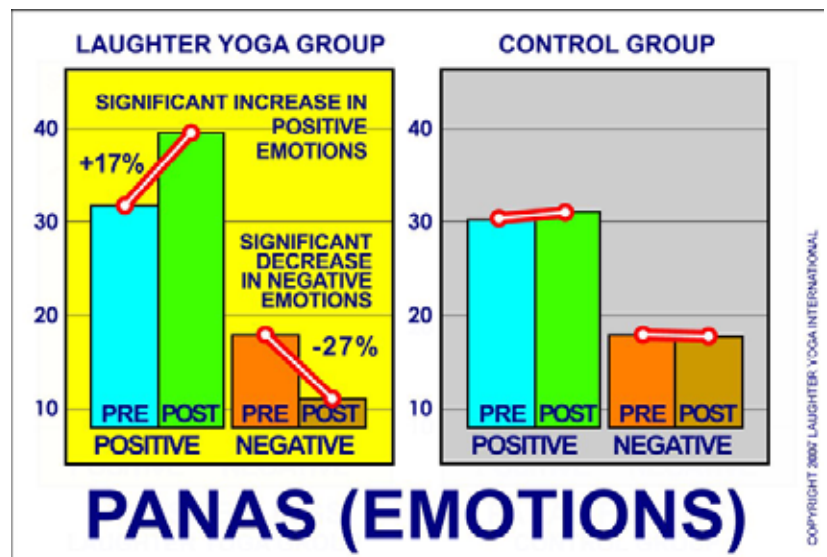
Results: Perceived Stress Scale

**The PSS test measures an individual's perceived stress.**

Both groups were measured before starting and after completing the laughter interventions.

PSS TEST	LAUGHTER YOGA GROUP	CONTROL GROUP
PRE PSS	**17.79** ±6.89	**19.33** ±5.04
POST PSS	**15.80**[A,B] ±5.28	**18.14** ±5.78
CHANGE	**11.1 %**	**6.1 %**

Values Mean ± SD
A   P < 0.05 Paired t-test pre- compared to post
B   P < 0.05 independent t test comparing LY group and WLC group.
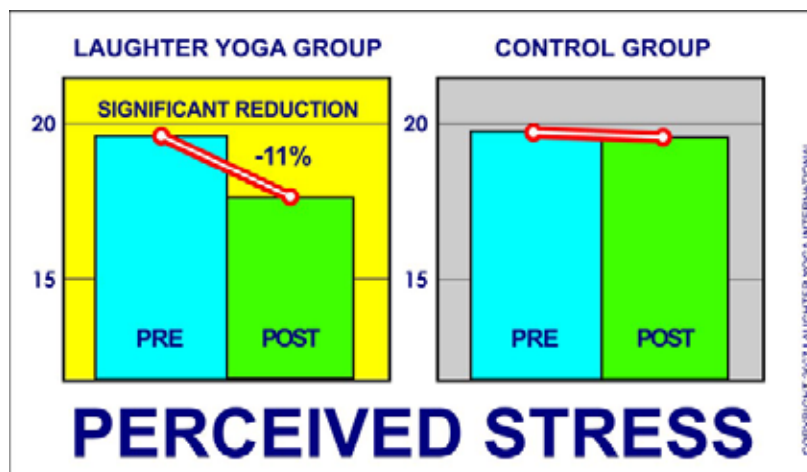
There was an 11% reduction in perceived stress in the Laughter Yoga group, against a small change in the control group.

This indicates significant stress release, and that individuals were now able handle new stressful events better.

Results: Alexithymia

Alexithymia is a serious condition in which people have difficulty in identifying and expressing emotions.

People with a high Alexithymia scale tend to fight with other people frequently, be cold & distant in their behavior, be socially inhibited, experience anxiety in the presence of others, show a lack of initiative, and have difficulty coping with social challenges.

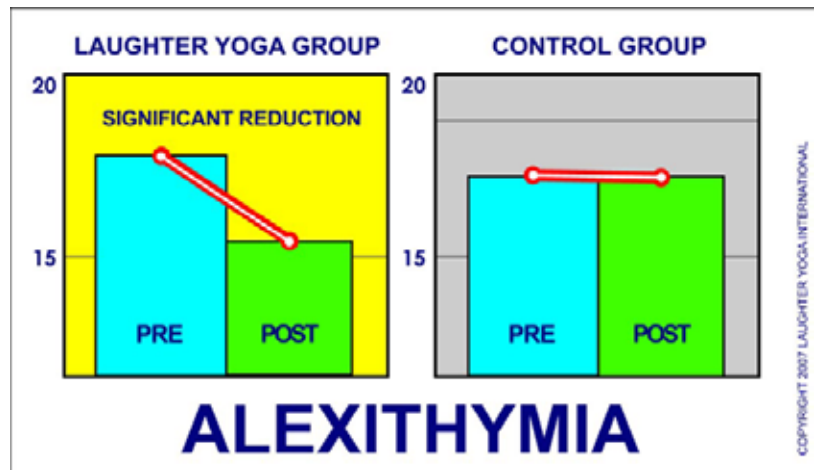| TAS TEST	LAUGHTER YOGA GROUP	CONTROL GROUP
PRE TAS	50 ±13.17	49.25 ±12.35
POST TAS	45.58[A,NS] ±11.20*ns	49.33 ±11.36
CHANGE	-8.84 %	0.16 %

Values Mean ± SD
A $P < 0.05$ Paired t-test pre- compared to post
NS   Not significant between groups
TAS   Toronto Alexithymia Scale

Alexithymia is strongly inverse to 'Emotional Intelligence'.

It reduces empathy, communication skills, creativity and innovation – all skills that are identified as critical for success in the workplace.

Our tests showed a significant 8% decrease in Alexithymia within the Laughter Yoga group after seven sessions against no change in the control group.

Answers: What are the effects of laughter yoga on stress in the workplace?

HEART RATE: Down. Indicates reduced stress.

BLOOD PRESSURE: Down. Indicates lower stress and improved stress management.

CORTISOL: Down. Indicates reduced stress levels.

PANAS TEST: Increase in positive emotions & decrease in negative emotions that will lead to improved work performance.

PSS TEST: Down. Perceived stress is reduced.

TAS TEST: Down. Alexithymia is reduced, Emotional Intelligence is increased.

Conclusion.

There can be no doubt that Laughter Yoga significantly reduces stress levels in the workplace.

Physiological, biochemical, and psychological tests all indicate reductions in stress and improvements in the subjects' abilities to cope with stress. This will result in improved physical and mental health. We observed the Laughter Yoga participants develop of a deep sense of physical, mental and emotional well-being.

Reduced stress is an indicator of wellness of the mind and body, and we would expect to see resulting reductions in illness and disease with corresponding drops in absence and sick leave.

We would also expect Laughter Yoga to result in increased productivity and quality of work, better communication and interpersonal relationships, and a more harmonious workplace.

It is remarkable that such significant changes were found after only seven 20-minute sessions of Laughter Yoga over a short period of time.

Dr. M S Chaya – Principal Investigator

Sponsors.

Special Thanks.

Research Team.

It was a challenge taking our research team and equipment to IT companies across Bangalore and completing scientific research in the field. Thanks to great teamwork it proved an enjoyable experience.

Heartfelt thanks to Dr. Madan Kataria, Dr. H R Nagendra, Dr. Nagarathna, the team, companies, Laughter Yoga leaders and participants for their help and support.

We hope to continue with longer studies to discover how the changes shown in this study continue over longer periods.

Dr M S Chaya – Principal Investigator

The SVYASA University research team further included:

Dr N K Manjunath	*Sri Vinod Kumar*
Dr Rao Raghavendra	*Sri Rajesh*
Dr Vadiraj	*Sri Pawan*
Dr Sudha Rani Shenoy	*Kumari Sneha Shekar*
Sri Gopal Krishna	*Sister Jija Shantha*
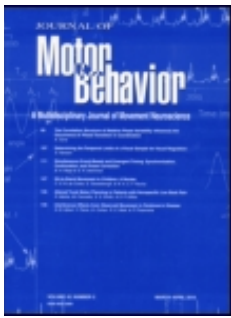
Laughing: A Demanding Exercise for Trunk Muscles

Heiko Wagner , Ulrich Rehmes , Daniel Kohle & Christian Puta

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Laughing: A Demanding Exercise for Trunk Muscles

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ABSTRACT. Social, psychological, and physiological studies have provided evidence indicating that laughter imposes an increased demand on trunk muscles. It was the aim of this study to quantify the activation of trunk muscles during laughter yoga in comparison with crunch and back lifting exercises regarding the mean trunk muscle activity. Muscular activity during laughter yoga exercises was measured by surface electromyography of 5 trunk muscles. The activation level of internal oblique muscle during laughter yoga is higher compared to the traditional exercises. The multifidus, erector spinae, and rectus abdominis muscles were nearly half activated during laughter yoga, while the activation of the external oblique muscle was comparable with the crunch and back lifting exercises. Our results indicate that laughter yoga has a positive effect on trunk muscle activation. Thus, laughter seems to be a good activator of trunk muscles, but further research is required whether laughter yoga is a good exercise to improve neuromuscular recruitment patterns for spine stability.

Keywords: laughing, motor control, EMG, Exercise, muscles, trunk

Laughing is one of the basic capacities that sets humans apart from most animals (Askenasy, 1987). Laughter has been investigated concerning social, psychological as well as physiological aspects (e.g., the positive effects on the hormonal, pulmonary, and cardiovascular systems; Askenasy, 1987; Bennett & Lengacher, 2008; Filippelli et al., 2001; Miller & Fry, 2009) and the muscular activity of facial and laryngeal muscles (Bloch, Lemeignan, & Aguilera, 1991; Hoit, Plassman, Lansing, & Hixon, 1988; Luschei, Ramig, Finnegan, Baker, & Smith, 2006). To our knowledge, there are no studies that investigated the trunk muscle activations during laughter.

Given that the local and global trunk muscles have a stabilizing effect on the spine (Bergmark, 1989; El-Rich, Shirazi-Adl, & Arjmand, 2004; Gardner-Morse & Stokes, 1998; Granata & Wilson, 2001; Grenier & McGill, 2007; Kavcic, Grenier, & McGill, 2004a; Liebetrau, Puta, Anders, de Lussanet, & Wagner, 2013; McGill, Grenier, Kavcic, & Cholewicki, 2003; Panjabi, 1992a; 1992b; Richardson, Jull, Hodges, & Hides, 1999; Wagner et al., 2005; Wagner, Liebetrau, Schinowski, Wulf, & de Lussanet, 2012), we expect that laughing may be beneficial to stimulate trunk muscles during physiotherapy and rehabilitation especially in cases where traditional exercises can not be applied (e.g., due to physical handicaps).

For a scientific investigation of laughter, a standardized exercise was necessary where laughing can be stimulated reliably. Based on the scientific research in gelotology (the science of laughter), laughter yoga was invented as a method to attain an authentic laughing through artificial laughing exercises, under the aphorism "Fake it until you make it!"

The aim of this study was to quantify the activation of trunk muscles during laughter yoga in comparison to crunch and back lifting exercises regarding the mean levels of trunk muscle activity.

Method

Participants

Seven male and seven female students participated in this study, with an average age of 24.9 ± 1.3 years and an average body mass index of 21.5 ± 2.5 kg/m^2. Average weight and body height was 66 ± 12.19 kg and 174.3 ± 7.4 cm, respectively. Prior to the study, all participants gave written informed consent.

Laughter Yoga

Because laughter yoga should be performed in groups, additional subjects attended the sessions, when the subjects were recorded. During the laughter yoga recording session, several different standardized laughter exercises were performed. For statistical analysis, the climax laughter exercises were chosen because here laughing increases gradually from lowest to strongest level. All attendees stood in a circle and after a deep intake of breath everybody started to laugh. This exercise was divided into five levels, growing from one to five, while level five was selected for statistical analysis. Laughing yoga was compared with five traditional trunk stabilization exercises (i.e., forearm bridge, side bridge, back-lifting, abdominal curl, back-lifting, and abdominal crunch).

Crunch and Back-Lifting Exercises

To evaluate muscular activation, traditional low back stabilization exercises were used as references, which have become a standard therapy in rehabilitation and prophylactic care (Kavcic et al., 2004a, 2004b; Stevans & Hall, 1998). For statistical analysis, the symmetric abdominal crunch and the back-lifting exercise were chosen as references for the abdominal and back muscles because they showed the highest muscular activations of the five traditional exercises.

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Experimental Setup

During the experiment one or two subjects performed stabilization exercises and laughter yoga successively, while the sequence was randomized. The five stabilization exercises were performed in the same order, three times for 10 s each, with a break of 10 s between each exercise.

Surface Electromyography

The muscular activation during laughter yoga and the traditional exercises was measured by surface electromyography (SEMG; Biovision, Wehrheim, Germany; 5–700 Hz, AD conversion rate 2000 Hz, gain 2500; Superlogics, Natick, MA, PCM12 Card: 12-bit, 16 channels) from three abdominal muscles (cf. Table 1; rectus abdominis [RA], obliquus internus abdominis [OI], obliquus externus abdominis [OE]) and two back muscles (cf. Table 1; erector spinae pars longissimus [ES], multifidus pars lumbalis superficial [MF]).

Intervals of 10 s for each stabilization and laughter exercise and each muscle were analyzed and displayed by MATLAB (The Mathworks, Natick, MA). The raw surface electromyography data were centered by subtracting the mean over each trial followed by rectification and smoothing using a moving average filter with a window size of 100 ms. For statistical analysis, the average activations for each muscle and exercise interval were calculated.

Data Evaluation

According to our aim, we tested for significant differences for the level of muscle activation between laughter yoga and classical exercises. Using the average rectified filtered SEMG levels, repeated measures analyses of variance (ANOVAs) were calculated. The ANOVAs for trunk muscles were performed separately for the abdominal and back muscles. For the abdominal muscles, we used the within-subject factors exercise (abdominal crunch, climax laughter yoga level 5) and muscle (RA, OI, OE). For the back muscles, a similar ANOVA with the within-subjects factor exercise

(back-lifting, climax laughter level 5) and muscle (ES, MF) were used. Results were corrected for violations of sphericity using the Greenhouse-Geisser approach for ε-correction of degrees of freedom. Post hoc analyses were performed using Duncan's post hoc test (abdominal muscles) and multiple t tests corrected for multiple comparisons (paraspinal muscles).

Results

Abdominal Muscles

Figure 1 shows the average rectified filtered SEMG levels. The ANOVA did not reveal a significant main effect of the factor Exercise, $F(1, 13) = 0.48$, $p = .5$. The main effect of factor muscles was significant, $F(2, 26) = 4.83$, $p = .021$, $\varepsilon = .9$. The main effect of the factor muscle resulted from the significant higher activation for the OI in comparison to the RA (Duncan post hoc test: $p = .006$). Furthermore, there was a significant interaction between exercise and muscle, $F(2, 26) = 5.6$, $p = .025$, $\varepsilon = .6$ (Figure 1A). Duncan's post hoc test revealed that the intensity of the RA during laughter yoga was lower than during abdominal crunch ($p = .03$), but still reached 45%. There were no significant differences between the abdominal crunch and the intensive laughter yoga exercise for the activation of OE ($p = .5$). Remarkably, the mean activation of OI during intense laughter yoga exceeded the activation during abdominal crunch by more than 150%. This latter finding was marginally significant ($p = .05$).

Paraspinal Muscles

The ANOVA revealed a significant main effect of the factor exercise, $F(1, 13) = 40.5$, $p < .0001$. For the paraspinal muscles (MF and ES) the activation during laughter yoga reached 48% compared with the back-lifting exercise for both back muscles separately. There was no main effect of the factor muscle, $F(1, 13) = 0.99$, $p = .3$, and no significant interaction between exercise and muscle, $F(1, 13) = 0.01$, $p = .9$. However, when ES and MF SEMG was analyzed separately,

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TABLE 1. Electrode Placement for Surface Electromyography

Muscle	Electrode position and orientation
M. rectus abdominis (upper part, RA)	4 cm lateral navel, caudal electrode at navel level, vertical
M. obliquus internus abdominis (OI)	1 cm medial to inguinal ligament, along horizontal line between both anterior superior iliac spines
M. obliquus externus abdominis (OE)	Cranial electrode directly below most inferior point of costal margin, on line to opposite pubic tubercle
M. multifidus (lumbalis, MF)	Caudal electrode at L_4 level, 1 cm medial from line between posterior superior iliac spine and 1st lumbar palpable spinous process, parallel to line
M. erector spinae (longissimus, ES)	Approx. 3 cm lateral midline over palpable bulge of muscle, lower electrode at L_1 level, vertical

Sources. Hermens et al., 1999; Ng, Kippers, & Richardson, 1998.

FIGURE 1. Average rectified filtered SEMG levels of abdominal (**A**) and paraspinal muscles (**B**) during a traditional stabilization exercise (crunch and back lifting) and climax laughter yoga (level 5). Vertical bars show 95% confidence intervals. Significant differences are marked: $^*p \le .05$; $^{***}p < .001$. RA = m. rectus abdominis; OE = m. obliquus externus abdominis; OI = m. obliquus internus abdominis; ES = m. erector spinae; MF = m. multifidus pars lumbalis superficialis.

SEMG levels for the back lifting exercise were greater than laughter yoga (*t* tests corrected for multiple comparisons; significance level was set on $p = .0125$: MF, $p < .0001$; ES, $p < .0001$; see Figure 1B).

Discussion

The aim of this study was to quantify the trunk muscle activation during laughter yoga in comparison to the levels of activity reached by conventional training exercises (crunch and back lifting) regarding the mean levels of trunk muscle activity. Our results show that the overall mean activity of the measured trunk muscles during the highest intensity of laughter yoga was comparable to that during traditional exercises. Remarkably, the mean activation of OI during intense laughter yoga exceeded the activation during abdominal crunch by more than 150%.

As stated in the introduction, laughter has many positive physiological and psychological side effects and is generally a pleasant activity, so it may have potential as a trunk muscle exercise (Cholewicki and vanVliet, 2002). However, laughter yoga is a very different kind of exercise than the traditional abdominal crunch and back-lifting movements. For example, the higher activity of the OI during laughter yoga compared to stability exercises may be an indication of the specific breathing-related aspect during laughter yoga. Another striking difference is the nature of muscular control. Whereas the traditional exercises are controlled in a cognitive manner, the laughter yoga exercises enable a high degree of internal, self-organized muscular control. However, it may be expected that the stronger emphasis of self-organization may be advantageous if the goal is to focus on neuromuscular contributions to spinal stability (Liebetrau, et al., 2012; van Dieën, Selen, & Cholewicki, 2003; van Dieën, Cholewicki, & Radebold; 2003). The presence or absence of muscular coactivation has influence on spinal stability (Reeves & Cholewicki, 2003; Zeinali-Davarani, Hemami, Barin, Shirazi-Adl, & Parnianpour, 2008).

Laughter yoga seems to be associated with the presence of the co-activation for abdominal and back muscles (Figure 2). This is exemplified by a detailed look at an exemplary 10-s interval during one of the tests. The recorded SEMG traces indicate that a qualitative difference may exist between the activation characteristics. Typically SEMG activation characteristic was a slow change in the activation during the abdominal crunch and the back lifting, whereas the laughter yoga exercises were typically modulated at higher frequencies showing an irregular, phasic pattern (Figure 2). Whereas the traditional physical exercises evoke highly regular and stereotypical muscular activities the patterns recorded during the laughter yoga are rhythmic at higher frequencies and much less stereotypical. Given this difference in activation characteristics and given the different relative mean activation between the performed exercises it will be interesting to test whether the laughter yoga training might have lasting influences on motor control, such as spinal stability. However, in the sense of the movement characteristics, the exercises used in the present study are not optimally comparable, because of the differences in rhythmic characteristics. Instead, if interested in investigating the frequency characteristics, other exercises may be better suited for comparisons to laughter yoga exercises, such as the cyclic upper body movements caused by an oscillating might pole (Anders, Wenzel, & Scholle, 2008; Moreside, Vera-Garcia, & McGill, 2007).

The potential therapeutic value (Granacher, Gollhofer, Hortobágyi, Kressig, & Muehlbauer, 2013; Navalgund, Buford, Briggs, & Givens, 2013) must be investigated in more detail. In this respect the present study is to be regarded as a preliminary result. We expect that further research have promising potential, given the very different activation patterns that occur during the laughter yoga and traditional exercises.

Our results indicate that a positive effect of laughter yoga may exist for quantitative and qualitative trunk muscle
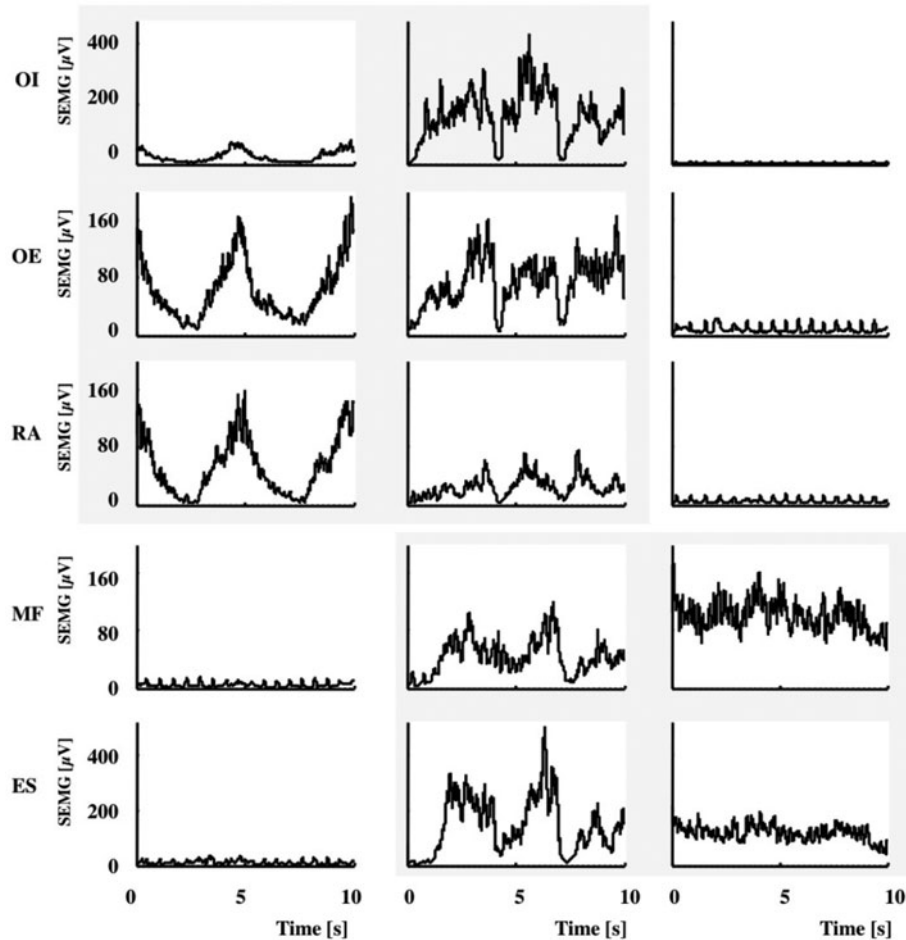
FIGURE 2. Exemplary trials of a representative subject produced by stabilising exercises and laughter yoga, showing SEMG activity from the abdominal (RA = m. rectus abdominis; OE = m. obliquus externus abdominis; OI = m. obliquus internus abdominis) and paraspinal muscles (ES = m. erector spinae; MF = m. multifidus pars lumbalis superficialis). Note the qualitative differences in the muscle activation characteristics.

activation besides the many positive social, psychological and hormonal effects that have been reported in the literature. Laughter yoga seems to be a good activator of muscles, but not necessarily a good exercise for neuro-musculo-skeletal problems in spine, spine stability, or for improving neuro-muscular recruitment patterns. This requires further research.

The specific and typical activation of trunk muscles that we found during laughter evoked by laughter yoga might enable young and old people irrespective of their liking of physical and sports exercises to engender in regular trunk muscle activity.

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The impact of laughter yoga
on subjective well-being:
A pilot study

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Abstract

Laughter has been associated with a number of physiological and psychological benefits. Laughter yoga (LY) is a contemporary technique that encourages participants to mimic the act of laughing, with the goal of achieving positive psychological outcomes. This paper describes an exploratory pilot study to evaluate the effect of a single LY class on the psychological well-being of people who attended such sessions voluntarily. Forty-four participants (72.7% female, Mean age = 58.86, SD = 14.12) were recruited from LY clubs around Melbourne, Australia, and completed measures of well-being were taken before and after the LY class. Following the LY session, significant improvements in positive emotions and reductions in the severity of symptoms of anxiety and stress were reported. Importantly, the change in well-being was greatest for participants who were experiencing lower well-being prior to the class. These findings suggest that LY shows promise as an effective intervention to temporarily increase well-being.

Keywords: subjective well-being; laughter yoga; mood.

1. Introduction

Laughter, in its basic form, is a psychophysiological response to a stimulus that leads to the production of muscle contractions, facial expressions, and other neurophysiological processes (Bennett & Lengacher 2008; Mora-Ripoll 2010; Mora-Ripoll & Garcia-Rodera 2008). In her review of the benefits of laughter, Mora-Ripoll (2010) concluded that the physiological benefits include improved respiration, general muscle relaxation, and enhanced mental functioning. The physiological changes were accompanied by psychological benefits, including increased positive mood and decreased stress.

Typically, laughter has been investigated in terms of its ability to reduce negative emotions like anxiety, stress and depression (Houston, McKee, Carroll & Marsh 1998; Mora-Ripoll 2010; Papousek & Schulter 2008; Shahidi et al. 2011). This property was used to propose a stress-buffering hypothesis by Kuiper & Martin (1998), following their revelation that individuals who reported more frequent laughter experienced less negative affect during stress. In confirmation, Ko & Youn (2011) reported that laughter therapy reduced depressive symptoms and increased sleep quality in a group of elderly people with high rates of depressive vulnerability.

In addition to reducing negative emotions, unsurprisingly, laughing also increases positive emotions (Mannell & McMahon 1982) more than simply smiling (Neuhoff & Schaefer 2002). In his review of the functions of laughter, Askenasy (1987) noted that, while laughing, a person feels free from their cares and worries and experiences prevailing joy. For people who experience more frequent bad moods, laughing may be a good technique to alleviate their negative emotions and restore their well-being to a 'happier' state. Although people in bad moods may not feel as if they have reason to laugh, there is emerging evidence that the laughter does not have to be genuine to elicit positive effects.

In one study, Neuhoff & Schaefer (2002) instructed participants to either laugh, smile, or howl for one minute, and measured their mood before and after each intervention. Their findings revealed that forced laughter enhanced mood more than either forced smiling or howling. In a subsequent study, Papousek & Schulter (2008) used the principles of conditioning to promote Cheerfulness training. Through this intervention, annoying or unpleasant experiences were paired with induced cheerful mood to reduce the adverse effects and encourage re-association with positivity. This study was unique as it provided a therapeutic behavioural framework by which to explain how the induction of positive emotions is effective.

Most recently, Ko & Youn (2011) conducted a laughter therapy programme with community-dwelling elderly people in South Korea. The initial laughter therapy session followed a sequence of relaxation, laughing, clapping, and laughter meditation, and subsequent sessions included dancing and singing to encourage laughter, as well as other laughter exercises. Mean depression scores were reduced for the laughter therapy group following the intervention, whereas no change was evident for the control group. Though the change in depression scores for the laughter therapy group achieved statistical significance, the reduction was just a single point on a 15-point scale. It should also be noted that the depression scores of both groups were elevated at baseline and so the effect of laughter therapy may only apply to those already experiencing low mood levels. Together, these findings provide evidence that forced laughter may be effective at improving positive mood, particularly for those who may be experiencing a reduction in such mood initially.

Laughter yoga (LY) is a specific type of laughter therapy that was developed in India in 1999 by Dr Madan Kataria, and is predicated upon the proposition that simulated laughter can elicit the same physiological and psychological benefits as authentic laughter. Thus, similar to the laughter therapy used in Ko & Youn's (2011) study, people who cannot achieve genuine laughter may benefit by mimicing the overt behaviour of laughter.

In confirmation of this proposition, the few available studies show LY to be promising as a form of therapy. A 2011 study revealed that elderly depressed women who engaged in LY reported increased life satisfaction compared to exercise therapy and control groups, though they failed to show a significant reduction in depressive symptoms (Shahidi et al. 2011). In other recent studies, patients awaiting organ transplants reported increased feelings of activation and cheerfulness following an LY intervention compared to a control group (Dolgoff-Kaspar et al. 2012), while a South African study of stroke survivours reported increased positive emotions following LY (Suraj-Narayan & Surajnarayan 2011). Similar

findings have been reported in an organisational context. Employees who completed 15 sessions of laughter yoga reported significant improvements in perceived self-efficacy in the workplace, and experienced sustained positive emotions at a 90-day follow-up (Beckman, Regier & Young 2007).

While these results provide evidence to support the use of laughter yoga as a psychological intervention, they have focused largely on clinical samples and have generally neglected to provide a theoretical framework by which to understand how LY can be an effective agent of change. Further, with the increased adoption of LY in mainstream society, no study has as yet explored the effects of LY for people who attend LY clubs at their own general interest and leisure. The present study seeks to explore the effects of LY in a non-clinical, self-selected sample, and provide a theoretical foundation to explain how LY affects well-being. With this understanding, the benefits of LY for well-being may inform future, larger-scale studies.

The homeostasis theory of subjective well-being (Cummins 2010) offers a sound framework within which to explore the effects of laughter yoga on both positive and negative emotions. Subjective well-being (SWB) refers to an individual's perception of the quality of their life, and is primarily driven by an underlying positive and stable, trait-like mood (Cummins 2010). Accordingly, the capacity of laughter yoga to affect subjective well-being is best understood as being a by-product of its influence on positive mood.

Specifically, homeostasis theory holds that SWB is generally held stable and maintained by bio-psychological mechanisms, analogous to the way that body temperature is managed by autonomic systems. As such, there is a normal level of SWB for each person that defines their set-point, and people only become consciously aware of their well-being when some external stressor threatens the system. Using data collected over a period of 12 years, the normative range for sample mean scores for SWB in Australia is found between 73.6 to 76.6 points on a 0-100 point scale (Cummins et al. 2012).

A key implication of homeostasis theory is that there is a 'ceiling effect', whereby SWB cannot chronically be raised above an individual's set-point-range. Accordingly, the effect of laughter yoga on SWB should be greater for those with SWB scores found below the normal range, when compared to those who are at normal functioning levels. A second implication is that if people function below their normal range, they are more likely to seek ways to increase their well-being than are people with normal functioning. Quite simply, there is no need for those already functioning as normal to enhance their well-being. Following this logic, one reason why people may frequent laughter yoga classes in their spare time could be because they function below the normal range of well-being and are seeking resolution to a happier state.

Based on this theoretical framework, the purpose of this study was to examine the effects of a laughter yoga class on SWB. Given the high prevalence rates of depression and anxiety in Australia, an easily accessible and cost-effective intervention that has the potential to reduce negative emotions and increase positive emotions would be highly desirable. As a pilot study, the findings of this research have the potential to inform larger studies, by providing a basis for understanding how laughter yoga affects SWB. It was hypothesised that participants who attended laughter yoga clubs would be functioning at lower levels of well-being than the general Australian population before their participation in the LY class. It was also hypothesised that LY would be associated with increases in positive emotions, and reductions in negative emotions. Finally, it was hypothesised that the change in SWB would be greater for those initially functioning below the normal well-being range.

2. Method

2.1 Participants

A sample of 44 participants was recruited from seven different Laughter Yoga clubs around Melbourne. Preliminary analyses revealed no differences in initial or subsequent well-being scores based upon which LY club participants attended. The participants ranged in age from 18-87, with a mean age of 58.86 (SD = 14.12). Most were female (72.7%).

A comparative sample of 44 participants was randomly extracted from the 23rd longitudinal survey of the Australian Unity Well-being Index (Cummins & Weinberg 2012). This sample was of comparative age (Mean = 59.50, SD = 13.85) though it contained a more even spread of males (47.7%) to females (52.3%). Since there was no evidence of gender differences for the well-being variables in the data file of origin, the sample was considered an appropriate comparison group.

2.2 Materials

Participants completed a questionnaire that included scales to measure general life satisfaction, subjective well-being, and general positive mood. Negative emotions as depressed mood, stress, and anxiety were also included. In addition, demographic information was collected as part of the Time 1 questionnaire.

General Life Satisfaction (GLS): GLS was measured by the single item "How satisfied are you with your life as a whole?". Participants rated their level of satisfaction on an 11-point scale anchored by the terms "Not satisfied at all" to "Completely satisfied".

Subjective Well-being (SWB): SWB was assessed using the Personal Well-being Index (PWI; IWBG 2006), a seven-item measure that approximates general life satisfaction. The seven items represent sub-domains of life as standard of living, health, achieving in life, relationships, personal safety, community connectedness, and future security. Each domain contributes unique statistical variance when regressed against GLS. Participants used the same response scale as for GLS. The PWI has strong psychometric properties and the IWBG report adequate test-retest reliability with Cronbach's alpha ranging between .70 and .85. Convergent validity has also been established with the Satisfaction with Life Scale (Diener, Emmons, Larsen & Griffin 1985), giving a correlation of .78 (IWBG 2006).

Mood: General positive mood was measured by asking participants how happy, content, and alert they generally feel on an end-defined 11-point scale from 0 (not at all) to 10 (extremely). These three affective adjectives were selected following findings that showed the terms happy, content, and alert explained in excess of 59% of variation in SWB and, thus, best represent HPMood, the type of mood that underlies evaluations of Subjective Well-being (Davern, Cummins & Stokes 2007; Blore, Stokes, Mellor, Firth & Cummins 2011). Responses to these three items were summed together to obtain an overall HPMood score.

Depression, Anxiety, Stress: The Depression Anxiety Stress Scale (DASS) was used to assess self-reported depressed mood, anxiety and stress. The DASS has demonstrated adequate psychometric properties with the scale authors reporting Cronbach's alpha for the subscales ranging from .84 to .91. Participants rated how much each statement applied to them on an 11-point scale ranging from "Not at all" to "Extremely".

2.3 Procedure

Participants in Laughter Yoga clubs were approached during one of their weekly classes and invited to participate in the study. The nature of the study was explained to them and their

confidentiality was assured. Members of the research team returned to the LY club the following week and distributed the initial questionnaire for completion prior to the class (Time 1). Participants were instructed to generate a unique code to ensure anonymity but enable their responses to be matched across the different time points. The Time 2 questionnaire was distributed immediately after the end of the Laughter Yoga class and the questionnaires were returned directly to the research team member upon completion.

The intervention followed the standard structure of a Laughter Yoga session, which involves repetition of three key components: During the 'Laugh' phase, the instructor guides participants through activities to simulate laughter. At the beginning of the session, this usually involves a greeting laugh, whereby participants greet each other by shaking hands and laughing while maintaining eye contact. Following this introduction, the 'Laugh' phase can involve different types of laughing, like the "lion laugh", the "telephone laugh" or the "eating breakfast laugh". In the 'Clap' phase of the class, participants pause to repeat the Laughter Yoga mantra of "Ho, ho, ha, ha, ha" while clapping in rhythm. This is followed by the 'Breathe' phase, where participants focus on relaxing and regulating their breathing. Although laughter games and the time spent in each phase can vary class by class, the 'Laugh, Clap, Breathe' structure is common to all sessions. Each session was 30 minutes in duration.

2.4 Data cleaning and preparation

Data were screened through SPSS Version 21 and checked for missing values. Cases were only included in analyses if they recorded data at both time points. Within each time point, missing values for individual scale items were found to be random and cases were excluded pair-wise where appropriate, following Pallant (2007). Data were screened for outliers at each time point.

One participant recorded the maximum possible score for SWB and HPMood. This was suggestive of an acquiescent response style and the case was removed from the data set prior to analyses. All scores were converted to percentage of Scale Maximum scores (%SM) as described in the PWI manual. This procedure transforms all results to lie on a 0-100 point scale.

3. Results

To test the first hypothesis, i.e. that participants who attended Laughter Yoga clubs of their own interest would be functioning at a lower level than the general Australian population, measures captured at Time 1 were compared to a random sample of 44 participants extracted from the 23rd longitudinal survey of the Australian Unity Well-being Index (Cummins & Weinberg 2012). Within this sample, one participant was identified as having outlying scores on multiple variables, and was excluded from analyses. Comparative data were available for all of the well-being variables, and results are shown in Table 1.

Table 1. Comparison of well-being variables between LY club participants (at Time 1) and a general Australian sample

	LY Clubs @ Time 1		General Australian pop.			
Variable	Mean	SD	Mean	SD	Comparison	Effect size (d)
GLS	68.60	21.56	78.57	14.24	t(73) = 2.521, p=.014	.55

SWB	71.95	17.17	76.55	14.34	t(80) = 1.317, p=.192	.29
HPMood	70.00	19.59	75.35	15.19	t(84) = 1.415, p=.161	.31
Depression	25.02	22.85	14.29	19.09	t(84) = 2.365, p=.020	.51
Anxiety	20.16	18.19	11.03	16.04	t(83) = 2.456, p=.016	.53
Stress	35.23	25.26	22.56	17.47	t(71) = 2.661, p=.010	.58

The figures in Table 1 reveal that the participants who frequented LY clubs reported lower general life satisfaction, with a GLS score of 68.60 being well below the normative range of 76.02 to 79.24 points (Table A2.21, Cummins et al. 2012). Similarly, their SWB score of 71.95 was well below the normal range of 73.78 to 76.68 points. The comparison sample, on the other hand, had a mean score on both variables that lay within their respective normal ranges. Although the difference between groups for SWB and HPMood was not large enough to achieve statistical significance, the small to medium effect size reported indicates that these trends would likely achieve significance in a larger sample (Cohen 1988).

The LY group members also had higher rates of negative emotions (depressed mood, anxiety, and stress) than the general Australian sample. The effect size was highest for the difference in stress levels between the two samples.

The DASS Manual (Lovibond & Lovibond 1995) provides suggested cut-off scores for diagnoses of levels of each of depression, anxiety, and stress. These are based on scores out of a possible 42, and following conversion to percentage of scale maximum scores, the LY group in this study fall within the 'mild' categories on each construct. The general Australian sample, on the other hand, is considered 'normal' by these cut-off scores.

To test the second hypothesis, i.e. that participation in a Laughter Yoga class would be associated with increases in SWB and decreases in negative emotions, repeated-measures t-tests were conducted to compare scores at Time 1 and Time 2 for LY participants.

Table 2. Comparison of well-being variables pre- and post-LY class

	Time 1		Time 2			
Variable	*Mean*	*SD*	*Mean*	*SD*	*Comparison*	*Effect size (d)*
GLS	68.60	21.56	77.21	16.08	t(42) = 3.873, p=.000	.40
SWB	71.93	17.39	77.96	12.14	t(39) = 3.437, p=.001	.35
HPMood	70.00	19.59	75.12	18.39	t(42) = 2.159, p=.037	.26
Depression	23.87	22.40	22.86	20.30	t(40) = .556, p=.581	.05
Stress	35.68	25.42	30.61	24.01	t(39) = 2.347, p=.024	.20
Anxiety	20.23	18.41	16.41	16.61	t(40) = 2.440, p=.019	.21

Table 2 reveals that participation in a Laughter Yoga class was associated with an immediate improvement in general life satisfaction and subjective well-being. The value for GLS now fell within the normal range, while SWB was above its normal range. While statistically

significant changes were also apparent in mood, stress, and anxiety, these levels of significance are marginal after the application of a Bonferroni correction. The largest effect was apparent for general life satisfaction, and there was no effect of LY to reduce symptoms of depression.

To determine whether participation in Laughter Yoga classes would be more beneficial for participants who reported lower levels of SWB, participants were split according to their SWB scores at Time 1. A cut-off score of 75.00 was used to split the sample into 2 groups, as 75.00 is the mean score for the Australian population (Cummins et al. 2012). A change score for SWB was computed as the Time 2 score minus the Time 1 score. Comparison of the change scores for each group revealed that the magnitude of change was significantly greater for participants initially reporting lower SWB (M = 10.29, SD = 13.67) than participants who were functioning within the normal range (M = 1.79, SD = 5.32), $t(25)$ = 2.592, p<.05.

An indicator of reliability change is useful, in this instance, to provide an indication as to whether the change in SWB scores is practically significant beyond what may be due to unreliability of the measure. The Reliability Change Index (Jacobson & Truax 1991) was calculated; it revealed that over a third of participants in the study achieved a change in SWB score larger than two standard deviations. Further, four times as many participants who achieved a reliable change reported SWB scores below 75 at Time 1. These results provide preliminary evidence to support the effectiveness of laughter yoga as a form of therapy to increase SWB for those whose SWB is below the normal range, but require validation in a larger study.

4. Discussion

Grounded within homeostasis theory, the present study aimed to explore the effects of Laughter Yoga (LY) on Subjective Well-being (SWB) to guide future research in this area. Given the small sample size and absence of a genuine control group, the interpretations made herein are only suggestive, and all findings require further testing and validation before they can be generalised to a wider sample.

Prior to the start of the LY session, it was observed that individuals who attended the LY classes were found to report levels of General Life Satisfaction (GLS) and SWB below normative ranges for the Australian population and to also have higher levels of depression, anxiety, and stress. These findings lend support to the implications of homeostasis theory (Cummins 2010), and the notion that people functioning below the normal range of well-being are more likely to be aware of their affective state, and actively seek out opportunities to improve their well-being.

Following the conclusion of the single LY session, there were improvements in SWB and GLS scores. Mood also increased, though not to the same extent. The finding that positive emotions increase following an induced laughter intervention is consistent with previous research (Dolgoff-Kaspar et al. 2012; Suraj-Narayan & Surajnarayan 2011; Beckman, Regier & Young 2007). Specifically, the increased GLS is consistent with the findings of Shahidi et al. (2011) who found that elderly participants diagnosed with depression also reported increases in GLS. The present study extended these findings, and indicated that a single LY session is associated with increased GLS even for people who are functioning below normal, but have not achieved diagnostic levels of psychopathology.

Following the single LY class, anxiety and stress scores were reduced from mild severity ratings to the normal range based on suggested DASS classifications (Lovibond & Lovibond 1995). However, depression levels remained in the mild range. The statistically significant reduction in anxiety and stress symptoms post-LY may have been related to

physiological changes associated with laughter. The muscle relaxation, reduced heart rate, and improved circulation associated with the induction of laughter (Mora-Ripoll 2010), may have alleviated the somatic symptoms associated with anxiety and stress. Depression, however, is not only characterised by low mood but is also associated with maladaptive cognitions, anhedonia and inertia (Lovibond & Lovibond 1995). As such, although inducing laughter may have the capacity to facilitate improvements in affective states, it may be insufficient to address the cognitive dysfunction and other symptoms that typify depression.

The final hypothesis, i.e. that larger increases in SWB would be observed for participants initially functioning below the normal level, was also supported. The increase in scores on SWB for participants who scored below the 'gold-standard' of 75.00 prior to the LY class was five times higher than for those who were already functioning above 75.00. Further, the change scores for participants who reported SWB below 75.00 reached the clinical reliability standard much more frequently than for those who reported SWB at or above the gold-standard at Time 1. This finding lends support to homeostasis theory (Cummins 2010), and is suggestive of important practical implications for the effectiveness of programmes intended to increase SWB. There appears to be a ceiling effect for SWB. As such, the findings of this study suggest that interventions aimed at improving SWB will be most advantageous for people who are functioning below the optimal level, and are in need of assistance to regain normal functioning. Those people who are operating within the normal range will experience little benefit. This is an important caveat for positive psychology interventions as the potential for increased well-being is not universal. The effectiveness of interventions to consistently increase SWB warrants further investigation with larger samples that include clinical and non-clinical participant groups.

While this study has provided interesting information, its usefulness would be enhanced by longer-term investigations that evaluated the changes in SWB over time. Certainly, of interest would be the duration of the positive effects following LY sessions. In the present study, participants were not attending their LY class for the first time and, thus, the Time 1 score is not a true indicator of baseline functioning. In fact, it implies that the effect of LY is not long-lasting, as participants returning for subsequent classes report lower SWB scores than they did following the LY class. In addition, the present study was unable to control the exact structure of each LY class, so the intervention administered at each location was not identical. It is plausible that there might be some aspects of LY that are more conducive to improving well-being, but were not practised routinely in each different class.

Further, it remains possible that, since participants were attending the LY session with the implied intention of increasing their SWB, they would be more likely to endorse an increase in well-being following the class. This may be of particular concern given the short time frame between the pre- and post-questionnaires. However, the finding that initial well-being scores were below the normal range for Australians suggests that these were true scores recorded by the sample, as it is extremely unlikely that they would have had knowledge of the normal ranges, and so could not have intentionally recorded their scores to be lower. Further, if recall effects were evident, then they would be expected to be expressed across each measure. The lack of change in depression scores suggests that participants were not motivated to report that LY was advantageous across the board of measures used.

Finally, the presence of a suitable control group could confirm that the improvement in well-being variables was due to the intervention, rather than representing the statistical phenomenon of regression to the mean. The inclusion of a control group would also enable consideration of whether laughter yoga, as a specific intervention, is more effective at improving SWB than other interventions. The findings of this study do not provide support for the effectiveness of LY over and above any other form of therapy, and it remains unknown

whether the improvements to SWB are due to the intervention itself, or due to participants' benefiting from the social environment that LY classes facilitate.

Despite the clear need for a control group, an appropriate control group is difficult to identify given that LY is such a unique activity. A suitable control group activity should be similar in all aspects to the LY group except for the specific practice of laughter yoga, but there is no conceivable alternative. For example, although participants undertaking regular yoga sounds like an obvious comparison group, the aim of regular yoga is to reduce heart rate and encourage relaxation, whereby the act of laughing necessarily increases heart rate. In the absence of a suitable control group, the Australian normative data were considered an appropriate comparison for this study.

While the benefits of laughter to improve positive emotions and reduce negative emotions are difficult to contend, the results of this study caution that the effectiveness is not universal. People already experiencing a normal level of well-being may not only be less likely to attend LY, but also appear to have less to gain from them. Thus, LY, similar to other positive psychology techniques, is perhaps best described as an intervention more likely to benefit people experiencing lower levels of SWB, and higher levels of anxiety and stress. This study has provided preliminary, albeit cautionary, results for the effectiveness of LY as an intervention to increase SWB, and requires further validation in a larger scale study.

Notes

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Brief Report
Laughter yoga activities for older people living in residential aged care homes: A feasibility study

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Objective: *To evaluate the effects of a laughter yoga activities (LY) program for older people living in residential aged care homes (RACHs).*

Methods: *A 6-week LY program was implemented at three RACHs with twenty-eight residents. A pre–post design was used to measure positive and negative affect, happiness, blood pressure and pulse.*

Results: *Post-session mean scores for positive mood, and happiness were significantly higher than pre-session scores in weeks 1, 3 and 6, and the post-session mean negative mood scores were significantly lower than pre-session scores in weeks 3 and 6. Post-session readings for mean systolic blood pressure were significantly lower than pre-session readings in weeks 1 and 6.*

Conclusion: *This study demonstrates the potential for using LY to improve mood and lower blood pressure of older people living in RACHs.*

Policy Impact: Laughter yoga should be considered by Management and Lifestyle coordinators/activities staff in residential aged care homes to be included in their regular activities program for residents. By incorporating LY into the culture of the RACHs, a sense of fun and happiness will be achieved for both residents and staff.
Practice Impact: Laughter yoga improves happiness and positive mood and decreases negative mood in older people living in residential aged care homes, and has the potential to lower blood pressure. It also provides opportunities for residents to exercise, have fun and enjoy themselves, so should be incorporated into lifestyle programs.

Key words: *happiness, laughter therapy, laughter yoga, nursing homes, older people.*

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Introduction

Older people in residential aged care are at elevated risk of depression [1–3]. A range of therapies have been implemented to reduce depression and anxiety and improve emotional well-being [4]. One such therapy is laughter yoga (LY), which combines simulated laughter exercises with deep breathing and clapping. It is conducted in a group setting which helps break down barriers between people, as it is believed that people are more likely to laugh in groups than when alone and that laughter is contagious, so in a group if one person laughs others will follow [5].

A growing body of evidence indicates the health benefits of laughter. These include reducing stress [6,7], blood pressure and stress hormones; increasing muscle flexion and triggering the release of endorphins – the body's natural painkilling chemicals that produce a general sense of well-being [7]. Laughter yoga is an aerobic activity, providing benefits such as stimulating circulation and pulmonary ventilation [8,9].

Research literature indicates that LY can improve the quality of life of older people and result in physiological and psychological health-related benefits [3]. Small but significant effects of laughter on sleep quality and depression have been demonstrated for older persons [10]. Laughter yoga combined with exercise has been associated with improved self-rated health, higher bone density levels and increased activity in older people [11]. The positive impacts of LY on well-being of older people with depression have also been reported. Studies with older adults have shown improvements in quality of life, mood and depression scores, and in their activities of daily living [12–14].

Research indicates an association between affect (including apathy) and activity participation among nursing home residents [3,15,16] and between engagement in therapeutic activities and improvements in apathy, suggesting that it is worthwhile to encourage residents with high apathy to engage in more activities to reduce apathy. Involving residents in active participation is good for both their mental and physical health. Despite evidence indicating the measurable benefits of laughter for older people, activity programs in residential aged care have rarely incorporated LY [3,10–14].

The aim of this study was to identify the effects of a LY program on the well-being of older people living in

residential aged care homes (RACHs). The study tested the hypotheses that LY can improve participants' mood, blood pressure and pulse.

Methods

Sampling

Residents from a convenience sample of three RACHs participated in this study. A LY session was conducted for the activities staff at the three RACHs to promote support for the program. These staff were asked to identify residents who met three inclusion criteria, namely, being capable of providing informed consent, actively participating in the LY program and answering follow-up questions. Of the 302 residents in the three selected homes, activities' staff identified 60 eligible residents. The first author visited these residents, explained the project, provided the participant information statement and collected signed consent forms. Twenty-eight residents agreed to participate in the study (a response rate of 47%) – six in Group 1, ten in Group 2 and twelve in Group 3.

Participants

Most participants were women (23 women, 5 men). The mean age was 84 years, and the age range was 61 to 96 years with eight residents in their 90s. Thirteen of the participants had a diagnosis of dementia.

Intervention

Six weekly LY sessions of 30 minutes duration were conducted at each site by a trained laughter therapist (second author). Residents were seated in a circle to maximise eye contact with each other and with the LY facilitator. Each session began with 10 minutes of breathing and stretching exercises: deep belly breathing; body stretching, gentle neck and shoulder stretches, and smiling to loosen up face muscles. This was followed by fifteen minutes of LY, which consisted of a physical activity and chanting ho, ho, ho, ha, ha, ha. An example is the 'Tapping body laugh' where participants use the left hand to tap five times from the shoulder to the wrist on the right side and repeat for left side and tap five times down both legs. As the participants tap, they repeat the chanting, which progressively becomes quicker. These exercises included a variety of laughs to stimulate vocal skills, fine and gross motor skills and a sense of play. Each session followed the same format. The final five minutes consisted of body relaxation, smiling and deep breathing.

Measures

The Positive and Negative Affect Schedule (PANAS) [17] was used to measure mood (or self-rated affect), and The General Happiness Scale (GHS) [18] was used to measure levels of happiness. Both measures have been tested for

validity and reliability [17,18]. Data were collected before and after the LY session at three time points during the 6-week period: in weeks 1, 3 and 6. Each participant's blood pressure and pulse were measured just before and immediately after each session by the first author (a nurse researcher). At the end of each LY session, participants were asked the following: Did you enjoy the laughter group session? If yes, what aspects did you enjoy? If no, tell me why? Their comments were written down verbatim by the researcher.

Data analysis

Data were analysed using SPSS Version 22. The impact of the intervention was assessed by (i) comparing mood, happiness, blood pressure and pulse measures before and after the sessions in weeks 1, 3, and 6; and (ii) comparing pre-program scores for mood, happiness, blood pressure and pulse measures (measured at baseline before the first session), with postprogram scores (measured after the final session in week 6). Paired-sample *t*-tests were used to test statistical significance. Residents' feedback on the experience of participating in LY was collated.

Ethics

Ethics approval for this study was obtained from a University Human Research Ethics Committee (approval number UHEC 11-090) following organisational approvals from the participating RACHs.

Results

Mean score increased on the GHS in weeks 3 and 6 and on the positive aspects of the PANAS in weeks 1 and 3 (Table 1). Postprogram mean scores on the GHS and the positive aspects of PANAS were significantly higher than the baseline scores, and negative aspects of the PANAS were significantly lower at the end of the six-week program. Mean readings decreased slightly between baseline and the end of the LY program for systolic blood pressure (from 137.5 preprogram to 133.4 postprogram) (Table 2).

Most participants indicated that they enjoyed participating in the LY program, and 24 stated that they would like to do it again. Participants identified the following benefits of the program: relaxation, socialising, being happy and laughing at oneself, as illustrated by the following comments: 'It was fun to laugh and see others laugh', 'It was nice having everyone laughing', 'The whole place feels joyful', 'It makes me feel good, 'Everyone is happy and me too', and 'It relaxes me'. Aspects of the program that participants reported enjoying the most were the breathing, exercises and interactions with others. Only one resident indicated that he did not enjoy the activity and did not return. Four residents stated it was 'childlike', but attended all sessions and did join in the laughter.

Table 1: Mean GHS and PANAS scores before and after three LY sessions (*n* = 28)

Session and measure	Mean	SD	*t*	df	Sig
General Happiness Scale					
Pre-session 1	5.2	0.973	−2.905	27	0.007
Post-session 1	5.6	0.685			
Pre-session 3	5.4	0.907	−3.827	27	0.001**
Post-session 3	5.8	0.621			
Pre-session 6	5.4	0.848	−3.356	27	0.002**
Post-session 6	5.9	0.744			
Pre-session 1 and post-session 6 GHS mean scores			−3.682	27	0.001**
Positive and Negative Affect Scale					
Positive pre-session 1	27.36	7.597	−4.338	27	0.000***
Positive post-session 1	30.32	7.799			
Negative pre-session 1	14.54	4.686	1.730	27	0.095
Negative post-session 1	13.89	3.775			
Positive pre-session 3	27.64	7.319	−4.453	27	0.000***
Positive post-session 3	31.14	7.783			
Negative pre-session 3	14.32	4.092	2.954	27	0.006
Negative post-session 3	12.89	3.326			
Positive pre-session 6	28.14	6.422	−2.897	27	0.007
Positive post-session 6	31.39	7.908			
Negative pre-session 6	14.14	4.034	2.555	27	0.017
Negative post-session 6	12.93	3.126			
Pre-session 1 and post-session 6 PANAS mean scores − Positive			−3.576	27	0.001**
Pre-session 1 and post-session 6 PANAS mean scores − Negative			2.259	27	0.032*

*P < 0.05, **P < 0.001, ***P < 0.001. GHS, General Happiness Scale; LY, laughter yoga; PANAS, Positive and Negative Affect Schedule.

Table 2: Mean systolic blood pressure and pulse rate readings before and after three LY sessions and pre–post LY program (*n* = 28)

Session and measure	Mean	SD	*t*	df	Sig
Blood pressure					
Pre-session 1	137.5	21.4	2.334	27	0.027*
Post-session 1	128.4	18.1			
Pre-session 3	142.0	23.5	1.432	27	NS
Post-session 3	136.4	19.8			
Pre-session 6	140.5	23.5	2.469	27	0.020*
Post-session 6	133.4	18.1			
Pulse					
Pre-session 1	71.2	9.5	2.897	27	0.007*
Post-session 1	69	7.8			
Pre-session 3	72	10.7	1.089	27	NS
Post-session 3	70	9.9			
Pre-session 6	72	11.3	0.902	27	NS
Post-session 6	71	8.5			
Blood pressure					
Pre-session 1 − BP	137.5	21.4	2.334	27	0.027*
Post-session 6 − BP	133.4	18.1			
Pulse					
Pre-session 1 − Pulse	71.2	9.5	0.902	27	NS
Post-session 6 − Pulse	71	8.5			

*P < 0.05. BP, blood pressure; LY, laughter yoga; NS, not significant; SD, standard deviation.

Discussion

Consistent with previous research that showed the positive impacts of LY on patients' mood [19], this pilot study indicates that a LY program has health and emotional well-being benefits for older people living in RACHs. The program resulted in measurable improvements in happiness scores, positive and negative mood scores, and in blood pressure. The drop in blood pressure was an expected result of the physical activity [8]. Most residents enjoyed the LY as it induced a sense of well-being and helped them feel connected with each other. These findings support research evidence [7] that indicates LY can result in a sense of well-being brought on by the release of endorphins.

The main limitations of this study were the use of a convenience sample, the small sample size, the non-experimental design and potential for gatekeeper bias to affect recruitment of participants. Including a comparison group in the study design was beyond the scope of this pilot project. Activities staff in this study could have denied access to some residents who might have been willing to take part, as nursing home staff members can be protective towards those they care for and sometimes block access to researchers [20]. Finally, attention given to the participants from the Laughter Therapist and the Nurse Researcher may have contributed to the participants increase in positive mood and happiness levels.

Conclusion

Despite its limitations, this pilot study contributes to a growing body of evidence that indicates that LY has physical, social and emotional health benefits for older people living in RACHs. Future research using an experimental design would enable researchers to (i) test Meeks et al.'s (2007) hypothesis that positive affect is linked to activity participation; and (ii) separate the effects of activity from the effects of LY. Laughter yoga provides opportunities for residents to have fun, enjoy themselves and to be involved in low-intensity physical aerobic activity in a safe and accessible way.

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Effect of laughter therapy on level of stress: A study among nursing students

Lakhwinder Kaur, Indarjit Walia

Abstract : A quasi experimental study was conducted in the National Institute of Nursing Education PGIMER,Chandigarh with an objective to evaluate the effect of laughter therapy on the stress level of nursing students. Total forty two BSc nursing first year students available during the time of data collection constituted the study sample. Data was collected before and after the experimentation. Experimentation involves administering laughter therapy for 15-20 minutes daily. During ten days, laughter therapy has shown positive effect on reducing the stress level of subjects at statistically significant level (t_{cal} 32,df 41, p <0.05) Mean stress score was decreased from 112 to 103 after the laughter therapy.

Key words :

Laughter therapy, stress level, nursing students

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Introduction

In every sphere of life, owing to social complexities or individual's own high aspirations, people are encountering stresses of various degrees very frequently. Stress impacts the health by lowering the resistance to disease and making the person more vulnerable to illness. The effect of stress on health depends heavily upon the severity of stress. Mild stress may actually improve the performance and functional efficiency of

individual, where as severe stress tends to impair the integration and effectiveness. Excessive stress eventuates in breakdown of system. Many studies have shown that stressful life situations generate changes, complexities and challenges to which if individual can not respond adequately, illness can result.[1]

Studies by American Medical Association have shown the stress as a major factor causing 75% of all illnesses and diseases today. As stress is experienced by all individuals in various periods of life, nursing students also experience stress related to new living environment, life style, health, academic performance, competition, career selection, and relationship with peer group, high expectations from parents etc. Patty Pits in his study has shown the tension and pressure as the frequent companion of nursing students. This study was conducted in America on the stress level of health professionals and has ranked the nursing students at the top.[2] All students respond differently to these stressors according to their age, sex,' personality, family, social status. Some are unable to cope with these stressors and inadequate coping leads to anxiety, withdrawal, frustration, aggression, lack of motivation, low self-esteem, physical illnesses and poor coping skills such as drug use and alcohol abuse[3]. One longitudinal study also revealed the effect of stress on illness of medical students. The researcher found decrease level of body's natural killer cells, which fight against infections and tumors.[4]

In order to reduce the stress level, number of relaxation techniques and exercise programs have been used. Among these laughter is considered as the best stress busting. Laughter as a therapy is found to lower the blood pressure, relieve stress, increase muscle flexion and boost the immune system by raising the level of infection fighting T cells, disease fighting proteins (gamma interferon) and beta cells. It also triggers the release of endorphins (body's natural pain killer) and produces a general sense of well being. Dr Leeberk studied the beneficial effect of laughter in reducing the stress hormones.[5] Doctor Kataria also cited in his book that Harvert Lefcourt from Waterloo University explored the use of laughter in changing the emotional response to stress. The positive psychological effect of laughter therapy includes mental alertness, increase in concentration, coopereration, creativity and self confidence plus better ability to cope with stress.[4] With personnel experience, investigator realized that nursing students experienced life stressful because of competition, geographical mobility, new life style, and strict disciplinary hostel life, financial burden, conflict with peer group, academic pressure as well as in the clinical area as they have direct exposure with patients. As review of literature revealed the benefits of laughter therapy, but no evidence has shown its effect on nursing students, thus need for conducting the study was recognized. The objective of this study was to evaluate the effect of laughter therapy on the level of stress among nursing students.

Hypothesis

There will be no effect of laughter therapy on the stress level of nursing students.

Material and Methods

Quasi experimental research design was used in this study. The study was conducted in the nursing hostel of National Institute of Nursing Education, PGIMER, Chandigarh in the month of March 2005. All the BSc nursing first year students were included in the study. Study sample comprised of 42 nursing students.

Data was collected by using assessment proforma. It was comprised of identification data (2 items) and numerical rating scale from 1-5 scores in which 1score indicated no stress,2 rare,3 Sometimes,4 Often and 5 Almost always. This scale was used to assess the level of stress experienced by study subjects on the first day and the last day of the study period. Experimentation included conducting a session of laughter therapy for 20 minutes daily for ten days. Stress experienced by study subjects was rated as mild, moderate and severe based upon the scores obtained.

For content validity and reliability, suggestions were received from five eminent personalities (nursing educationist, psychologist and research experts) and was found valid and reliable. Ethical considerations were taken by seeking the permission from the higher authorities and also verbal consent of the study subjects. The data was analyzed as per the objectives by applying both descriptive and inferential statistics.

Results

Mean age$\pm$ SD of the subjects was 19 ± 4.2, ranging between17-21 years.Table 1 depicts that 38% study subjects were of 19 years old,equal subjects (57.2%) subjects were of 18 and 20 years. (Table 1)

**Table 1: Age Wise Distribution of Subjects**   **N$=$42**

Age (yrs)	f(%)	
17	01 (02.4)	
18	12(28.6)	Range 17-21
19	16(38.0)	Mean$=$19$\pm$4.2
20	12(28.6)	
21	01 (02.14)	

Regarding the level of stress before experimentation (laughter therapy) twelve (28.6%) subjects experienced mild stress, twenty three (54.7%) experienced moderate level of stress. The number of subjects experienced moderate level of stress was reduced to 18(42.8%) from 23(54.7%) after the experimentation. Although same number of subjects experienced severe level of stress before and after the laughter therapy. It inferred that laughter therapy has positive effect in reducing the level of stress of study subjects. (Fig 1)

Fig. - 1 : level of stress pre therapy and post therapy
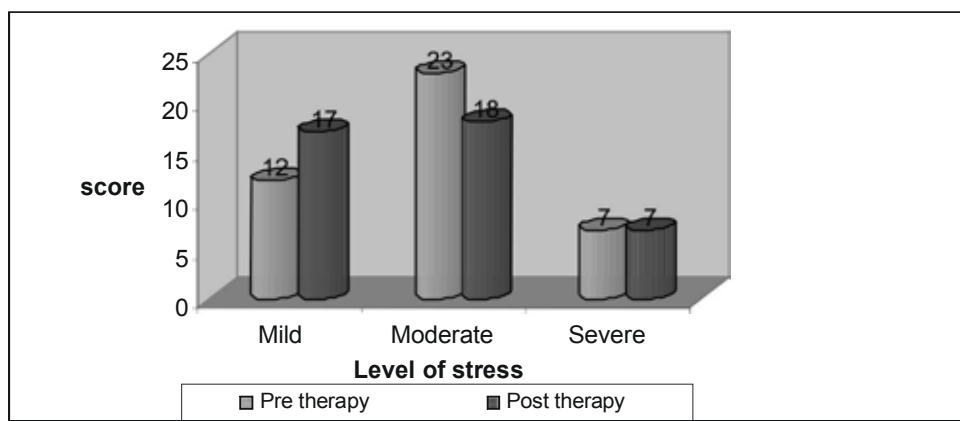
Great variation (418) in the stress score of subjects pre therapy (4740) and post therapy (4322) was observed. As the t_{cal} (32)>t_{tab} at 5% level of significance. A significant difference in the pre therapy and post therapy stress score was found. Hence the null hypothesis was rejected i.e. laughter therapy has a positive effect on the level of stress. (Table3)..

Hence the null hypothesis was rejected Le. laughter therapy has a positive effect on the level of stress. (Table3).

Table 3 Stress Score Pre and Post Therapy   **N=42**

	Pre therapy	Post therapy	Difference	Level of significance
Total score	4740	4322	418	t = 32
Mean score	112.85	102.9	9.9	df = 41
SD	27.6	29.6	2	P < 0.05
				Significant

Discussion

Present era is marked as an era of stress. Every person experience different forms of stress throughout the life. It is more likely to be the reflection of interpersonal problems than the physical noxious stimuli for change and growth. Many studies have shown the negative effects of stress on the health. To get relief from stress, numbers of interventions were carried out. Among these, laughter is considered as the best one as it needs no talent. Review of literature has shown the positive impact of laughter in improving the health status. As nursing students are the part of this world, they are not screened from the shadow of stress. Present study reflects the stress level of nursing students at different levels i.e. mild (28.6%), moderate (54.7%) and severe (16.6%).Study conducted by Dr Patty pits also revealed the stress as a companion of nursing students.[2]

Old age saga 'laughter is a best medicine'. Many studies conducted in the medical field revealed the positive effect of laughter in improving the health by improving the immune system. Study conducted by Dr Leeberk also revealed the beneficial effect of laughter in reducing the stress hormones and improving the immune system.[5] Similarly in this study, stress level of study subjects was decreased at statistically significant level (t 3.2,p.05) following the laughter therapy session. With experimentation, decrease in the moderate level of stress was found from 23 to 18. Mean difference in stress score was 9.9. Hence the positive effect of experimentation (laughter therapy) on reducing the stress level was proved. Although review of literature has shown the positive effect of laughter in reducing the stress level but no related study is found on nursing students.

"Laugh and the world will laugh with you" an ancient old saga said. Laughter as an antidote for stress helps in the pursuit of happiness.[6] One must laugh every day as it has shown many benefits in improving the health status. 'A laugh a day will keep the doctor away", to proof these lines, further research studies on larger sample and for longer duration are highly recommended.

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The Effects of Laughter Therapy on General Health of Elderly People Referring to Jahandidegan Community Center in Shiraz, Iran, 2014: A Randomized Controlled Trial

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ABSTRACT

Background: Aging and its social-biological process naturally impair the functions of different body organs and cause progressive disabilities in managing personal affairs and performing social roles. Laughter therapy is an important strategy which has been recommended by experts for increasing health promotion in older adults. Therefore, we aimed to investigate the effect of laughter therapy program on public health of senior citizens.

Methods: In a randomized controlled trial, we enrolled 72 senior citizens aged 60 and over referring to Jahandidegan (Khold-e-Barin) retirement community center in Shiraz, southwest Iran during January to February 2014. The participants were assigned into experimental (N=36) and control (N=36) groups. Data were collected using General Health Questionnaire (GHQ-28) and demographic questionnaire. The participants of experimental group attended a laughter therapy program consisting of two 90-minute sessions per week lasting for 6 weeks.

Results: We found a statistically significant correlation between laughter therapy program and factors such as general health (P=0.001), somatic symptoms (P=0.001), insomnia and anxiety (P=0.001). However, there was no statistically significant correlation among laughter therapy, social dysfunction (P=0.28) and depression (P=0.069).

Conclusion: We concluded that laughter therapy can improve general health and its subscales in elderly people.

Trial Registration Number: IRCT2014061111691N4

KEYWORDS: Elderly; General health; Laughter therapy

INTRODUCTION

The world's population is rapidly aging and developing countries are more involved with such issue. According to the United Nations' estimates, elderly population is predicted to increase from almost 10.5% of the total population in 2007 to 28.8% by 2050.[1] In 2006, 7.3% of whole Iranian population aged 60 and over.[2]

Aging and its social-biological process naturally impair the functions of different body organs and cause progressive disabilities in managing personal affairs and performing social roles. Such impairments are more evident in social and psychological dimensions of the elderly people's life and may impose limitations on personal and social communications networks. However, social and psychological dimensions of life have been found to influence health significantly.[3, 4]

As the elderly population increases, the health problems, especially mental health problems, of such an age group become more important. Accordingly, the elderly's health issues can be investigated in two dimensions of physical and psychological. Physical problems such as different types of cancers, cardiovascular diseases and chronic obstructive pulmonary disorders are more prevalent in older adults than their younger counterparts. Depression, anxiety and dementia are also common psychological problems among this age group.[4] On the other hand, the incidence of psychiatric disorders in senior citizens, who are residents of nursing homes, is approximately 80%. Among the psychological health issues occurring among the aging population, depression has the highest prevalence rate (17%).[5] Public health in the elderly people includes four dimensions: physical health, physical functioning, anxiety and depression.[6]

For health promotion in older adults, various strategies have been recommended by experts, among which laughter therapy is an important one.[7] Laughter causes synchronized contraction of facial muscles, increases respiratory rate, blood flow and the release of adrenaline in blood and ultimately leads to joy and happiness. It is the cheapest medicine for preventing many diseases and fighting against them. Laughter also decreases the heart beat rate and blood pressure while it increases oxygen intake in tissues by making the individuals take deep breaths. Hence, laughter can benefit both mental and physical health.[8, 9]

On the condition that psychological stress-induced hormone is secreted continuously and in large amounts, the immune system cannot fully perform its normal functions. Therefore, it puts the internal organs of the body under intense pressure and paves the way for various infections and diseases. Research has proved that laughter plays a critical role in strengthening the immune system and maintaining health and wellness.[10] Laughter has been indicated to have several positive physiologic effects, one of the important of which is helping the individual cope with stress and reducting anixity; in addition, that may have a role in reducing the incidence of obesity that may positively effect the physical health.[11]

Currently, there are several laughter therapy clubs in various parts of the world where a group of people gather to practice laughter as a form of exercise. In laughter exercise program, initially the participants laugh "artificially" until, gradually, the fake laughter becomes realandleads to releasing anti-stress and joyful hormones. Moreover, in laughing, the diaphragm and abdominal muscles move and stimulate the parasympathetic nervous system; this reduces stress hormones and ultimately promotes relaxation in individuals.[8, 12]

Since special attention should be paid to physical and mental health in older adults, laughter therapy can be applied as an effective strategy leading to health promotion, vitality and happiness in such age group.[13] Therefore, we aimed to investigate the effect of a 12-week laughter therapy program on public health of the senior citizens referring to Jahandidegan (Khold-e-Barin) retirement community center in Shiraz.

METHODS

This study was approved by the Ethics Committee of Shiraz University of Medical Sciences (Ethics Committee Approval Number: CT-92-6759). In this non-blinded randomized controlled trial (because intervention of laughter the arapycannotbe conducted as blinding), from 1000 records of the elderly registered in Jahandidegan (Khold-e-Barin) 80 were selected through simple random method by their records. The sample size was calculated as 36 in each group based on the data of similar studies and using mean comparison formula (the mean and standard deviatin in the experiment and control groups were 39.5±10 and 32.90±.9.50, respectively with a power of 80% and α: 0.05).[13]

$$n = \frac{(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta})^2 \ (\delta_1^2 + \delta_2^2)}{(\mu_1 - \mu_2)^2}$$

$$\frac{(1.96 + 0.85)^2 (10.4 + 9.5)}{(39.5 - 32.9)^2} = 36$$

In addition, based on withdrawal cases in the follow up time, sample size was increased to 40 participants in each group. In this study, 80senior citizens aged 60 and over attended Jahandidegan (Khold-e-Barin) daily community center of aging in shiraz, southwest Iran during January to February 2014. After obtaining written informed consent, balanced block randomization method was used to randomize the participants, In fact, block ranomization was used for selection of samples. All of the four blocks were selected (AABB, ABAB, ABBA, BBAA, BABA, BAAB) and numberd from 1-6 and randomization was done using the tagble of random numbers. Finally 40 elderly people were enrolled in the experimental and control groups. Eight participants were excluded from the study due to different reasons (Four of them were excluded because they did not attend the sessions regularly and 4 of them refused to participate in the study) (Figure 1).

Inclusion criteria were the age of 60 years and over, willingness to participate in the study, completing written informed consent form, not participating in a similar study simultaneously and lack of mental disability. The exclusion criteria were any experience of social-family crisis during the study, unwillingness to participate in the study, the absence of more than two sessions and any types of respiratory diseases which can be transmitted to other participants.

After explaining the aims and method of the research to the participants, data were collected using General Health Questionnaire (GHQ-28) and demographic questionnaire which enquired about age, sex, age, educational, marital and occupational status. GHQ-28 was completed by the participants of the experimental and control groups before and after the intervention.

GHQ-28 is a 28-item self-report questionnaire which contains 4 subscales measuring somatic symptoms, anxiety, insomnia, social dysfunction, and depression. The score for each sub scale ranges from 0 to 21. The total score, which is obtained by summing up the scores of all subscales, ranges from 0 to 84 with lower scores indicating higher general health status. The reliability and validity of the questionnaire were assessed in various studies and were also estimated and confirmed in Iran by Mohammad et al. (2009) and Malakouti et al. (2007) after being translated into Persian. Cronbach's alpha was calculated as 0.9.[14, 15]

The elderly in the experimental group participated in a laughter therapy program consisting of two 90-minute sessions per week for 6 weeks. The program included performing breathing and physical exercises as well as laughter techniques. However, the participants of the control group received no intervention. The questionnaires were completed again by the participants of both groups immediately after the intervention.

The collected data were analyzed using SPSS software, version 21. Non-parametric tests including Wilcoxon and Mann-Whitney were used. The significance level was set at 0.05. Also, for assessment of normality Kolmogorov–Smirnov test was applied.
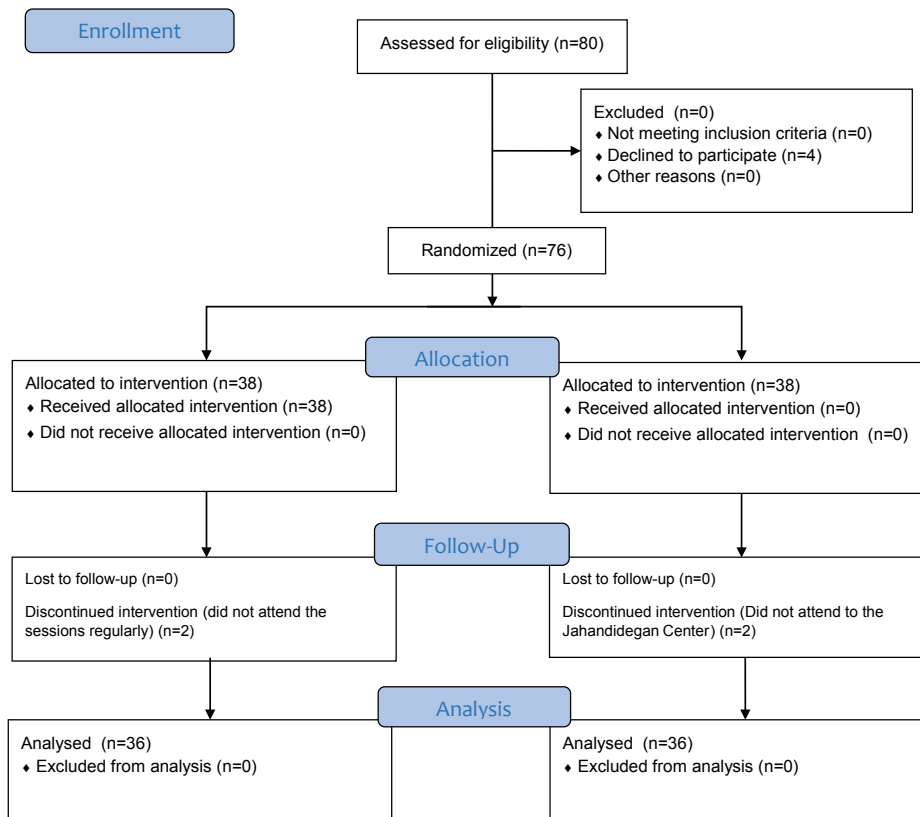
CONSORT Flow Diagram

Figure 1: Diagram of the participants in the study

RESULTS

The mean±SD age of the participants was 68.55±6.24 and 67.27±5.87 in the experimental and control groups, respectively. 66.7% of the participants in the control and 72.2% in the experimental groups were women. Table 1 shows demographic variables of the participants.

The mean scores of general health and its subscales as well as the correlations between mean scores of subscales before and after the intervention are shown in Table 2. In addition, results of Kolmogorov–Smirnov test (K–S test) showed that data in our study did not have a normal distribution, so non-parametric tests were used for data analysis (P=0.01).

Table 2 shows that the status of general health and all its subscales improved in the experimental group after the intervention. Moreover, the difference between the scores before and after the intervention was statistically significant for all subscales in the experimental group (P=0.05). In the control group, the status of all subscales improved significantly after the intervention (P=0.05), while we found no statistically significant difference between the total mean scores of general health and social dysfunction in such group before and after the intervention.

The differences in the mean scores of the two groups were compared to specify the correlation between laughter therapy and public health and its subscales (Table 3).

Table 3 shows that the difference between the experimental and control group was statistically significant in terms of the mean scores of general health and other subscales and insignificant in terms of the mean scores of physical dysfunction and depression.

Table 1: Frequency distribution of demographic variables in the experimental and control groups

Variables	Classification	Experimental group Frequency (Percentage)	Control Group Frequency (Percentage)
Age	60-65	12 (33.3)	18 (50)
	65-70	14 (38.9)	8 (22.2)
	70-75	4 (11.1)	3 (8.4)
	higher than 75	6 (16.7)	7 (19.4)
Ducational Status	Illiterate	6 (16.7)	4 (11.1)
	Primary Education	16 (44.4)	20 (55.6)
	Secondary Education	8 (22.2)	10 (27.8)
	Higher Education	6 (16.7)	2 (5.6)
Marital Status	Single	0 (0)	2 (5.6)
	Married	14 (38.9)	18 (50)
	Divorced	6 (16.7)	4 (11.1)
	Widow	16 (44.4)	12 (33.3)
Occupational Status	Unemployed	12 (33.3)	4 (11.1)
	Self-employed	4 (11.1)	2 (5.6)
	Clerk	0 (0)	2 (5.6)
	Retired	6 (16.7)	12 (33.3)
	Housewife	14 (38.9)	16 (44.4)
Sex	Male	10 (27.8)	12 (33.3)
	Female	26 (72.2)	24 (66.7)

Table 2: Comparison of the mean scores of general health subscales before and after the intervention

Groups	Experimental group			Control Group		
Scales	Before the Intervention	After the Intervention	P value*	Before the Intervention**	After the Intervention***	P value*
	Mean±SD	Mean±SD		Mean±SD	Mean±SD	
Somatic symptoms	6.86±4.30	3.47±3.44	0.001	7.05±5.83	4.91±3.40	0.02
Anxiety and insomnia	7.83±4.74	3.84±2.77	0.001	6.55±5.06	4.33±3.22	0.01
Social dysfunction	7.66±4.93	5.25±3.25	0.04	5.72±5.64	3.72±3.44	0.09
Depression	9.27±7.98	4.24±4.20	0.01	5.98±6.25	4.44±4.41	0.01
General health	34.94±21.76	18.33±16.16	0.01	36.80±10.41	20.25±16.52	0.83

*Used from Wilcoxon test; **The same time as before the intervention in the experimental group; ***The same time as after the intervention in the experimental group

Table 3: Comparison of the difference in the mean scores of general health and its subscales in the experimental and control groups before and after the intervention

Public Health Scales	Groups	Mean Difference (Before-after)±SD	Z	P value*
Somatic Symptoms	Experimental group	-3.39±4.97	-2.05	0.04
	Control Group	-2.13±4.73		
Anxiety and insomnia	Experimental group	-4±5.38	-2.21	0.03
	Control Group	-2.12±4.78		
Social dysfunction	Experimental group	-3.41±6.54	-1.06	0.28
	Control Group	-2±6.09		
Depression	Experimental group	-5.08±8.03	-1.81	0.07
	Control Group	-1.80±6.59		
General Health	Experimental group	-16.61±26.19	-3.57	0.0001
	Control Group	-16.55±10.43		

*Used from Mann-Whitney test

DISCUSSION

We examined the effect of a laughter therapy program on the public health of the senior citizens referring too neoftheretirement community centers in Shiraz. We compared the mean scores of general health subscales in the experimental and control groups before and after the intervention (Table 2). The results showed that the mean score of somatic symptoms'sub scale significantly decreased in the experimental group after the intervention, indicating the positive effect of intervention on the participants of this group (P=0.001). A significant difference was also detected in the control group between the mean scores in this regards before and after the intervention (P=0.02). Our findings also demonstrated that general health and all its subscales had been improved in the experimental group after the laughter therapy intervention and the improvement was statistically significant. However, we found no significant difference in the control group between the scores of social dysfunction (P=0.09) and general health total scores (P=0.83) before and after the intervention. Laughter decreases stress hormones and increases the immune cells and antibodies; thus, it can be considered as a factor that improves the general health.[16-19]

Furthermore, we compared the difference in mean scores of general health and its subscales in the experimental and control groups before and after the intervention. The significant difference between the two groups on each subscale is also reported in Table 3. According to our results, the difference in the mean scores of somatic symptoms was found to be statistically significant in both groups (P=0.04), reflecting the effectiveness of the interventions in improvement of this subscale in the participants. Our finding was consistent with those of Behzadi, Ramezani and Saifie Zarie, explaining the positive effect of laughter therapy in improving such subscale by influencing respiration, improving the immune system, relaxing muscles as well as reducing pain, blood pressure and previous health problems.[7, 10, 16-19]

Besides, we observed that the difference in the mean scores of anxiety and insomnia was statistically significant in both groups (P=0.027), reflecting the effect of the interventions on reducing anxiety and insomnia in our elderly participants. The result was similar to those of Behzadi, Ko et al., Houston et al., Bennett et al., Dixon and and Thorson, signifying the positive effects of laughter therapy on eliminating negative thoughts, changing attitudes and beliefs, creating positive emotional states, discharging dense excitement, and alleviating the symptoms of diseases.[12, 13, 16, 20-23]

However, the difference in the mean scores of social dysfunction subscale was not statistically significant in both groups (P=0.28), confirming the ineffectiveness of the interventions in improvement of such disorder in the participants. This finding was in contrast with those of Behzadi and Shahidi due to differences in the sample size and duration of the interventions.[13, 16]

Also, the difference in the mean scores of depression subscale was not statistically significant in the experimental and control groups (P=0.04), reconfirming the ineffectiveness of the interventions in reducing depression in the participants. The findings of Behzadi, Ko and Youn and Shahidi were different from ours in this regard. Such difference may have resulted from the short duration of our study and the fact that making changes in depression mood is a timely process. If we could continue the study for a longer time, we would probably observe changes in depression mean scores.[12, 13, 16]

The difference in the mean scores of general health was found to be statistically significant in both groups (P=0.001), signifying the positive effect of laughter therapy intervention on the improvement of general health in the elderly people who participated in our study. Several studies found similar results and also mentioned laughter therapy as the simplest and the most cost-effective method of reducing the

mentioned health problems. Our results have also proved the fact that some factors such as participation in group laughter therapy sessions and accompanying peers, sense of solidarity and belonging to the group, creating positive emotional states, changing attitudes and improving relationships with others as well as social relationships could positively affect general health.[16, 22, 24, 25] Besides, improving mood and cell activity, reducing stress, strengthening the immune system, improving attitudes towards self and life, increasing self-confidence, energy, precision and concentration are among other influential factors that can affect general health.[13, 26, 27]

The advantages of present sudy were its design as RCT that removed the confunder variables and sutible attendance of the elderly with low withdrawal in the time of research. However, the intervention (Laughter therapy) was subjective and was implanted in a short period of time (6 weeks); this was the main limitation of this study.

CONCLUSION

We can conclude that laughter therapy can improve general health and its subscales in the elderly people. Therefore, the results obtained from the present study can help authorities and experts in the field of geriatric care management to adopt precise plans and policies to increase general health by making the senior citizens and their families aware about the advantages of laughter therapy and establishing laughter therapy clubs.

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Conflict of Interest: None declared.

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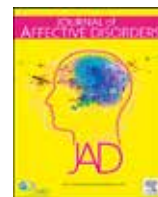
Research paper

Feasibility of a group-based laughter yoga intervention as an adjunctive treatment for residual symptoms of depression, anxiety and stress in people with depression

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A B S T R A C T

Background: Laughter Yoga (LY) is a group-based intervention involving simulated laughter, gentle stretching, rhythmic breathing and meditation. There is some limited evidence that LY reduces depressive symptoms over the short term. However, the quality of previous LY studies is poor and none involved working-aged people with a clinical diagnosis of depression. Therefore, this study aimed to investigate the feasibility and potential efficacy of LY for improving residual mood, anxiety and stress symptoms in adults diagnosed with depression.
Methods: Fifty participants were randomised to the group LY intervention (*n* = 23) consisting of eight sessions over four weeks, or treatment-as-usual (*n* = 27). Participants completed the Depression Anxiety Stress Scale and the Short Form 12 item Health Survey at baseline (T0), post-intervention (T1) and at 3 months follow-up (T2). LY participants also completed a Client Satisfaction Questionnaire (CSQ8) at T1 and eleven participated in individual qualitative interviews at T2.
Results: The LY group had statistically greater decreases in depression and improvements in mental health related quality of life compared to the control group from T0 to T1. The CSQ8 scores indicated a favourable level of satisfaction with the LY intervention. The qualitative interviews highlighted aspects of the intervention that were effective and those requiring modification.
Limitations: Limitations include the small sample size and treatment-as-usual control group.
Conclusions: A full scale RCT of LY could be feasible if some modifications were made to the protocol/intervention. The intervention may be effective to improve depression and mental health related quality of life immediately post intervention.

1. Introduction

Depression is a relatively common mental health disorder affecting around 350 million people worldwide (Marcus et al., 2012; Kessler and Bromet 2013). The illness is associated with an impaired ability to function on a day-to-day basis (WHO 2016) and hence contributes significantly to the global burden of disease (Reddy 2010). Depression is treated using a range of pharmacological and psychosocial approaches, with outcome being highly influenced by social, environmental, biological and psychological factors (NICE 2009). Although pharmacological treatments are helpful for many people, some studies show that only one in three patients with Major Depressive Disorder reach remission with first-line antidepressant drugs (Rush et al., 2006). Residual symptoms such as depression and anxiety are also common, with numerous studies showing that over 50% of patients in remission report two or more residual symptoms (Miller et al., 1998; Nierenberg

et al., 1999; Nil et al., 2016).

Due to the limited effectiveness of pharmacological treatments for some people, alternative treatments for depression are increasingly popular. Consequently, these interventions have attracted the attention of researchers seeking to establish their effectiveness as treatment adjuncts. These treatments are generally well tolerated and include exercise, light therapy, mindfulness-based meditation, omega-3 fatty acids and yoga (Ravindran et al., 2009). A meta-analysis of traditional yoga for depression (Cramer et al., 2013) reported that severity of depressive symptoms reduced significantly over the short term when compared with standard care (a medium-large effect size of SMD = −0.69). Significant positive improvements in depressive symptoms were also observed when comparing yoga to relaxation and exercise interventions (effect sizes of 0.62 and 0.59 respectively). Exercise and yoga have also been shown to have moderately positive effects on anxiety (Saeed et al., 2010). The therapeutic mechanisms of yoga are

thought to relate to positive influences on emotional regulation and a moderation of reactions to stressful events (Streeter et al., 2012). Studies suggest that yoga may improve mental well-being as it increases levels of dopamine, stimulates thalamic GABA release, reduces levels of plasma cortisol and increases serotoninergic activity (Kjaer et al., 2002; Streeter et al., 2012).

Following the encouraging results of the effects of meditational and aerobic types of yoga on well-being (Pilkington et al., 2005) some limited research has been conducted to establish the efficacy of laughter yoga (LY) on psychological and physical well-being. LY was created by Dr Madan Kataria in India in 1995, it is a type of group based laughter exercise involving simulated laughter, gentle movement/stretching, rhythmic breathing and meditation (Bennett et al., 2015; Dolgoff-Kaspar et al., 2012). It has become increasingly popular worldwide and is now promoted as a low cost, low risk, less time-consuming intervention to improve well-being. Dr Kataria suggests that simulated laughter (not reliant on humour) has the same beneficial effects on the human body as genuine laughter, for example by reducing levels of stress related hormones (Kataria, 2005). Although there is a lack of substantial objective evidence for this claim, a recent study (Fujisawa et al., 2018) provides some indication that simulated laughter may have a positive impact on reducing cortisol levels in a similar fashion to that seen resulting from genuine laughter (Berk et al., 1989; Hubert et al., 1993). Fujisawa et al. (2018) controlled study randomised 120 healthy university students to a 30-minute single session of either LY, watching a comedy film or reading a non-humorous book. The results showed that participants who underwent LY had significantly reduced levels of salivary cortisol from baseline to 30 min after the intervention ($F = 4.33$, $p = 0.016$), whereas there was no improvement in the book reading group. However, the group of students who watched a comedy movie had higher reductions in cortisol than the LY participants ($F = 30.11$, $p < 0.001$) and the effects lasted longer. It is also hypothesised that the therapeutic effects of LY may result through actions on the same body systems as both yoga and genuine laughter; for example, by increasing serotoninergic activity, promoting relaxation and through relieving muscle tension (Bennett and Lengacher, 2008; Shahidi et al., 2011; Bennett et al., 2015). In addition, LY may improve mood by triggering genuine and contagious laughter in a group setting, and through strengthening social bonds by laughing with groupmates (Pan and Yeh, 2016).

Robust clinical studies of LY are scarce, and most focus on the well-being of people without a diagnosis of mental illness, or with diagnoses of specific physical illnesses. A recent systematic review of group LY interventions for improving mental health in adults (Bressington et al., 2018) identified six experimental studies conducted with a range of different populations. Only one study has been published which tests the effects of LY in people with diagnosed mental disorders (Shahidi et al., 2011); which compared the effectiveness of LY, group exercise and usual treatment to improve depression and life satisfaction in a group of elderly moderately depressed females. The systematic review (Bressington et al., 2018) concluded that LY has a promising effect on depressive symptoms, with significant medium-large effect sizes in two studies over the short term. However, the reviewed studies were small and generally of poor methodological quality.

Due to popularity of LY and the lack of good quality evidence, there was a need to conduct rigorous studies testing the potential effects of the intervention and the feasibility of conducting a full scale RCT to improve the symptoms of adults diagnosed with depression. Therefore, this study aimed to investigate the feasibility, acceptability, satisfaction and potential efficacy of a group-based LY intervention for improving residual symptoms of mood, anxiety and stress in working-aged people with a diagnosis of depressive disorder.

2. Study objectives

- To determine the feasibility of conducting a full scale randomized

controlled trial.
- To examine acceptability and satisfaction of the LY intervention from patients' perspectives.
- To evaluate the potential effects of the group-based LY intervention compared with treatment as usual, on residual symptoms of depression, anxiety and stress.
- To evaluate the potential effects of the group-based LY intervention compared with treatment as usual, on health-related quality of life.

3. Methods

3.1. Study design

This feasibility study used a non-blinded parallel-group randomised controlled trial design. We prospectively registered the study protocol on 18/05/2017 with ClinicalTrials.gov (reference: NCT03163940).

3.2. Study setting

The study was carried out from August 2017 to March 2018 in the Community Psychiatric Service of a large psychiatric hospital in Hong Kong. The service provides comprehensive multidisciplinary community psychiatric case management and treatment for a population of approximately 1.2 million people in the geographical catchment area.

3.3. Participants

All study participants were community-dwelling people who had a diagnosis of depressive disorder and at the point of recruitment were being treated in the community by the Community Psychiatric Service.

Participant inclusion criteria were: (a) male or female aged from 18–60 years; (b) diagnosed with and being treated for a depressive disorder (F32, F33: ICD-10-CM) as confirmed by a psychiatrist; (c) not receiving any other yoga, psychosocial or humour based intervention (currently or within the last three months); (d) able to commit to attend the LY groups; (e) current use of antidepressant and with no plans to change the medication during the next 3 months; (f) able to speak Chinese or English; (g) able to provide written informed consent and considered safe and competent to participate in the study (as suggested by their psychiatrist); (f) with baseline residual symptoms of depression (DASS score ≥ 10), in addition to anxiety (DASS ≥ 8) and/or stress (DASS ≥ 15).

Exclusion criteria were: (a) a history of bipolar disorder or schizophrenia; (b) physical health problems which may present risks if engaging in LY (i.e. hernia, injuries, etc. determined by their psychiatrist); (c) having co-morbidity of another chronic physical and/or mental health problem such as learning disability, substance misuse disorders and organic brain diseases; (d) receiving any talking therapies at recruitment or throughout the study period.

3.4. Recruitment, randomisation and blinding

The nurse consultant of the participating community mental health team was asked to nominate patients who met the study inclusion criteria. Each eligible participant was given a unique identification number in sequence according to their alphabetical order of surname. A list of random identification numbers was generated by an online external randomisation service (researchrandomizer.com) and this list was used to determine the order in which patients were approached by their keyworker. Participants were recruited in three consecutive cohorts over a three-month period.

After written informed consent was obtained, the baseline measurements were completed by participants supervised by a trained research assistant (RA). Only participants found to meet the DASS score inclusion criteria progressed to the randomisation stage, where they were individually assigned to either the LY or TAU control group (also

using random numbers generated by the randomisation service). All randomisation was carried out by a researcher not otherwise directly involved in the study. Due to the nature of the intervention it was not practical to blind participants or study personnel to treatment allocation after baseline assessments were conducted.

3.5. Ethical considerations

Ethical approval was obtained from the University's Research Ethics Committee and the Cluster Clinical Research Ethics Committee of the Hong Kong Hospital Authority prior to commencement of the study. The keyworker discussed the study with potential participants in detail, provided additional written information, and ascertained their capacity to provide informed consent. Potential participants were given adequate time to consider their decision. All participants were made aware that once they had provided written informed consent they could withdraw from the study at any point without needing to give a reason and without any negative treatment-related consequences. Potential risks to participants (i.e. emotional distress) arising from taking part in the study were monitored (and where necessary managed) by the LY group facilitator and a member of nursing staff at the group sessions.

3.6. Sample size

Our sample size estimation was based on previous literature that recommends feasibility studies adopt sample sizes of between 24 and 50 (Sim and Lewis, 2012; Julious, 2005) and a review of feasibility studies registered on the United Kingdom Clinical Research Network, which reported that the median sample size for studies with continuous outcome measures was 30 (Billingham et al., 2013). Therefore, assuming a minimum of 30 participants is required in each group, and taking into account a 20% drop-out rate observed in many psychosocial intervention studies (Van Daele et al., 2012), our target sample size was 36 in each study group (i.e., 72 participants in total).

3.7. Interventions

3.7.1. LY intervention
The LY groups were offered twice weekly, for 45 min each time. Each participant was asked to attend a total of 8 groups (over 4 weeks). Each group was designed to have a maximum of 12 participants. The LY groups were facilitated by one experienced certified lead LY trainer and supported by one of the three co-investigators who were also certified LY facilitators. In order to maintain consistency in the content of the LY group intervention across different groups the lead facilitator followed a pre-designed intervention content schedule. The three co-investigators monitored the lead LY trainer's fidelity to this planned schedule of activities using a pre-designed checklist.

Each session included the four essential steps of LY with integrated laughter meditation and grounding exercises. The intervention also provides an opportunity to connect with other people in the group in an enjoyable way. The four steps of LY are composed of (1) warm up exercises (e.g. clapping and body movement, (2) deep breathing exercises, (3) childlike playfulness and (4) laughter exercises (e.g. greeting laughter, lion laughter and other self-created laughter exercises, and closing cheers).

Laughter meditation involves focusing on the experience of laughter and the associated bodily sensations. The resulting focus on the present-moment is hypothesized to provide temporary relief from negative thoughts and rumination whilst providing an opportunity for a release of negative emotions. Unconditional or genuine laughter is often experienced during laughter meditation; this can become infectious and trigger laughter in other people within the group, hence creating greater connections with group members. The grounding exercises generally consist of a brief guided relaxation with deep breathing and are designed to enable participants to ground the energy of laughter

and relax after each laughter exercise. The childlike playfulness aspect of LY is integrated into many of the laughter exercises through acting and improvisation, it is intended to reduce inhibitions, cultivate a sense of openness and convert simulated laughter into genuine laughter during the groups. This sense of playfulness and openness is reinforced at the end of each laughter exercise by swinging the arms and chanting "Very good", "Very good" and "Yay". An example of a laughter exercise incorporating playfulness is the "milkshake laughter" exercise, in which participants pour and mix the ingredients of two imaginary glasses of milk by chanting "Aeee" and then laugh when pretending that they are drinking the milkshake. A selection of different LY exercises were conducted in each group to avoid repetition. Participants were also given a LY workbook and encouraged to practice the LY exercises individually outside the group sessions (i.e. at home).

3.7.2. Treatment-as-usual
Both the intervention and TAU control groups received their usual routine community mental health care (including medications) and attended medical outpatient appointments as determined by their individual needs. We asked TAU participants to refrain from joining any LY group or other humour-based formal intervention during the study time. The RA also asked the participants if they had attended such sessions during the follow-up assessments.

3.7.3. Data collection
The RA and keyworkers collected the baseline data at recruitment (including sociodemographic data, quantitative measures and relevant clinical data). The RA collected all follow-up outcome data and conducted the qualitative interviews. The primary and secondary outcomes were recorded at baseline, after the 4 weeks' intervention period (within one week of finishing the groups), and at 3 months after finishing the intervention.

All participants completed a demographic questionnaire specifically developed for this study. Information gathered included their age, sex, marital status, living situation, education level, employment status, comorbid physical illnesses, duration of depression diagnosis and prescribed medications for mental health.

3.7.4. Establishing the feasibility of conducting a full scale RCT
In order to assess the feasibility of conducting a full scale RCT, pertinent data was recorded throughout the study, including: participation/refusal rate, drop-outs, intervention attendance rates, adverse events and reasons for non-participation/withdrawal. LY participants were also asked to keep a diary (contained within the LY workbooks) of when and for how long that they may have practiced the intervention outside the facilitated groups and during the follow-up period in order to ascertain the feasibility of home practice.

3.8. Establishing acceptability and satisfaction of the LY intervention from patients' perspectives

Individual qualitative interviews were conducted to explore patients' views on the acceptability of group LY. Twelve patients who received the LY intervention were invited to a short interview (maximum of 25 min) with the RA at three months' follow-up. To obtain a broad spectrum of views about the intervention, participants were purposively selected for interview based on their level of participation and outcomes (i.e. two participants from each of the following groups: full attendance, partial attendance (60–90%), infrequent attendance (<50%), and three participants each from: DASS improved, DASS no change/deterioration).

In order to ascertain patients' satisfaction with the intervention all LY participants were asked to complete the Chinese language version of the Client Satisfaction Questionnaire (CSQ8) (Attkisson and Zwick, 1982; Attkisson, 2012) in the week post intervention. The CSQ8 is a widely used and well-established standardised self-report measure of
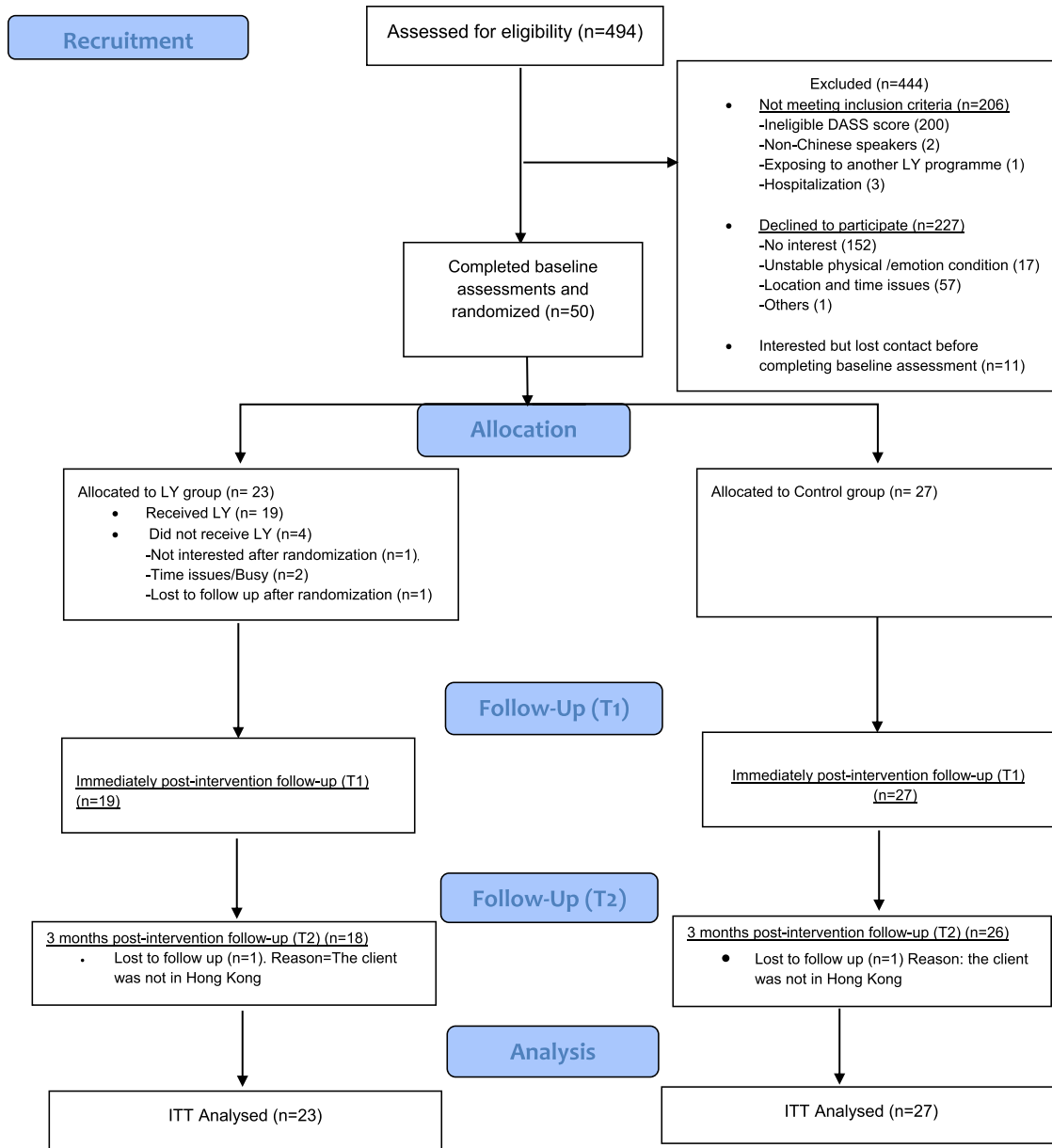
Fig. 1. CONSORT diagram.

client/patient satisfaction with a service or intervention. It consists of eight Likert scale questions scored from 1–4 and is reported to have excellent reliability (alpha coefficients range from 0.83 to 0.93) and internal consistency in patients with a variety of physical and mental health conditions (Attkisson and Zwick, 1982).

3.9. Establishing potential effects of the LY intervention on patient outcomes

Participants' levels of depression, anxiety and stress was measured using the Chinese version of the Depression Anxiety Stress Scale (DASS–21) initially developed by Lovibond and Lovibond (1995). It consists of 21 items with three subscales of seven items each (depression, anxiety and stress). Each item is scored on a 4-point Likert scale (from 0–3), with a higher score indicating more severe levels of distress. The Chinese version has been shown to have good test-retest reliability, internal consistency and convergent validity with the Chinese Beck Depression Inventory and Chinese State-Anxiety Inventory in the general population and in people with diagnosed mental illness (Oei et al., 2013; Chan et al., 2010, 2012).

The Short Form 12 item (version 2) Health Survey (SF12v2) was used to measure patients' self-reported physical (PCS-12 composite score) and mental (MCS-12 composite score) health-related quality of life (Lam et al., 2013). The Hong Kong Chinese version of the SF12v2 has demonstrated good test-retest reliability and internal consistency (Cronbach's alpha 0.67; and intraclass correlation 0.82); and high sensitivity and very high construct validity in Chinese populations (Lam et al., 2013).

3.10. Data analysis

Descriptive statistics were used to contextualise the demographic and clinical characteristics of the study population. Mann Whitney U Test and Chi-Square/Fisher Exact Test were used for comparisons of demographic/clinical characteristics and outcome measures between the two groups at baseline. Outcome analysis was performed on an intention to treat basis by comparing the changes in the outcomes from baseline to two post-tests between groups using Generalized Estimating Equations (GEE) with identity link function and AR(1) correlation

structure for the repeated measures. The GEE approach can account for intra-correlated repeated measure data and accommodate missing data that is missing at random. All statistical tests were two-sided and the significance level was set at 5%. Data were analysed by a statistician not otherwise involved in the study.

3.11. Qualitative interview data analysis

Inductive thematic content analysis was used for the interview data (Braun and Clarke, 2006). The recorded interviews were transcribed into Cantonese by the RA and cross-checked for accuracy by one Cantonese-speaking co-investigator. The transcripts were independently coded by two co-investigators. The initial codes were then discussed and combined to form main categories and subcategories. Coding/category discrepancies were resolved by referring back to the data as needed and via further discussion by the research team in order to reach agreement.

4. Results

4.1. Study participants

A total of 494 patients with a diagnosed depressive illness were identified from the patient records. Of these, 206 (41%) did not meet the inclusion criteria, mainly due to scoring too low on the DASS sub-scales (n = 200). Eleven (2%) were interested to take part, but could not be contacted to complete the baseline assessments. A further 227 (45%) potential participants declined to participate. Finally, 50 participants were randomly allocated into either the LY (n = 23) or TAU (n = 27) group after completing the baseline measurements. Please see Fig. 1 for CONSORT diagram summary of the study.

Analysis of participants' baseline demographic and clinical characteristics (Table 1) revealed no statistically significant differences between the two groups. Participants had a mean age of 46 years in the LY group and 49 in the TAU group (Range 18–60). The majority (70%) were women, living with relatives (75%) and were married (42%). A minority were employed (16%), although most (86%) had completed at least secondary school education. They had been diagnosed with depression for an average of around 4 years in the LY group and 5 years in the TAU group. One half of participants had also been diagnosed with comorbid physical illnesses. All were prescribed antidepressant medication, with just under a third (28%) receiving two different antidepressant drugs. The majority (52%) were prescribed a hypnotic, 60% were taking anxiolytics and 40% were also prescribed an antipsychotic drug. Please see Table 1 for study participants' demographic and clinical characteristics.

4.2. Feasibility of conducting a full scale RCT

The overall refusal rate of eligible participants was 78.8% (227 from 288). Of these, 66% (n = 152) were not interested in the intervention and 25% (n = 57) were unable to attend due to inconvenient group times/locations. Seventeen (7%) of eligible participants declined participation due to their mental state. Nineteen (83%) of the 23 patients randomised to the LY group after baseline measures were completed received the intervention, the most common reason for not starting the intervention was a lack of time and inconvenience of the LY group schedule.

In terms of attrition, one LY participant was lost to follow-up at the three-month point as she had left Hong Kong. All 27 TAU participants completed assessments at baseline and at T1 (post intervention) and one was lost to follow up at three-months, also due to being away from Hong Kong. The attendance rates of the 19 participants who were randomized to the LY group ranged from 1–8 sessions, with a median of 4 (mean = 4.10, SD = 2.64). Unfortunately, only two LY participants returned their completed workbooks with details of home practice. One

Table 1
Sample demographic/clinical characteristics at baseline.

	LY (n = 23)	TAU (n = 27)	
	n (%)	n (%)	p
Age (M, SD)	46.30, 12.84	49.37, 9.13	.53[a]
Duration of depression diagnosis, in months (M, SD)	48.59, 45.21	62.31, 49.47	.19[a]
Gender			
Male	6 (26.1)	9 (33.3)	.58[b]
Female	17 (73.9)	18 (66.7)	
Marital status			.50[b]
Single	7 (31.8)	4 (14.8)	
Married	8 (36.4)	13 (48.1)	
Widow/Divorced	7 (31.8)	10 (37)	
Dwelling status			.73[c]
Living alone	4 (18.2)	7 (25.9)	
Living with relatives	18 (81.8)	20 (74.1)	
Education level (Highest qualification)			.44[b]
No education	2 (9.1)	1 (3.7)	
Primary	3 (13.6)	8 (29.6)	
Secondary	14 (63.6)	17 (63)	
University or above	2 (9.1)	1 (3.7)	
Others (e.g. still under education)	1 (4.5)	0 (0)	
Employment status			.50[b]
Full-time/Part time	2 (9.5)	6 (22.2)	
Unemployed	16 (76.2)	18 (66.7)	
Others (e.g. Housewife)	3 (14.3)	3 (11.1)	
Physical comorbidities			
Systemic (e.g. Hypertension)	4 (17.4)	4 (14.8)	1.00[c]
Diabetic	2 (8.70)	6 (22.2)	.26[c]
Chronic Pain	2 (8.70)	3 (11.1)	1.00[c]
Hepatic (e.g. Fatty liver)	1 (4.35)	2 (7.40)	1.00[c]
Respiratory (e.g. Asthma)	0 (0)	2 (7.40)	.49[c]
Neurological	1 (4.35)	1 (3.70)	1.00[c]
Endocrine	1 (4.35)	1 (3.70)	1.00[c]
Others	2 (8.70)	2 (7.40)	1.00[c]
No. of physical comorbidities			.47[b]
0	12 (54.5)	13 (48.1)	
1	6 (27.3)	10 (37.0)	
2	3 (13.6)	1 (3.7)	
3 or above	`1 (4.5)	3 (11.1)	
No of antidepressants			.53[b]
1	17 (73.9)	18 (66.7)	
2	5 (21.7)	9 (33.3)	
No of hypnotics			.59[b]
0	12 (52.2)	15 (55.6)	
1	10 (43.5)	12 (44.4)	
No of anxiolytics			.29[c]
0	11 (47.8)	8 (29.6)	
1	9 (39.1)	17 (63.0)	
2	2 (8.7)	2 (7.4)	
No of antipsychotics			.77[b]
0	14 (60.9)	15 (55.6)	
1	8 (34.8)	12 (44.4)	

LY: Laughter Yoga Group; TAU: Treatment as usual group.
Note: LY group demographic/clinical information missing for one to two participants.
[a] Mann Whitney U Test.
[b] Chi-Square Test.
[c] Fisher Exact Test
*p < 0.05.

practiced every day for 5 to 10 min from the start of the intervention to 3 months follow-up. The other practiced LY at home on 12 occasions (for 5 to 10 min) during the month when she attended the groups. The main reason for not competing the workbooks was due to forgetfulness or lack of motivation. Some participants also expressed concerns about practicing at home, which was explored in the individual qualitative interviews.

Table 2
Examples of participant quotes by theme.

Theme	Sub-theme	Quote
What worked	Stress relief and relaxation	*"When interacting with each other with ha ha ha, feeling more relaxed" (LY32)*
		"Teaches you the techniques of releasing the stress such as appraising positively to yourself by saying "very good very good !" … helps people with illness to alleviate emotions …release stress" (LY38)
		"The atmosphere is relaxing, very enjoyable., I never thought I can laugh so easily, in the past I easily get tense, sometimes now I laugh a bit more (LY4) " (LY04)
	Happiness	*"Being taught by the instructor and with the group are happy ….being relaxed, playing together is happiness" (LY21) …*
		"I laugh very happily indeed, so freely … I have never been so happy at home before especially in this recent year, now I can laugh happily, I feel good and blessed" (LY38)
		"When I feel unhappy, I will say "ha ha ha" to myself and become happy…"(LY23)
	Exercise without restrictions	*"We are taught how to breath in and out and it can be practiced while we are on the bus or waiting for the bus". (LY21)*
		"The he-he-ha-ha activity can be done while walking or waiting for the bus, do it silently, people won't notice you are breathing, I can help myself without affecting others". (LY04)
		"While cooking and washing, I will do "ha ha ho ho" in the kitchen, while watching TV, I will clap hands"(LY11).
	Laughing in a group	*"We will act together and share our feelings in group after the event, the interaction and the exchanges with others are friendly …I like the activity of acting as sailing boats and swinging motion …it is fun" (LY54)*
		" one follows the other.., it is a genuine laugh, not the same as the dead atmosphere at work…it gives the group an environment and the feelings of being together" (LY11)
		"I like participating in events, if not attending the classes, I may do nothing, no spirit at all". (LY43)
What did not work	Difficulty practicing outside the groups	*"I will practice at home at the beginning, especially when my emotion is bad. This made me feel relaxed and happy, I didn't have to keep things bottled up... but my sons would say I am crazy…they told me to calm myself down" (LY32)*
		"I am staying at home…. in a subdivided flat and I don't even have space to practice. My children will scold me, they are old enough to call me crazy now… he will scold me…" (LY04)
		"I fear that neighbors would think I am crazy-therefore rarely practice" (LY38)
	Physical and mental health barriers to attendance	*"I am so afraid to meet people. I am scared that the others will see me and don't want to meet anyone. I just want to hide myself. Sometimes I don't want to go anywhere… I feel very uncomfortable and tired… I don't have the mood to do it." (LY32)*
		"If I am not injured, I will attend all the sessions…I have been seeing the physiotherapist for a long time, but I was still feeling painful all the time. And then I started feeling reluctant to come" (LY21)
		"I had a hospital admission and could not practice the LY" (LY06)
	Childlike playfulness	*"It is useless from my perspective, I find these activities to be childish. I know I should not devalue it. But when I am doing those movements, I find that to be childish" (LY57)*
		"… Because she told us to return to the childhood and act like a child… this makes me resist at the beginning… I am already quite old. I have thought of whether I should return in the next session" (LY11)
	Negative effects	*"I am feeling breathless and feeling very uncomfortable. I was feeling extremely uncomfortable on the second and third day. (LY23)*
		"My heartbeat became very obviously fast. The pulse made me feel uncomfortable. I just know that I couldn't sleep well at those nights. I don't know what's going on" (LY06)
What to improve	Bigger venue	*"I think the venue can be bigger. It would be great if the sessions could be held outdoor." (LY04)*
		"We are doing movements at most of the time. If the area is bigger, it will be less crowded and group members will feel more comfortable (LY12)
	Realistic expectations	*"The first session… I don't know the fact that it will involve so much things… I mean laughter Yoga… I am quite surprised. After doing a few acts in the first session, why is it so different (from other yoga programmes)? (LY11)*
		"Better to have some introductory information about LY and better to let participants know the content of the 8 sessions" (LY57)
	Increase number of people in the groups	*"It would better if there are more people.. The more people the better… I don't have a specific number on that… More people can create a better atmosphere" (LY04)*
		" It would be happier if there are more people. More people when practicing…. So that we can laugh together" (LY32)
	Greater variation of group exercises	*"Apart from laughter and "happiness", you can think of adding some songs (into the programme)… singing songs…and unleashing our desire to perform" (LY21)*
		"We were doing similar things throughout the 8 sessions, it is quite rigid..", I mean there is nothing new. You need some variety among the activities… More movement involving four limbs in LY would be better" (LY43)
	Longer program	*"I think the number of sessions is too little. I prefer at least 10–15 sessions because we are not familiar (with the exercise) at the beginning….Everyone does (encounter the same problem)… We are not dare to laugh at the beginning" (LY06)*
		"It is good to provide a long term course for us… those with depression or those who are taking your medications… It is good for us if this programme can last longer because we our kind of people always have poor memory" (LY38).

4.3. Satisfaction and acceptability of the LY intervention

The LY participants' ($n = 19$) satisfaction with the intervention (measured using the CSQ8) ranged from 16 to 30 (from a maximum of 32), with a mean score of 21.90 (SD = 3.67) and median of 22.0; suggesting an overall favourable level of satisfaction.

Twelve LY participants were purposively selected to attend an individual follow-up interview in accordance with the study protocol. One did not attend due to being way from Hong Kong. The eleven interviews lasted from 10 to 25 min. Content analysis of the transcripts revealed three main themes: *what worked, what did not work,* and *what to improve*. Thirteen sub-themes were also identified. Please see Table 2 for each theme, subtheme and associated example quotations.

In terms of positive effects of LY ("*what worked*" theme), most of the interviewees who attended more than two sessions explained that attending the groups and practicing the exercises made them feel happy, helped them to relax and provided an opportunity to release negative emotions. Some participants also mentioned that they felt great benefit from the group interaction and sharing their feelings with others. In addition, five interviewees stated that they were able to use the deep breathing approaches and practice some basic LY exercises whilst travelling or carrying out household chores.

In relation to the "*what did not work*" theme, nine participants mentioned having difficulty in practicing laughter yoga openly (at home or in the public area) due to the small living environment in Hong Kong and fears that other people would be concerned about their mental state and label them as being "crazy". Eight participants discussed how daily problems with their mental health (i.e. low mood/motivation) or physical health (chronic pain) prevented them from attending the groups or practicing LY on some occasions. Three

participants (who attended two or less sessions) did not enjoy or appreciate the childlike playfulness exercises that are at the core of the LY approach and indicated that they encountered difficulty in making fake laughs, especially at the beginning of the course. Three other participants also expressed that they experienced some negative effects of the LY, including feeling breathless and having an increased heart rate.

Many participants also identified some areas of the LY intervention that required improvement ("*what to improve*" theme). These included having a bigger venue, more people in the groups, a wider variety of activities and a longer programme duration. Two interviewees also mentioned a discrepancy between their original expectation of the intervention (i.e. a traditional yoga class) and the actual LY intervention (with fake laughter, playfulness and no traditional yoga positions).

4.4. Effects of the group-based LY intervention compared with treatment as usual

The outcome measure results indicated that the LY group had a statistically greater decrease in depression (DASS21 – Depression scale) than the control group from baseline to immediately following the intervention ($B = -5.123$, 95%CI: -9.527 to -0.72; $p = 0.023$). However, there was no statistically significant difference in the change in depression from baseline to 3-month follow-up between the two groups ($B = -2.724$; 95%CI: -7.106 to 1.658; $p = 0.223$).

There was also a statistically greater improvement in mental health related quality of life (MCS of SF12v2) in the LY group compared to the control group from baseline to immediately after the intervention ($B = 4.386$, 95%CI: 0.342 to 8.430; $p = 0.034$). Similarly to the depression scores, the improvement in mental health related quality of life was not significantly different between groups over 3-months follow-up ($B = 3.775$, 95%CI: -0.883 to 8.432; $p = 0.112$).

There were no statistically significant differences in changes in anxiety (DASS21 –Anxiety scale) between groups from baseline to the first follow-up ($B = -3.256$, 95%CI: -7.309 to 0.258; $p = 0.068$) or second follow-up ($B = -2.321$, 95%CI: -6.458 to 1.816; $p = 0.271$). There were also no significant differences between groups in changes in stress (DASS21- Stress scale) from baseline to the first ($B = -3.796$, 95%CI: -7.743 to 0.151; $p = 0.59$) or second ($B = -2.101$, 95%CI: -6.200 to 1.997; $p = 0.315$) follow-up points. Likewise, changes in physical health related quality of life (PCS of SF12v2) were not significantly different between the groups immediately following the intervention ($B = 0.476$, 95%CI: 1.706 to -2.867; $p = 0.780$) or at 3-months follow-up ($B = -2.767$, 95%CI: -6.854 to 1.501; $p = 0.209$).

Please see Table 3 for the estimated marginal means and standard errors of the outcome measures at all follow-up points.

5. Discussion

Despite the promising results observed post intervention, the feasibility of conducting a future large scale randomized controlled trial of LY in the study setting using exactly the same study design and procedures is doubtful. We eventually recruited approximately 20% of eligible participants, which was below our target sample size. The main reason for lack of interest in the study related to practical problems with attending LY groups. This was primarily because we scheduled the LY groups twice a week (on weekdays) and many potential participants were unable to commit to this due to existing household and childcare responsibilities. Future studies of LY in the study setting should therefore consider improving accessibility by offering less frequent groups during the week and at weekends, or perhaps by offering four groups per week of which participants could choose two that are most convenient. Some of the eligible clients were also unfamiliar with the LY intervention and refused to take part because they feared they would be required to maintain physically strenuous yoga poses. We addressed this in the latter phases of recruitment by showing video examples of the intervention to alleviate their concerns. This strategy seemed to be effective, and therefore future studies of LY could consider utilising multi-media information sources to ensure that potential participants are very clear about the nature of the intervention, rather than just relying on discussion and written information.

On reflection, our participant eligibility criteria were also very restrictive and this appears to have been a barrier to recruitment. We specified that participants were required to have residual symptoms of depression, in addition to residual anxiety and/or stress in order to join the study. These eligibility criteria resulted in 40% of the almost 500 potentially eligible participants being excluded because they scored too low on one or more of the DASS subscales. In fact, 63 people who met the minimum symptom threshold for depression were deemed ineligible to take part because they did not have additional symptoms of anxiety and/or stress. Therefore, the feasibility of recruiting sufficient numbers for a future full scale RCT might be improved by adopting eligibility criteria of residual depressive symptoms without the requirement for other additional symptoms.

We also examined satisfaction of the LY intervention from participants' perspectives; the median CSQ8 scores indicated a generally positive level of satisfaction and perceived usefulness of the LY intervention. In addition, the individual qualitative interviews revealed some interesting and useful information that is relevant for planning future LY interventions for people with depression. The majority of participants found that the simulated laughter and breathing exercises were very useful to help them relieve stress/tension and generally feel happier. Many participants also reported that laughing in a group setting triggered contagious genuine laughter and that attending the groups afforded them a rare opportunity to share their feelings with others. These perceived benefits seem to be consistent with the literature suggesting hypothesized therapeutic effects of LY (Bennett and Lengacher, 2008; Shaidi et al., 2010; Pan and Yeh, 2016).

In terms of the acceptability/tolerance of the LY intervention, three study participants described experiencing some discomfort relating to an increased heart rate, developing a dry mouth and feeling breathless.

Table 3
Study outcome measures of both groups at the three time points.

Outcome	Baseline LY Estimated Marginal Mean (SE)	TAU Estimated Marginal Mean (SE)	Post intervention LY Estimated Marginal Mean (SE)	TAU Estimated Marginal Mean (SE)	3 months LY Estimated Marginal Mean (SE)	TAU Estimated Marginal Mean (SE)
Depression	27.62 (1.99)	23.48 (1.41)	23.10 (2.01)	24.07 (1.78)	24.23 (1.95)	22.81 (1.75)
Anxiety	26.87 (1.42)	22.30 (1.26)	23.78 (1.51)	22.74 (1.42)	24.17 (1.55)	21.92 (1.84)
Stress	29.62 (1.40)	24.74 (1.60)	26.19 (1.75)	25.11 (1.28)	27.34 (1.45)	24.56 (1.72)
PCS	37.35 (1.58)	36.54 (1.11)	38.54 (1.77)	37.26 (1.23)	36.26 (1.97)	38.14 (1.44)
MCS	30.60 (1.48)	35.30 (1.21)	33.93 (1.95)	34.25 (1.32)	34.84 (1.58)	35.77 (1.74)

LY: Laughter Yoga Group; TAU: Treatment as usual group.
SE = Standard Error.
PCS = Physical composite score of SF12v2; MCS = Mental composite score of SF12v2.
Depression, Anxiety and Stress subscales from DASS21.

However, none of these issues required any medical/nursing intervention. None of the previous LY studies has reported the incidence of adverse advents and it is therefore impossible to ascertain if such discomfort is a common occurrence (Bressington et al., 2018). Similarly, many studies of traditional yoga for depression fail to report harms/adverse events (Cramer et al., 2013); although systematic reviews of yoga for schizophrenia (Cramer et al., 2013a) and anxiety/stress (Li and Goldsmith, 2012) concluded that there was no evidence of severe adverse events. A minority of participants (*n* = 3) reported that they found it difficult to engage with the playfulness aspect of LY and make fake laughs. It is noteworthy that these participants found this most problematic in the earlier groups, and this may suggest that there needs to be a degree of socialisation into the intervention in order to cultivate a sense of openness and remove initial inhibitions. Problems engaging with the intervention have not been reported in previous LY studies (Bressington et al., 2018), however most of these studies involved participants who had pre-existing relationships with each other (i.e. college students, care home residents and work colleagues). Whereas many of the LY group members in the current study did not know each other and this lack of familiarity might have further contributed towards any embarrassment. Future studies of LY might benefit from integrating some relationship building activities into the initial group sessions.

Although some participants were able to use the breathing exercises and less obvious LY techniques whilst in public, the majority were not able to openly practice LY whilst at home or outside. The inability to practice arose from concerns that others would view them as "crazy" because they would be overheard in the densely populated environment of Hong Kong. These fears are understandable in Hong Kong due to the prevailing stigmatisation towards mental illness reported in Chinese societies, and may be magnified because Chinese people are likely to internalize this public stigma (Kung, 2001; Mak and Cheung, 2008) and perceive a need to keep their mental illness a secret (Ow and Katz 1999). It is therefore possible that further improvements in depression and mental health related quality of life were not observed at 3 months follow-up due to the lack of home practice performed by the LY participants. While most LY studies (and other similar laughter therapy studies) have only measured outcomes immediately following the groups, there is some limited evidence that improvements in mental well-being can be maintained over time, albeit not in a study population with a diagnosed depressive illness. For example, a study involving 33 employees of a behavioural health centre reported that 15 daily sessions of LY techniques resulted in significant improvements in self-regulation, optimism, positive emotions, and social identification that were maintained at 90 days follow-up (Beckman et al., 2007).

Based on the participants' narratives, some modifications to the intervention should be considered to enhance engagement and promote home LY practice. Data from the qualitative interviews highlight that the less obtrusive home LY exercises, such as clapping and silently/quietly chanting "ha ha, ho ho", were regularly used by some participants, suggesting that these type of exercises may be more acceptable. As most of the participants' concerns about using the more obvious home LY exercises related to how they may be viewed as being "crazy" by family members, this may suggest that there is a need to socialise family members into the intervention before home practice can be used. Therefore, it may be useful to encourage participants to share information about LY with their relatives, or perhaps invite dyads of participants and their relatives to attend the LY groups together. However, promoting home practice to maintain improvements in outcomes is likely to be challenging because participants' lack of persistence with yoga-based interventions and the loss of short-term gains is a commonly reported issue, particularly in people with depression. For example, a 6 month RCT of traditional yoga for healthy older adults (Flegal et al., 2007) reported an overall class attendance rate of 77% and 64% adherence with yoga home practice, however participants with higher self-rated depression scores at baseline were statistically

more likely to drop out and less likely to engage in home practice. Similarly, a systematic review of yoga for depression (Cramer et al., 2013) reported that only five from the twelve included RCTs had acceptable rates of attrition. Some potential strategies to improve class attendance, study attrition and persistence with home practice might include providing reminders, making home practice instructions as simple as possible, rewarding attendance and offering social support/reinforcement (Flegal et al., 2007; McDonald et al., 2002; Salmon et al., 1998).

A number of potential modifications to the interventions were directly proposed by the study participants, and these may enhance the effectiveness and acceptability of the intervention. Perhaps most importantly, these included ensuring that potential participants were fully aware how the LY intervention differs from traditional yoga and including a greater variety of LY exercises/activities in the groups. Some participants also suggested that singing and/or exercise that is more physical should be built into the LY intervention. This would be potentially beneficial as some studies have previously been conducted using "Laughter Therapy", which includes some of the simulated laughter techniques used in LY in conjunction with exercise. These studies resulted in significant improvements (immediately post-intervention) in general health, insomnia, and anxiety (Ghodsbin et al., 2015), self-rated health (Hirosaki et al., 2013), and depression/sleep quality (Ko and Youn, 2011) in the elderly participants.

The final objective of this study was to evaluate the potential effects of the group-based laughter yoga (LY) intervention on depression, anxiety, stress and health related quality of life. The results were encouraging as there were statistically greater improvements in depression and mental health related quality of life in the LY group compared to the control group immediately after the intervention. However, these statistically significant improvements were not apparent from baseline to 3 months follow-up. There were no significant differences between groups in other outcome measures.

6. Study limitations and strengths

This study has some limitations worthy of consideration. This is a feasibility study with a small sample size. It was also impossible to blind participants to group allocation, and as the outcomes measures were all self-completed, the results are heavily subject to performance and social-desirability bias. A further potential limitation is the reliance on community diagnoses of psychiatric disorders to assess eligibility (as opposed to the use of a structured diagnostic interview). In addition, the study did not involve an active comparison group intervention; therefore, there is a risk that the positive effects of the LY intervention may only relate to non-specific group effects. Despite these limitations, this study has a number of methodological strengths, including the random selection of participants, random allocation to groups and strict adherence to the study protocol.

7. Conclusion

The findings suggest that a full-scale RCT of LY as an adjunctive treatment for residual symptoms of depression could be feasible if some modifications were made to the protocol/intervention. The results also show that the intervention could be effective to reduce depression and improve mental health related quality of life immediately post intervention. Future studies of the LY intervention in Hong Kong should use an active control group intervention, adopt a less restrictive residual symptom eligibility criteria, aim to gradually socialise participants into the intervention, incorporate a greater variety of exercises in groups, teach home practice exercises that can be used unobtrusively and schedule sessions flexibly to encourage attendance.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jad.2019.01.030.

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The effectiveness of stress management training program on depression, anxiety and stress of the nursing students

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Abstract

BACKGROUND:

Stress has been defined as a barrier to concentration, problem solving, decision making, and other necessary abilities for students' learning; it also has some symptoms and illnesses in the students such as depression and anxiety. In reviewing stress and its consequences, the methods of coping with stress in the method of response to it would be more important than the nature of stress itself. Therefore, this study aimed to determine the effectiveness of stress management training program on depression, anxiety and stress rate of the nursing students.

METHODS:

This parallel group randomized quasi-experimental trial, was done on 68 Bs nursing students of Nursing and Midwifery School in Isfahan University of Medical Sciences from 2010 to 2011. The questionnaires of this study consisted of individual characteristics and Depression, Anxiety and Stress Scale (DASS-42). In a random fashion, The intervention group was trained with stress management training program in 8 two hours sessions, twice a week. The questionnaires were completed by both groups before, after and one month after the study.

RESULTS:

The results of the study indicated that there was no significant difference before the intervention in depression, anxiety and stress mean scores in the two groups. After the intervention, the mean scores of anxiety and stress in the intervention group was 5.09 (4.87) and 8.93 (6.01) and in the control group was 10 (6.45) and 13.17 (7.20), that reduction in depression mean score was significantly greater in the intervention group in the control group (p = 0.040). Furthermore, the mean scores of anxiety and stress showed a significant difference between the two groups (Anxiety p = 0.001; Stress p = 0.011); this reduction also had been remained after a month.

CONCLUSIONS:

According to the results of the present study, holding stress management training program workshops in different courses of the mental health department can improve mental health of the students.

KEY WORDS: Psychological stress, training programs, depression, anxiety, nursing students

Stress is a multidimensional phenomenon which is focused on dynamic relationship between the individual and the environment. It is also defined as a stressor, individual's response to the stimuli and interaction between the individual and the environment. It should be noted that some degree of stress can be effective on increasing and improving individuals' performance. Evidences indicate that most of the human successes are created in stressful conditions; but high rate of stress would followed by numerous consequences, including mental and physical illnesses, sleep disorders, restlessness, irritability, forgetfulness, abnormal fatigue, reduced individual's resistance and recurrent infections, headaches, poor concentration, memory impairment and reduce in problem solving ability.[1] In general, everyone experiences the stress, but students are a group of people who are at the higher risk of stressors due to the transitional nature of the student life; because they need to adjust themselves with the life environment which requires compliance with new social norms and new friendship. Accordingly, their perception from an event is affected as a stressor and selecting coping strategies which they use them in the particular situations. These groups should cope with the increasing global demands i.e. decision making about issues such as occupation, life style, friends, family, religion and politics. They should also meet the needs of family, teachers, friends and other groups; therefore, they establish important emotional ties with the environment or non-family members and also establish their own value systems which, in most of the cases, influenced by the family and the culture they have been belonged to.[2] Studies indicated that medical students such as nursing students experience many stressor agents.[3] Nursing students are influenced by the various hospital stressor agents in addition to the stress caused by theoretical training environment. Hospitals are considered as one of the most stressful work environments, because there, it is the matter of humans' death and life.[4] According to the study of Fathi which was done in Kurdistan in 2004, the most psychological stress factor of the nurses was related to the ward's critical environment (77.13%) and patients' mortality (75.7%). Besides, Fathi quoted from Nasiri that the most stressful cause of the nursing students had been due to transmission of the contagious diseases.[5] The stress which is resulted from the environment not only can cause the academic failure, but also can affect the way their personality develops and also cause the incidence of many undesirable behaviors in them.[4] Totally, theses stressor agents can be divided into three categories: category related to education, clinical, and socio individual factors.[6] Various types of stress causes the reduction of individual's resistance through the negative effect which apply on the person's social and individual coping resources and in long-term can have unpleasant effects on student's physical and mental health. It was indicated that stress can cause mental and physical illnesses, dysfunction and adjustment disorder and ultimately reduction of students' quality of life.[7,8] So that in 2006, Assadi et al in their study found that psychological problems was more prevalent among medical students, graduates and women.[9] Studies indicated that prevalence and severity of mental and psychological problems has been increased in students compared to the non-student population. According to the reports of National Institute of Mental Health, recent study results in Wolfson Health Sciences Institute of London indicated that 44 percent of the male students and 64 percent of the female students suffered from anxiety and 12 percent of the male students and 15 percent of the female students suffered from depression. The consultants of the mentioned institute had reported the increase rate of referred students to the consultant centers from 2.4 per 100,000 students in 1995 to 9.7 in 2000.[10] In the study of Ebrahimian on 113 nursing students of Azad University of Semnan, it was indicated that 57.5% of nursing students of Azad University suffered from various degrees of depression.[11] In reviewing stress and its consequences, in the stress coping strategies, the method of response to it would be more important than the nature of stress itself. The more appropriate method used in coping with stress, the less he/she would be damaged.[12] There are various methods recommended to control or reduce the stress.[13] Stress coping skills have a comprehensive concept and multiple cognitive-behavioral components. Generally, coping has been described as efforts to comply the individual with the environment or efforts for preventing from the negative consequences of stressful situation. Two main methods for preventing from stress are deal with problem-focused directly on the issue which includes direct activities on the environment in order to change or correction of the situation which is threatening and also emotion-focused practices which include thoughts or activities in order to control the unpleasant feelings which have been created from stressful conditions. Problem oriented techniques include active methods such as cognitive and behavioral problem solving.[14] Cognitive-behavioral coping strategies are the most effective methods to reduce the stress.[15] Considering that all the living organisms experience the stress, the aim of nursing is not removing

the whole stress completely, because stress is part of the life. Response to stress can be in an unhealthy way, and the role of the nurse at this time is helping to promote the health. Health promotion includes strategies for reduction and management of the stress, the nurse also can use nursing process in order to manage the stress.[16]

Stress management practices include; yoga relaxation, progressive muscle relaxation, breathing exercises, meditation and mental imagery.[17] There have been done many studies about the effectiveness of stress management training on anxiety, depression and stress rate so that Mehrabi et al in their study had reviewed the effectiveness of this approach on emotional problems of the diabetic patients and have found that stress management training can be helpful as a comprehensive diabetes care.[18] Other studies also indicated the efficacy of this approach in reducing the stress and anxiety resulted from the tests in the pupils.[15] Researches indicated that stress management was associated with reduction of the depression[17] and anxiety symptoms.[15] Kong also in his study (2009) titled as "the effectiveness of a stress coping program based on mindfulness meditation on the stress, anxiety, and depression experienced by nursing students in Korea" showed that the above approach could be effective in reduction of the stress and anxiety of the nursing students.[19] The effectiveness of stress management training on the academic achievement of Tiran and Karvan's students was investigated; the results showed that stress management training could result in progresion in academic achievement.[20] Considering the wide use of stress management training program for emotional problems and various diseases and also high rate of anxiety and depression in nursing, the studied researches on this group have been descriptive. Therefore, the researcher decided to conduct a study as reviewing the effectiveness of stress management training program on depression, anxiety and stress of the nursing students of School of Nursing and Midwifery of Isfahan University of Medical Sciences in 2010. It will hope that this study be a step toward enhancing the scientific output and students effort to achieve the decent position and fertile the scientific context more appropriate.[•]

Methods

This study was a parallel -group randomized quasi-experimental trial, from 2010 to 2011conducted in Nursing and Midwifery School in Isfahan University of Medical Sciences on 68 Bs nursing students.

The study population included all male and female nursing students who were studying in Isfahan Nursing and Midwifery university in 2010-2011, in the second and third years (third, fourth, fifth and sixth semesters). 72 students were randomly assigned to two groups using the list of students studying in the second and third year in 2010-2011 and based on the odd and even numbers.first group (n=38) trained stress management training program (8 two hours sessions, twice a week). And second group (n = 38) did not recived training.

The groups were heterogeneous in terms of gender and the majority of the members were fixed until the end of the sessions.

In order to match both groups, the questionnaires were analyzed and then called to all. After explanations about the study, they evaluated to had inclusion criteria, then consent forms and the questionnaires were completed by them. Finally seventy-six subjects elected among them.

At the last session of the stress management training program and one month after that, the questionnaires were given to the subjects of both groups to complete them simultaneously. This program was compound of cognitive-behavioral techniques which merged with cognitive-behavioral stress management method as stress management intervention. This program was a close and structural and had the intervention which was 8 sessions, twice a week, that each session was two hours. The activities of the studied sessions were as the following table. To collecting the data, the questionnaire was used which had two parts: a questionnaire for personal information (7 questions) and a self- report questionnaire with 42 questions for anxiety (14), depression (14) and stress (14) with Likert scale from 0 to 40 (DASS-42). The data were analyzed through descriptive and inferential statistical methods using Software $SPSS_{18}$.

1st session	Introduction session and providing information about the stress
2nd session	Familiarity with gradual muscle relaxation and its implementation with mental imagery
3rd session	Familiarity with the consequences and physical symptoms of the stress
4th session	Relaxation and imagery and training and diaphragm breathing practices
5th session	Linking thoughts and emotions and familiarity with cognitive errors
6th session	Discussion about relaxation exercises
7th session	Replacement of logical thoughts and personal stress management program
8th session	End of the stress management training program, completing the questionnaire

Results

The mean age in both group was 20.9 ± 1.3 (range: 19-25) and standard deviation was 21.2 ± 1.3. To assess these parameters, independent t-test was used indicating no significant difference between them (t = 1.14; p = 0.256). In the intervention group 57.6% and 42.4% of the students were female and male respectively, and in the control group 54.3% and 45.7%. In the intervention group and control group 97% and 88.2% of the study subjects were single. The maximum frequency of their current residential rate was in the intervention group (60.6%) for living with the family and in the control group (62.9%) for living in the dormitories. The most incoming rate of the subjects' families was in the intervention group (75%) and control group (79.4%) for living expenses. A hundred percent of the students' parents in the intervention group and 88.6% in the control group were alive. 69.7% subjects. In the intervention group and 71.4% in control group was related to the third year students. Evaluations of differences in mean changes of depression scores before, just after and one month later in the intervention group was done using ANOVA with repeated observations. The results of this test indicated that statistically there was a significant difference between depression scores before, just after and one month later of the intervention (p < 0.001). Furthermore in the control group, comparing mean changes of depression scores inciccating a significant difference between the depression scores in three steps (p = 0.006).

ANOVA with repeated observations in mean scores of anxiety in three phases in the intervention group showed that there was a significant difference between mean scores of anxiety in three steps (p = 0.005), and as it was expected, mean scores of anxiety before and after the intervention had a significant difference by used of paired t-test (t = 2.71; p = 0.011), but mean scores of anxiety showed no significant difference after and one month after the intervention based on paired t-test (t = 1.03; p = 0.306) and mean score of anxiety had significant different one month after the intervention compared to before the intervention (t = 3.60; p = 0.001). The mean scores of anxiety had been reduced after the intervention so it can be concluded that stress management training program caused reduction in anxiety symptoms in the nursing students. Comparing mean scores of anxiety before, after and one month after that in the control group was done using ANOVA with repeated observations. The results of this test showed that there was a significant difference between anxiety scores in three phases (p = 0.009). The mean scores of anxiety before and after the study had a significant difference based on the paired t-test (t = 4.067; p = 0.000). In addition, mean scores of anxiety had a significant difference after and one month after the study based on paired t-test (t = 2.452; p = 0.019). But mean score of anxiety was not significant one month after the study compared to before the study (t = 0.065; p = 0.949).

Comparing mean scores of stress in the intervention group in three phases, before, after and one month after the intervention showed a significant difference (p = 0.000), but this was not significant in the control group (p = 0.074).

Tables 1 to 3 were designed in order to compare mean scores of depression, anxiety and stress in the intervention and control groups in three phases.

Discussion

There were many studies that evaluated the role and importance of the cognitive and behavioral techniques in reducing the stress, anxiety and depression and other mental stress. The aim of present study was to determine the effectiveness of stress management training method on depression, anxiety and stress rate of the nursing students of Nursing and Midwifery school in Isfahan University of Medical Sciences. The results of this study indicated that anxiety level of the nursing students had reduced through implementing stress management training program. In the other hand, the stress management training program caused

reduction in anxiety level which this result was in accordance with the result of of Sajadinejad et al[27], Mehrabi et al[18], Davazdahemami et al[28], Antoni et al studies that all of them have approved the effecacy of cognitive and behavioral stress management on reducing the depression.[29] It is necessary to reduce the anxiety level and prevent educational failure and their efficiency in the clinical practice. As the results of the present study indicated, stress management training program had a reductive effect on anxiety level of the nursing students.[30]

The studies of Hirokawa, Yagi and Miyata showed that stress management training based on the meditation could significantly reduce the anxiety level of the nursing students in the intervention group compared to before the intervention. Besides, this program caused a significant reduction in stress level of the nursing stress in comparison to before the intervention.[31] The study of Heravi et al evaluated the effect of relaxation practices on anxiety level of the nursing students' exams. In the mentioned study it was indicated that relaxation trainingprograms (progressive muscle relaxation and diaphragm breathing practices) caused reduction in anxiety level in the intervention group from 46.5 percent (before intervention) to 17.5 percent (after the intervention).[32] Therefore, in the present study which was done on the nursing students, relaxation techniques were used in order to reducing anxiety level of the nursing students who had high size courses, compaction of the exams, and stressful clinical environment; the results of both studies indicated the efficacy of this technique in reducing the anxiety level of the nursing students.

Any change in the individual's life requires new adjustment with the condition. Furthermore, according to the cognitive-behavioral theory, coping strategies have important role in stress reduction and consequently mental health. Besides, stress alonehas a limited value in explanation and predication of individuals' situation, and do not considering as their coping skills. On the other hand, when someone has better sources for coping, the likelihood of catch at vulnerable situations are more.[33]

Accordance to the results of the present study, Dehghan Nayeri et al trial determined the effect of relaxation on stress and quality of life of the students lived in the dormitories, it showed that mean score of stress in the intervention group was 1.51 before the intervention which was t-test significant difference after the intervention in terms of stress level by using test showed.[13] Moreover, in support of the results of the present study, the findings of study of Ja et al (2004) titled as "the effect of psychosocial stress management on stress coping student nurses" indicated that students stress level in the intervention group after the intervention had significantly decreased that in comparison to the control group was significant, but on the depression and anxiety of the students this was not effective[34] which was not accordance in regard to present study; because in the present study stress management training program also had a reductive effect on the depression and anxiety of the students, May be due to difference in the obtain of results; in the present study, stress management training was used in cognitive-behavioral technique in addition to relaxation techniques. In addition, comparing the mean scores of anxiety and stress one month after the intervention showed a significant difference between the two groups, but there was no significant difference between two groups one month after the intervention in depression mean score. The study results of Davazdahemami et al titled as "reviewing the effectiveness of stress management training in cognitive-behavioral technique on blood sugar and depression of patients with type II diabetes" indicated that stress management training program could reduce the depression mean score of the patients in the follow-up step, which this reduction was significant as compared with the control group.[28]

Study results of Antoni et al titled as "How stress management improves quality of life after the treatment for breast cancer" showed that depression level of the women with breast cancer had reduced in the intervention group in the follow-up step and this reduction was significant as compared with the control group.[29]

The study of Mehrabi et al indicated that stress management training program in cognitive-behavioral technique could have a significant reduction in stress, anxiety and depression level in the intervention group in comparison with the control group and this reduction was also significant in the follow-up step.[18] The researcher believed that maybe the cause of difference in the present study, unlike the two previous mentioned studies was that the study subjects were selected randomly from the nursing students who were studying in the School of Nursing and Midwifery of Isfahan who most of them were the classmates

together and had interaction together in the university environment. Therefore, there was the possibility of transferring the learned information in the stress management training program and the control group might have been influenced by the intervention group. Therefore, the depression level of the control group had decreased in parallel with the intervention group so reduction in depression mean score could not be significant one month after the intervention in the test group in comparison with the control group. The findings of the present study indicated that management training program on depression, anxiety and stress rate of nursing students can promote the mental health and improve academic achievement and provide clinical services in the hospital by the students.

The role of the psychiatric nursing department should not be ignored here, because they can have a valuable role in reduction the stress and facilitate the students learning, So according to the results of the present study, holding stress management workshops in different courses and implementing psychotherapy train ing programs can improve the mental health of the students.

The authors declare no conflict of interest in this study.

Acknowledgments

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Figures and Tables

Table 1

Mean score	Intervention group		Control group		Independent t-test	
	Mean	SD	Mean	SD	p value	t
Depression	10.63	10.02	9.34	7.79	0.553	0.591
Anxiety	7.60	6.10	7.88	6.51	0.856	0.181
Stress	13.39	9.18	12.82	9.09	0.80	0.806

Comparing the mean scores of depression, anxiety and stress in the intervention and control groups before the intervention

Table 2

Mean score	Intervention group		Control group		Independent t-test	
	Mean	SD	Mean	SD	p value	t
Depression	6.03	5.76	9.08	6.25	0.04	2.09
Anxiety	5.09	4.87	10	6.45	0.001	3.52
Stress	8.93	6.01	13.17	7.20	0.01	2.62

Comparing the mean scores of depression, anxiety and stress in the intervention and control groups after the intervention

Table 3

Mean score	Intervention group		Control group		Independent t-test	
	Mean	SD	Mean	SD	p value	t
Depression	4.69	5.35	6.02	6.08	0.343	0.955
Anxiety	4.39	3.54	7.82	8.14	0.029	2.22
Stress	5.96	5.60	10.40	9.96	0.028	2.24

Comparing the mean scores of depression, anxiety and stress in the intervention and control groups one month after the intervention

Effects of a laughter and exercise program on physiological and psychological health among community-dwelling elderly in Japan: randomized controlled trial.

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Abstract

AIM: To examine the effects of a once-weekly laughter and exercise program on physical and psychological health among elderly people living in the community. As a regular exercise program can be difficult to maintain, we provided a more enjoyable program to enhance adherence to exercise.

METHODS: A total of 27 individuals aged 60 years or older, without disabilities, were randomly assigned to either an immediate treatment group (n=14) or a delayed treatment group (n=13). The intervention was a 120-min session consisting of laughter and exercise, carried out once a week for 10 consecutive weeks. Measurements taken at baseline, 3 and 6 months included bodyweight, height, body fat, lean mass, bone mineral density, hemoglobin A1c (HbA(1c)), glucose, high-density lipoprotein and low-density lipoprotein cholesterol, and triglycerides, as well as self-rated health and psychological factors.

RESULTS: All participants completed the 3-month program. Bone mineral density increased significantly in the immediate treatment group compared with the delayed treatment group during the first 3 months (P<0.001). In addition, HbA(1c) decreased significantly (P=0.001), and self-rated health increased significantly (P=0.012).

CONCLUSIONS: The combination of a laughter and exercise program might have physiological and psychological health benefits for the elderly. Laughter might be an effective strategy to motivate the elderly to participate in physical activity.

Publication types, MeSH terms   ✚

Research Article
Laughter and Stress Relief in Cancer Patients: A Pilot Study

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The purpose of this study was to examine the effect of a therapeutic laughter program and the number of program sessions on anxiety, depression, and stress in breast cancer patients. A randomized controlled trial was conducted involving 31 patients who received four sessions of therapeutic laughter program comprised and 29 who were assigned to the no-program control group. Scores for anxiety, depression, and stress were measured using an 11-point numerical rating scale. While no change was detected in the control group, the program group reported reductions of 1.94, 1.84, and 2.06 points for anxiety, depression, and stress, respectively ($p < 0.01$, $p < 0.01$, and $p < 0.01$). Scores decreased significantly after the first therapeutic laughter session ($p < 0.05$, $p < 0.01$, and $p < 0.01$). As the therapeutic laughter program was effective after only a single session in reducing anxiety, depression, and stress in breast cancer patients, it could be recommended as a first-line complementary/alternative therapy.

1. Introduction

The increase in the survival of cancer patients has created interest in quality of life and the various factors affecting it. Breast cancer is the second most frequent cancer in Korean women and occurs most often in middle-aged women in their 40s and 50s [1]. The 5-year survival rate of breast cancer patients has continued to increase since 1993 and it has the second highest survival rate at 91.3% in the last 5 years, beaten only by thyroid cancer [1]. Among the various factors reported to affect quality of life is psychological stress, which leads to depression and anxiety [2]. Psychological stress prevalence is very high among breast cancer patients in Korea, with depression affecting 44% of the cancer patient population [3] and 36% of breast cancer patients undergoing radiation therapy; meanwhile, 21% experience anxiety [4]. Therefore, effective interventions to reduce psychological stress are needed urgently.

Laughter is regarded as a long-standing complementary and alternative therapy since 1970 [5]. As laughter is a noninvasive complementary/alternative therapy, the use of laughter therapy has spread rapidly. Currently, there are several laughter therapy clubs around the world in which people gather to practice laughter and laughing on purpose; this fake laughter gradually becomes effective in releasing "anti-stress and joyful hormones" [6]. Studies on the effect of laughter have been actively promoted, and some studies have specifically targeted dialysis patients, elderly people, transplant patients, postpartum women, and smokers [6–9].

Studies have found a variety of positive effects of laughter therapy on anxiety, depression, tension, rage, and general health, and it has been found useful for insomnia, pain relief, improving pulmonary function, and increasing immunity [6, 7, 10–15]. Meanwhile, some studies have been conducted among cancer patients with laughter therapy demonstrating major positive effects on quality of life, resilience, immunity, anxiety, depression, and stress [14, 16–18]. Nonetheless, the therapeutic effects of laughter for cancer patients are not at a point where they can be confirmed because most previous research was conducted using comparisons without randomization [10–13]. Moreover, a standardized therapeutic laughter program (TLP) has not been developed yet, which means that laughter therapy has not been actively promoted by the medical community for cancer patients. While the

results of TLP for health have been positive [19], and there is an "abundance of non-evidence-based opinion" regarding TLP in the literature, so an evidence-based approach is required [20].

In order to evaluate the effects of laughter for cancer patients accurately, various sources of bias should be controlled thoroughly. Thus, we designed a randomized controlled trial to compare the effect of a TLP consisting of four sessions and significant decrease of depression, anxiety, and stress was reported among breast cancer patients undergoing radiotherapy [16]. Data collected through conduction of this trial form the basis of our comparative analysis. The secondary purpose of this study was to measure whether the effects of laughter therapy differ based on the number of sessions attended. An additional concern was that measuring psychological stress routinely using multiple item questionnaires such as the Hospital Anxiety Depression Scale (HADS) [21] and Brief Encounter Psychosocial Instrument-Korean version (BEPSI-K) [22] is difficult in a busy outpatient setting. Therefore, we evaluated the level of depression, anxiety, and stress additionally using a single-question, 11-point numerical rating scale (NRS).

2. Methods

This study was conducted as a secondary analysis using data collected from a randomized controlled trial to investigate the effects of laughter on depression, anxiety, and stress among breast cancer patients in comparison to a nontreatment control group [16]. This study was approved by the ASAN Medical Center Institutional Review Board.

2.1. Participants and Intervention. Breast cancer patients receiving postoperative radiation therapy were recruited between September and October 2008 at the ASAN Medical Center. We excluded patients with psychiatric problems, including major depressive disorder and anxiety disorder, as determined by medical record review; each participant was interviewed and checked for their past or current medical problem, including psychiatric problems, during their admission before operation, and this was reaffirmed via the self-reporting questionnaire on their baseline visit before randomization.

A total of 62 patients were randomized into the TLP and nonintervention groups. The TLP was administered for four sessions by a licensed TLP trainer, with each session lasting 60 minutes; the control group did not receive any intervention. The program consisted of periods of loud, prolonged laughter together with information about the effects of the TLP (details of the TLP are described in Supplement 1 in Supplementary Material available online at http://dx.doi.org/10.1155/2015/864739).

2.2. Data Collection and Statistical Analysis. To investigate the effects of the TLP, a single-question, 11-point (ranging from 0 to 10) NRS was used to measure anxiety, depression, and stress levels (details of the NRS are described in Supplement 2); as gold standards, anxiety and depression were measured using the HADS [21], and stress was measured using the BEPSI-K [22]. The TLP group participants and the control participants were measured for anxiety, depression, and stress before and after participation in four TLP sessions using the NRS, HADS, and BEPSI-K; in addition, the NRS scores of the TLP group for anxiety, depression, and stress were measured after each TLP session (Figure 1).

In order to confirm the validity of the NRS, the correlations between it and the HADS and BEPSI-K were analyzed using Spearman's rank correlation coefficient test. Baseline NRS scores for anxiety, depression, and stress before the TLP were compared using independent t-tests and the Mann-Whitney U test. The differences between the NRS scores for anxiety, depression, and stress in the two groups were examined using an analysis of covariance, adjusted for baseline stress scores and marital status, which had a significant effect in a previous study [16]. The primary analysis was an intention-to-treat analysis (ITT), and a per-protocol analysis (PP) was performed as a secondary analysis. Only patients who participated in more than two of the four TLP sessions were included in the PP analysis. The effects of the number of TLP sessions attended were analyzed using a repeated measures analysis of variance with Bonferroni's posttest correction. All analyses were performed using SPSS software (version 18.0).

3. Results

Of the 60 patients who participated in the study, 29 in the control group and 31 in the TLP group were included in the ITT analysis (Figure 1); for the PP analysis, 20 from the TLP group who had more than two sessions and 29 in the control group were included. There was no significant difference except for marital status between the general characteristics or disease characteristics of the two groups (Table 1). Spearman's rank correlation between the NRS and HADS scores for anxiety is 0.59 ($p < 0.01$) and, for depression, 0.62 ($p < 0.01$). The correlation between the NRS and BEPSI-K for stress is 0.63 ($p < 0.01$). As evaluated, the NRS scores for anxiety displayed a moderate correlation with the HADS scores. For depression and stress, the NRS scores had a strong correlation with the HADS and BEPSI-K scores.

The NRS scores for anxiety, depression, and stress of the TLP group decreased by 1.94, 1.84, and 2.06 points, respectively, whereas no changes were reported in the control group ($p < 0.01$, $p < 0.01$, and $p < 0.01$) (Table 2). In the PP analysis, there were also significant differences in the NRS scores for anxiety, depression, and stress between the TLP group and control group (Table 2).

The results obtained by repeatedly measuring and comparing the NRS scores for anxiety, depression, and stress of the TLP group showed that, as the number of TLP sessions attended increased, the NRS scores for anxiety, depression, and stress decreased significantly ($p < 0.01$, $p < 0.01$, and $p < 0.01$) (Figure 2). The posttest results after every TLP session showed that anxiety, depression, and stress levels decreased ($p < 0.05$, $p < 0.01$, and $p < 0.01$) between the presession scores and the first postsession scores, and there were no further significant changes (Figure 2).
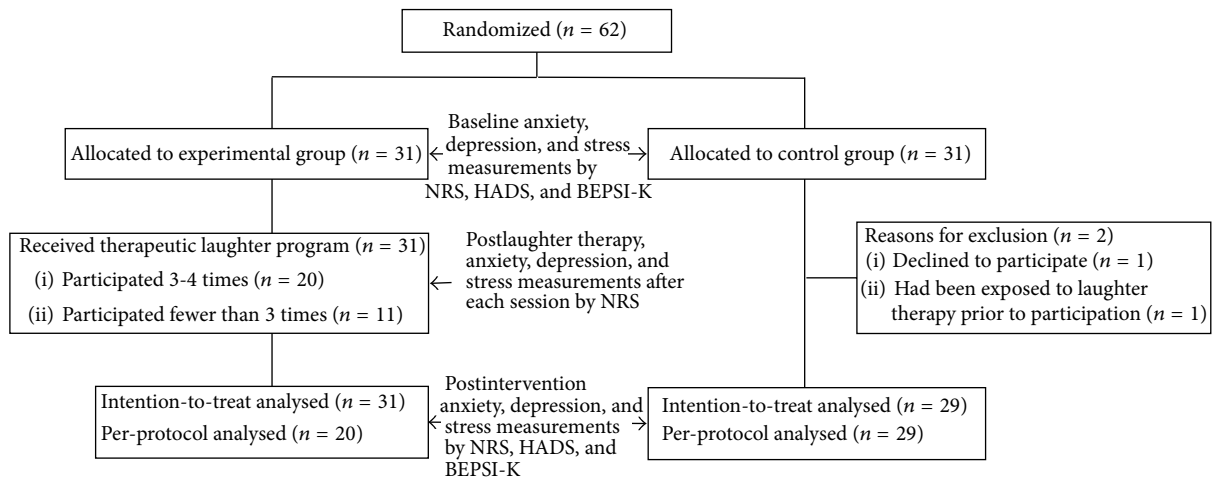
FIGURE 1: Flow chart of the randomized controlled trial to evaluate antipsychological stress effects of laughter therapy in breast cancer patients. NRS (numerical rating scale); HADS (Hospital Anxiety Depression Scale); BEPSI-K (Brief Encounter Psychosocial Instrument-Korean version).

TABLE 1: Baseline characteristics of intention-to-treat population of two groups.

Characteristics	Subtotal	Experimental group ($n = 31$) n (%)	Control group ($n = 29$) n (%)	p value
Age (years)				
<40	13	9 (29%)	4 (14%)	
40–49	23	12 (39%)	11 (38%)	0.38[b]
50–59	17	8 (26%)	9 (31%)	
≥60	6	2 (6%)	5 (17%)	
Marital status				
Yes	50	22 (71%)	28 (97%)	0.01[b]
No	10	9 (29%)	1 (3%)	
Education level				
≤Middle school	8	3 (38%)	5 (63%)	
High school	24	15 (63%)	9 (38%)	0.35[a]
≥College	28	13 (46%)	15 (54%)	
Cancer stage				
0	4	2 (7%)	2 (7%)	
I	25	11 (36%)	14 (48%)	0.83[b]
II	21	12 (39%)	9 (31%)	
III	10	6 (19%)	4 (14%)	
Operation				
Breast conserving operation	53	28 (90%)	25 (86%)	0.70[b]
Mastectomy	7	3 (10%)	4 (14%)	
Past treatment				
Operation	29	18 (29%)	11 (38%)	0.12[a]
Operation and chemotherapy	31	13 (71%)	18 (62%)	
Current cotreatment				
None	14	9 (29%)	5 (17%)	0.28[b]
Hormone therapy	46	22 (71%)	24 (83%)	

p values were calculated by (a) Chi^2 test and (b) Fisher's exact test.

TABLE 2: Change of numerical rating scale scores for anxiety, depression, and stress after therapeutic laughter program.

	Intention-to-treat analysis			Per-protocol analysis		
	Experimental group ($n = 31$)	Control group ($n = 29$)	p value	Experimental group ($n = 31$)	Control group ($n = 29$)	p value
	Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD	
Baseline						
Anxiety	3.42 ± 2.08	3.21 ± 2.24	0.66[b]	3.20 ± 2.31	2.97 ± 1.92	0.70[a]
Depression	3.48 ± 2.14	2.97 ± 1.92	0.33[a]	3.30 ± 2.03	3.21 ± 2.24	0.83[b]
Stress	3.32 ± 2.09	3.62 ± 1.95	0.57[a]	3.35 ± 2.21	3.62 ± 1.95	0.38[b]
Postintervention						
Anxiety	1.48 ± 1.46	3.31 ± 2.22	<0.01[c]	1.10 ± 1.41	3.31 ± 2.22	<0.01[c]
Depression	1.65 ± 1.62	3.31 ± 2.04	<0.01[c]	1.30 ± 1.66	3.31 ± 2.04	<0.01[c]
Stress	1.26 ± 1.32	3.72 ± 1.81	<0.01[c]	0.80 ± 1.20	3.72 ± 1.81	<0.01[c]
Difference						
Anxiety	−1.94 ± 1.97	0.10 ± 1.97	<0.01[b]	−2.20 ± 1.85	0.10 ± 1.97	<0.01[b]
Depression	−1.84 ± 1.63	0.34 ± 1.97	<0.01[b]	−1.90 ± 1.55	0.34 ± 1.97	<0.01[b]
Stress	−2.06 ± 2.00	0.10 ± 2.14	<0.01[b]	−2.55 ± 1.88	0.10 ± 2.14	<0.01[b]

p values were calculated by (a) independent t-test, (b) Mann-Whitney test, and (c) analysis of covariance test adjusting for marital status and baseline distress score.

4. Discussion

TLP was effective in lowering anxiety, depression, and stress as measured by the NRS in breast cancer patients undergoing radiation treatment in comparison to the control group. This finding concurs with the HADS and BEPSI-K results [16]. Therefore, using the NRS instead of the HADS (14 items) and BEPSI-K (5 items) could be a useful option among routine repeated measures in busy outpatient settings.

Moreover, we found that the anxiety, depression, and stress levels of breast cancer patients could be reduced after a single TLP session. The reduction of anxiety, depression, and stress after TLP has been reported in a number of studies [6, 8, 23–26], and various physiological effects of TLP have also been reported [8, 27–30]. Although the mechanism of the TLP's effect is not well understood, researchers have reported that laughing reduces neuroendocrine and stress-related hormones, and a hypothesis regarding the TLP mechanism that contributes to psychological stress reduction has been suggested [27]. We found that the antiphysiological effects were evident after one session of TLP. However, while we reported that a single session of TLP was effective in nurses [31], another study conducted among the elderly found that a single session was not effective for depression and anxiety [32].

These conflicting findings may be due to the difference between the study populations. While the study on nurses was comprised of participants who were young and female, the elderly participants in the second study included men and women who were over 60. In the present study, the participants consisted only of female breast cancer patients in their 40s. Therefore, the homogeneity of the participants should be considered when planning laughter programs. In this study, the TLP consisted of a detailed standardized program to make participants laugh a great deal. It comprised activities that induced loud laughter as a result of direct participation and physical activity appropriate to the characteristics and age of the breast cancer patients. This is thought to have contributed to enhancing the TLP effects.

Moreover, across the studies, the number and duration of TLP sessions varied so that the TLPs comprised of eight 20-minute sessions or a single 60-minute session showed improved mood states [6, 16–18, 23–25]. Although a single-session TLP could be effective as reported in our study, we could not assert that the effect would last for a clinically meaningful period. Because the TLP was implemented four times, repeated participation in the TLP could affect the maintenance of antiphysiological effects. As this study was only a "pilot study" conducted to measure the immediate antistress effects of TLP, long-term effects could not be measured. This means that the effects of the TLP cannot be compared with the effect of this intervention in persons with a full-blown psychiatric disease. Moreover, the highly selective inclusion and exclusion criteria could limit the generalizability of the results. Because of these limitations, further studies should assess the long-term effects of TLP and find a mechanism through which laughter could affect mental health.

5. Conclusion

The TLP is effective in reducing anxiety, depression, and stress in breast cancer patients, and such effects can be attained after only one session. This study is useful as there has been little previous analysis of the effect of the number of TLP sessions. TLP could also be used effectively in clinical practice settings, as it is a noninvasive, easy-to-use complementary/alternative therapy; therefore, it is recommended that medical professionals use a standardized
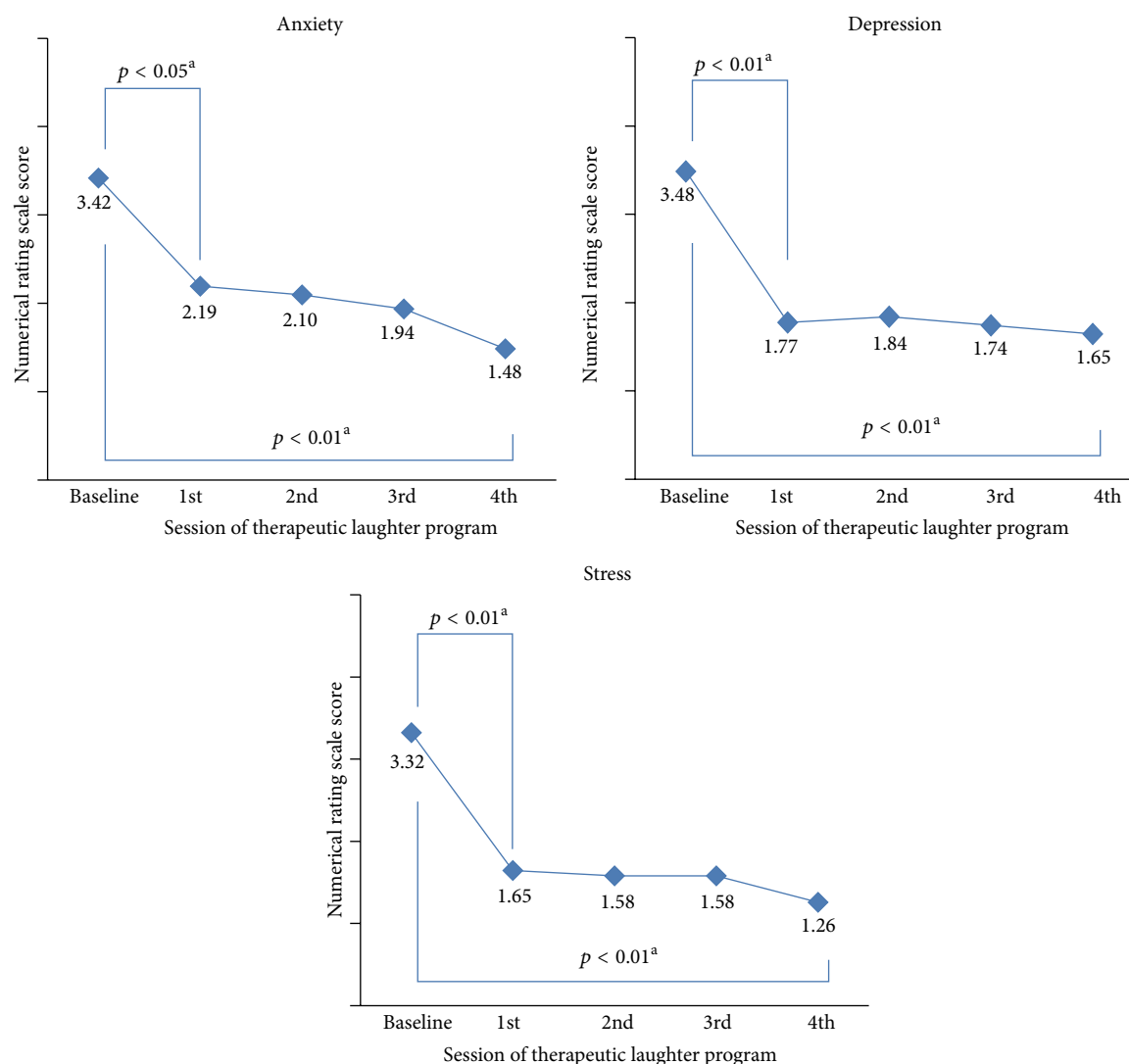
FIGURE 2: Anxiety, depression, and stress scores of the experimental group according to attended numbers of laughter therapy sessions. p values were calculated by (a) repeated measures analysis of variance test.

TLP as a complementary intervention to assist with patient treatment.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

Authors' Contribution

H. J. Kim is the guarantor of the paper. S. H. Kim and H. J. Kim contributed to the study design, data analysis, and paper writing. Y. H. Kim contributed to the study design and planning. All authors approved the final version of the paper.

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Laughter therapy as an intervention to promote psychological well-being of volunteer community care workers working with HIV-affected families

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Abstract

The study explores the experiences of volunteer community care workers working with HIV-affected families, participating in laughter therapy. Laughter therapy is being used as an intervention to positively influence individuals experiencing various forms of emotional distress. Community care workers play a vital role in the support of the HIV/AIDS-infected and -affected members in communities. The nature of this type of work and their limited training contributes to high levels of secondary trauma and emotional exhaustion. The purpose of the study was firstly, to explore the effects of working with orphans and vulnerable children (OVC) on the community care workers and secondly, to establish the impact that laughter therapy has to positively combat stresses of working within the care workers' environment. All the community care workers from a community-based organisation that provides care for HIV/AIDS-infected and -affected OVC and their families in the greater region of Soweto, South Africa, took part in daily laughter therapy sessions for one month. To assess the experiences of participants of laughter therapy, seven community care workers agreed to participate in a mixed method assessment. Interviews were conducted before and after the intervention using the Interpretative Phenomenological Analysis as framework. As supportive data, a stress and anxiety and depression scale were added in the interview. Participants reported more positive emotions, positive coping, improved interpersonal relationships and improvement in their care work after exposure to laughter therapy. Quantitative results on stress, anxiety and depression for each participant confirmed observed changes. Laughter therapy as a self-care technique has potential as a low-cost intervention strategy to reduce stress and counteract negative emotions among people working in highly emotional environments.

Keywords: laughter therapy, volunteer community care workers, orphans and vulnerable children, psychological well-being, mixed methods

Introduction

A large number of children who have been orphaned or affected by HIV/AIDS in South African are cared for by either their immediate or extended families, specifically grandparents or older siblings (Foster, Levine, & Williamson, 2005; Schenk et al., 2008; Townsend & Dawes, 2009). To address some of the challenges faced by households that care for orphaned and vulnerable children (OVC) (Vermaak, Mavimbela, Chege, & Esu-Williams, 2004), various community-based organisations (CBOs) offer care services to these HIV-affected families (Schenk, Michaelis, Sapiano, Brown, & Weiss, 2010; U.S. President's Emergency Plan for AIDS Relief, 2012). Because of limited professional services, various different categories of care workers developed (Cameron, Coetzee, & Ngidi, 2009) as part of task shifting in health and social services (Callaghan, Ford, & Schneider, 2010; Schneider & Lehmann, 2010; WHO, 2007).

Community care workers are community members with no formal professional or paraprofessional qualifications that are trained to provide specific healthcare or social services (Cameron et al., 2009; Lewin et al., 2005). CBOs recruit volunteering community members, provide in-service training, support and a stipend for them to take care of various practical, social and psychological needs of a few HIV-affected families in their community (Uys, 2002; Uys & Cameron, 2003).

The positive impact of doing community care work within the HIV/AIDS context for the community and the volunteer community care workers has been well documented (for example, Akintola, 2008; 2010; Wringe, Cataldo, Stevenson, & Fakoya, 2010). Providing care to people in need is often regarded as a very rewarding and altruistic action. However, stress and depression have also been reported as possible negative effects on community care workers (Armstrong, 2000; UNAIDS, 2000). Care workers

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are often exposed to illness and death, hardships and trauma of clients, emotional involvement and high expectations and responsibilities, often in a context of low remuneration and lack of recognition (Akintola, 2008; Cataldo, Kielmann, Kielmann, Mburu, & Musheke, 2015; Peltzer & Davids, 2011). Exposure to intense emotional contexts can result in secondary traumatisation (being indirectly traumatised by helping others) which could lead to compassion fatigue in professionals (Berger, Polivka, Smoot, & Owens, 2015; Coetzee & Klopper, 2010; Meadors & Lamson, 2008). Because of limited training care workers are often over-involved with the problems of their clients and are even more at risk of experiencing secondary traumatisation and emotional exhaustion (Pirraglia et al., 2005; Shapiro, Brown, & Biegel, 2007; Visser & Mabota, 2015). Peltzer and Davids (2011) found that 78% of care workers (lay counsellors) in their study experienced high levels of job stress and that 31% felt emotionally drained by their work. These care workers are often also burdened by their own personal needs which could negatively influence the quality of their care services (Cataldo et al., 2015; Coetzee & Klopper, 2010; O'Neill & McKinney, 2003).

The psychological well-being of care workers is important as it directly influences their ability to provide effective services to the families in their care (Corey, 2013). Van Dyk (2013, p. 286) states that ' ... it is important for the self-preservation of care workers and for their emotional survival that they should take care of themselves'. Self-care, the cornerstone of compassion fatigue prevention, is often neglected by care workers (Geteri & Angogo, 2013; Wentzel & Brysiewicz, 2014). Cameron et al. (2009) therefore advocate the provision of interventions to assist community care workers to deal with their emotional needs and job stress. Research shows that taking care of the providers on a personal level had positive impact on their stress and compassion fatigue levels (Meadors & Lamson, 2008). As an effort to promote self-care of care workers, this study aims to explore the benefits of laughter as a therapeutic intervention to increase the psychological well-being of community care workers.

Laughter as an intervention to promote well-being

Laughter is a familiar action for most individuals. It has been the subject of consideration by a long and honourable list of thinkers, from the Greek philosophers (Plato, Aristotle and Hobbes) to modern psychologists. However, there is little academic literature and research of laughter and the therapeutic use of laughter to enhance psychological well-being in the human and social sciences. A number of theories have attempted to explain the value of laughter. Kant and Schopenhauer regarded laughter as a reaction to perceived incongruity, while the Relief Theory is based on the premise that laughter is the release of surplus nervous energy (Morreall, 1983). Furthermore, Morreall (1986) theorised that humour and laughter can be a path to mental health as it may provide an individual with some form of relief from the mundane aspects of human existence. Laughter can therefore be associated with the framework of positive psychology.

Positive psychology aligns its focus with mental health and building positive qualities, rather than mental illness (Donaldson,

Dollwet, & Rao, 2015; Snyder & Lopez, 2002). The essence of Positive Psychology is captured in the following statement:

Psychology is not just the study of disease, weakness, and damage; it also is the study of strength and virtue. Treatment is not just fixing what is wrong; it also is building what is right. Psychology is not just about illness or health; it is about work, education, insight, love, growth, and play. (Seligman, 2002, p. 4)

In line with this way of thinking, building an individual's strengths is possibly the most effective and powerful therapeutic intervention (Seligman, 2002).

The ability to laugh assists individuals to develop an affinity towards positive emotions, and the expression thereof, which in turn also has a positive influence on their affect (Junkins, 1999). Fredrickson (2001) claims positive emotions contributes to personal well-being. This occurs by broadening thought-action or expanding the individual's attention and ideas. It helps in undoing the effects of negative emotions and increasing psychological resilience and personal resources. Furthermore, positive affective experiences contribute to and have a long lasting effect on personal growth and development (Fredrickson, 2001).

Although laughter can be associated with silliness and frivolousness by some, laughter therapy is based on the premise that laughter is a primary cathartic trigger, enabling the release of previously unexpressed emotions (Junkins, 1999). Cousins (1979) was one of the first authors who wrote about laughter as a therapeutic intervention based on his own experiences in overcoming a serious chronic disease. He subjected himself to continuous viewings of his favourite comedy shows. He advocated that 10 minutes of laughing gave him two hours of drug-free pain relief.

In addition, Berk et al. (1989) examined the effects of laughter on neuroendocrine hormones that are involved in classical stress responses. The researchers concluded that joyful laughter modifies or reduces some of the neuroendocrine hormone levels associated with stress. Similar results were found in an experiment where participants were exposed to a humorous video of their choice, compared to participants in the control group that viewed a tourism video. The research findings showed that the cortisol levels and self-reported stress levels of participants exposed to the humorous situation decreased more rapidly than those of the control group (Bennett, Zeller, Rosenberg, & McCann, 2003). Furthermore, laughter may not only buffer the effects of stress but may play an important role in enhancing the pleasures of positive life events (Martin, Kuiper, Olinger, & Dance, 1993). According to Colom, Alcover, Sanchez-Curto, and Zarate-Osuna (2011), laughter activates the subcortical regions with specific reference to the nucleus accumbens, a key component of the mesolimbic dopaminergic system. This reward system provides pleasure when something of value is obtained. In an earlier study, laughter was found to be utilised as one of the major cathartic practises for releasing or healing emotional pain. When people laugh, they are releasing painful feelings which could have been repressed over a long period of time (Goodheart, 1994).

There seems to be some obstacles to utilising laughter therapy. During the formative years, children are conditioned to laugh when it is socially appropriate. This conditioning negatively influences the application of laughter as a therapeutic intervention. Individuals tend to feel uncomfortable and fear losing control cathartically when exposed to laughter, crying or anger expressions. On the contrary, losing control of one's emotions cathartically allows one to regain control of one's life through flexible, creative and caring means (Goodheart, 1994). Despite the biological evidence that laughter therapy has a positive effect on distressful experiences of participants (Bennett et al., 2003; Colom et al., 2011), there is still scepticism among psychologists and psychiatrists about the value of laughter as a therapy for intense emotions such as depression and anxiety (Junkins, 1999). There are also questions about how participants experience this therapy and how it contributes to positive experiences. This study explored the experiences of community care workers that participated in laughter therapy.

Laughter therapy

Given that laughter has been found to have several positive effects, many variations of laughter therapy have been developed. For the purpose of this study, Aerobic Laughter Therapy (ALT), a cognitive behavioural technique, was utilised.

According to the Association for Applied and Therapeutic Humor, therapeutic humour is defined as:

> *an intervention that promotes health and wellness by stimulating a playful discovery, expression or appreciation of the absurdity or incongruity of life's situations. This intervention may enhance health or be used as a complementary treatment to facilitate healing or coping, whether physical, emotional, cognitive, social or spiritual. (Association for Applied and Therapeutic Humor, 2000, para 5)*

Based on this definition, ALT utilises techniques that promote playfulness and expression of the frustrations and stressors of life. ALT sessions typically begin with physical warm up activities, which include stretching, clapping and body movements. These techniques promote childlike playfulness to assist in breaking down inhibitions. Participants are then led through a series of breathing techniques, followed by numerous laughter exercises that combine acting and playful visualisation techniques (Kataria, 2002). These exercises, when combined with the strong social dynamics of group behaviour, can lead to prolonged and wholehearted unconditional laughter. ALT is delivered according to rigorous standardised procedures ensuring consistent delivery and results (Gee, 2011). The programme was developed during three years of practical trials to help individuals and groups to combat the effects of stress and depression (Gee, Jaffer, & Matanda, 2010; Jaffer, Gee, & Matanda, 2011). Currently, laughter therapy, specifically ALT, is implemented by a non-profit organisation InHappiness (International Happiness Institute) in palliative and home-based care settings in South Africa to counter stress and depression and builds health and happiness in these target groups (http://www.inhappiness.org/about-inhappiness.htm).

Aim of the study

The aims of the research were (1) to understand the emotional experiences of community care workers taking care of HIV-affected families and (2) to explore their experiences of laughter therapy sessions as a form of self-care to determine the value of laughter sessions in this context.

Method
Context of the research

The research was done among the volunteer community care workers of a CBO that provides an integrated child/family centred programme for OVC in Soweto, South Africa. The CBO provides home visits that include psycho-social, educational, nutritional and household support for over 300 children and their families. The CBO has been in operation for over 7 years. The CBO recruits community members as care workers and provides them with basic in-service training and support. The specific services the care workers provide for HIV-affected families include: distribution of food parcels, access to social grants, community education programmes, home visits and palliative care, assistance with household chores, limited counselling and identification of needs and referral to relevant services.

InHappiness Institution, a non-profit organisation sponsored by UNAID, offered laughter therapy sessions for the care workers of the CBO in the form of self-care activities. The authors were granted permission to conduct the research during a series of laughter therapy sessions in this context.

Research design

A mixed methods research design involves combining quantitative and qualitative research techniques, methods, approaches and concepts into one single study (Johnson & Onwuegbuzie, 2004). The rationale for this type of research is that using both qualitative and quantitative research methods provides a better understanding of a research problem and more validity of the findings than using either research approach in isolation (Creswell, 2009; Johnson & Onwuegbuzie, 2004). It also draws on the strengths of each approach while giving a more holistic and complete understanding of the phenomenon under exploration. In this study, the qualitative data analysis is given priority and quantitative results are used to support the qualitative results – it is thus a qualitative dominant mixed analysis (Johnson & Onwuegbuzie, 2004).

The qualitative study made use of the Interpretive Phenomenological Analysis (IPA) (Smith & Osborn, 2008). The aim of this approach is to understand how people attempt to give meaning to their personal and social worlds (Smith & Osborn, 2008). Edmund Husserl, a key developer of phenomenology, describes the aim of this method as to clarify how a certain phenomenon is experienced and presents itself to human awareness (Spinelli, 2005). This approach allows the researcher to explore and understand the personal world of another through a process of interpretation (Willig, 2008). In this study, the community care workers were guided towards communicating their experiences of being a care worker and participating in laughter therapy sessions.

The quantitative data consist of pre-and post-scores for each participant on two questionnaires to determine whether change took place. Because of the small sample size, each individual's scores could be interpreted and compared with his/her qualitative data. The mixed methods approach thus provides results using different data collection strategies.

Participants

Qualitative and quantitative data were collected from a sample of care workers that was selected using purposive sampling (Teddlie & Yu, 2007). Purposive sampling is a method that selects individuals that meet particular criteria (Terre Blanche, Durrheim, & Painter, 2006). Participants were required to meet the following inclusion criteria:

- Being a community care workers at the CBO
- Will participated in the ALT programme provided by InHappiness
- Have an English proficiency comparative to a grade 12 qualification to enable the researcher to conduct interviews in English. (This was done so that the richness and meaning of language will not be lost in the process of translation.)

Participants were recruited through the director of the CBO, depending on their availability, suitability to the study and willingness to participate. From the 30 care workers at the CBO who participated in the laughter sessions at the time, 10 participants, 3 male and 7 female, were willing to participate in the research. At the time of the post-assessment, three of the care workers, one male and two females, were no longer employed by the CBO (due to high turnover) and thus dropped out of the study. The participants that completed both interviews were thus two males and five females between the ages of 20 and 38 ($M = 28.83$, SD $= 7.44$). They worked for the CBO for between 2 months and 7 years. Each of them had between 10 and 15 families in their care at any given time.

Data collection

Data were collected through personal face-to-face semi-structured interviews and two short questionnaires before and after completion of the laughter therapy sessions.

Interviews

Through semi-structured interviews, the researcher created an environment of openness and trust wherein the participants were able to express their views openly. A question guide with open-ended questions permitted the participants to share their experiences using their own words. The goal of the pre-intervention interview was to explore the experiences of working as care workers and the impact care work had on the participant's psychological well-being. Examples of questions were: (1) How do you experience your work as a care worker? (2) How do you know when you are stressed? (3) How does stress affect your work with the children in your care? (4) How do you deal with upsetting problems?

In the post-intervention interviews, the researcher asked questions pertaining to the participants' experience during and after the laughter sessions and the effect these sessions have had on their personal well-being. Example of questions: (1) Describe your experiences of the laughter sessions? (2) In what way has laughter influenced the way you view your work and your life in general?

The face-to-face interviews, before and after the therapy, were conducted by the researcher in the participants' place of work and were approximately 30 minutes long. The interviews were tape recorded, with the permission of the participants.

Questionnaires

Two short questionnaires were administered before and after the laughter therapy intervention to provide additional data on the change in experiences of anxiety, depression and stress. Psychometric scales are often regarded as providing more rigorous data than qualitative data from interviews.

Hospital anxiety and depression scale (HADS)

The HADS (Zigmond & Snaith, 1983) was used to assess levels of anxiety and depression among care workers. The HADS was originally developed to screen for anxiety and depression among people attending a hospital as out-patients (Zigmond & Snaith, 1983). The scale has since been widely used as a reliable and valid measure to assess anxiety and depression in various populations (Bjelland, Dahl, Haug, & Neckelmann, 2001). The HADS consists of 14 items, divided into two subscales: anxiety and depression. Items that relate to anxiety include 'I feel tense or wound up' whereas items that relate to depression include 'I have lost interest in my appearance.' Response categories were on a 4-point scale of how often the respondent feels that way. According to Zigmond and Snaith (1983), scores of 11 or more on either subscale are indicative of depression and anxiety, where scores of 8–10 represent 'borderline' cases and 0–7 acceptable mental wellness. A study conducted by Mykletun, Stordal, and Dahl (2001) confirmed that both the anxiety and depression subscales were found to be internally consistent, with a Cronbach coefficient of 0.80 for anxiety and 0.76 for depression.

Perceived stress scale (PSS)

The PSS is a widely used psychological assessment of perception of stress (Cohen, Kamarck, & Mermelstein, 1983). The PSS is a 10-item scale that measures the degree to which particular events in one's life are considered stressful. High scores indicate more perceived stress. Items consist of questions such as 'How often have you felt nervous or stressed?' Participants rated how often they had experienced these feelings in the last month on a 5-point Likert scale ranging from 0 (*never*) to 4 (*very often*). The internal consistency was found to be 0.82 and test–retest reliability found to be 0.77 (Cohen et al., 1983; Remor, 2006). A Cronbach's alpha of 0.72 was obtained using a sample of South African adults (Hamad, Fernald, Karlan, & Zinman, 2008). The PSS was found to be a significant predictor of appraised stress levels for a heterogeneous community group (Cohen et al., 1983).

Research process

In the pre-intervention interview, the researcher assisted each participant in completing the two questionnaires, whereafter the

personal face-to-face semi-structured interview was conducted. Two weeks after the completion of the pre-intervention data collection, the participants were introduced to the trainers of the InHappiness laughter programme. The trainer was the founder of the Inhappiness Institute, a certified trainer (www.inhappiness.org). Participants were introduced to ALT through the education of laughter and numerous childlike techniques. The care workers participated in daily 10–15 minutes of group laughter sessions for a month. Sessions started with physical activity, breathing exercises and playful activities to break inhibitions down. This was followed by numerous laughter exercises that combined acting and playful visualisation techniques (Kataria, 2002). These exercises, when combined with the strong social dynamics of group behaviour, can lead to prolonged and wholehearted unconditional laughter.

The researcher conducted the post-intervention interviews after a period of one month of daily laughter sessions. The interviews may have had therapeutic value, because the participants shared their experiences and emotions openly.

Data analysis

The contents of the tape recordings of the interviews were transcribed verbatim and analysed using the IPA methodology (Smith & Osborn, 2008). The researcher interpreted the experiences of the participants as they tried to make sense of what happened to them before, during and after the laughter therapy. This involved reading and re-reading the text to extrapolate themes which were then clustered according to higher order themes. Paraphrased extracts were used to make the voice of the participants heard. The researcher previously participated in laughter therapy sessions and was interested in how others experienced these sessions. To reduce bias, the researcher maintained reflexivity throughout the process through the recordings of her encounters in a journal. This ensured self-monitoring in order to focus on the participants' experiences and not on the researchers' assumptions and expectations. The researcher liaised with a colleague

who has done an independent analysis of data to reach consensus on the main themes. Furthermore, the researcher discussed her interpretations with participants to validate her interpretations. This was done to enhance trustworthy interpretation of the data (Smith & Osborn, 2008).

The pre- and post-results of the scale scores of each participant were presented in the format of graphs. The graphs illustrated change that took place after the intervention. The data from the qualitative and quantitative analysis were triangulated to understand the reactions of participants.

Ethical approval

The study was approved by the ethics committee of the Faculty of Humanities, University of Pretoria. Participation was voluntary and participants signed informed consent forms.

Results

Themes from pre-intervention interviews

The themes that emerged from the data analysis were: emotional impact of being a care worker and coping mechanisms they used. Each main theme and sub-themes are illustrated in Fig. 1 and discussed below. To protect the identity of the participants, pseudonyms have been used in this study.

Emotional impact of being a care worker

Altruism/empathy

Most of the care workers voiced that they have a strong bond with the families in their care. They understand the challenges the children were experiencing and felt the responsibility to make a difference in the children's lives.

Being a care worker it's all about responsibility and loving and respecting other people. And putting yourself like in their shoes how they feel. (Gift, male, 29 years, 7 years of experience as a care worker)
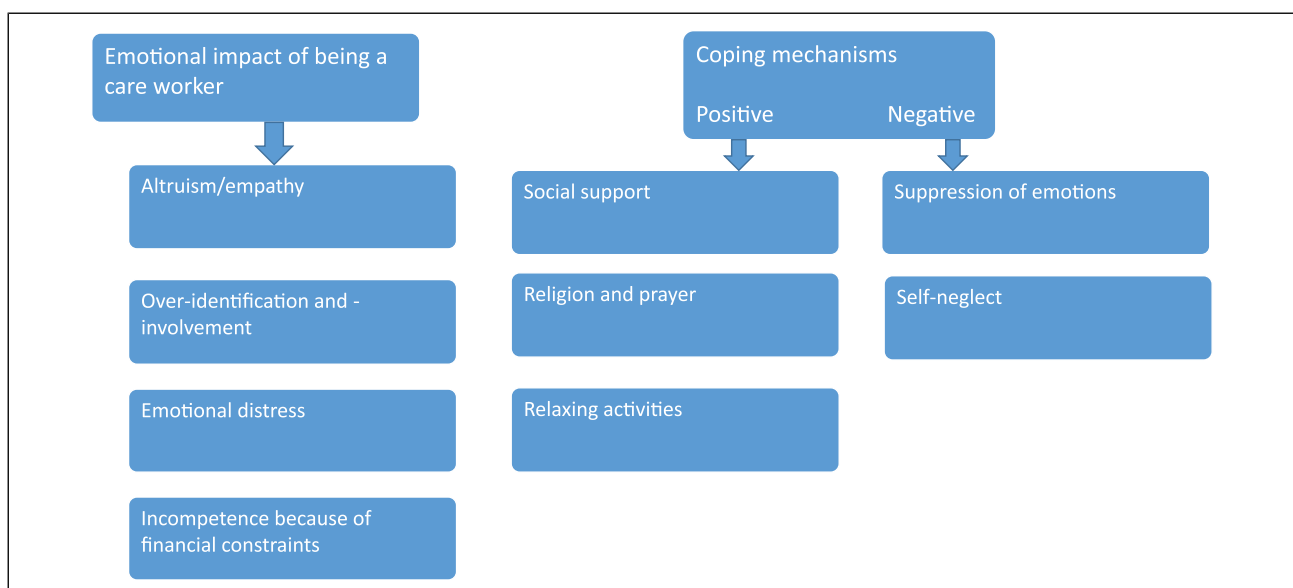

Fig. 1. Themes and sub-themes on experiences of being an OVC care worker.

The care workers' understanding of the children is often built on their own experiences in similar situations. They thus identified strongly with the plight of the families. They wanted to help families because they received help themselves or did not receive help and wanted to help others to be better off than they were:

It's because of my growing up, you know seeing the challenges and like wanting to help other people. I would understand exactly where they're coming from. (Precious, female, 38 years, 5 years of experience as a care worker)

When I became an orphan, I was cared for and looked after by the care workers in this CBO. Now I want to share the love that I was shown back to the community through my work as a care giver. (Mpumi, female, 20 years, 6 months of experience as a care worker)

I never had someone to be my care worker. My situation is almost their situation, so I decided to be a care worker so that I can inform them and help them grow and be strong. (Kenzo, male, 20 years, 2 years of experience as a care worker)

Over-identification and -involvement

Most of the care workers were themselves from families affected by HIV/AIDS. They thus understand them but often over identify with them and become overly involved. For example:

They are like my real family. Even the one weekend I just go and visit those families, I just took a long walk and see how they are doing. (Gift, male, 29 years, 7 years of experience as a care worker)

The care workers expressed that they get personally involved with the children. This often triggered their own unresolved emotional issues which results in sleepless nights and intense sadness. One caregiver said she feels 'pains in my heart' when listening to the hardship of children and their families.

Most of the time I cry about them. But I tell myself that there are things I cannot do even though I want to help the children. (Precious, female, 38 years, 5 years of experience as a care worker)

Emotional distress

In their daily work duties, the care workers experienced numerous challenges that contributed to their experience of negative emotions. Some of the participants reported intense sadness and physical symptoms of stress such as severe headaches, loss of appetite, fatigue and inability to focus on their work. The care workers thus experienced high levels of emotional exhaustion.

I have a lot of headaches and I sleep a lot. I don't have an appetite. I don't eat and I don't like noise. I'm short tempered and I cry most of the time. (Mpumi, female, 20 years, 6 months of experience as a care worker)

Sometimes I'm being stressed. I suffer from severe headaches. When I start thinking about the situation, my head would start to be sore. (Gift, male, 29 years, 7 years of experience as a care worker)

Incompetence because of financial constraints

Most of the participants reported the limited financial resources available at the CBO to meet the needs of the community, as a major stress factors. The care workers conveyed feelings of being stressed, exhausted, frustrated and at times overwhelmed especially because they feel unable to help families and children to address their needs, as illustrated below:

Why am I here? I feel so useless, because I can't help this person with money. They come to you thinking you'll help but you can't help, you have no resources, your hands are tied. It drains me, it drains me, it puts me down. (Mpho, female, 32 years, 3 years of experience as a care worker)

It can become very difficult to look the person in the eyes and tell them I can't help you, go home. Even though you send them to other places, you know those places won't help. They come here because they saw you helping other people. If I had this (money) I would help. (Mpho, female, 32 years, 3 years of experience as a care worker)

Coping mechanisms

Given the challenges in their work environment, the care workers have adopted some positive and negative coping mechanisms. Some positive approaches were the following.

Social support

The care workers received formal forms of support from their management. In addition, they used informal support from their co-workers, family and friends. They described talking about their frustrations and fears as a way of coping with their daily stressors. It helped them to overcome the feelings of being overwhelmed by the burdens and limitations of their work environment. Support systems buffered their levels of distress:

Usually I talk it over with my colleagues. I can bounce it off the people that are strong. When you start saying that, they calm you down saying eh relax. Here at work I have this friend. She is my strength, when I feel weak and down, I go to her. (Mpho, female, 32 years, 3 years of experience as a care worker)

Religion and prayer

Many of the participants reported making use of their religious beliefs and affiliations in times of stress. They prayed, went to church and participated in other religious activities. These participants explained experiencing emotional relief and support through these pursuits:

Emotionally, you know, I grew up in this kind of family that always tell me that when you are kind of stressed, go to church. You know, I survived by that. (Thandi, female, 34 years, 3 years of experience as a care worker)

Relaxing activities
The participants utilised numerous kinds of relaxation activities such as reading, walking, creative arts and listening to music. They expressed feeling relieved during these activities as it allowed them to process their work circumstances. They gained a sense of rejuvenation through relaxation activities.

Negative coping strategies include the following:

Suppression of emotions
Most of the participants reported that in order for them to work effectively with the children, they had to put their own feelings aside. Their primary concern was the well-being of the children. However, most participants voiced that suppressing their feelings has had a negative impact on their own emotional well-being. For example:

> When you come here, you have to snap out of it. You don't want to take your stressors and put it on them. You want them to feel happy. (Mpho, female, 32 years, 3 years of experience as a care worker)

> At times I tell them that I might look like this strong person but inside I'm hurting and (crying) most of the time I do suppress my feelings and act as if nothing is happening, but I know deep inside it hurts. (Precious, female, 38 years, 5 years of experience as a care worker)

Self-neglect
All the participants noted that it was their primary concern to meet the needs of the children, often at the expense of their own well-being. In the long run, lack of self-care and emotional support result in feelings of incompetence and infective work:

> When I am stressed of course I don't take good care of myself. Even my siblings will notice. I lose concentration on the things that I was supposed to do. I just end up forgetting them. (Thandi, female, 34 years, 3 years of experience as a care worker)

Themes from post-intervention interviews
Care workers expressed that laughter therapy played an important role in their lives and that it made them feel well. The discussion of the intervention generated much laughter during the interviews with the care workers. They reported that laughter helped them to get through difficult situations in the work place, as well as in their personal lives. Laughter relieved tension and strengthened the interactions between the care workers.

Four themes emerged from the interviews conducted after the care workers participated in one month of daily group laughter therapy sessions.

Positive emotional experiences
Most of the participants were initially sceptical about the value of laughter therapy. However, as the sessions progressed they began to enjoy it. In contrast with the pre-interviews, they reported experiencing a variety of positive emotions such as joy, happiness, relief and hope. This is illustrated in the following quotes:

> I feel I have joy in my heart after laughing, you feel relieved. Eish, I don't know how to explain it but you feel you are happy. (Victoria, female, 34 years, 6 years of experience)

> I felt something like relief in my body, like when you feel weight on your shoulders, but then I felt relieved and now I feel so light. (Mpho, female, 32 years, 3 years of experience)

> Immediately when you are laughing there is something that will move you from this situation you are in and go to another better situation. It gives you hope. (Gift, male, 29 years, 7 years of experience)

> You know they were amazed to hear that with only laughter it can be able to change your life. (Precious, female, 38 years, 5 years of experience)

Positive coping
The participants reported that laughter had changed the way they interpreted situations. Laughter worked as an effective tool to help the participants see a negative incident in a positive light. For example:

> There is stress out there, but you have to look at it in a different perspective and not always stress about things. Be level-headed not to go down with stress. (Mpho, female, 32 years, 3 years of experience)

> I used to worry a lot but now it's different. Through the laughter sessions it's better because now I know how to control myself towards anger, towards bad emotions, thinking a lot. Yes it has helped a lot. (Thandi, female, 34 years, 3 years of experience)

Participants were given the daily opportunity to express and release the emotions that they had ignored for so long. They therefore expressed suppressed emotions and felt a sense of relief.

Through doing the laughter sessions in a group, the care workers developed support from co-workers as an effective coping mechanism in a stressful work environment.

Improved interpersonal relationships
For the care workers, laughter functioned as a binding factor in relationships. They felt that laughing as a group had strengthened their work relationships and improved their relationships with friends and family as well. It awakened them to want to be more sociable and interactive with others:

> You know, before I just need to be alone, but now I know to call them, let's sit together and I'm engaging much more with them than before. So you find through laughter you are able to engage with other people. (Thandi, female, 34 years, 3 years of experience)

Whenever somebody says something it doesn't bother me anymore, I don't take it personally. Those people that I pushed away from me, I need them to be around. (Precious, female, 38 years, 5 years of experience)

I was this person that was not in the mood to be with people. But since after (the laughter) I just really wanted to be with people, wanted to see other people. (Precious, female, 38 years, 5 years of experience)

Positive social interactions served to reinforce their positive emotions, thereby creating a sustainable system of wellness.

Improvement in care work
Care workers had more positive feelings, were more hopeful and made intimate contact with the children in their care. Some participants used laughter in their contact with the children to bring hope in difficult situations:

I feel lighter. I give them hope. You laugh when you touch somebody and some kids have never been touched before. You touch them and they smile because laughter brings a smile to the face. Your own face opens up, like your eyes and everything when you are laughing. And then you give the next person hope, they will get through it somehow. There is hope even if they are in a bad situation. (Mpho, female, 32 years, 3 years of experience)

Care workers realised that they have to change themselves before they can expect others to change. Most of the participants indicated some changes in their behaviours and in the way they view their situations:

If you want people to change, you have to change first. By changing the way I look at things I will be impacting others. (Mpho, female, 32 years, 3 years of experience)

Integration with quantitative results
Two questionnaires were administered before and after the laughter therapy intervention to identify changes that took place with regard to stress, depression and anxiety of each participant. The scores of each participant were plotted in Figs. 2 and 3 to understand the participants' reactions.

The scores for each participant showed some interesting results. Although most of the participants experienced less stress,
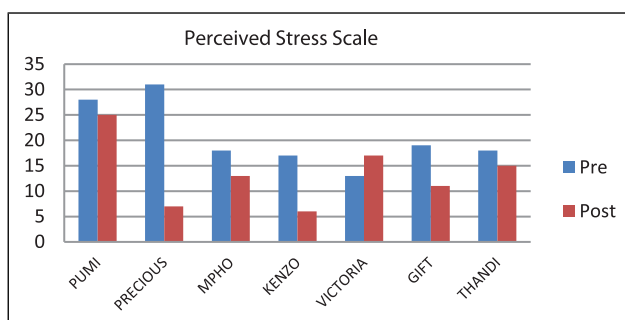
Fig. 2. Pre- and post-intervention stress scores per participant.
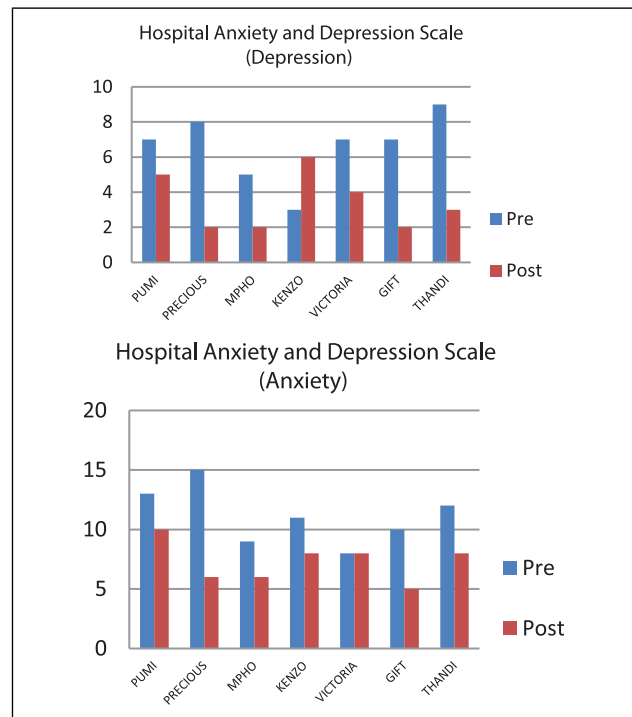
Fig. 3. Pre- and post-intervention test analysis (HADS).

anxiety and depression after the therapy sessions, all participants did not have similar experiences. For example, Victoria reported more stress after the intervention, her levels of anxiety remained the same, while her experiences of depression were lower after the intervention. Victoria experienced her work as frustrating because of the minimal salary she receives and limited financial resources available to care for the children. During the intervention period, she had applied for a learnership position to improve her circumstances. Her elevated levels of stress could be contributed to her uncertainty of her capabilities to get the learnership.

Thandi experienced the highest level of depression before the intervention. Since her mother passed away, she was left to take care of her siblings. The intervention helped her to process her feelings and she reported significantly less depression after the intervention. Similarly, Precious appeared to experience the largest differences between pre- and post-intervention assessments on all three scales. Before the intervention, she was depressed and withdrew to the extent of attempting suicide earlier in the year. In the post-intervention interview, she displayed energy and optimism, more confidence and was more sociable. She describes her reaction to laughter therapy as follows: 'I think I am loving myself more and understand that it's up to me to want to be happy.'

Discussion
The purpose of the study was to explore the emotional experiences of community care workers attending to HIV-affected families. Secondly, their experiences of laughter therapy sessions as an intervention strategy to promote their psychological well-being were explored.

The nature of their work involves a mammoth task to care for the infected and affected families. Because care workers were from the same community and many of them were from HIV-affected families themselves, they could express empathy and altruism to help others in similar situations. They could thus identify with the plight of the community in which they work, which contributed to involvement and job satisfaction (Van Dick, Van Knippenberg, Kerchreiter, Hertel, & Wieseke, 2008). Though, over-identification and over-involvement could result in emotional distress (Collins, 2007). Their lack of formal training can contribute to the experience of secondary trauma, following from being confronted daily with the traumas of their clients. It seemed that some of the care workers experienced high levels of emotional exhaustion, especially when they did not have the resources to address the families' needs (Price et al., 2013; Storey & Billingham, 2001).

In order to buffer the effects of emotional distress, care workers used positive and negative coping mechanisms. In order for them to carry out their work effectively, they had a tendency of masking, overlooking and ignoring their own emotions. They often neglected their own well-being (confirmed by Geteri & Angogo, 2013 and Moremi, 2012) which may have contributed to the accumulation of negative emotions such as high anxiety and stress reported in the pre-intervention assessment. Because self-care is the best strategy to overcome emotional exhaustion (Geteri & Angogo, 2013; Wentzel & Brysiewicz, 2014), daily laughter therapy sessions were introduced in this group of care workers.

The results showed that most of the participants of the laughter intervention reported less stress, anxiety and depression after the intervention. Laughter is associated with the cathartic release of accumulated emotions (Goodheart, 1994). Participants had the opportunity to express and release the emotions that they had previously ignored and suppressed. Many of them thus expressed feeling a sense of relief after the intervention. The release of these negative emotions was accompanied by the experience of positive emotions, such as joy, happiness, relief and hope. Fredrickson's (2001) theory of positive emotions emphasises the process by which individuals' daily experiences of positive emotions can multiply over time to build an array of substantial personal internal resources. As such, the participants' exposure to daily laughter therapy sessions facilitated the development of an entire repertoire of positive emotions which can contribute to the alleviation of negative emotional experiences. Laughter induces a form of relaxation that allows people to feel rather than to think. It tends to bypass the cognitive system and focuses on the emotions (Goodheart, 1994). Once positive emotions are activated, it re-energises a person to take a new viewpoint of life and make better judgements. These positive experiences can have a positive cyclic effect on the individual's emotions, cognitions and behaviour, similar to the negative cycle identified by Beck (2011). The positive cycle can be continuously reinforced and broadened through continuous use.

These positive experiences allowed for the development of more positive interactions with co-workers, family members and friends. Positive social interactions again serve to strengthen positive emotions, thereby contributing to the positive cycle of well-being (Vittengl & Holt, 2000; Waugh & Fredrickson, 2006). Many researchers have found that positive social interactions aid in the development and maintenance of psychological well-being (Collins, 2007; Halbesleben, 2006; Medland, Howard-Ruben, & Whitaker, 2007).

The laughter sessions helped the care workers to develop a positive mind set and to take control of their own emotions. This increased their ability to relate and to provide support for the families in their care (Colom et al., 2011). These results contribute to the limited evidence of the potential of laughter as a strategy to reduce stress and counteract negative emotions (Falkenberg, Buchkremer, Bartels, & Wild, 2011; Ko & Youn, 2011).

Limitations

In this research, qualitative and quantitative data were collected from a small sample of care workers that was selected through purposive sampling, where availability and willingness also played a role. The research mainly focused on the qualitative results obtained from interviews with participants. The quantitative results were used to support the qualitative results. The small sample size made it possible to link the qualitative and quantitative data of each participant to understand their reactions to the intervention. On the other hand, the small sample size and lack of control group data limited the use of the quantitative results. It was not the intention of the research to determine the effectiveness of the intervention – rather to explore the experiences and the value of laughter for the care workers. Due to the nature of qualitative research, the results may have been different if the research was done with another group of care workers. The results may thus not be transferable.

The subjective role of the researcher(s) as in all qualitative research should be noted, although various measures were taken to enhance trustworthy results.

Furthermore, some limitations with the language capabilities of the participants were encountered. Although all the respondents had passed matric through medium English, the participants were not fluent in English which could negatively affected their ability to express their deep-felt emotions.

Conclusions

There are often media reports on laughter implemented as an intervention in various contexts, but research is seldom done on the experience and value of such sessions for the participants. This research explored the value of laughter as a low-cost intervention for care workers in an HIV context to deal with negative emotions such as anxiety and depression and to promote psychological well-being. Through daily exposure to laughter sessions, the care workers experienced more positive emotions, improved social relationships and improved ways of coping as well as lower levels of anxiety, depression and stress. The triangulation of qualitative and quantitative data made it possible to understand how laughter helped care workers to develop a positive mind set and improved relationships that could improve their ability to provide care for the families they work with.

To improve the services of care workers in South Africa, previous research indicated that they need to be appropriately trained and supported (Dewing et al., 2013; Petersen, Hanass Hancock, Bhana, & Govender, 2014). This research showed that care workers need emotional support and learn self-care skills. When people working in intense emotional situations receive help on a personal level and learn self-care skills, they can develop strengths to cope with stress and compassion fatigue (Meadors & Lamson, 2008) which can contribute to their psychological well-being and care giving. Laughter is a possible resource that is easily available and can be a low-cost strategy to reduce stress and counteract negative emotions among people working in highly emotional environments. This research supports Morreall (1983, 1986) in his unwavering belief that laughter is an important factor in understanding humanity and in contributing to human well-being.

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Psychological, immunological and physiological effects of a Laughing Qigong Program (LQP) on adolescents

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Summary
Objectives: One objective of this study was to assess the effects of laughter on the psychological, immunological and physiological systems of the body. Another objective was to introduce the Laughing Qigong Program (LQP), as a method of standardization for simulated laughter interventions.
Design: A randomized, prospective, experimental study of the LQP was conducted in a group of adolescents ($n = 67$) in Taiwan. During study-hall sessions, experimental subjects ($n = 34$) attended the LQP for eight-weeks. Simultaneously, control subjects ($n = 33$) read or did their homework. All subjects were tested before and after the intervention on the following: Rosenberg Self-Esteem scale (RSE), Chinese Humor Scale (CHS) and Face Scale (FS) as psychological markers; saliva cortisol (CS) as an immunological marker; blood pressure (BP), heart rate (HR), and heart rate variability (HRV) as physiological markers of the body's response to stress. Mood states (FS) were measured before/after each LQP session.
Results: Mood states ($p = .00$) and humor ($p = .004$; $p = .003$) improved in the experimental group; no significant changes were found in the controls ($p = 69$; $p = 60$). The immunological marker of stress, cortisol levels, decreased significantly for those who participated in the LQP ($p = .001$), suggesting lower levels of stress after completion of the program.
Conclusions: The LQP is a non-pharmacological and cost-effective means to help adolescents mitigate stresses in their everyday life.
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Background

In 2005, the World Health Organization (WHO) acknowledged that ''there is no health without mental health''.[1] Embracing the WHO mandate, this study investigates a new mental health promotion plan developed in Taiwan: the Laughing Qigong Program (LQP). The LQP is based on findings in two fields: positive psychology[2] and psychoneuroimmunology.[3] These two fields, focusing on positive mental health and the effects of emotions on physiology, respectively, have engendered a new field of research: *gelotology*,[4] the study of laughter. Gelotology examines the notion that laughter attenuates biochemical markers of stress in the body.[5–7]

Literature review

Comprehensive reviews[8–11] investigating the link between humor and health make distinctions between humor and laughter. Martin[9] and Bennett and Lengacher,[8] provide similar definitions: ''Humor can be used to refer to a stimulus (e.g., a comedy film), a mental process (e.g., perception of amusing incongruities), or a response (e.g., laughter, exhilaration).'' Laughter, however, is defined as ''a psychophysiological response to humor that involves both characteristic physiological reactions and positive psychological shifts.'' This area of gelotology not only makes a clear distinction between humor and laughter, but goes further to demarcate ''simulated'' versus ''spontaneous'' laughter.[10] The LQP is a ''simulated'' laughter program whereby laughter is self-induced, with no specific reason.

Humor and laughter as coping

Studies have demonstrated the use of humor as a coping mechanism in different stages of life: lowered levels of stress for undergraduates,[12] increased self-efficacy for those in the workplace,[13] and decreased pain for arthritis sufferers.[14] However, the mechanism between humor and laughter is still in its infancy and further studies need to differentiate whether laughter, irrespective of a humor stimulus, can be a viable means of coping.

Psychological effects of laughter

Many studies have investigated the psychological effects of laughter: these include mood states,[15] self-esteem,[16] self-efficacy,[13] and depression,[17–19] Though results are still inconclusive,[20,9,11] it seems that positive mood states accompanying laughter result in positive psychological effects, as well as possible analgesic or immunoenhancing[21] effects.

Immunological effects of laughter

Immunological effects of laughter involve the neurophysioanatomical pathway.[22,23] One hypothesis is that laughter affects the brain (i.e., amygdala, thalamic, hypothalamic and subthalamic areas of the dorsal brain system) via the central nervous system (i.e., parasympathetic and sympathetic responses). Specific to the central nervous system, researchers have investigated various pathways, including the hypothalamic-pituitary-adrenal (HPA) axis,[24] and the sympathetic-adrenomedullary (SAM) system.[9] The effects of laughter on these systems include reductions in serum cortisol levels.[25,6]

Physiological effects of laughter

It is hypothesized that laughter decreases stress hormones and acts to buffer the effects of stress on the cardiovascular system.[26] Studies have argued that vigorous laughter can produce heat, sweat and stress relief similar to the results of aerobic exercise.[27] These cardiovascular changes have been investigated via blood pressure (BP),[26,28,29] and in particular the vascular endothelium.[28] Other studies have investigated heart rate (HR) and heart rate variability (HRV). Little effect was seen on HR,[30] but strong, if transient, effects on HRV were observed.[31]

Qigong

Qi (pronounced ''chee'') can be translated loosely as ''life force.'' All living things are considered to possess qi, a field of energy in and around the body. *Qigong* is a term for various disciplines believed to improve qi through body movements, calming the mind, and attention to breathing. Currently, it is reported that more than 100 million people practice qigong in China,[32,33] and many more practice around the world to treat a host of diseases and ailments: cancer,[34,35] fibromyalgia,[36] psychological symptoms,[37] mood,[38] cardiopulmonary effects,[39] lung functioning,[40] and BP.[41]

Laughing qigong

The *LQP* is a combination of qigong techniques and simulated laughter with a focus on the mind and body connection. It is based on three sets of principles: 1) Chinese medicine (i.e., yin/yang theory, *qi*, and meridian and organ functions); 2) Qigong (i.e., relaxation, core strength, deep diaphragmic breathing); and 3) Positive psychology (i.e., one can choose how to react to situations or events).

The LQP is comprised of four stages (refer to Appendix I), with the third, ''Transformation,'' stage being comprised of two parts: the stating of emotions and simulated laughter. An increased awareness of emotions and current mood states is elicited through the ''stating'' and it is believed that negative mood states can be ''transformed'' through simulated laughter. Participants are taught to accept negative emotional states and, rather than feeling helpless or overwhelmed, actively engage in transforming them internally and while in the company of others in the LQP group. Social support is propagated because participants realize that they are not alone in feeling their negative emotions. By providing a safe context for releasing emotions, and then transforming them in a group setting, the LQP process generates a sense of empowerment.

The LQP has been conducted in many communities (e.g., cancer groups, elderly centers) in Taiwan for the past 15 years. It is a mental health promotion program drawing on both Eastern and Western paradigms.

Laughter programs around the world

Many studies have been conducted recently around the world,[42,10] investigating simulated laughter programs. From Tehran[18] to Canada[23] to Korea,[19] researchers are just beginning to investigate the healing effects of laughter on the body and mind. Though gelotology is still in its infancy, laughter programs have garnered world-wide popularity, particularly the Laughter Club movement (Laughter Yoga).[43] One objective of this article is to introduce an innovative simulated-laughter program, the LQP, and address some of the weaknesses of previous studies (e.g., nonexistent control groups, lack of standardized baseline measures, etc.)

Adolescents

This study relates to adolescence, a stage of life often marked by anxiety[44] and fluctuating mood states,[45] and suggests that a laughter program can reduce associated stresses. During adolescence, a time when coping strategies and personality traits are being formed,[46] the LQP can teach positive coping skills to deal with stressors particular to adolescence, such as examination stressors and the increased need to belong to peer groups.

Study goals

The aim of this study was to present a standardized, innovative protocol for laughter interventions and to assess the effects of the LQP, on the psychological, immunological and physiological systems of the body.

Methods

Participants

Participants were students recruited from a public junior high school in Taipei, Taiwan. Two 7th grade classes ($n = 67$) were chosen to participate as the experimental ($n = 34$) and control ($n = 33$) groups. The experimental group had 18 females and 16 males; the control group included 15 females and 18 males. Informed consent was obtained from both students and parents. The study was approved by an institutional review board.

Participants were to be excluded if past health records from their school folders indicated a medical diagnosis of severe mental disorders or history of substance abuse. These two criteria were chosen since a previous diagnosis of severe mental disorders could confound results of the psychological effects of the LQP and a history of substance abuse could confound effects of immunological or physiological effects. Evaluations were based only on medical records in the student's academic folders, however, and were not directly asked of participants. None of the participants met these exclusion criteria.

The defining factor for participant inclusion was the time frame in which the student could engage in LQP, based on school schedules. The review of gelotology did not find demographic characteristics (e.g., SES, age, marital status etc.) correlated with a propensity to laugh and thus such factors were not surveyed. This may be considered a limitation of the study and future studies should include a demographic survey.

Procedure

A prospective, experimental/control group design was employed, and quantitative and qualitative data were collected over a two-month period (April and May) for a total of eight sessions. During "study-hall" time (45 min), the experimental group participated in the LQP (Appendices I and II), while the control group simply read books or did their homework. Thus, the LQP protocol consisted of one-hour sessions once a week for 8 weeks, of which 45 min was the LQP intervention and 15 min consisted of data collection. During the first and the final sessions, both groups were asked to complete psychological measures and submit to BP measurements, HR measurements, saliva cortisol assessments and HRV analysis. In the intervening sessions, only the experimental group completed the Face Scale (FS), before and after the LQP (refer to Fig. 1).

Measures

Psychological measures
Rosenberg's Self-Esteem Scale (RSE; [47]) is a 10-item measurement of self-esteem with high internal consistency ranging from.86 to.93[48] and test-retest reliability over a 2-week period of.85.[49] Higher scores on the RSE indicate higher self-esteem. A Chinese translation of the RSE was used in this study.

The *Chinese Humor Scale (CHS)* is a 30-item measurement which assesses four dimensions (subscales) of humor: a) creativity; b) tendency; c) perceptivity and d) attitude (refer to Appendix II). *Humor creativity (HC)* measures the ability to use humor creatively or in novel situations. *Humor tendency (HT)* assesses the ability to laugh or find humor in situations where others may not. *Humor perceptivity (HP)* assesses perceptions of humor in oneself and others. *Humor attitude (HA)* measures attitudes regarding humor and mood states. The CHS uses a Likert 4-point response from "never" to "always", with higher scores indicating an increased ability to use humor to mitigate the stresses of everyday life. Internal consistency Cronbach's-alpha reliability coefficient is.93 and alpha coefficients for each of the four factors range from .76 to .94.[50]

The *Face Scale* (FS) measures current mood. It is a pictorial array of 20 faces arranged in sequence, from the most positive mood (1 point) to the most negative mood (20 points). Inter-rater reliability and construct validity have all been assessed ($r = 0.81$; [51]). The FS has become widely accepted and is an effective nonverbal method for conveniently assessing moods.[52] Measurements promptly after LQP prevented recall bias.

Immunological measures
Enzyme link immunoassays (saliva *cortisol* samples) were collected by two medical technologists using cotton swab extraction. Subjects kept cotton wads in their mouths for two minutes, after which samples were evaluated using an enzyme-linked immunosorbent assay (ELISA).[53]
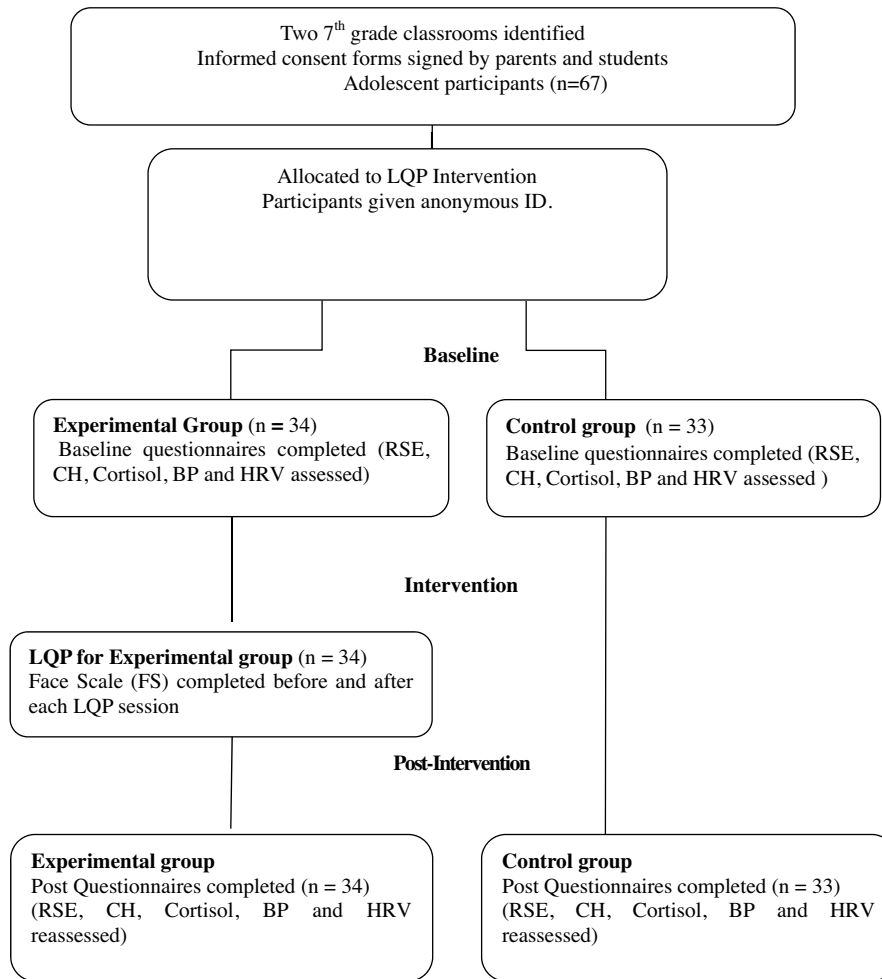
Fig. 1 LQP study protocol.

Physiological measures

Blood pressure (BP) and Heart Rate Variability (HRV). Systolic (SYS) and diastolic (DIA) pressure and HRV were measured with the right arm in the supine position using an autonomic nervous system wristwatch (ANSWatch, ITRI Taiwan Science Co). All participants were instructed to remain absolutely still for 7 min. HRV rates were measured in high-frequency (HF) and low-frequency (LF) components, and the ratio LF/HF was calculated. The HF component reflects parasympathetic activity and LF reflects both sympathetic and parasympathetic tone.[54]

Statistical analysis

Statistical analyses were performed using SPSS version 17.0 for Windows. Paired *t*-tests were conducted to assess differences before and after the LQP; ANCOVA was used to account for pre-test scores and control for the possible effect of gender in the psychological, immunological and physiological measures.

Results

Psychological measures

After completing eight sessions of the LQP, experimental and control groups were compared using four psychological measures: self-esteem (RSE), humor (CHS), and mood states (FS). Mean CHS scores significantly increased in the experimental group from 78.15 ($\pm$19.13) to 85.27 ($\pm$20.00) after the LQP ($p = .004$) and one of the subscales of the CHS, Humor Creativity (HC), also showed a significant increase for theexperimental group from 39.59 ($\pm$11.46) to 44.38 ($\pm$12.30) after the LQP ($p = .003$). ANCOVA results showed significant influence of the LQP on CHS ($P = .01$) and HC ($P = .01$). There were no significant changes in the control group for any of the psychological measures.

Mood states were assessed using the FS after each session (Table 2) and significant differences were observed in the experimental group during sessions 2, 3, 4, 6, and 7 ($p < .00$). ANCOVA results showed that those who attended the LQP significantly improved in mood state ($P = 04$; refer to Table 2).

Table 1 Experimental and control group: analysis of pre- and post-test scores of psychological measures; RSE, CHS, SS, FS.

| | Experimental (n = 34) | | | | | | Control (n = 33) | | | | | | ANCOVA |
| | Pre-test | | Post-test | | t-test | | Pre-test | | Post-test | | t-test | | P |
	Mean	SD	Mean	SD	p		Mean	SD	Mean	SD	p		
RSE	28.24	5.35	27.38	6.13	.283		28.12	6.18	27.70	5.29	.588		.74
CHS	78.15	19.13	85.27	20.00	.004*		77.94	18.12	76.97	19.84	.686		.01**
HC	39.59	11.46	44.38	12.30	.003*		40.79	9.71	40.03	11.50	.596		.01**
HT	14.41	4.10	15.70	4.08	.058		14.24	4.16	14.21	4.59	.961		.13
HP	11.53	3.53	12.32	3.15	.169		10.73	3.01	11.24	3.29	.359		.36
HA	12.62	3.20	12.59	3.30	.948		12.18	2.96	11.48	3.49	.154		.25
FS	4.62	3.10	4.03	3.42	.335		6.30	5.28	7.09	5.42	.309		.04**

RSE: Rosenberg Self-Esteem scale; CHS: Chinese humor scale; HC: humor creativity; HT: humor tendency; HP: humor perceptivity; HA: humor attitude; FS: face scale.
* Significance p < .05, paired t-test.
** Significance P < .05, ANCOVA.

There were no significant changes in the control group for mood states (FS).

Immunological and physiological measures

Cortisol showed significant differences between pre-test 48.35 (±12.53) to 38.50 (±13.10) and post-test levels (p = .001) in the experimental group. ANCOVA results show a borderline significant result with a P-value of.058. There were no significant changes in cortisol levels in the control group (Table 3). Paired t-tests did detect significant differences between pre-test and post-test levels for HF (63.68 ± 9.11 to 55.24 ± 12.90; p = .007); LF (36.32 ± 9.11 to 44.76 ± 12.90; p = .007) and LF/HF ratios (.610 ± .274 to 942 ± 745; p = .036) in the control group (Table 3). This will be discussed below.

Discussion

This study was designed to determine the effects of the LQP on a group of junior high school students. Mood states and humor improved in the experimental group, while they showed no significant changes in the control group. Moreover, the immunological markers of stress, cortisol levels, showed significant decreases for those who participated in the LQP, suggesting lower levels of stress after completion of the program.

Given that the Transformation stage of the LQP consists of stating of emotions and simulated laughter, it is difficult to determine which aspect dominated the effects. Research has shown that laughter affects the HPA axis by instigating sympathetic and parasympathetic responses[9]; we further hypothesize that the act of ''stating'' helps participants become aware of their emotional states (i.e., psychological effect) and that simulated laughter generates heat in the body (i.e., physiological and immunological effects). Unfortunately, we do not have the technology to discriminate between the two. However, promising advances in the research of vascular endothelium[28] may help to differentiate the effects of each component of LQP in future studies.

Psychological effects

Humor is believed to benefit health through the positive emotional states accompanying laughter. Our results showed significant increases in mood states immediately after completing the LQP for every session except one (refer to Table 2) as well as significant improvements in mood over the span of the experiment. These findings support other studies,[55,25,56] that have found improved mood states after engaging in laughter.

After completion of the LQP, the experimental group showed significant increases in humor scores and in participants' abilities to find humor in creative new ways or situations. Those in the control group showed no significant

Table 2 Mean differences for mood states (FS) in the experimental group for each session.

| Session | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | |
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pre-test FS	4.96	2.43	5.76	3.87	5.18	3.18	4.29	3.04	4.53	3.39	5.44	3.71
Post-test FS	2.86	1.78	3.15	2.27	3.68	3.14	4.09	3.18	2.97	2.89	2.85	2.44
Paired t-test p	.00*		.00*		.01*		.69*		.00*		.00*	

FS: face scale.
* Significance p < .05.

Table 3 Experimental and control group: analysis of pre- and post-test scores of immunological and physiological measures; CS, SYS, DIA, HR, HRV, HF, LF, LF/HF.

| | Experimental (*n* = 34) | | | | | Control (*n* = 33) | | | | | ANCOVA |
| | Pre-test | | Post-test | | *t*-test | Pre-test | | Post-test | | *t*-test | *P* |
	Mean	SD	Mean	SD	*p*	Mean	SD	Mean	SD	*p*	
CS	48.35	12.53	38.51	13.13	.001[*]	36.47	14.53	35.87	14.01	.677	.058
SYS	124.34	24.25	119.91	14.03	.261	112.87	11.97	113.19	17.55	.929	.314
DIA	78.22	11.10	80.22	8.21	.374	78.94	8.14	76.19	12.29	.366	.147
HR	89.47	14.12	85.69	11.58	.206	88.48	16.36	87.48	13.15	.775	.547
HRV	209.82	140.36	178.91	183.42	.389	253.90	160.67	247.77	189.66	.883	.234
HF	62.06	7.1	57.42	13.47	.102	63.93	9.17	54.73	12.99	.004[*]	.458
LF	38.09	7.1	43.03	13.49	.075	36.07	9.17	45.27	12.98	.004[*]	.534
LF/HF	.64	.22	.85	.56	.073	.61	.28	.99	.75	.015[*]	.431

Immunological measure: CS: cortisol; Physiological measures: SYS: systolic blood pressure; DIA: diastolic blood pressure; HR: heart rate; HRV: heart rate variability; HF: high frequency levels; LF: low frequency levels; LF/HF: low frequency/high frequency ratio.
[*] Significance *p* < .05, paired *t*-test.

changes in humor scores. These results suggest that those who attended LQP were able to increase their ability to laugh by finding humor in new ways and use to use simulated laughter as a means to reduce stress.

The ''stress-moderator theory''[9] contends that stress depends upon cognitive appraisal of events and on coping skills. Those with a better sense of humor seem to frame more positive appraisals. The LQP appears to engender humor as a stress moderator, providing participants with a coping strategy and a means to relieve embarrassing situations. A secondary effect of the LQP is to provide social support. Humor is commonly cited in laughter research as going hand-in-hand with social support, resulting in stress-buffering and health-enhancing effects,[57,13] When participants could actively voice their current mood states individually and in the context of a group, social support was prompted. By meeting continuously for 8 weeks, participants began to feel more comfortable voicing current moods and transforming them in a group context.

It is worthy to note, however, that there were only limited significant changes in the indexes of Table 1 (refer to Table 1): RSE, HT, HP and HA showed no significant changes. One explanation may be that self-esteem (RSE) is an enduring, stable personality trait[46] which takes more time and exposure to the intervention to change. Moreover, components of humor such as HT, HP and HA are also more stable traits and perhaps the current 8-week intervention only had a ''low-dose'' effect. Future studies may focus on a longer intervention with more sessions during each week.

Immunological effects

The present study found lowered levels of cortisol for LQP participants and no significant changes were found in the control group. These immunological effects are similar to those described by Toda and Ichikawa,[25] who found that ''laughter, particularly in young people, may relieve stress (p. 496).'' During adolescence, a time when peer influence is at its greatest, an increase in ''social identification'' is one of the strongest factors indicating why laughter can be

a viable means of increasing social support.[58] A shared laugh during the upheavals and differing mood states of adolescence can go a long way toward making a teenager feel a sense of belonging and thus toward reducing stress.

Physiological effects

This study examined BP, HR and HRV as physiological indicators. There were no significant changes in these variables for the experimental group. However, there were unexpected significant changes in the control group for HRV, HF, LF and LF/HF ratios. Given the constraints of the environment (i.e., administration-approved time periods in the school day), the control group may have been engaging in stress-relieving activities such as reading or writing. It can be argued that ''down time'' for the control group was also stress-relieving. In the fields of public health and social sciences this issue is not uncommon. Fitzpatrick and colleagues[59] note, ''But public health interventions can rarely replicate the controlled environment of the clinic... maintaining pure control groups without cross-contamination may be impossible or impractical... (p. 9)''. In this particular case, ''cross-contamination'' could have occurred during the experimental protocol. While administering the physiological measures, experimental subjects were prohibited from speech or movement for over 7 min. This proved difficult for some subjects. These factors could explain the unexpected results in the control group.

Limitations

First, the size of this study was relatively small (experimental *n* = 33; control *n* = 34), so generalizations to the general population are difficult. Future studies may focus on surveying demographic variables and seeing if they moderate the effects of the LQP. Second, this study did not include a follow-up to evaluate long-term effects. Finally, cortisol levels were only measured once a day due to time constraints of students' schedules, but future studies should consider measurements throughout the day.[60] Given the unexpected

results of the control group in this study, the suggestion for two control groups,[9,42] seems astute, in the context of future studies.

Conclusion

This study provides the field of gelotology with an innovative new mental health promotion program. The LQP is offered as a standardized laughter therapy protocol which can facilitate cross-study comparisons in future research. Martin[9] noted, ''the need for researchers to address questions of how much laughter, of what intensity and for how long it is needed to produce various physiological effects.'' The present study provides a good starting point for narrowing quantitative parameters for simulated laughter programs. Based on this study, a minimum of at least 1 session per week, for at least 20 min and at an intensity that would elicit deep abdominal breathing, is recommended as a baseline for realizing benefits.

Those in clinical medicine (e.g., physicians, school nurses, etc.) are often the ''first responders'' when an adolescent seeks help with mental health issues (often via psychosomatic complaints). Given the increasing popularity of laughter programs worldwide, more patients may now be willing to try laughter as an alternative means of stress relief. Evidence-based studies are greatly needed to ensure that health care practitioners can confidently recommend this treatment.

Unpredictable mood states during adolescence seem universal; changes in the body go hand-in-hand with fluctuating hormones and the increased importance of peer opinions. Alternative and complementary treatments such as the LQP provide non-invasive, non-pharmacological means of managing these transitions, simultaneously moderating stress levels and providing social support through the simple act of sharing a good laugh.

Author's contributions

CC was responsible for the concept, design and supervision of the study, and was the guarantor for the paper. GT did the statistical analysis and prepared the first and all subsequent drafts. CH gave advice on the statistical analysis, helped with preparation of figure and revised final draft.

Disclosure statement

No competing financial interests exist.

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Appendix A. Laughing Qigong Program (LQP) Protocol

- Warm-up stage (2 — 3 minutes): The goal of this stage is to loosen and stretch the muscles of the body and mentally prepare for laughter exercises. Participants are starting to ''clear and clean'' (*qing, ganjing*) their bodies of thoughts and ''toxic'' qi. Participants stretch forward to touch their ankles with hands crossed, slowly stretch upwards, yawn and then rest. This stage is similar to stretching when rising from bed in the morning. Repeat 3 times.
- *RenMai - DuMai* stage (3 — 4 minutes): The goal of this stage is to generate warmth in the body. The *RenMai - DuMai* stage is based on the Chinese meridians known as the *Ren conception vessel* (starts from perineum, up in front of torso, to area of lower lip) and the *Du governing vessel* (starts from the tip of the coccyx, up along the spinal column, over the head and ending at the upper lip). The focus of this stage is deep breathing from the *dantian* (1.5 cm below navel) — also known as diaphragmic breathing. Participants stretch forward, tucking the chin towards the chest, and then back pushing the abdomen forward. While stretching upwards they start laughing and making ''ha-ha'' sounds. Other sounds are also emitted (''Yi'', ''Wu'', ''Ou,'' ''Ah,'' and ''E'') in accordance with the five Chinese meridians (Spleen/Stomach, Lung, Kidney, Liver and Heart). Chinese medicine believes that ailments are caused by energy blockages which create disharmony and imbalance in the body. By emitting sounds, one can aid in the healing of blocked meridians because these sounds emit an ''energy'' which can help heal the body. By giving voice to these blocked energies, one is able to help release pent-up energy systems. Each sound is emitted 3 times: the 1st time for 1-2 seconds fairly quickly; the 2nd time, 3-5 seconds, still quick; and the 3rd time for 8 seconds, more slow and drawn out. The 3rd time the sound is made, the syllable is much longer, almost similar to mantra chanting. The duration and speed is also dependent on individual tempo; if one is too tired, slow down the speed. This ''release'' is also a major component of the next stage, the Transformation stage.
- Transformation stage (10 minutes): The goal of this stage is physical movement, exercise of the body and transformation of negative energy (qi) into positive energy. Participants are asked to release bottled up emotions by starting with feeling ''cold'' in the body. By stating, ''I'm cold!'' or ''I'm angry!'' or ''I'm afraid!'' participants simulate a temper tantrum with stomps, shivers, and screams, and then stretch arms overhead and shout ''ha'' releasing energy upwards. Interspersed are ''ha-ha'' sounds and laughing. During this stage, participants are asked to ''transform'' their current mood states. Not only does this offer a positive means to deal with emotions such as anger, frustration, anxiety or fear; it also gives voice to one's current mood states. Instead of ''bottling up'' or ''pushing away'' perceived ''negative'' emotions; participants are encouraged to display a whole range of emotions. Many times, participants shout, ''I've had enough!'' ''I'm tired of all this!'' or ''I'm so angry I can't take it anymore!'' with much emotion and pent-up frustration. By giving participants a way to vent in a

controlled and supportive, they are able to express their emotions and realize that these are just passing thoughts; in essence, they can be ''laughed'' away. The actual physical gestures and simulations serve as a means of active transformation. Similar to a car engine which begins to motor, one actively ''motors'' the negative mood states into positive energy through self-induced laughter. Thereafter, participants laugh for 2 − 3 minutes continuously. After laughing, participants take deep breaths from the *dantian* and rest. During this stage, participants take turns coming to the center of the circle to lead the group.

- Cool-down stage (5 minutes): The goal of this stage is to cool down the body and mind, and close with a tai-chi self-massage (sweeping the hands over the arms and legs and simulating ''washing'' the face) or meditation. In addition, this stage ends with all participants going around and thanking other participants with a ''ha'' as each participant claps hands. Not only is there a formal way of ending the LQP session, but in essence, the closing offers a chance for participants to feel that they are part of social group.

A.1. LQP Fundamental Tenets

The LQP requires three changes to be successfully implemented:

- Changes in the Body − Opening & Stretching:
  - Goal: Stretch tendons, ligaments and muscles in order for qi to flow.
- Changes in Physiological States of the Body Through Laughter:
  - Goal: Release ''toxic'' qi and cleanse the body and spirit.
- Changes in the Mind − Deep Sighing, Yawning & Letting Go:
  - Goal: Letting go of mental attachments and relaxing the body and mind.

Appendix B. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.ctim.2013.09.004.

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Improving the experience of patients on dialysis through intradialytic laughter therapy

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The patient experience of maintenance hemodialysis is frequently described as stressful, depressing and replace with monotonous. Ways to improve the patient experience through laughter therapy programs have not formally been put into practice. This pilot study explored the feasibility, safety, acceptance and patient experience of laughter therapy in two hemodialysis centers in California from September 2016 to April 2017.

Laughter therapy sessions were implemented weekly for 30 minutes per session. Evaluation consisted of surveying and interviewing patients (n=58) and staff (n=25).

The results indicated that 70% of surveyed staff and patients agreed the laughter therapy program had a positive impact on patient mood and would recommend it for future centers. Intradialytic laughter therapy is safe and feasible and can improve perceptions of mood in patients on dialysis and dialysis staff.

Background

Laughter therapy is a wellness therapy gaining popularity around the globe. It is based on the concept that intentional laughter, used as a component of a wellness program, can be therapeutic when performed in a systematic and coordinated way. The inclusion of laughter as a therapy can be provided in different forms and has variously been termed as laughter wellness, laughter recovery, laughter yoga, gelotology, conscious laughter, mirthful laughter and voluntary simulated laughter.

Foley and colleagues found that laughter therapy can provide respite from the adverse emotional effects associated with illness by improving mood. De La Fuente Mochales found that laughter therapy decreased pain, and Shahidi M and colleagues found it reduced depression and Walter and colleagues noted an improved overall quality of life for patients who had laughter therapy.

Bennett and colleagues found that intentional laughter has been used widely for people with mental health conditions, chronic disease and cancer across a range of ages from pediatrics to geriatrics.

Intentional laughter is used in most forms of laughter therapy. It is also referred to as conscious, simulated, mirthful or voluntary laughter. Intentional laughter consists of "deep belly laughter" practiced over a sustained period of time to enhance the

many benefits associated with laughter. The brain knows it is not genuine laughter, but the body does not. This activity can offer benefits for patients who report low levels of happiness, particularly in life satisfaction, life achievements and relationships, according to Bennett and colleagues. Laughter elevates mood, energy and vigor and increases memory, creative thinking and problem-solving skills. Neuhoff and colleagues found that intentional laughter can change our mental map from a negative to a positive mental attitude that may assist people affected by end-stage kidney disease.

Why laughter therapy in hemodialysis?

According to Bennett, undergoing maintenance hemodialysis thrice weekly is a life-sustaining therapy dreaded by many patients, resulting in loss of control over their life and increased fatigue and unhappiness. Adaptation to the dialysis reality varies, but overwhelmingly, adjusting to the hours required on dialysis is a common challenge for patients, partly due to the lack of constructive activity while dialyzing. Trials to increase activity and decrease the boredom during hemodialysis have included seated Zumba, book clubs, exercise activities and bingo. The aim is often to enhance the patient experience and quality of life or simply humanize the therapy and take advantage of the time spent on the machine.

Bennett and colleagues also found that laughter therapy on dialysis can be viewed as physical activity or as an exercise program. Dialysis patients have poor muscle function because of the symptoms of age, kidney disease and the long hours attached to a dialysis machine. Intentional laughter can create a heightened total-body response by exercising the facial, chest, abdominal and skeletal muscles, improving tone. It can also help to improve cardiovascular function, respiratory function, elevate pain tolerance and increase the body's immune defense systems.

Dunbar and colleagues found that intentional laughter can foster better communication which leads to a less confrontational approach in tense situations and a change from individual competitiveness to team cooperation. Thus, in hemodialysis centers, laughter has the potential to improve interpersonal interaction, relationships, increase friendliness, helpfulness and can help build group identity, solidarity and cohesiveness.

There has been limited experience of laughter therapy outside of the United States (Israel and Australia) where laughter has been shown to be feasible in outpatient hemodialysis centers, according to Bennett and Dahan and colleagues. One Australian program consisting of 30 minutes every dialysis for 4 weeks was associated with a decrease in intradialytic hypotension and showed trends in decreased anxiety and increased mood.

U.S. clinics are commonly larger than Australian clinics, designed to service between 24 and 48 patients at a time. These are frequently designed to physically separate patients, resulting in decreased intradialytic interpersonal communication between patients. Thus, it can be a challenge to promote a group therapy, such as laughter therapy, in a clinical context where mandates for infection control, personal protection and staffing determine the workflow processes.

The aim of this report is to summarize 6 months of experience of laughter therapy in two Satellite Healthcare hemodialysis centers in California.

'Laugh Out Loud' Hemodialysis

Laughter therapy sessions were performed at mutually agreed upon times by staff, patients and therapists and performed once weekly. Each 30-minute session consisted of breathing and stretching exercises that facilitated intentional laughter exercises and laughter meditation (Table 1). At Satellite Dialysis Vallejo, morning and middle shift patients on both Thursdays and Fridays participated. At Satellite Dialysis Sacramento, early morning and middle shift patients on Friday only participated. Participation varied from 50% to 100% of patients on any given shift.

Table 1. A typical laughter therapy session

Activity	Details	Time
Warm-up exercises	• Deep belly breathing • Body stretching, arms and legs • Gentle neck and shoulder stretches • Think of something pleasant and smile and loosen up the face • Throat/chest/belly laugh exercise, from a shallow style of breathing to slower, deeper breathing, with the laughter eventually coming from the core • Rollercoaster exercise	10 minutes
Laughter exercises	• Slot machine jackpot laugh – Yes! • Access arm still laugh • Silent laughter • Cell phone laugh • Sprinkler laugh • Teeth brushing laugh • Milkshake or cocktail laugh • Greeting laugh; handshaking • Waving to others • Aloha laugh • Triathlon laugh (combination of running, swimming, cycling laughs) • Clock watching laugh • Shower laugh • Cup of tea laugh • Game show kiss laugh	15 minutes
Laughter meditation and warm down	• Body relaxing; smiling and relaxing; breathing and relaxing and ending with application of "laughter lotion" • Affirmation (I am amazing, I am healthy, I am happy, I am strong) • Giggle glitter • Laughter hugs • Laughter goodbye kiss	5 minutes

Source: Paul N. Bennett, RN, MHSM, PhD; Toni Luckett, RN; Joy Cunanan, RN; Christine Kalife, BA; and Brigitte Schiller, MD, FACP, FASN

One laughter therapist was contracted for each center. The therapist then chose from one to three trained assistants, depending on the size of the clinic and the number of patients per shift. Laughter therapists were educated and orientated to the dialysis center, which included talking and listening to patients, policy and procedure orientation, infection control and mandated flu vaccinations.

Training

Staff education at the Vallejo center consisted of a 30-minute PowerPoint presentation for all staff and a short laughter therapy demonstration held in the conference room. In Sacramento, we added two practical laughter sessions at the nurse's console in full view of the patients. Both clinics had two laughter champions assigned whose main responsibility was to liaise between the center and the

laughter therapists. These champions were patient care technicians, registered nurses, dietitians and social workers. Posters were developed to both advertise and educate patients and staff.

Staff were encouraged to participate in the laughter therapy sessions for a portion of time during each 30-minute session. Allied health staff, such as social workers and dietitians, assisted by organizing their patients' appointments around the pre-arranged laughter therapy session times. Nephrologists also assisted by ensuring that patient care rounds were not scheduled during laughter therapy. Where possible, staff assisted the laughter therapists in engaging and encouraging patients.

Patient and staff perceptions

Patient and staff views on the program were gathered using questionnaires and semi-structured interviews. A Californian State independent review board approved the evaluation process. All respondents signed informed consent forms prior to completing questionnaires and interviews. Fifty-eight patients returned completed questionnaires from a total of 95 eligible patients (61% response rate).

Results from the patient questionnaires can be found in Figure 1. Overall, 63% of responding patients believed the laughter therapy had a positive impact on their mood during dialysis, with 68% recommending laughter therapy for other patients. Twenty percent of patients had concerns regarding laughter therapy in the dialysis centers.

In interviews, some patients expressed their frustration with the boring aspects of dialysis and said laughter therapy helped pass this time in a fun and engaging way. Patients also noted increased staff and patient comradery and stated that the laughter therapy made people feel happy and helped them forget about their problems or worries. Patients noted that the program worked well for some patients but not others, and those who were indifferent still recommended continuing laughter therapy for the benefit of other patients who they knew enjoyed it.

Staff

Twenty five out of 47 staff members (53% response rate) completed and returned evaluation questionnaires. Respondents included 11 patient care technicians, six nurses and eight ancillary staff (dietitians, social workers, biomedical technicians and administrators). Results from the questionnaires can be found in Figure 2. More than 70% of staff believed the laughter therapy had a positive impact on patients' mood, with a similar number recommending laughter therapy for other patients. Twenty-four percent of the staff had concerns regarding the safety of

laughter in the dialysis centers, although there was a strong interest by the center staff to learn more about the physical and psychological benefits of laughter therapy.

As a follow-up to the questionnaire, 10 staff members agreed to be interviewed using a semi-structured interview format. Staff were positive regarding laughter therapy, even commenting that the positive effects of laughter continued even on non-laughter therapy days. Overall, staff members interacted with each other more positively, often invoking language used in the laughter therapy sessions, passing each other on the treatment floor with a "ho, ho, ho, ha, ha, ha." Staff also reported attitude changes in some patients who were initially resistant to the therapy but ultimately embraced it. Laughter therapy helped these patients "come out of their shell" and engage with their other patients and staff.

Figure 1. Laughter therapy perceptions: Patients

	Laughter had a positive impact on my mood	I would recommend LT to other patients	I would like to have more info about LT	I had concerns about the safety of LT during dialysis
Disagree**	11	10	14	28
Neutral	9	7	12	11
Agree*	35	36	26	10

■ Agree*   ■ Neutral   ■ Disagree**

*Strongly agree and agree responses combined
**Strongly disagree and disagree responses combined
LT = Laughter Therapy

Figure 2. Laughter therapy perceptions: Staff

	Laughter had a positive impact on the mood of my patients	I would recommend LT to my patients	I would like to have more info about LT	I had concerns about the safety of LT during dialysis
Disagree**	7	8	4	13
Neutral			1	5
Agree*	18	17	16	6

■ Agree*   ■ Neutral   ■ Disagree**

*Strongly agree and agree responses combined
**Strongly disagree and disagree responses combined
LT = Laughter Therapy

Staff noted the importance of providing in-depth education at the start of the program, including the health benefits of laughter therapy. At one of the centers, patients who were spoken to individually regarding the pilot program and laughter benefits began to participate when initially averse to the program. Interestingly, as staff and patients became more familiar with the program, staff commented on the noise level on the treatment floor. Some staff felt laughter therapy was too loud while others felt that the noise was a positive change.

Improved patient experience

The 6-month experience with two intradialytic laughter pilot programs has demonstrated the potential for laughter therapy to be integrated into a hemodialysis center's every day work. However, to ensure success, a program must be more than just placing a laughter therapist into a hemodialysis clinic. Requirements needed to succeed include executive support, medical director buy-in, patient education, staff education, appropriate scheduling, access management, new laughter exercises each session and potentially a time limit of 3 months. A full set of recommendations can be found in Table 2.

Table 2. Intradialytic Laughter Therapy recommendations

1. Choose a clinic whose staff has shown interest to integrate fun/wellness/ laughter into routine care
2. Schedule 30-minute laughter therapy sessions every shift or weekly
3. Three months of laughter therapy is recommended, possibly repeated
4. Ensure appropriate times for patients and staff, avoiding turnaround times and shift changeovers
5. Staff education
   - Minimum total time 1 hour per staff member (to be done in groups)
   - Include two staff laughter therapy sessions in clinic treatment area
6. Patient education
   - Total time 30 minutes per patient
   - Interpreters for patients should be included in pre-education
   - Include laughter videos through clinic monitors
7. Provide laughter bands for patients to use to keep AV access arm still during therapy session
8. Vary exercises by replacing three exercises every session with new ones
9. Measure effect may be monitored by
   - Depression, anxiety, and stress scale
   - Staff "time spent with patients" measure
   - ICH-CAHPS

The capacity for laughter therapy to improve patient experience as measured by the Core ICH-CAHPS Survey, according to the 2017 In-Center Hemodialysis CAHPS Survey Administration and Specifications Manual from CMS, needs to be seen. Future surveys measuring patient depression, stress and anxiety are also needed in the future to better assess the value of such programs.

Although most patients and staff found laughter therapy to be positive, we found a small percentage of patients who did not want to be included. We recognized the importance that some patients just aren't in a good space and laughter may be too intrusive. Our experience found that with the right amount of education and preparation for patients and staff, most patients will participate. Importantly, the patients who did not wish to participate still encouraged others to participate and they stated that they enjoyed hearing other patients participating and laughing.

Conclusion

Laughter therapy can improve interpersonal interaction and relationships, increase friendliness and helpfulness, and help build group identity, solidarity and cohesiveness. Although not for everyone, laughter therapy has been shown to be a positive therapy and can be seen as an important element to efforts in humanizing hemodialysis care and improving the experience of patients on dialysis. *-by Paul H. Bennett, RN, MHSM, PhD*

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Research Article

Evaluation of a Laughter-based Exercise Program on Health and Self-efficacy for Exercise

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Abstract

Background: Despite health benefits of physical activity (PA) and risks of physical inactivity, many older adults do not accumulate sufficient levels of PA to achieve associated health benefits. Lack of PA enjoyment may be a barrier to PA participation. Combining simulated laughter and PA for strength, balance, and flexibility is a potential solution for helping older adults maintain independence in activities of daily living through enjoyable participation in PA.
Purpose of the study: The purpose of this study is to assess whether combining simulated laughter exercises with a moderate-intensity strength, balance, and flexibility PA program (i.e., *LaughActive*) increases participation in PA, health, and self-efficacy for PA among older adults residing in 4 assisted living facilities (ALFs).
Design and methods: The 12-week wait list control pilot study used pre- and 6-week post-intervention comparisons within and between groups identified by paired sample *t*-test results among those who participated in twice-weekly *LaughActive* classes (*n* = 27).
Results: Significant improvements ($p < .05$–$.10$) were observed in mental health (SF-36v2), aerobic endurance (2-minute step test), and self-efficacy for exercise (OEE).
Implications: PA programs that elicit positive emotions through simulated laughter have the potential to improve health, physical performance, and self-efficacy for PA among older adults and may positively influence participant adherence.

Keywords: Physical activity, Exercise intervention, Assisted living, Laughter, Simulated laughter

Regular physical activity (PA) is needed throughout the life course. Sufficient PA in older adult populations is associated with lower all-cause mortality and reduced risk of a number of chronic conditions, including coronary heart disease, high blood pressure, stroke, type 2 diabetes, metabolic syndrome, osteoporosis, colon cancer, breast cancer, anxiety, and depression (Nelson et al., 2007). Regular PA reduces the impact of age-related declines in aerobic endurance and the degenerative loss of muscle mass, quality, and strength, which prevents or mitigates functional limitations (Vogel et al., 2009). These benefits are crucial in the

maintenance of older adults' ability to perform activities of daily living (ADLs). Modest evidence supports the association of PA with enhanced sleep quality and health-related quality of life (HRQOL), whereas strong evidence supports the association between PA and higher levels of functional health, reduced risk of falls and lower incidence of hip fracture, and improved cognitive function (Nelson et al., 2007; U.S. Department of Health and Human Services [USDHHS], 2008).

Despite the health benefits of PA and the risks of physical inactivity, many older adults are not physically active

and therefore do not accumulate sufficient levels of PA to obtain the associated health benefits. The 2008 Physical Activity Guidelines recommend that all adults participate in a minimum of 30 minutes of PA at least 5 days per week to counter the negative effects of inactivity and achieve desirable health outcomes (USDHHS, 2008). Acquiring sufficient levels of PA according to these guidelines requires that adults maintain motivation to adhere to regular PA, which often presents a particular challenge for the older adult population (Brawley, Rejeski, & King, 2003).

Enjoyable exercise programming may serve as a mediator to PA in older adults (Phillips & Flesner, 2013). Mullen and colleagues claimed, "Enjoyment is both a predictor and outcome of physical activity participation" (2011, p. 1). Participants that anticipate enjoyment as a part of PA can improve their commitment and adherence to exercise activities, due to anticipated positive emotions associated with the activities (Mullen et al., 2011).

It seems plausible that if participants who anticipate enjoyment as a part of PA can improve their commitment and adherence to exercise activities, then a program that specifically targets exercise enjoyment through eliciting positive emotions would motivate participants to participate in the program both initially and on a continuing basis. Laughter may be a valid part of the solution. The pleasant associations with laughter may add enjoyment to an exercise program and increase program adherence (Hirosaki et al., 2013).

Not only is laughter generally considered to be an enjoyable activity; laughter itself is associated with improved physiological and psychological functioning. Physiologically, laughter positively impacts the central nervous, muscular, respiratory, circulatory, endocrine, immune, and cardiovascular systems (Fry, 1986, 1992). The physical act of laughter shares many common benefits associated with exercise (Fry, 1994). A recent literature review confirmed the following physiological benefits of laughter: (1) exercises and relaxes muscles; (2) improves respiration; (3) stimulates circulation; (4) decreases stress hormones; (5) increases immune system defense; (6) elevates pain threshold and tolerance; and (7) enhances mental functioning (Mora-Ripoll, 2011). The physical benefits of laughter are complemented by the scientifically validated psychological effects of laughter, which are summarized as follows: (1) reduces stress, anxiety, tension, and counteracts depressive symptoms; (2) elevates mood, self-esteem, hope, energy, and vigor; (3) enhances memory, creative thinking, and problem solving; (4) improves interpersonal interaction and relationships and increases feelings of bonding; (5) increases friendliness, helpfulness, and builds group identity, solidarity, and cohesiveness; (6) promotes general psychological well-being; (7) improves quality of life and patient care; and (8) intensifies joy and is contagious (Mora-Ripoll, 2011).

It is important to distinguish between humor and laughter. "Humor and laughter are distinct events (although often associated): while humor is a stimulus and can occur without laughter, laughter is a response and can occur without humor" (Mora-Ripoll, 2011, pp. 173–174). Simulated laughter techniques such as laughter yoga achieve the health benefits of laughter without relying on humor to elicit the laughter stimulus. Simulated laughter techniques are based on knowledge that the body cannot distinguish between genuine and self-initiated laughter (Kataria, 2011). Although the laughter used in simulated laughter techniques is initially self-initiated, the laughter exercises facilitate the act of making eye contact and enacting playful behaviors with other participants, which generally transitions the laughter itself from laughter that is simulated to genuine laughter. Simulated laughter may lead to increased intensity and duration of laughter, both through intentionally self-initiating deep and prolonged laughter at will, and through transitioning into genuine and spontaneous laughter triggered through the eye contact and playful behaviors shared among participants. These two effects have the potential to result in increased physiological responses (Mora-Ripoll, 2011).

Simulated laughter may be an ideal means for older adults with functional or cognitive impairments to access the health benefits of laughter. Humor may lead to laughter, but it is elicited through a mental stimulus and therefore requires a high degree of mental functioning including attention, working memory, flexible thinking, extraction of word meaning, and a positive mood state in order to perceive and appreciate humor (Takeda et al., 2010). However, when laughter is self-initiated as bodily exercise, older adults do not need to rely on cognitive skills to "get the joke," or a positive mood state to reap the benefits of laughter. Furthermore, laughter is universal. Nearly everyone enjoys laughing, and laughter is almost always positive; whereas, humor can sometimes be misjudged and elicit negative emotional responses. These benefits are especially relevant to older adults with moderate dementias (Takeda et al., 2010). Because simulated laughter exercises can be facilitated while seated and are suitable for a wide range of physical abilities, they may serve as a cardiovascular exercise program for sedentary individuals who cannot, or will not, participate in more traditional forms of exercise.

Although both humor-based and simulated laughter are associated with positive health outcomes, the dose–response relationship to outcomes, long-term effects, and the underlying mechanisms and processes of laughter require further clarification (Mora-Ripoll, 2011, Proyer, Ruch, & Rodden, 2012). To the best of our knowledge, laughter has only been used as an additional behavioral modification to positively impact exercise adherence in one intervention (Hirosaki et al., 2013).

The purpose of this exploratory pilot study was to assess whether a novel PA program that incorporates simulated laughter exercises within a moderate-intensity strength, balance, and flexibility PA program would increase participation in PA, overall health and self-efficacy for PA among

older adults residing in assisted living facilities (ALFs). Although simulated laughter has potential as an accessible, sustainable, and enjoyable modality to improve older adults' PA program adherence and associated outcomes, no studies have examined the impact of simulated laughter as part of a dedicated PA program. The specific research aims and corresponding hypotheses that guided this research are as follows:

Aim 1: Increase overall health among older adults residing in ALFs.

(1) The *LaughActive* intervention will improve subjective health outcomes, or heath-related quality of life (HRQOL) measures of older adults residing in ALFs.
(2) The *LaughActive* intervention will improve objective health outcomes, or physical performance measures of older adults residing in ALFs.

Aim 2: Increase self-efficacy for PA, or the confidence to engage in PA, among older adults residing in ALFs.

(1) The *LaughActive* intervention will be positively associated with aspects of improved self-efficacy for PA among older adults residing in ALFs, including (a) physical, social, and self-evaluative outcome expectations for exercise; (b) increased perceived facilitators and reduced perceived barriers to exercise; and (c) exercise enjoyment.

Design and Methods

The 12-week study used a wait list control design with baseline and 6-week post-intervention comparisons within and between intervention groups. Researchers collected data from the intervention group at two points in time: Time 1 (pre-intervention baseline) and Time 2 (6-week intervention conclusion). Researchers collected data from the wait list comparison group members at three points in time: Time 1 (pre-intervention baseline), Time 2 (6-week waiting period conclusion; wait list comparison group intervention baseline), and Time 3 (6-week intervention conclusion). Each group engaged in one 6-week *LaughActive* intervention (described *Intervention*).

Participants and Recruitment

The study used a convenience sample of four comparable ALFs in terms of environmental variables (i.e., facility type, average monthly cost of residency, services offered, number of apartments, and number and types of PA activities offered in the facilities). The ALFs were for-profit with average monthly fees ranging from $3,675 to $4,895. Number of apartments ranged from 46 to 75. In addition to other activity programming, the facilities provided exercise classes twice a day, six times per week. A study of ALF facilities suggested that individual factors such as older age, comorbid conditions, reported ADL impairment,

and moderate-to-severe cognitive impairment were more likely than facility factors to predict negative physical function (Giuliani et al., 2008). Facility names were randomly drawn to determine the intervention and control groups.

To identify individuals who were interested in study participation, 45-minute *LaughActive* resident demonstration sessions were conducted in place of the regularly scheduled morning exercise class at each site. Site Activity Directors selected residents with no more than moderate levels of cognitive impairment and placed the resident demonstration session flyers into eligible residents' mailboxes. Session participants received a brief overview of the *LaughActive* program and forthcoming research study, followed by an interactive demonstration.

Participant recruitment sessions were conducted at each facility within 2 weeks following the demonstration sessions. Individuals who expressed interest in study participation were screened to determine if they were English-speaking, at least 60 years of age, and were able to get around with or without assistance from devices or one caregiver. Six of 43 potential participants screened were not eligible for further consideration, as the research team found that they were unable to perform the preliminary screening procedures due to attention or memory issues.

The American Heart Association (AHA)/American College of Sports Medicine (ACSM) Health/Fitness Facility Pre-participation Screening Questionnaire was used to determine participants' risk stratification for experiencing a cardiovascular event while engaging in moderate-intensity exercise programming (ACSM, 2014). Based on participants' responses to this interview-assisted questionnaire, participants were classified as low, moderate, or high risk for experiencing a cardiovascular event during exercise participation. According to the screening protocol, participants with one or more symptoms of, or who had been diagnosed with cardiovascular, pulmonary, and/or metabolic disease were considered to be at high risk and were advised to obtain physician's clearance before beginning the *LaughActive* program (Balady et al., 1998). Regardless of participants' risk status for experiencing a cardiovascular event while engaging in moderate-intensity exercise, all study participants were given a copy of a medical release form in order to consult with their physicians before participating in the *LaughActive* intervention. The study was approved by the Georgia State University Institutional Review Board, and all study participants provided written informed consent.

Intervention

This *LaughActive* intervention is a 6-week exercise program delivered twice weekly for 45 minutes each session using two progressive exercise routines. *LaughActive* is a moderate-intensity exercise program for older adults that combines simulated laughter exercises with a dedicated strength, balance, and flexibility exercise program.

Laughter exercises and deep breathing techniques are interspersed throughout the exercise program and are positioned to participants as "laughter and deep breathing breaks."

The strength, balance, and flexibility components of the intervention coincide with the ACSM/AHA PA recommendations for older adults (Nelson et al., 2007). In developing the two exercise routines that were used for the intervention, these older adult–specific guidelines were followed in terms of the session format, the selection of exercises for the program, the progression of the exercises within the class sessions, and the progressive advancement of exercise difficulty from the first to second routine (weeks 1–3 and weeks 4–6, respectively). Each session included 5–10 minutes of warm-up exercises followed by 30–35 minutes of intensive repetitive exercises, before concluding with 5–10 minutes of cool down and stretching.

Although *LaughActive* is not a dedicated endurance program, it may have elements of aerobic benefit. The physical act of laughter is comparable with mild cardiovascular exercise and shares many common physiological benefits associated with exercise (Fry, 1994). Facial, respiratory, and laryngeal muscles are all used to produce laughter, which creates changes in lung volume and muscle compression in the airways. This may cause physiological changes that necessitate increased oxygen consumption and in turn, raise the heart rate (Buchowski et al., 2007). Intense laughter elicited through laughter exercises used in *LaughActive* may be equivalent to the short aerobic bursts that occur in interval training, in which the exercise intensity is varied within a single bout of exercise (Garber et al., 2011). The interval training model consists of a series of maximal effort sprints with a period of lower-intensity active recovery between each series (Metcalfe, Babraj, Fawkner, & Vollaard, 2012). Interval durations have been evaluated that range from 15 seconds to several minutes (Arnardóttir, Boman, Larsson, Hedenström, & Emtner, 2007). Interval and continuous duration endurance training produce similar effects in healthy adults (Garber et al., 2011). Some studies have demonstrated similar efficacy of interval training and traditional continuous duration endurance training in a number of cardiorespiratory fitness and cardiometabolic biomarkers in participants with metabolic, cardiac, or pulmonary disease (Beauchamp et al., 2010; Earnest, Blair, & Church, 2010; Guimarães et al., 2010; Rognmo, Hetland, Helgerud, Hoff, & Slørdahl, 2004; Warburton et al., 2005; Wisløff et al., 2007). The laughter exercises incorporated rhythmic movement of the major muscle groups while laughing. For instance, a laughter exercise might engage the biceps and triceps muscles by inviting participants to clean out limiting thoughts with "mental floss." In this exercise participants imagine a giant string of floss passing in and out through the ears as participants flex and extend the arms out to the side, all while laughing. The *LaughActive* sessions included, on average, 8–10 laughter exercises lasting 30–60 seconds each. A laughter exercise was typically incorporated into the workout routine after every 2–4 strength, balance, and flexibility exercises.

The *LaughActive* intervention used dumbbell weights for upper body strengthening exercises and resistive body weight for lower body strengthening exercises. In accordance with industry recommendations, sessions included one set of 8–10 exercises with 10–15 repetitions for each exercise (Nelson et al., 2007). So that the intervention continued to remain at moderate intensity for each participant as gains were made in muscle strength, resistance was gradually progressed over the course of the intervention, ranging from 1 to 3 lb dumbbell weights and progressive body weight exercises, as tolerated by individual participants.

The first author facilitated all *LaughActive* exercise sessions and is qualified to facilitate safe and effective exercise sessions. Fitness-related certifications include Group Fitness Instructor (American Council on Exercise [ACE]); Senior Fitness Specialist (ACE); Laughter Yoga Teacher (Laughter Yoga International); and CPR/AED/First Aid (AHA). The two exercise routines that comprised this intervention were developed in partnership with the third author, an associate professor of Gerontology and a certified Personal Trainer and Group Fitness Instructor (National Exercise Trainers Association [NETA]). The intervention was supported by written protocol for both routines, and each session was facilitated according to its protocol with minimal variation from the written protocol between groups.

Strength exercises targeted the muscles of the shoulders, chest, back, biceps, triceps, forearms, wrists, abdominals, inner and outer thighs, hips, glutes, quadriceps, hamstrings, and the supporting tissues of the ankles. Due to functional limitations of study participants and the associated risk of falls, balance exercises were completed while seated. Balance exercises focused on strengthening key muscles involved in balance, such as the abdominals, quadriceps, hamstrings, calves, and the supporting tissues of the ankles. Static stretching techniques were incorporated into the cool down segment. Per industry recommendations, static stretches were held for 10–30 seconds and were repeated 3–4 times for each stretch (Nelson et al., 2007). Muscles that were stretched included the neck, shoulders, chest, back, hamstrings, calves, shins, and the supporting tissues of the ankles.

Outcome Measures

Data on the following measures were collected at baseline only:

Exercise Risk Stratification

The participants' risk stratification for engaging in moderate-intensity exercise was determined using the AHA/ACSM Health/Fitness Facility Pre-participation Screening Questionnaire (ACSM, 2014).

Sociodemographic Variables

The sociodemographic variables included in the study are as follows: age, gender, race, education level, marital status, and physical activity participation frequency and type, height (inches), body weight (lb), and body mass index (BMI). Physical measurements were obtained using a standard measuring tape and scale. BMI (kg/m²) was determined using a BMI calculator.

Outcome measures were assessed at three points in time. Data were collected using paper and pencil interview-assisted questionnaires and an observational fitness test.

Subjective Health or HRQOL

Subjective health status was assessed using the SF-36v2 Health Survey Standard Form (4-week recall), a widely used, comprehensive, and validated measure of HRQOL (Ware et al., 2007). The SF-36v2 measures eight domains of health, including Physical Functioning ([PF] 10 items); Role-Physical or role participation with physical health problems ([RP] 4 items); Bodily Pain ([BP] 2 items); General Health [GH] 5 items); Vitality ([VT] 4 items); Social Functioning ([SF] 2 items); Role-Emotional or role participation with emotional health problems ([RE] 3 items); and Mental Health ([MH] 5 items). The SF-36v2 generates two types of summary scores for physical and mental health. All domains and the component scores use norm-based scoring.

Objective Health

Objective physical performance was measured using the Senior Fitness Test ([SFT] Rikli & Jones, 1999). The SFT assesses lower and upper body strength, aerobic endurance, lower and upper body flexibility, and agility/dynamic balance. Respectively, test items that measure these functional fitness domains include chair stand (repetitions/30 seconds); arm curl (repetitions of 5 lb weight for women and 8 lb weight for men/30 seconds); 2-minute step (steps/2 minutes); chair sit-and-reach (inches); back scratch (inches); and 8-foot up-and-go (seconds).

Perceived Physical, Social, and Self-evaluative Outcome Expectations for Exercise

Outcome expectations for exercise were assessed using the Outcome Expectations for Exercise (OEE) scale (Resnick, Zimmerman, Orwig, Furstenberg, & Magaziner, 2000). The OEE was developed to assess older adults' perceived consequences of exercise behavior. The scale consists of nine statements regarding the benefits of exercising with high reliability (Resnick et al., 2000). For each statement, participants indicate the degree to which they agree with each statement (e.g., "Exercise makes my muscles stronger") on a scale of 1 (*strongly disagree*) to 5 (*strongly agree*). The numerical ratings for each response are tallied and then divided by the number of responses. Higher scores indicate higher levels of outcome expectations for exercise.

Perceived Facilitators and Barriers to Exercise

The Self-Efficacy for Exercise (SEE) scale measured perceived facilitators and barriers to exercise (Resnick & Jenkins, 2000). The SEE is a 9-item scale designed to measure participants' perceived confidence in their ability to exercise three times per week for 20 minutes despite the presence of commonly identified barriers to participation among older adults, such as pain or fatigue. For each item, participants indicate their confidence to execute exercise behavior on a 10-point scale ranging from 0 (*not confident*) to 10 (*very confident*). The score is obtained by summing the numerical ratings for each response and then dividing by the number of responses. Higher scores indicate stronger levels of self-efficacy expectations for exercise. This measure has been shown to have high reliability (Resnick & Jenkins, 2000).

PA Enjoyment

Participants' feelings of enjoyment in response to PA were assessed using the Short Physical Activity Enjoyment Scale (8-Item PACES; Mullen et al., 2011). Respondents are asked to rate "how you feel at the moment about the physical activity you have been doing" using a 7-point bipolar rating scale. Higher PACES scores reflect greater levels of enjoyment. The measure has been shown to have high reliability (Mullen et al., 2011).

Program Adherence/Participant Adherence

Participant adherence was measured by the percentage of participant program attendance. These measurements were tracked via a roll sheet in which the exercise instructor documented attendance. Participation was tallied according to percentage of each class attended (i.e., 100% for full class, 75% if participant arrived after the warm-up, 50% for half of class, and 25% if participant arrived for stretching only). Participant adherence was calculated by summing the total number of classes attended and dividing by 12 total sessions.

Program Satisfaction

The Satisfaction Questionnaire included open- and close-ended questions asking participants to assess the *LaughActive* program.

Measurements were collected by the first author (*LaughActive* instructor), second author, and a team of six graduate research assistants. In order to reduce participants' response bias, members of the research team who were not involved in facilitating the *LaughActive* exercise sessions assessed program satisfaction.

Statistical Analyses

Independent samples *t* tests were used to determine baseline differences between the intervention and wait list comparison groups. Paired sample *t* tests were used to assess change between pre- and post-test results on intervention

participants and wait list comparison group members. Individuals with missing data on outcomes were excluded pairwise; no imputation was done. IBM SPSS Statistics for Windows, Version 21.0 (IBM Corp., 2012) was used to calculate the variations in all pairs of determined study variables. Given the relatively small sample size of this pilot study, the relatively large effect sizes needed to achieve statistical significance in a small sample and the targeted number of variables compared over time, the decision was made to set the alpha level to less than .10 with no Bonferroni adjustment made.

The SF-36v2 Health Survey was scored using the QualityMetric Health Outcomes Scoring Software 2.0. The SFT was scored using the Senior Fitness Test Scoring Software 2.0.

Results

Thirty-seven participants from across four recruited sites were included in the study (see Figure 1 for participant flow diagram). A total of 34 participants were initially recruited at the Time 1 baseline recruitment sessions. Two sites participated in the intervention from Time 1 to Time 2. The other two sites, during this Time 1 to Time 2 period, provided the wait list comparison group members. From Time 2

to Time 3, the latter two sites contributed intervention participants. The majority of these participants from the original control sites had been wait list comparison group members. Three participants, who had not been wait list comparison group members, were added at Time 2.

Three participants did not receive the allocated intervention due to fewer than 50% program participation. Six participants were lost to follow-up. Reasons for loss to follow-up were fall or medical condition since baseline assessment prohibiting exercise participation and observational fitness test evaluation ($n = 2$), significant cognitive decline since pre-intervention measurement ($n = 1$), moved out of the ALF ($n = 2$), and refusal to complete follow-up measurements ($n = 1$). No participants withdrew from the study for reasons directly related to the *LaughActive* program and no adverse events were reported. Of the 28 study participants who completed measurements, one participant was excluded from the final analyses due to high inconsistencies in responses, as determined by the SF-36v2 Health Survey Response Consistency Index (RCI) data quality indicator.

The mean number of classes attended was 9.85 ($SD = 2.09$; range = 4–12). The majority of participants (22 or 81.4%) who were included in the final analyses ($n = 27$) attended at least 75% of the *LaughActive* program. The *LaughActive* participant adherence rate is consistent with
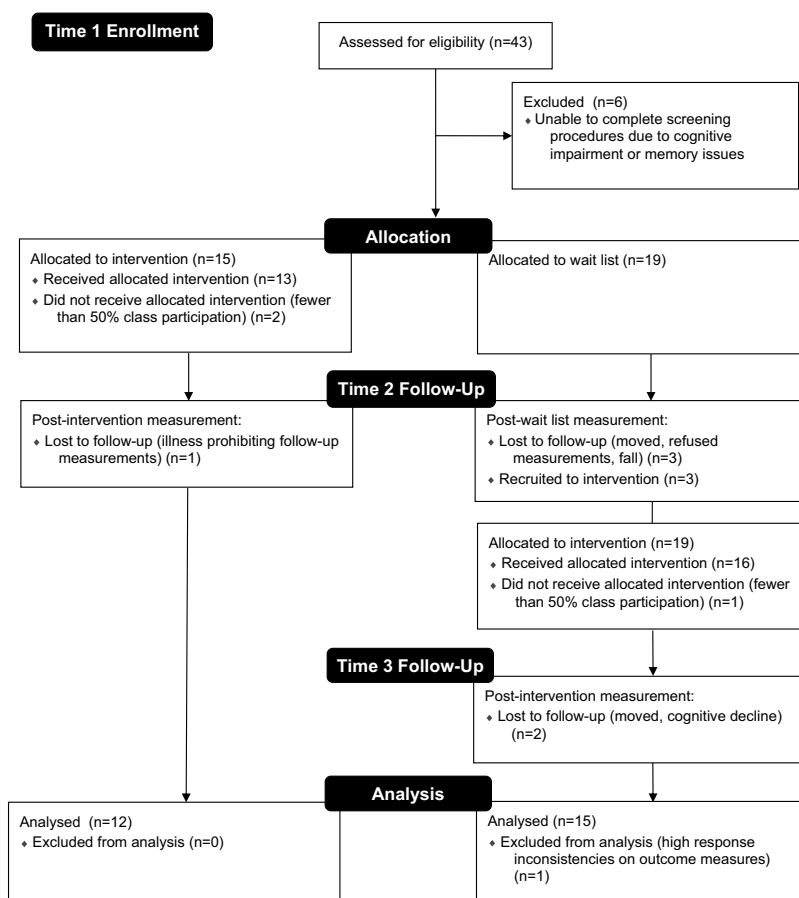

Figure 1. *LaughActive* intervention participant recruitment and participation.

other findings of exercise program attendance in older adult populations ranging from 60 to 90% (Resnick, Luisi, & Vogel 2008). In fact 48.1% of the sample attended more than 90% of the program, whereas only 14.8% attended less than 60% of the program.

Descriptive characteristics of the sample ($n = 27$) are presented in Table 1. The mean age was 81.55 years ($SD = 7.48$) and the mean BMI ($n = 25$) was 27.40 ($SD = 4.93$). The majority of study participants were Caucasian (88.9%), women (81.5%), not married or living with a partner (84.6%), and college educated (74.1%) and exercised at least 5 days per week (55.5%). Independent samples t tests indicated that there were no significant differences in sociodemographic variables between the intervention and wait list comparison groups at baseline.

Table 2 shows the baseline and end point retest scores for the health and self-efficacy measures for all participants during their intervention period. We observed statistically significant within-group improvements in mental health ($p = .056$), aerobic endurance ($p = .036$), and outcome expectations for exercise ($p = .006$) in the intervention participants. We observed statistically significant within-group declines ($p = .026$) in agility and dynamic balance (8-foot

Table 1. Sociodemographic Characteristics of Participants Who Completed the *LaughActive* Intervention

	Completed ($n = 27$) n (%)
Age (years)	
60–70	3 (11.1)
71–80	3 (11.1)
81–90	19 (70.3)
91–100	2 (7.4)
Gender	
Male	5 (18.5)
Female	22 (81.5)
Race	
White (not Hispanic)	24 (88.9)
Black/African American (not Hispanic)	3 (11.1)
Education	
Some high school/high school graduate	7 (25.9)
Some college/college graduate	16 (59.3)
Graduate education	4 (14.8)
Partnership status	
Married/living with partner	4 (15.4)
Other	23 (84.6)
Exercise class participation	
Do not participate	2 (7.4)
1 day per week	5 (18.5)
2 days per week	2 (7.4)
3 days per week	1 (3.7)
4 days per week	2 (7.4)
5 days per week	3 (11.1)
More than 5 days per week	12 (44.4)

up-and-go test). The wait list comparison group also significantly declined ($p = .053$) in this measure during the control period.

Satisfaction scores for participants ($n = 27$) are presented in Table 3. Unanimously, participants were satisfied with the program and enjoyed being in class. Respondents indicated that they found laughter to be an enjoyable addition to a traditional exercise program (96.2%). Moreover, 88.9% of respondents stated that the laughter helped to make exercise more accessible, and the same proportion also found that the program enhanced their motivation to participate in other exercise classes or activities. All participants stated that they felt better overall, and 92.6% found more joy in their lives as a result of the *LaughActive* program. Furthermore, 88.9% of respondents wanted to continue the program two times per week.

Several themes emerged from analysis of participants' responses to the open-ended questions. These responses included appreciation of the following aspects of the *LaughActive* intervention: interaction with peers; mood benefits; enjoyment/fun; laughter; the program as different; and appreciation of the instructor's equating the exercises with functional movements needed to perform ADLs. Respondents specifically referenced the laughter aspect of *LaughActive*, as well as their appreciation of the idea of integrating laughter into an exercise program. Examples of these statements include "I love to laugh and this gives me more of a chance to do that"; "I don't laugh enough. I appreciated the program"; "It's a great idea, combining laughter with the exercise"; and "Laughing is a good thing for the geriatric population. This needs to be offered at senior centers."

Discussion

In assessing the impact of a 6-week laughter-based PA program, we found statistically significant improvements in mental health, aerobic endurance, and outcome expectations for exercise in the intervention participants. Aim 1 was partially supported in that statistically significant within-group improvements were observed in mental health (MH) and aerobic endurance (2-minute step test). The 5-item MH domain measures the four major mental health dimensions of anxiety, depression, behavioral/emotional control, and psychological well-being. Higher scores indicate improved states of peace, happiness, calmness, and behavioral/emotional control (Ware et al., 2007). These significant improvements in mental health are supported by Satisfaction Questionnaire findings.

The improvements in aerobic endurance require further exploration because *LaughActive* could not be considered an endurance program in the traditional sense because the program did not incorporate activities that increase the heart rate and breathing for a continuous period of at least 10 minutes (Bauman et al., 2016). Instead the heart and breathing rate were increased through the 30- to 60-second

Table 2. Within-group Change of Outcomes From Baseline to End Point for *LaughActive* Participants

Outcomes	Baseline M (SD)	End point M (SD)	p Value
Subjective health (*n* = 27)			
SF-36v2			
PCS	46.76 (9.09)	47.05 (8.05)	.844
PF	42.72 (10.07)	42.58 (10.52)	.942
RP	47.67 (9.51)	48.75 (8.62)	.529
BP	52.51 (9.62)	53.15 (9.02)	.692
GH	53.36 (8.80)	54.27 (8.21)	.386
MCS	56.12 (8.32)	57.59 (6.86)	.262
VT	56.11 (9.95)	57.87 (10.46)	.332
SF	51.95 (9.00)	52.32 (8.45)	.864
RE	50.88 (8.15)	50.88 (7.25)	1.000
MH	54.35 (8.91)	56.68 (5.68)	.056*
Objective health			
SFT			
Chair stand (*n* = 23)	6.78 (3.04)	7.04 (3.03)	.756
Arm curl (*n* = 27)	10.40 (4.05)	9.92 (3.48)	.589
2-Minute step (*n* = 25)	55.66 (21.34)	64.33 (23.66)	.036**
Chair sit-and-reach[a] (*n* = 26)	−3.42 (3.61)	−4.26 (3.97)	.114
Back scratch[a] (*n* = 25)	−6.80 (5.41)	−6.51 (5.01)	.687
8-Foot up-and-go[b] (*n* = 25)	13.53 (6.48)	15.10 (7.38)	.026**
Self-efficacy (*n* = 27)			
OEE	4.09 (.60)	4.35 (2.34)	.006**
SEE	6.43 (2.34)	6.85 (2.12)	.404
PACES	20.18 (9.81)	17.44 (8.84)	.227

Notes: BP = Bodily Pain; GH = General Health; MCS = Mental Component Summary; MH = Mental Health; OEE = Outcome Expectations for Exercise Scale; PACES = Physical Activity Enjoyment Scale; PCS = Physical Component Summary; PF = Physical Functioning; RE = Role-Emotional; RP = Role-Physical; SEE = Self-Efficacy for Exercise Scale; SF = Social Functioning; SFT = Senior Fitness Test; VT = Vitality.
[a]Scores further from 0 in the negative direction indicate worse outcomes.
[b]Higher scores indicate worse outcomes.
*$p < .10$; **$p < .05$ indicate significance of group difference from baseline (paired sample *t* test, two-tailed).

aerobic bursts throughout the session in the form of laughter exercises. Given that this was a multimodal strength, balance, and flexibility program that included laughter, it is difficult to differentiate which mode(s) of exercise contributed to the increase in aerobic endurance. As Bauman and colleagues (2016) state, "Notably, aerobic capacity improves after isolated resistance training in older adults, because strength and muscle mass contribute to aerobic capacity, and thus resistance training may subsequently result in increased ability to engage in endurance activities like walking" (p. S275).

The *LaughActive* program aimed to improve self-efficacy for PA by improving outcome expectations for exercise, increasing perceived facilitators and reducing perceived barriers to exercise, and enhancing exercise enjoyment. Aim 2 was partially supported in that statistically significant within-group improvements (*p* = .006) were observed in outcome expectations related to exercise (OEE). Outcome expectations play an important role in influencing older adults' exercise adoption and maintenance of exercise behaviors, and in fact may be better predictors of exercise

behavior than beliefs regarding the ability to continue exercising despite perceived barriers (Resnick et al., 2008).

LaughActive was intended to serve as a program that would improve outcome expectations for exercise by both educating participants on the benefits of exercise and helping them to experience enjoyment through laughter. Throughout the sessions, the instructor narrated the health benefits of engaging in regular exercise (e.g., exercise strengthens muscles and bones), as well as the benefits of each exercise on functional performance (e.g., this exercise helps us to get in and out of a chair more efficiently). Given the statistically significant increase in MH domain scores and feedback on the Satisfaction Questionnaire, it is clear that participants experienced enhanced joyful affective states during this program, which in turn could have positively impacted outcome expectations (Jette et al., 1998; Resnick & Jenkins, 2000; Resnick et al., 2008).

Simulated laughter interventions have been shown to positively impact mental health outcomes in older adults (Ko & Youn, 2011, Shahidi et al., 2011). In our study, we observed statistically significant increases in mental health

Table 3. Satisfaction Questionnaire Results for *LaughActive* Participants

Description	*n* = 27	
Outcome variables (4-point scale, where strongly agree = 4)	*M (SD)*	Agree or strongly agree (%)
I am satisfied with the *LaughActive* program	3.56 (.506)	100
As a result of the *LaughActive* program, I feel better overall	3.41 (.501)	100
As a result of the *LaughActive* program, I find more joy in my life	3.19 (.557)	92.6
The *LaughActive* program was appropriate for my physical fitness level	3.44 (.577)	96.2
I found the laughter aspect of the *LaughActive* program to be an enjoyable addition to a traditional exercise program	3.44 (.577)	96.2
The laughter aspect of the *LaughActive* program helped to make exercise more accessible for me	3.19 (.622)	88.9
The *LaughActive* program enhanced my interaction with my classmates during the exercise classes	3.30 (.724)	85.1
The *LaughActive* program enhanced my interactions with others outside of class	3.00 (.734)	81.5
The *LaughActive* program enhanced my motivation to participate in other exercise classes or activities	3.26 (.656)	88.9
I would like to continue participating in the *LaughActive* program	3.37 (.688)	88.8
I would like to continue participating in the *LaughActive* program *two* times per week	3.26 (.656)	88.9
I would like to continue participating in the *LaughActive* program *three* times per week	2.67 (.734)	51.8
I would recommend the *LaughActive* program to a friend	3.44 (.577)	96.2
Outcome variables (3-point scale, where *often* = 3)	*M (SD)*	Sometimes or often (%)
I felt comfortable approaching my instructor with questions or comments	2.67 (.555)	96.3
I liked the instructor's teaching approach	2.89 (.320)	100
I was satisfied with the way my instructor taught the classes	2.93 (.267)	100
I enjoyed being in class	2.93 (.267)	100
I felt that I was a valued and respected member of the class	2.85 (.362)	100

and outcome expectations for exercise that may have motivated continued participation. However, we did not see a significant impact on enjoyment, or a relationship between the number of classes attended and mental health (MH), outcome expectations (OEE), or enjoyment (PACES). Therefore, it is unclear in our study what role these outcomes play in exercise adherence. This unclear pathway warrants future research.

Limitations

Despite the study's strengths, there were several limitations. The findings of the study are limited by small sample size and selectivity. Although the sample of participants included in the final analyses (*n* = 27) met the requirements of power calculation (*n* = 21), it was relatively small, given the number of study outcomes. Future studies would likely benefit from a larger probability sample and a randomized rather than wait-listed control group. We used a convenience sample, which may be biased by overrepresentation or underrepresentation of particular groups of people. Although this sample was likely representative of the average ALF resident in terms of age, gender, race, and education, the sample was fairly homogenous, as the majority of the study

participants were Caucasian, women, and well educated. Furthermore, the ALF sites selected for this intervention all had established exercise programs with twice-daily exercise classes 6 days per week. Therefore, these findings cannot be generalized to a more heterogeneous sample of older adults, or to other ALFs without established exercise programs.

This intervention was designed to improve participant adherence to PA programming. However, we were not able to obtain data on participants' regular exercise class attendance other than baseline and follow-up self-report measures, nor could we control for exercise attendance outside of the *LaughActive* program. It is possible the results of the study could be partially attributed to attendance in other exercise programs, but it is not likely. Participants were residing in ALFs that provided exercise programming that met twice daily, 6 days per week. We substituted two morning classes with the *LaughActive* programming. We assume that the level of other exercise participation remained constant before, during, and after the intervention. This should be a conservative assessment of *LaughActive* programming impact because the majority of participants were already engaged in exercise programming at the onset of the intervention.

The lack of additional statistically significant findings in physical performance measures may be related to the

instrument selected to measure efficacy of this intervention for this study population. Although the SFT is suitable for use with dependent older adults who need assistance with basic ADLs, the instrument was designed to assess the physical performance capacity of independent, community-dwelling adults (Rikli & Jones, 2013). The instrument uses continuous-scale scores, which can accommodate a wide range of physical ability levels. However, many of the fitness tests were too difficult for this study population to perform, resulting in the need for modifications in performance of the tests. The frequent use of modifications was problematic for scoring the SFT and, subsequently, measuring change over time.

Due to the exploratory nature of this study, the first author facilitated the *LaughActive* class sessions and collaborated in both data collection and analysis. The impact of this potential bias is mitigated, as a team that included the first author, second author, and six graduate research assistants collected measurements.

Future Research

PA experts contend that further well-designed research is needed to clarify varying levels of dose–response across diverse populations, medical conditions, and risk factors; establish minimum and maximum thresholds for activity; and measure varying intensities of PA (Hughes et al., 2011). Future laughter studies are needed to better outline underlying laughter mechanisms and processes and derive theoretical models for testing (Proyer et al., 2012). These substantial contributions would provide a framework for evaluating the dose–response relationships of laughter on outcomes.

Implications

It is well demonstrated that exercise is important for maintaining health and independence, yet many older adults are not sufficiently active to gain the associated health benefits, and inactivity remains a major public health concern. Programs are needed that promote optimal physical functioning and prevent or delay deficits that lead to increased disability and loss of functional independence, and in the case of ALF residents, costly and unwanted transfer to nursing homes (Giuliani et al., 2008). PA interventions that emphasize enjoyment through eliciting positive emotions among program participants have potential to motivate a largely sedentary older adult population to adopt and adhere to exercise behaviors that contribute to maintaining functional independence. Simulated laughter as part of a dedicated PA program may transform exercise into an enjoyable experience for older adults by helping them to laugh unconditionally, experience positive emotions, and associate these positive emotions with their experience of exercise participation. These joyful affective experiences

may influence outcome expectations for PA and predict ongoing adherence.

Further well-designed research is needed to better understand the underlying mechanisms of laughter and substantiate the dose–response relationship of laughter and its associated health benefits. This research is one of few studies to evaluate the potential of simulated laughter in improving health outcomes among older adults, and the first evaluation of a dedicated PA program that incorporated simulated laughter. This pilot study demonstrated promising results and may spark more research to evaluate the potential of simulated laughter in conjunction with PA as a viable technique for enhancing the health and adherence outcomes of PA programs.

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Effect of Laughter Yoga on Psychological Well-being and Physiological Measures

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ABSTRACT

Context • In 2014, laughter yoga (LY) achieved the intermediate level, tier 2, under the Title III-D Evidence-based Disease Prevention and Health Promotion Program through the Administration on Aging (AOA). Further research is needed to qualify LY under the criteria for the highest tier, tier 3, to assure continued funding for LY classes at senior centers.

Objectives • The study intended to demonstrate further the benefits of LY and to qualify LY as tier 3 under Title III-D.

Design • Using a quasi-experimental design, the research team conducted a preintervention/postintervention study in 3 phases.

Setting • The study was done in a variety of community centers. Phase 1, a pilot phase, was limited to North Carolina, and phase 2 was conducted in multiple states. Phase 3 was held at the North Carolina Area Agency on Aging's annual Volunteer Appreciation meeting.

Participants • Participants in phases 1 (n = 109) and 2 (n = 247) enrolled in LY classes. Classes were advertised by fliers posted in community and in retirement centers. The ability of participants to participate in a class was based solely on their desire to participate, regardless of age, ability, health status, or physical impairment. Phase 3 (n = 23) was a convenience sample only. All phases were voluntary.

Outcome Measure • The pre- and posttests for all 3 phases were Likert-scale surveys, 10 questions on the Psychological Outcomes of Well-being (POWB) survey. Pulse and other physiological measurements were also assessed pre- and postintervention. Analysis included a *t* test on each of the 10 POWB and physiological measures for all phases.

Results • All 10 POWB measures for phases 1 and 2 showed significant improvements between the pre- and postintervention testing ($P < .001$). Phase 3, the control, showed no significant improvement.

Conclusions • The initial study demonstrated that LY meets the criteria to qualify for tier 3 under the Title III-D Evidence-based Disease Prevention and Health Promotion Program and that a large number of Americans, regardless of age and physical ability, could benefit from LY. (*Adv Mind Body Med.* 2016;30(1):12-20.)

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Numerous studies have shown the health benefits of laughter.[1-3] In 1994, Madan Kataria, MD, a physician from India, developed laughter yoga (LY).[1] LY combines real and simulated laughter that often results in yogic breathing.[4] In the practice, laughter is simulated as a body exercise in a group,[4] which often results in spontaneous, genuine laughter.[5]

The purpose of the current quasi-experimental, case-control study was to demonstrate the benefits of LY and to qualify it as meeting the criteria for the highest tier, tier 3, under the Title III-D Evidence-based Disease Prevention and Health Promotion Program.

What then defines a program as *evidence based*, and why is that attribution important?

Evidence-based

Evidence-based (EB) programs are based on scientific research.[6] The Older Americans Act (OAA) is considered a major vehicle for the federal government to deliver needed services to the aging.[7] Titles III and IV of the OAA reaffirm the Administration on Aging's (AOA's) commitment to making sure that EB programs are accessible to older Americans.[8] EB health-promotion programs have been shown to reduce the need for costly medical interventions as well as patients' dependency on governmental programs. Standards exist for grading clinical research under EB criteria.[8] On February 14, 2014, the North Carolina Division of Aging and Adult Services formally approved LY as an intermediate level, or tier 2, program under the Title III-D Evidence-based Disease Prevention and Health Promotion Program.

To be awarded tier 3, a program must also meet 3 additional criteria in addition to meeting the criteria for tiers 1 and 2. Tier 3 programs must also (1) be proven effective for an older-adult population, using an experimental or a quasi-experimental design; (2) have been fully translated into programs at 1 or more community site(s); and (3) have developed and disseminated products that are available to the public.[9]

Benefits of Laughter

Methodologically, it is important to distinguish between humor and laughter or simulated laughter.[10] Humor and laughter are not synonymous. Simulated laughter can mimic the effects of laughter.[11] Laughter is a physiological event, whereas humor is a subjective construct.[12]

The effects of laughter are physical.[10] Laughter can provide an aerobic workout and, by increasing vascular blood flow, reduce blood pressure.[13] Likewise, simulated laughter has been found to boost mood and produce a feeling of psychological well-being.[11] Self-induced or simulated smiling had been found to be a mood enhancer.[11] Compared to aerobic exercise, laughter has been shown to be more effective in decreasing anxiety.[14,15]

Studies have shown the beneficial effects of laughter, real or simulated, on different body systems, including the mental, hormonal, and immunological.[5,16] As a group-exercise program, laughter has been found to be at least as effective as medication in treating depression and improving life satisfaction for elderly depressed women.[4,17] Laughter is cathartic and can bring about a metamorphosis in emotions.[1]

Further, Mora-Ripoll[18] has shown that the human brain does not distinguish between real and simulated laughter. He indicates that simulated or self-induced laughter is increasingly gaining popularity worldwide. The health benefits of laughter are well-known; incorporating yogic breathing enhances those benefits.[19]

Laughter Yoga

LY was founded by Dr Kataria in 1994 as a combination of both yogic breathing and unconditioned laughter.[4] Dr Kataria's interest in laughter as a form of healing medicine was sparked by Norman Cousins' book, *Anatomy of an Illness as Perceived by the Patient: Reflections on Healing and Regeneration*, which discussed actively addressing a life-threatening illness through humor.[13,17] Cousins, when he was told that he had Marie-Strumpell disease, began his own research on the healing effects of laughter, based on research conducted by Hans Selye.[20] Cousins's doctors found that the pre- and posttests for a laughter-intervention class showed a cumulative drop of 5 points in the rate of erythrocyte sedimentation.[17,20] An elevated sedimentation rate can indicate the presence of inflammation.[21] Cousins found that 10 minutes of genuine belly laughter resulted in at least 2 hours of pain-free sleep.[17] Dr Kataria was intrigued and wondered whether similar results could be replicated with a group in a class-like environment.[4]

LY and Yoga Clubs

Dr Kataria formed the first laughter club with 4 volunteers who told jokes to each other.[4] After a few weeks, the attempts at humor failed; Dr Kataria then introduced yogic-breathing techniques that simulated laughter and childlike-playfulness exercises, which resulted in the LY program.[22] Dr Kataria found that the effect of those combined activities had a beneficial effect on both the mental and physical aspects of health; hence, the term *laughter yoga* was created.[4]

LY combines laughter with yogic breathing.[4] The laughter is simulated; participants laugh without relying on jokes, humor, or comedy.[4]

Laughter, LY, and Seniors

Laughter has been shown to improve mental functioning and increase memory, interpersonal responsiveness, and alertness.[14] Laughter can generate a *total-body* response that tones muscles, an especially important function for bedridden and wheelchair-bound individuals.[14] The digestion rate can be improved with laughing due to the engagement of muscles of the gastrointestinal system.[14] Laughter has also been shown to release endorphins and decrease pain.[23,24]

LY can be easily adapted to a variety of environments and skill levels. Its ease of use and portability help to make LY accessible to a variety of populations, including older adults.[19] McMahan has demonstrated the physiological benefits of laughter with older adults.[14]

LY can be done from a chair or wheelchair with a few simple modifications to encourage interaction with other club members.[17] LY classes can increase social interaction, which in turn can benefit mental and physical health. The lack of equipment costs and the flexibility of place and space help to make LY a cost-effective and entertaining way to introduce a pleasant form of exercise for people of varying ages and abilities.[17,19,25]

METHODS

The purpose of the current quasi-experimental, case-control study was to demonstrate that LY is effective with older-adult populations. The study was conducted in

3 phases. The pilot, phase 1, included only an intervention group and was conducted in North Carolina. Phase 2 also included only an intervention group and was conducted in 6 states: California, Illinois, Massachusetts, New Hampshire, New Mexico, and Rhode Island. Phase 3, the control element, was conducted with a control group in North Carolina only.

Participants

Participants in phases 1 and 2 were recruited using flyers distributed primarily through senior centers. The courses in senior centers were voluntary and free of charge. Other venues included community centers and libraries.

Participation in the study was voluntary. Individuals who chose to participate in the LY classes were not obligated to participate in the study unless they chose to do so. Class size ranged from 8 to 10 participants with 1 instructor. The ability of participants to participate in a class was based solely on their desire to participate, regardless of age, ability, health status, or physical impairment.

Participants in all groups were told that the study was examining specific outcomes from LY to see whether it could meet the federal criteria that had been established for EB, but very little other explanation was provided. Consultation on and review of the structure of the study protocol was provided by the PhD evaluator at the North Carolina Division of Aging & Adult Services. Consultation included, but was not limited to, used of intervention and control groups, data collection (participant demographics, outcome measures), and analysis strategy. No formal approval was required by the agency or LY International. Participation in all phases was voluntary and those individuals who did not want to participate did not. No incentives were offered for participation.

Phase 1. To find participants for the intervention group in phase 1, certified LY instructors (CLYLs) in North Carolina invited individuals in their LY classes to be participants in the study. A total of 114 individuals enrolled in the phase. Original enrollment was 118. Four individuals did not complete all data collection and were not used for analysis.

Phase 2. To find participants for the intervention group in phase 2, CLYLs from 6 additional states enlisted volunteers from their LY classes to participate in the study. A total of 300 individuals enrolled in the phase. Original enrollment was 352. A total of 52 individuals did not complete all data collection and were not used for analysis.

Phase 3. To create a control group, the member of the research team who worked at the Southwestern Commission Area Agency on Aging invited the people who attended its annual Volunteer Appreciation meeting to participate in the phase 3 assessment. The researcher explained the need for a control group and asked for volunteers to participate. A total of 31 individuals enrolled in the phase. Seven individuals did not complete all data collection and were not used for analysis.

Procedures

Participants in all phases completed the Psychological Outcomes of Well-being (POWB) form, developed by Dr Kataria (Figure 1). The POWB forms were handed out at the beginning of classes for the intervention groups. Those groups completed the *before* side of the forms at their seats and then joined in a 60-minute LY class. At the conclusion of that class, the participants returned to their seats to complete the *after* side of the form. The control group completed the forms twice during the annual Volunteer Appreciation meeting. For phases 1 and 2, the completed POWB forms were collected by the CLYLs, and the forms were then packaged and sent to the student intern for coding. No identifying information was collected on the form.

Physiological measurements were also collected in all phases. In phase 1, a total of 5 measurements were collected: (1) systolic blood pressure, (2) diastolic blood pressure, (3) mean blood pressure, (4) blood oxygenation, and (5) heart rate in beats per minute (BPM). Blood oxygenation

Figure 1. POWB Pre- and Postintervention Surveys

First 3 Letters of Your First Name _____
First 3 Letters of Your Last Name _____
Your Age _____
Date_____
Location_____

HOW DO YOU FEEL?
Complete this page **Before** you take part in the Laughter Yoga Class.

Complete a new one **After** you take part in the Laughter Yoga Class.

To measure the immediate effects of Laughter Yoga:

Well-being Questions

	\<Worst CIRCLE Best\>
Enthusiasm	1 2 3 4 5 6 7 8 9 10
Energy level	1 2 3 4 5 6 7 8 9 10
Mood	1 2 3 4 5 6 7 8 9 10
Optimism	1 2 3 4 5 6 7 8 9 10
Stress level	1 2 3 4 5 6 7 8 9 10
Level of friendship with group members	1 2 3 4 5 6 7 8 9 10
Level of awareness about your breathing	1 2 3 4 5 6 7 8 9 10
Level of muscle relaxation	1 2 3 4 5 6 7 8 9 10
Level of mental relaxation	1 2 3 4 5 6 7 8 9 10
Ability to laugh without a reason	1 2 3 4 5 6 7 8 9 10

Abbreviation: POWB, psychological outcomes of well-being.

and blood pressure were not measured in phases 2 or 3 due to a lack of equipment. Therefore, the only physiological measurement collected in those phases was heart rate.

The completion of phase 1 resulted in the formal approval of LY as a tier 1 (minimal criteria) EB program by the North Carolina Division of Aging and Adult Services in August 2013. In phases 2 and 3, participants also completed a demographic form to provide data that included gender, race/ethnicity, a self-assessment of current health, and quality-of-life measures. The addition of the form was recommended by the North Carolina State Unit on Aging for phases 2 and 3 after LY had achieved its tier 1 status (Table 1). To achieve tier 2, practice in additional states was required, as was the introduction of a control group. Tier 2 was achieved in February of 2014.

Phase 1. This pilot phase began with the first CLYL training in October 2012 and concluded on June 30, 2013. All CLYLs were new to LY and were recruited by the principal investigator. Each was trained by the research team using the core curriculum from LY International. To ensure consistency, all CLYLs conducted LY sessions 1 or more times prior to administering the study. That practice was a deliberate part of their training to ensure that the new CLYLs would be consistent in conducting the LY classes that they would subsequently facilitate.

Phase 2. The research team randomly contacted 1 of the 6 LY master trainers who are located in the United States. That master trainer then recruited other CLYLs from 6 additional states to enlist volunteers to participate in the study. Master trainers have completed 60 hours of training, including 15 days in India with the founder. CYLTs receive 40 hours of training from either teachers or master trainers. CLYLs receive 20 hours of training from teachers or master trainers.

Phase 3. The members of the control group completed the demographics questionnaire as well as the *before* side of the POBW form at their seats at the start of the meeting. After the 2 forms were filled out and the first physiological readings were taken, the normal agenda for the Volunteer Appreciation meeting resumed. Sixty minutes after those first readings and tests, the meeting agenda was paused to give participants the opportunity to complete the second POWB test and physiological readings.

Intervention

The intervention phases were LY classes given by CLYLs, who volunteered their time to teach the LY courses. All classes followed the same structure and basic exercises. A typical laughter class began with energetic chants of "ho-ho, ha-ha-ha," and hand-clapping.[26] Full-hand, palm-on-palm, finger-on-finger clapping was done to stimulate pressure points and increase energy levels, whereas the "ho-ho, ha-ha-ha" activated the diaphragm, which prepared the body to breathe deeply throughout the practice.[27]

The LY class was led through a variety of laughter exercises with names such as milkshake laughter, lion laughter, and shake-hands laughter, to promote playfulness among the members.[26] Forced laughter quickly became genuine as each group worked together on the exercises.[17,26] The LY exercises lasted anywhere from 20 minutes to 1 hour and generally ended with group chanting and/or meditation.[17]

Outcome Measures

Phase 1. To ensure fidelity with the collection of physiological data, CLYLs were issued identical Food and Drug Administration (FDA)-approved, automatic blood-pressure cuffs (EastShore Medical Supply, Algoma, WI, USA) and pulse oximeters (Clinical Guard, Atlanta, GA, USA) and were trained on the proper protocol and use of the equipment by the research team. Heart rate was displayed on identical, FDA-approved pulse oximeters, which were given to each of the CLYLs. Each instructor was trained in the equipment use and then practiced using the equipment until demonstrating reliably consistent readings. To ensure internal validity, all CLYLs were trained by the research team using the same training materials. In the training, the physiological measures were taken and recorded by the CLYLs who would be performing the procedures in the study's LY classes after they had received instruction from the CLYLs who taught the class on the proper procedures to take them. The training CLYLs offered assistance as needed.

Phase 2. To ensure fidelity in the collection of physiological data, an instructional video was viewed by each collaborating LY instructor prior to giving the classes.[28] The video demonstrated the proper method and established the standards for measuring pre- and postintervention heart rates, using the radial-artery measurement technique. The instructors demonstrated the technique to participants in the intervention groups, who then took their own pulse rates, with the instructors giving timed start-and-stop commands, according to the protocol established in the instructional video. When necessary, the instructors assisted participants in locating their pulse points. Data were contributed by CLYLs, leaders, and master trainers from California, Illinois, Massachusetts, New Hampshire, New Mexico, and Rhode Island.

Phase 3. The member of the research team who was present demonstrated the radial-artery method of taking a pulse, after which the participants measured their own pulse rates, with the researcher giving timed start-and-stop commands. When necessary, the researcher assisted participants in locating their pulse points.

Data Analyses

Data were analyzed in SPSS version 21 (Release Version 21.0.0.0, SPSS Statistics for Windows, Version 21.0, IBM Corporation, Armonk, NY, USA). Based on the type of data and the research goal, which was the identification of differences between baseline and the end of the intervention, and the small sample size for phase 3, the current research team chose the paired-samples t test as the most appropriate method of statistical analysis to examine the changes from preintervention to postintervention for repeated-measures groups, where the same participants are tested more than once. A paired-samples t test was calculated to compare the

Table 1. Demographic Data of Initial Participants in Phases 1, 2, and 3

	Phase 1 NC (Pilot)		Phase 2 Multistate		Phase 3 Control	
	n	%	n	%	n	%
Total	114	100%	300	100%	31	100%
Gender						
Female	NA	NA	238	79%	25	81%
Male	NA	NA	62	21%	6	19%
Hispanic/Latino or Spanish origin						
Yes	NA	NA	18	6%	3	10%
No	NA	NA	278	93%	27	87%
Unknown	NA	NA	4	1%	1	3%
Blank	NA	NA	0	0%	0	0%
Race/ethnicity						
American Indian	NA	NA	1	0%	1	3%
Asian or Asian-American	NA	NA	8	3%	NA	NA
Black or African-American	NA	NA	21	7%	NA	NA
Hawaiian Native or Pacific Islander	NA	NA	0	0%	NA	NA
White or Caucasian	NA	NA	251	84%	30	97%
Other or blank	NA	NA	19	6%	NA	NA
Age range (y)						
<20	0	0%	4	1%	NA	NA
20 to ≤30	6	5%	12	4%	NA	NA
30 to ≤40	17	15%	22	7%	1	3%
40 to ≤50	14	12%	38	13%	NA	NA
50 to ≤60	21	18%	73	24%	3	10%
60 to ≤70	24	21%	77	26%	7	23%
70 to ≤80	22	19%	48	16%	11	35%
80 to ≤90	9	8%	18	6%	9	29%
≥90	0	0%	8	3%	NA	NA
Blank	1	1%	0	0%	0	0
Military service						
No	NA	NA	278	93%	23	74%
Yes	NA	NA	20	7%	8	26%
Blank	NA	NA	2	1%	0	0%
Provider told had chronic conditions						
Arthritis/rheumatic disease	NA	NA	77	16%	16	32%
Breathing/lung disease	NA	NA	48	12%	2	6%
Cancer	NA	NA	38	11%	6	19%
Depression or anxiety disorders	NA	NA	52	16%	0	0%
Diabetes	NA	NA	24	7%	6	22%
Heart disease	NA	NA	10	3%	3	14%
Hypertension (high blood pressure)	NA	NA	73	17%	2	4%
Osteoporosis (low bone density)	NA	NA	21	5%	1	2%
Other chronic condition	NA	NA	25	6%	8	18%
Stroke	NA	NA	1	0%	1	2%
Blank	NA	NA	110	18%	5	8%
Region						
Blank	NA	NA	16	5%	1	3%
Midwest	NA	NA	54	18%	0	0%
West	NA	NA	58	19%	0	0%
South	NA	NA	61	20%	30	97%
Northeast	NA	NA	111	37%	0	0%

	Phase 1 NC (Pilot)		Phase 2 Multistate		Phase 3 Control	
	n	%	n	%	n	%
Number of people currently in household (including yourself)						
1	NA	NA	78	26%	6	19%
2	NA	NA	120	40%	21	68%
3	NA	NA	56	19%	2	6%
4	NA	NA	32	11%	1	3%
5	NA	NA	6	2%	0	0%
>5	NA	NA	3	1%	0	0%
Blank	NA	NA	5	2%	1	3%
Have you ever taken this workshop before?						
Yes	NA	NA	175	58%	9	29%
No	NA	NA	120	40%	20	65%
Blank	NA	NA	5	2%	2	6%
How did you hear about this class?						
Church faith-based group	NA	NA	2	1%	1	3%
Flyer/poster	NA	NA	28	9%	0	0%
Friend/family	NA	NA	108	35%	6	19%
Healthcare provider	NA	NA	3	1%	0	0%
Newspaper ad/article	NA	NA	30	10%	0	0%
Other	NA	NA	56	18%	13	42%
Senior center announcement	NA	NA	32	10%	8	26%
UHC/AARP	NA	NA	0	0%	1	3%
Blank	NA	NA	51	16%	2	6%
In general, would you say your health is:						
Excellent	NA	NA	59	20%	5	16%
Fair	NA	NA	15	5%	5	16%
Good	NA	NA	87	29%	10	31%
Very good	NA	NA	139	46%	11	34%
Blank	NA	NA	0	0%	1	3%
How would you rate your overall quality of life?						
0-3, very poor to poor quality	NA	NA	2	1%	0	0%
4-6, average quality	NA	NA	60	20%	2	6%
7-10, good to excellent quality	NA	NA	237	79%	29	94%
Blank	NA	NA	1	0%	0	0%
Number of times hospitalized in the past 6 mo						
0	NA	NA	287	96%	29	94%
1	NA	NA	9	3%	2	6%
2	NA	NA	2	1%	0	0%
3	NA	NA	1	0%	0	0%

Abbreviations: NC, North Carolina; NA, not available; UHC/AARP, UnitedHealthcare/American Association of Retired Persons.

Table 2. Paired *t* Test of the 10 Indicators of POWB and of Physiological Measures

POWB Results	Phase 1 n = 109			Phase 2 n = 247			Phase 3 n = 23		
	Mean	SD	*t*	Mean	SD	*t*	Mean	SD	*t*
Enthusiasm	-0.92	1.20	-7.99[a]	-2.05	1.62	-19.98[a]	-0.08	0.50	0.43
Energy level	-1.25	1.56	-8.36[a]	-2.55	1.64	-24.53[a]	-0.08	0.78	0.60
Mood	-1.02	1.08	-9.86[a]	-2.23	1.73	-20.32[a]	0.04	0.86	0.81
Optimism	-1.07	1.26	-8.92[a]	-2.04	1.77	-18.20[a]	0.00	0.59	1.00
Stress level	-1.32	2.22	-6.24[a]	-1.83	2.94	-9.80[a]	0.17	0.70	0.26
Level of friendship with group	-1.00	1.64	-6.41[a]	-1.98	1.89	-16.43[a]	-0.42	0.93	0.038[b]
Level of awareness about breathing	-1.60	2.01	-8.33[a]	-2.69	2.00	-21.15[a]	-0.21	0.59	0.096[c]
Level of muscle relaxation	-1.75	1.62	-11.32[a]	-2.98	1.76	-26.68[a]	-0.04	0.69	0.77
Level of mental relaxation	-1.80	1.74	-10.82[a]	-3.04	1.94	-24.66[a]	-0.21	0.98	0.31
Ability to laugh without a reason	-1.51	2.03	-7.81[a]	-2.58	2.21	-18.39[a]	-0.13	1.33	0.65
Physiological Results									
Heart rate (BPM)	1.35	11.90	1.19	4.51	12.27	5.79[a]	-1.63	3.62	-2.20[b]
Systolic	5.11	14.65	3.66[a]	NA	NA	NA	NA	NA	NA
Diastolic	1.24	8.70	1.49	NA	NA	NA	NA	NA	NA
Mean blood pressure	2.52	8.62	3.07[d]	NA	NA	NA	NA	NA	NA
Blood oxygenation	-0.55	4.42	-1.32	NA	NA	NA	NA	NA	NA

Abbreviations: POWB, psychological outcomes of well-being; SD, standard deviation; BPM, beats per minute; NA, not available.

[a]$P < .001$.
[b]$P < .05$.
[c]$P < .10$.
[d]$P < .01$.

mean pretest scores with the mean posttest scores of phase 1 and 2 data. The alpha level of $P < .05$ was considered statistically significant for all analyses. Statistical analysis was conducted on the 10 POWB questions for all 3 phases and on the 3 physiological measurements for phase 1 and on the 1 physiological measurement for phases 2 and 3. No statistical analyses were done on the demographic data collected for phases 2 and 3.

RESULTS
Participants

Only those participants who completed the pre- and postintervention class surveys were included in the study.

Phase 1. The median age for phase 1 participants was 57 years, with the youngest being 26 years and the oldest 89 years. Of the 114 who initially began the study, only 109 completed both the pre- and postintervention surveys.

Phase 2. The median age for phase 2 participants was 58 years, with the youngest being 12 years and the oldest 94 years. Of the 300 who initially began the study, only 247 completed both surveys and were included in the study.

Phase 3. The median age for phase 3 participants was 78 years, with the youngest being 46 years and the oldest 96 years. Of the 31 who initially began the study, only 23 completed both surveys and were included in the study.

Well-being Results

All 10 POWB measures for phases 1 and 2 showed significant differences ($P < .001$) between the preintervention and postintervention tests.

For phase 1, the following were found: enthusiasm, $t_{109} = -7.99$, $P < .001$; energy level, $t_{109} = -8.36$, $P < .001$; mood, $t_{109} = -9.86$, $P < .001$; optimism, $t_{109} = -8.92$, $P < .001$; stress level, $t_{109} = -6.24$, $P < .001$; friendship with group, $t_{109} = -6.41$, $P < .001$; awareness about breathing, $t_{109} = -8.33$, $P < .001$; muscle relaxation, $t_{109} = -11.32$, $P < .001$; mental relaxation, $t_{109} = -10.82$, $P < .001$; and ability to laugh without a reason, $t_{109} = -7.81$, $P < .001$.

For phase 2, the following were found: enthusiasm, $t_{247} = -19.98$, $P < .001$; energy level, $t_{247} = -24.53$, $P < .001$; mood, $t_{247} = -20.32$, $P < .001$; optimism, $t_{247} = -18.20$, $P < .001$; stress level, $t_{247} = -9.80$, $P < .001$; friendship with group, $t_{247} = -16.43$, $P < .001$; awareness about breathing, $t_{247} = -21.15$, $P < .001$; muscle relaxation, $t_{247} = -26.68$, $P < .001$; mental relaxation, $t_{247} = -24.66$, $P < .001$; and ability to laugh without a reason, $t_{247} = -18.39$, $P < .001$.

For phase 3, the only measures of significance were the following: (1) the level of friendship with group members—$t_{23} = 0.038$, $P < .05$, with the difference being statistically significant; and (2) the level of awareness about breathing—$t_{23} = 0.096$, $P < .10$, with the difference trending toward significance (Table 2).

Table 3. Percentage Changes Between Preintervention and Postintervention Test Results

Physiological Outcomes of Well-being	Phase 1 (n = 109)			Phase 2 (n = 247)			Phase 3 (n = 23)		
	Pre	Post	% Change	Pre	Post	% Change	Pre	Post	% Change
Enthusiasm	8.18	9.07	11%	6.71	8.80	31%	7.10	7.43	5%
Energy level	7.53	8.73	16%	6.18	8.70	41%	6.67	7.03	5%
Mood	8.21	9.22	12%	6.74	9.00	33%	7.53	7.57	0%
Optimism	8.14	9.19	13%	6.92	8.98	30%	7.57	7.60	0%
Stress level	6.96	8.27	19%	6.11	7.98	31%	7.03	7.14	2%
Level of friendship with group members	8.01	9.01	12%	6.77	8.73	29%	7.43	7.73	4%
Level of awareness about breathing	7.50	9.10	21%	5.96	8.57	44%	6.53	7.10	9%
Level of muscle relaxation	7.25	9.02	24%	5.72	8.69	52%	6.50	6.41	-1%
Level of mental relaxation	7.25	9.06	25%	5.78	8.77	52%	6.72	6.83	2%
Ability to laugh without a reason	7.46	8.95	20%	6.53	9.04	39%	6.07	6.38	5%
Physiological Results									
Heart rate (BPM)	78.22	76.86	2%	74.03	69.66	6%	71.93	73.60	-2%

Abbreviation: BPM, beats per minute.

For phase 1, the percentage changes in the measures from preintervention to postintervention were as follows: (1) enthusiasm—an 11% increase, from 8.2 to 9.1; (2) energy level—a 16% increase, from 7.5 to 8.7; (3) mood—a 12% increase, from 8.2 to 9.2; (4) optimism—a 13% increase, from 8.1 to 9.2; (5) stress level scale—a 19% increase, from 7.0 to 8.3; (6) level of friendship—a 12% increase, from 8.0 to 9.0; (7) breathing awareness—a 21% increase, from 7.5 to 9.1; (8) muscle relaxation—a 24% increase, from 7.3 to 9.0; (9) level of mental relaxation—a 25% increase, from 7.3 to 9.1; and (10) ability to laugh without a reason—a 20% increase, from 7.5 to 9.0 (Table 3).

For phase 2, the changes in the measures from preintervention to postintervention were as follows: (1) enthusiasm—a 31% increase, from 6.71 to 8.80; (2) energy level—a 41% increase, from 6.18 to 8.70; (3) mood—a 33% increase, from 6.74 to 9.00; (4) optimism—a 30% increase, from 6.92 to 8.98; (5) stress level—a 31% increase, from 6.11 to 7.98; (6) level of friendship with group members—a 29% increase, from 6.77 to 8.73; (6) breathing awareness—a 44% increase, from 5.96 to 8.57; (8) muscle relaxation—a 52% increase, from 5.72 to 8.69; (9) mental relaxation—a 52% increase, from 5.78 to 8.77; and (10) ability to laugh without a reason—a 39% increase, from 6.53 to 9.04.

A summary graph of the percentage changes between the pre- and postintervention data indicates that the multistate, phase 2 intervention group had much higher percentages of change in POWBs as compared with the North Carolina-only, phase 1 intervention group and the phase 3 control group (Figure 2).

Physiological Results

In analyzing phase 1 physiological measurements, only 2 measures resulted in significance differences between preintervention and postintervention: (1) systolic blood pressure—$t_{109} = 3.66$, $P < .001$; and (2) mean blood pressure—$t_{109} = 3.07$, $P < .01$ (Table 2).

Pre- and postintervention heart rates for phases 2 and 3 revealed significant results in both phases. For phase 2, heart rates had very significant results—$t_{247} = 5.79$, $P < .001$. For phase 3, changes in heart rate were modestly significant—$t_{23} = -2.20$, $P < .05$ (Table 2).

For phase 2, the overall postintervention heart rate was decreased by 4.37 heart beats (6%), from 74.03 to 69.66 (Table 3). For phase 1, the overall postintervention heart rate was decreased by 1.36 heart beats (2%), from 78.22 to 76.86. For phase 3, the overall postintervention heart rate was increased by 1.67 heart beats (-2%).

DISCUSSION

Based on the findings of the current preliminary study, 1 hour of LY positively affected physiology and well-being for the 2 intervention groups as compared with the control group that did not participate in LY.

The differences noted between phases 1, 2, and 3 in percentage changes between pre- and postintervention are understandable. The participants in the control group did nothing to affect their POWBs beyond hearing the annual report. The fact that the control group's pulse increased could be an indication of stress as a result of being in a study or stress resulting from the annual report findings.

The differences in the POWB results between phases 1 and 2 could be explained by the fact that the phase 2 trainers had vastly more experience in giving LY classes as compared with the phase 1 trainers. Renshaw et al[29] have shown that experienced instructors, in many cases, have greater success in imparting knowledge and skills as compared with newly trained instructors. The phase 2 instructors had an average of 5 years of experience teaching LY classes, and many were

Figure 2. Graphical Representation of Preintervention to Postintervention Changes in POWB
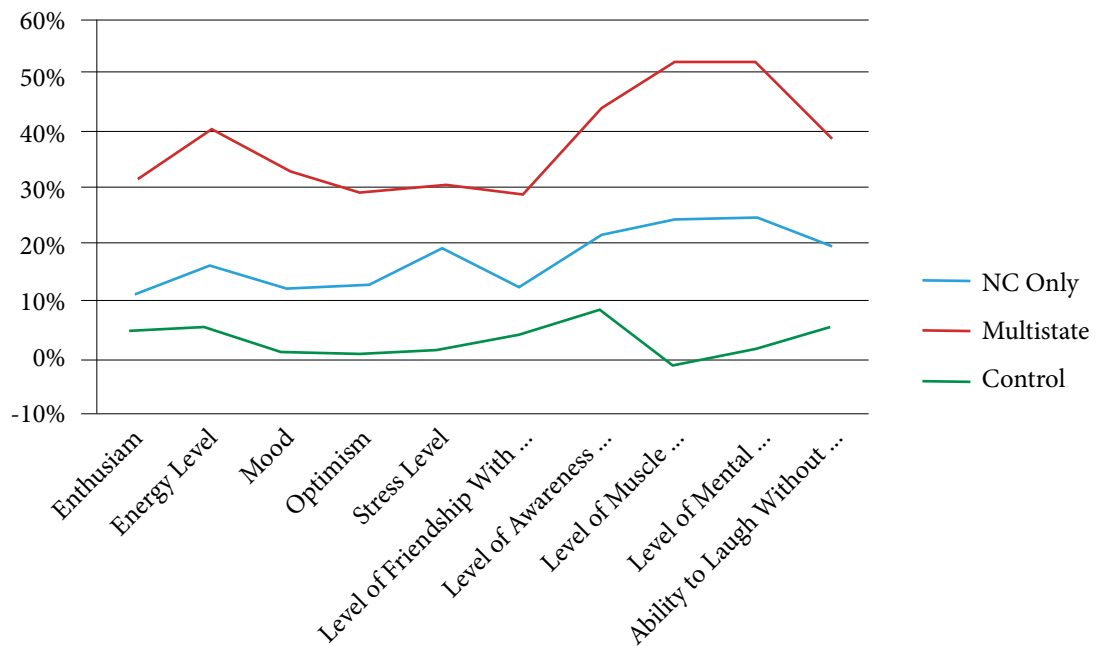
Abbreviations: POWB, psychological outcomes of well-being; NC, North Carolina.

certified to teach other EB courses. The phase 1 instructors were newly trained to teach LY classes, and none of them had experience with teaching EB courses.

Potential Biases

Several limitations existed with the current study. The sample size was small. The phase 1 instructors were newly trained and all had received their training and instruction directly from the primary investigator, potentially introducing an issue with external validity. The similarity of results from phase 2, however, where the instructors had received their LY instruction from a variety of sources, would indicate that bias was not present. The phase 2 instructors also had on average 5 years of experience in teaching LY classes, and although the CLYLs for phase 1 had no experience with EB courses, several were certified to train some other EB classes.

Figure 2 displays a clear difference in the results from phase 2 as compared with phase 1, indicating that the newly trained instructors were perhaps less effective as compared with the more-experienced instructors. The phase 3 group was small and limited to 1 meeting at 1 location. Although all participants were told few details about the study, they were told about the study's aims, which introduced an issue of internal-validity bias.

The POWB stress level measure is scored identically to the other 9 measures, 1 being worst and 10 being best. Although the postintervention score numbers were higher, indicating improvement in the individual's stress level, future use of the POWB should include consideration of changing the scale for this item.

The same student intern collected and coded all the forms. Data were not re-entered for reliability/validation checking by an external reviewer, introducing possible data entry errors. The scale used to measure well-being was created by the creator of the LY program, introducing potential bias. Participation was voluntary. The sample used in the study may be different from the general population in that they chose to take the course and were self-selected to participate in the study.

Evidence-based

In keeping with the Title III-D OAA EB criteria, the research team believes that the current study met all 3 tier 3 standards. The study was (1) able to demonstrate that LY was effective with an older-adult population, using a quasi-experimental design; (2) fully translated into classes at 1 or more community sites; and (3) provided products that were available to the public through the LY Web site[i] and through the training that the CLYLs received.

CONCLUSIONS

The purpose of the current initial study was to demonstrate that LY meets the criteria to qualify for the highest tier, tier 3, in the Title III-D Evidence-based Disease Prevention and Health Promotion Program and that a large number of Americans, regardless of age and physical ability, could benefit from LY. The research team believes that those

i.   Web site available at http://www.laughteryoga.org.

goals have been met. The preliminary results support the fact that the current, quasi-experimental, case-control study demonstrated that LY is easily implemented in a variety of locations and that LY has activities to support healthy lifestyles and promote healthy behaviors that can potentially reduce the need for more costly medical interventions. Those individuals who participated in the current initial study demonstrated statistical improvements in all of the well-being measures and most of the physiological measures.

More research is needed. Further experimental studies are planned to change the preintervention to postintervention well-being scale (POWB) to a scale that has been vetted by an agency independent of the LY organization. In addition, changes need to be made to address the lack of blinding and to increase the sample size of any future study. The control population needs to be more representative of the intervention population, both in size of population and in location. The researchers hope to continue their research with the aims of obtaining long-term, EB results and of demonstrating quantifiably that LY can promote healthy behaviors and reduce the need for more costly medical interventions.

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Effect of laughter yoga on morale of old age home residents

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Abstract

Introduction: The elderly population is increasing in the world and some of them are forced to stay in old age homes. Low morale, which is a sign of depression, can result from overlooking their medical and social problems as a part of normal ageing. **Objectives:** The objectives of the study were to find out the effect of "laughter yoga" on the morale of the elderly living in old age homes of Kottayam district and to identify the relationship between selected baseline variables and morale. **Methods:** Study participants were 153 elderlies, above 60 years of age, from randomly selected old age homes. Basic pre-test and post-test experimental designs with biweekly measurements were carried out using Philadelphia Geriatric Centre Morale Scale. Six days of 30 minutes laughter yoga sessions were administered for eight weeks in the experimental group. **Results:** Pre-test morale scores were low in both the groups. The experimental group showed gradual improvement on morale (χ^2=30.218, df=4, p= .000). There was significant association between physical dependence (χ^2 =16.992, df=4, p= .002), forced placement in old age home (χ^2=24.592, df=1, p= .000), duration of stay in the old age home (χ^2=16.221, df=8, p= .39) and morale. **Conclusion:** Dependency for activities of daily living was found to be associated with low morale. Voluntary admission to old age home and the duration of stay for two to three years were found to be high in morale. Laughter yoga was found to be effective in improving morale among elderly old age home residents.

Key words: Laughter yoga, elderly old age home inmates, morale

Introduction

Kerala is one of the first states in India to reach an advanced stage in demographic transition. According to Bhat and Rajan (1990), there is a rapid increase in the number of the elderly within the state due to continuously declining number of births and the youths' migration in large numbers in search of job opportunities. Forty percent of Kerala's total population will be elderly by year 2061 (Krishnakumar, 2012). Often the medical and social problems of elderly are over looked and neglected by seeing them as a part of normal ageing. Low morale is the result of this neglect, which leads to depression; a common and serious condition in the aged. While working with extremely vulnerable population like the elderly, nurse-patient interaction is critical to the patient's experience of dignity, self-respect, sense of self-worth and well-being. These factors can

significantly reduce depressive symptoms and improve the morale among the elderly (Haugan, Instrand and Moksnes, 2013). Poly pharmacy and increasing health care costs also adds to the problems of the poor elderly. Inexpensive alternative forms of therapy, which is not causing adverse reactions, must be looked for. Laughter yoga is one kind of therapy with psychological as well as physiological benefits, which is developed by Dr M Kataria, an Indian physician in the year 1995. For the past two decades, the laughter club concept of laughter exercise has been introduced to many populations, but it has found its greatest favour so far with the elderly (Kataria, 2011).

Kerala with its unique features of ageing is the state with maximum old age dependency ratio (which is 19.6% of the population) (Census, 2011). The districts, which are having highest problems, are the districts of Pathanamthitta followed by Alapuzha and Kottayam (Rajan, 2000). Of the three, Kottayam is having the highest number of old age homes. Therefore, it would

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be apt to study the elderly inmates of old age homes of Kottayam district.

In India, the revised National Policy for Senior Citizens (NPSC, 2011) recognizes that outcome changes such as improvement in quality of life, socioeconomic conditions and health of senior citizens can be brought about only through the collaborative efforts of the government, civil society, and the private sector. Nurses and other professionals working with elderly clients can make use of laughter yoga, which is an inexpensive and non-invasive therapeutic technique, if sufficient research evidence can be generated to support it. Laughter therapy will further have a positive effect even on the care givers.

The study objectives were to find out the effect of "Laughter Yoga" on morale of the elderly clients living in old age homes of Kottayam district and to identify the relationship between selected baseline variables and morale.

Materials and Methods

The experimental approach with basic pre-test and post-test design and time series measurements were used (Polit, 2012). We measured the effect of continuous practice of laughter yoga on morale of the elderly clients living in old age homes of Kottayam district with a time interval of two weeks for a period of two months. Four old age homes were randomly selected from 32 registered old age homes, which are scattered in the five taluks in Kottayam District using cluster sampling technique. In the first stage, two taluks were randomly selected from the five taluks (Kottayam and Meenachil). Two old age homes from Kottayam were selected as the experimental group and two homes from Meenachil were selected as control group in the second phase randomly. All inmates, who were eligible to participate in the study as per the inclusion criteria from all four clusters, were selected as sample for the study. These homes are run by Christian managements mainly to cater the needs of the poor elderly who are having no one to care. They are providing care in the areas of health, spirituality, general areas, and having provision for recreational facilities.

Clients who were willing to participate in the study and who were recommended by the old age home physician or nurse regarding their ability to comprehend and having fitness to participate in laughter yoga were included. Clients who were seriously ill or suffering from a debilitating illness and with severe hearing impairment and difficulty to communicate were excluded from the study. Based on the sampling criteria we got 153 samples for the present study. The experimental group consisted of 34 male subjects and 57 female subjects making a total of 91 subjects to begin with. At the end of eighth week, the experimental group had 77 members due to attrition at different weeks, because of sickness (10 members), hospitalization (three) and death (one). The control group consisted of 30 male subjects and 32 female subjects making a total of 62 subjects to begin with. At the end of eighth week there were only 61 participants and there was one attrition due to sickness. From the clusters, all eligible inmates were invited to participate in the study. But total number of inmates varied in different homes and there was an unwillingness to participate in the study especially from male subjects. Participation was purely on voluntary basis, which lead to unequal number of participants in control and experimental groups. Control group had assessment at the same time interval as that of the experimental group. But they were not receiving the intervention. They were wait-listed.

Baseline data sheet and the Philadelphia Geriatric Centre Morale Scale (PGCMS) (Lawton, 1975) were the tools used. The base line variables of age, gender, marital status, number of children, religion, education, occupation, income, visitors, method of placement in old age home, and duration of stay in old age home were collected.

The PGCMS (Lawton's PGC Morale Scale)– is the 17 item revised version of the PGC morale scale (Lawton, 1975) is the generally used scale, which provides a multidimensional approach to assess the psychological state of older people. It has been developed by M. Powel Lawton and his staff at the Madelyn and Leonard Abrahamson centre for Jewish life (formally the Philadelphia geriatric centre). For scoring, each high morale response gets a numerical score of one and others get no score. Totaling the number of high responses gives the individual score for a particular administration of the scale pattern. Score of zero to nine was taken as low morale score, 10 to 12 was treated as mid morale score and 13 to 17 was treated as high morale score. Pinar and Oz (2011) have reported the validity and reliability of this tool among Turkish

elderly people. They calculated reliability by internal consistency using Kuder Richardson 20 (KD-20) and item total correlation. KD-20 was 0.92 for total PGCMS. Confirmatory Factor Analysis (CFA) was used to test the structure of the PGCMS. However, the structure of Morale scale by factor analysis was not taken for the present study. The tool was translated to the vernacular language Malayalam by five language experts in Malayalam and it was then retranslated to English by English language experts. The reliability of the translated tool was estimated by calculating Cronbach alpha coefficient which was 0.85 showing that the tool is reliable for the elderly population.

Data collection technique

PGCMS was filled up by those elderly, who were comfortable in filling the questionnaire by them. Interview technique was used for others.

Ethical considerations

The study was approved by the institution. Prior permission was taken from the old age home authorities to carry out the research study. Written informed consent was obtained from each participant. Confidentiality of the data collected was also assured and privacy was provided during the interviews.

The pilot study helped us to evaluate the feasibility of the protocol and to effect necessary modifications in the main study. During the pilot study, the authors had tried to keep a fixed set of laughter technique for the sake of uniformity. But from the group of male participants there was a request for change in technique to laugh since they felt bored with the same technique every day. It was decided to use a variety of techniques (developed by Kataria) to engage the clients playfully and without boredom, which was well-accepted by the participants.

The laughter yoga intervention

One session of laughter yoga was for 30 minutes. Following steps were used. Clapping in a rhythm "1-2 . . . 1-2-3" along with chanting of "Ho-Ho-, Ha-Ha-Ha-," greeting laughter, gibberish talking, deep breathing with inhalation through the nose and prolonged exhalation (three to five times), milk shake laughter, lion laughter, appreciation laughter, argument laughter, forgiveness/apology laughter and blowing birth day candles. The intervention was performed in the morning and afternoon hours (after breakfast and prior to lunch

hours, before and after the evening tea according to the availability of subjects without affecting the daily routines of the home). The authors had undergone laughter yoga training under Dr Kataria and got certified as an Internationally Certified Laughter yoga teacher. The participants were taught the intervention by the researcher. The authors gave training to three assistants and interested staff members from the old age homes in laughter yoga. They were instrumental in gathering the participants and initiating the therapy every day. The authors had also participated in the sessions at different homes on a planned schedule. Each of the exercises was repeated for one to two minutes with rhythmic clapping and "Ho–Ho- HA- HA – HA" chanting. Deep breathing techniques (smelling the rose, candle blowing) were placed in between with shoulder exercises for shoulder mobility. Laughter meditation was the next step. Finally, the session was concluded with a slogan that "we are the happiest people in the world. (Kataria, 2002). None of the experimental and control group subjects had prior knowledge or exposure to Laughter Yoga. After the eighth week of measurement the control group subjects were also taught laughter yoga techniques for relaxation and well-being.

Results

The statistical analysis of the data was done using statistical package for social sciences (SPSS) version 20. Skewness and kurtosis of the distribution were calculated (Skewness-0.482, standard error 0.196. Kurtosis-0.954, standard error-0.390). Based on the findings Kolmogorov-Smirnove and Shapiro-Wilk tests of normality were done. Since the data were found to be not normally distributed, it was planned to use nonparametric tests for hypothesis testing (Indrayan, 2008). Changes in variable between pre-testing and the post tests were done with frequency and percentage and Mann-Whitney test to compare the control group and experimental group. Within group comparisons from pre-tests to post tests for the control and experimental group were done with Friedman test. The association between morale and the socio demographic variables were studied using Chi-square test.

Majority of the study participants (43.1%) were between the age group of 60 and 70 years, 28.1% were 70 and 80 years and 28.8% were above the age of 80 (excluding the upper age limits), 58.2% of

participants were females; among them 0.7% of participants were Muslims, 41.2% were Hindus, and 58.2% were Christians. 61.4% of subjects were having primary level of education and 19.6% were illiterates. 33.3% of subjects were single, 41.17% were widowed, 10.5% were separated, 9.2% were married, 5.95% were divorced, 51% of the participants (including single individuals) were without children, 26.14% of subjects were housewives, 31.40% were coolies and 8.55% had no jobs. Subjects having some jobs were found to be without pension and retirement benefits. 81.05% of subjects were totally dependent on old age home for their survival since they had no other source of income.
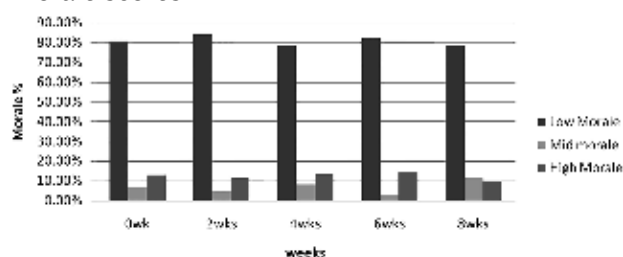
Morale scores

Figure 1: Percentage distributions of scores on Philadelphia Geriatric Center Morale Scale of control group

As shown in Figure 1, 80.60% of control group showed low morale at pre-test. Post-test low morale scores were 83.90%, 78.70%, 82.00% and 78.70% respectively for the second, fourth, sixth and eighth weeks, respectively. This shows that majority of the control group subjects had low morale from pre-test to post-tests. High morale scores at pre-test were seen in 12.90%, after two weeks, it became 11.30%. Remaining post test scores were 13.10% (fourth week), 14.80% (sixth week), 9.80% (eighth week). The mid morale score at pre-test was 6.50%. It showed fluctuations during post-tests – 4.80%, 8.20%, 3.20%, and 11.50%, respectively from second to eighth weeks. It shows that only about 20% of the elderly are having mid to high morale score in the control group.
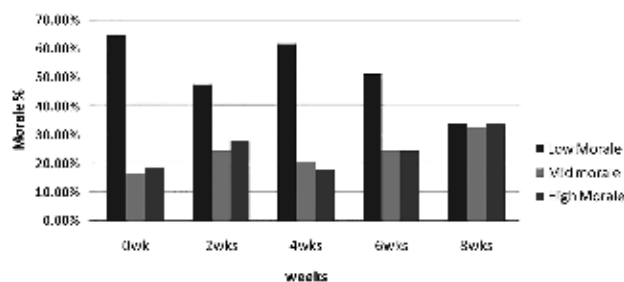

Figure 2: Percentage distributions of scores on Philadelphia Geriatric Center Morale Scale of experimental group

As shown in Figure 2, 64.80% of experimental group showed low morale, 16.50% showed mid morale, 18.70% showed high morale at pre-test. During post-test, low morale scores were 47.70%, 61.90%, 51.20%, and 33.80% respectively from second week to eighth week. The mid morale scores improved at first post-test to 24.40%, but decreased to 20.20% at second post-test and showed steady improvement in sixth week (24%) to eighth week (32.50%) post-tests. The high morale scores for the post-test was 27.90% (second week), 17.90% (forth week), 24% (sixth week) and 33.80% (eighth week). The values showed improvement in morale after the laughter yoga intervention. At the same time, it shows that in spite of the intervention, the morale became low without sustaining the improvement as seen in first post-test. But continued practice of Laughter Yoga was giving steady improvement in morale. The results show that it is not easy to bring changes in morale and there are fluctuations in the morale of the elderly.

Table 1 shows the mean rank of morale of the experimental group from pre-test to post- tests for second, fourth, sixth, and eighth weeks (N=77). (χ^2= 30.2l8, df = 4, p= .0001) and the mean rank of morale of the control group from pre-test to four post-tests. (N=61) (χ^2 = 3.520, df=4, p= .475). Table 1 also explains that there was no change in morale among the control group.

Table 1:

Within Group Comparison of Experimental Group and Control Group on Morale (Using Friedman Test) between Five Time Point

		Morale Score Mean Rank							
Group	Pre-test	Post-test							
		2 wks	4wks	6wks	8wks	N	χ^2	df	p Value
Experimental	2.62	3.14	2.68	3.03	3.53	77	30.218	4	.0001
Control	3.03	2.91	3.07	2.99	2.99	61	3.52	4	.475

Table 2:
Between Group Comparison of Control and Experimental Groups on Morale Using Mann- Whitney Test

	Morale Scores				
	Pre-test	Post-tests			
		2 wks	4wks	6wks	8wks
Mann-Whitney U	2401	1738.5	2162.5	1802	1277.5
Z	-1.963	-4.195	-1.963	-3.358	-5.068
p - Value	.050	.0001	.050	.001	.0001

Table 2 shows that the control and experimental group had significant difference in their morale from pre-test to post-test on eighth week. A fluctuation is seen in both groups in the fourth week measurement. Significant difference is seen between the groups in the sixth and eighth weeks. It shows that continuous practice of laughter yoga can cause improvement in the morale of the elderly.

There was no significant association between any of the variables and the morale age and morale (likelihood ratio=5.877, *df*=4, *p*= .209), gender and morale *(χ²=4.562, df =2, p= .102)*, Religion and morale (likelihood ratio=5.239, *df*=4, *p*= .264), level of education and morale (likelihood ratio = 10.608, *df*=10, *p*=.389), marital status and morale *(χ²= 10.776, df=8, p=.215)*, number of children and morale (likelihood ratio=15.497, *df* =16, *p*=.410), chronic illness and morale (likelihood ratio= 0.728, *df* =2, *p*=.685) and number of visitors to morale, (likelihood ratio= 4.846, *df* =4, *p*=.237).

Table 3:
Association between Selected Baseline Variables and Morale Scores

N=153

Baseline Variables	χ^2	df	p value
Duration of stay in the old age Home	16.221	8	.039
Physical dependence	16.992	4	.002
Nature of admission to the old age home	17.699	4	.001

Table 3 shows significant association between the baseline variables of duration of stay, physical dependence and nature of admission to old age home and the morale scores. Duration of stay from two to three years of stay had high morale. Less than two years and more than three years of duration were associated with low morale. Those elderly, who were physically dependent on others for activities of daily living, had significantly low morale. Elderly, who were forcefully placed by their own children had low morale and people, who took voluntary admissions had mid and high level of morale.

Discussion

Elderly residents in old age homes are low in their morale. Only 12.9% of the control group subjects and 18.70% of the experimental group had high morale. Whereas 6.5% of the control and 16.55% of the experimental group had mid morale scores and majority of the control group subjects had low morale from pre-test through the post-tests. There were 64.8% of experimental group subjects with low score on morale at the pre-test level and it became 28.6% at the end of eight weeks of laughter yoga. The experimental and control group were not similar at the pre-test level on morale because 80.6% of the control group subjects reported low morale whereas, only 64.80% of the experimental group had low morale (z = -1.963, p= .050).

During the course of the study, though there were slight fluctuations in scores, the control group subjects remained low in their morale scores, as shown by the Friedman test (χ^2=3.520, df = 4, p = .475) whereas the experimental group showed a significant improvement in morale (χ^2= 30.218, df= 4, p = .0001). The two groups were different throughout the study as shown by Mann-Whitney test (z=4.195, p =.0001 (second week), z = -1.963, p=.050 (forth week), z = -3.358, p = .001 (sixth week) z = -5.068, p = .0001 (eighth week)). Around the fourth week the control and experimental group had an increase in minor ailments due to the weather change, which has affected their state of general health and thereby a reduction in their motivation to continue the laughter yoga. Comparatively the study participants were better than other inmates of the old age homes. Two participants dropped out due to viral fever. The result pattern shows change in morale as well as the score fluctuations denoting the fact that various conditions can influence the morale of the elderly and a technique like laughter yoga can have a buffering effect for the same. The authors have not come across any reported studies on laughter yoga and elderly morale.

Woo et al. (2005) have reported depression as the predominant factor contributing to morale as measured by the PGCMS among elderly Chinese aged 70 years and above living in community. PGCMS scores were strongly correlated with GDS scores too - (Spearman's

correlation coefficient being -0.77 ($P<$ .001, n=752). They have identified male gender, old age (above 90 years), being married, good health condition, good social support, good hearing, vision and ability to chew, enough money for expenses, absence of weight loss, absence of disturbing symptoms, pain, insomnia and falls as factors related to good score on morale. Majority of old age home inmates of the current study were lacking in all these factors and it actually explains their low morale scores. Matsudaira, Takayama Suganuma, and Ogawa (2010) studied the factors related to the subjective well-being of elderly residents of special nursing homes using PGCMS. The mean PGCMS score was 16.06 to 3.95 points. Multiple regression analysis has shown that security, human relations being good, acceptable physical state of health and degree of freedom in everyday life were found to underlay a subjective feeling of happiness (morale) among people living in old age homes.

Loke, Abdulleh, Chai, Hamid and Yahya (2011) have examined the relationship between morale measured by PGCMS and disability, social support, religiosity and personality traits. Greater disability from chronic illness was associated with low morale. Poor/reduced social support was related to poor attitude towards ageing and lonely dissatisfaction. Increased religiosity had relatively improved one's attitude towards ageing and life satisfaction, improving the morale, but made no difference to the anxiety. Positive personality traits were associated with a modest but consistent improvement in morale. The study identified social support and disability as the modifiable risk factors to improve morale. In the present study, there was association between morale and physical dependency on others resulting from chronic illness or disability, but no association was found between chronic illness and morale. Value based laughter yoga techniques, laughter meditation, prayer for world peace and group approach itself may be helpful in improving the spiritual strength and social support of the elderly, when practiced almost six days a week in a group setting.

Present study did not show any association between age and morale. Woo, Ho and Wong, (2005) had a different observation about the elderly Chinese individuals who were living in community and not in old age homes. They found a higher PGCMS score among people of more than 90 years old. We have observed that in the oldest old acceptance of the ageing process contributes to a higher morale. Low morale goes very well with increase in depression among the elderly as age advances. There was statistically significant association between duration of stay in the old age home and morale. The following are our inferences with reference to this finding: The initial years (less than two years) the elderlies were found to have low morale. It is the most disturbed phase of living in an old age home. When their duration of stay increases (upto four years) probably they are coming to terms with the old age home environment and may be their own life. But when the duration of stay increases (more than four years) they go back to a state of poor well-being, low morale and more of hopelessness and worthlessness. They even felt that they lost their own identity and is viewed as an inmate of old age home, who is having nothing to look forward except death. Some of the inmates were found to be seeking placement in another old age home during this time period. Morale was found to be highest (4l.7%) among the inmates with a duration of two to three years (But their number was small) (likelihood ratio = 167.22l, $df = 8\ p < .39$).

People when they are reasonably healthy were given various responsibilities in the day to day activities of the old age home. Comparatively people with duration of two to three years of stay who were active had a sense of usefulness derived by their engagement in such responsibilities. This in fact might be the reason for their improved morale. As duration progresses this ability is deteriorating, which makes them nonproductive and dependent on others due to poor physical health. This naturally pushes them to low morale, poor well-being and increased severity of depression. The present study could not find any statistically significant association between morale and the presence of chronic diseases. There was statistically significant association between physical dependency and morale as shown by the present study (likelihood ratio = 16.992, $df = 4\ p <.002$). Compared to people those who are independent in activities of daily living and those who used assistive devices for locomotion had better condition than that of dependent clients. Dependency is perceived by the elderly negatively and it affects the morale. Often, they felt that, they are at the mercy of other people and a burden for others.

No significant association was found between number of visitors and morale. This could be due to the very small number of subjects having regular visitors. Loneliness and a feeling that they are not wanted by the immediate family members and relatives were expressed as a bitter experience by most of the elderly.

Conclusions

The elderly clients residing in old age homes have low morale. The elderly who were forced by own children for old age home placement was having very low morale. Morale of subjects who were staying in the old age home for two to three years found to be better than others with less than two years or more than three years of stay. Dependency on others for activities of daily living caused low morale among the elderly residing in old age homes. Elderly who took voluntary admission to old age home were found to be comparatively high in morale. Gender distribution gives evidence to feminization of the elderly. Laughter yoga was found to be effective in improving morale among elderly clients, who were residing in old age homes.

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ORIGINAL ARTICLE

Effects of laughter therapy on depression, cognition and sleep among the community-dwelling elderly

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Aim: To investigate the effects of laughter therapy on depression, cognitive function, quality of life, and sleep of the elderly in a community.

Methods: Between July and September 2007, the total study sample consisted of 109 subjects aged over 65 divided into two groups; 48 subjects in the laughter therapy group and 61 subjects in the control group. The subjects in the laughter therapy group underwent laughter therapy four times over 1 month. We compared Geriatric Depression Scale (GDS), Mini-Mental State Examination (MMSE), Short-Form Health Survey-36 (SF-36), Insomnia Severity Index (ISI) and Pittsburgh Sleep Quality Index (PSQI) between the two groups before and after laughter therapy.

Results: There were no significant differences in baseline characteristics between the two groups. Before laughter therapy, the GDS scores were 7.98 ± 3.58 and 8.08 ± 3.96; the MMSE scores were 23.81 ± 3.90 and 22.74 ± 4.00; total scores of SF-36 were 54.77 ± 17.63 and 52.54 ± 21.31; the ISI scores were 8.00 ± 6.29 and 8.36 ± 6.38; the PSQI scores were 6.98 ± 3.41 and 7.38 ± 3.70 in laughter therapy group and control groups, respectively. After laughter therapy, the GDS scores were 6.94 ± 3.19 ($P = 0.027$) and 8.43 ± 3.44 ($P = 0.422$); the MMSE scores were 24.63 ± 3.53 ($P = 0.168$) and 23.70 ± 3.85 ($P = 0.068$); total scores of SF-36 were 52.24 ± 17.63 ($P = 0.347$) and 50.32 ± 19.66 ($P = 0.392$); the ISI scores were 7.58 ± 5.38 ($P = 0.327$) and 9.31 ± 6.35 ($P = 0.019$); the PSQI scores were 6.04 ± 2.35 ($P = 0.019$) and 7.30 ± 3.74 ($P = 0.847$) in both groups, respectively.

Conclusion: Laughter therapy is considered to be useful, cost-effective and easily-accessible intervention that has positive effects on depression, insomnia, and sleep quality in the elderly. **Geriatr Gerontol Int 2011; 11: ••–••.**

Keywords: cognitive function, depression, insomnia, laughter therapy, sleep quality.

Introduction

The degenerative changes of biological and psychological functions of elderly people come with age. In Korea, the population of those over 65 years was 9.1% in 2005[1] and diseases of the elderly became a central issue.

Depression is a common condition in the elderly that negatively affects numerous parts of their lives. The prevalence of depressive disorder among those over 65 years was 10.99% to 16.7% in Korea,[2,3] approximately 2.3% to 15.8% in the USA.[4,5] Recent studies have reported that untreated depression is related to the increase of illness and disability, suicide and mortality.[6] It also places a substantial burden on family caregivers as well as health and social services.

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The decline of cognitive functions is a primary symptom of dementia, one of the most important diseases afflicting elderly people. It begins with memory disturbances, miscalculations, disorientation and eventually results in a total loss of self-care and social functions. In Korea, the prevalence of dementia was 8.3% in the elderly over the age of 65 years in 2005, and it is predicted to increase up to 9.0% in 2020, according to the National Statistical Office. Dementia may accompany other psychiatric symptoms like depression, sleep disorder, personality changes, delusions and hallucinations. Because of these degenerative changes and chronic comorbidities, elderly people are at a higher risk of living a diminished quality of life.

So far, numerous researches on non-pharmacological treatments for those degenerative changes have been published. Among those non-pharmacological treatments, laughter therapy is a noticeable psychotherapeutic intervention for depression and dementia of the elderly. Takeda et al.[7] mentioned that laughter can be a good and effective complementary and alternative intervention in the treatment of dementia patients because laughter is preserved in dementia patients. Laughter therapy provides information on various ways of making humor. It is cost-effective and it does not need any special space nor special preparations. Freud (1905)[8] mentioned that humor can be seen as a specific defense mechanism, by which positive emotions can overcome the undesirable negative emotions involved in a stressful situation. One very early report by Paskind et al.[9] examined the impact of laughter upon muscle tone. It was demonstrated that intense laughter led to decreased skeletal muscle tone or relaxation of muscle groups. This report was the first research on the physiology of laughter. Since then, several studies concerning laughter in the treatment of patients who are suffering from psychiatric and physical diseases have been published; improving of quality of life in patients with depression or dementia,[10] decreasing stress and increasing natural killer cell activity[11] and acting as moderator of stress for depressive symptoms[12] as examples. However, most studies on laughter therapy are limited to disabled patients with psychiatric diseases or cancer; there is a lack of studies on community-dwelling elderly people in spite of the effects of laughter.

Therefore, the purpose of this study was to investigate the effects of laughter therapy on depression, cognitive function decline, sleep quality and quality of life for community-dwelling elderly people.

Methods

Subjects

Between July and September 2007, we recruited the study participants by free health consultation through a community center in Daegu, South Korea. The eligibility criteria included: (i) age of 65 years or older; (ii) no history of admission within 1 month; and (iii) no involvement in other research studies. The total number of participants who agreed to the study and satisfied the inclusion criteria was 200 initially. We explained the purposes of this study and then interviewed participants to gain data from a questionnaire for 2 weeks. After the first interviews, the subjects were divided randomly into two groups of 100: 100 participants in the laughter therapy group and 100 participants in the control group. The subjects in the laughter therapy group underwent laughter therapy once a week, totally four times during 1 month; 1 month after its completion, they filled out the follow-up questionnaire with the help of research assistants. The 100 subjects in the control group did not receive any intervention and were shielded from laughter therapy; 2 months after the first interviews, they also filled out the follow-up questionnaire with the help of research assistants in the same week as the laughter therapy group.

The total study participants, who fulfilled the initial questionnaire sincerely, consisted of 83 subjects in the laughter therapy group and 91 in the control group. We excluded 35 subjects in the laughter therapy group, who had received laughter therapy less than three times or answered the questionnaire insincerely; and 30 subjects in the control group, who answered the follow-up questionnaire insincerely or were lost to follow up. Therefore, we analyzed 109 participants as final subjects, 48 in the laughter therapy group and 61 in the control group.

Laughter therapy

Laughter therapy was performed by a nurse, who had been certified in laughter therapy by the Laughter-Therapy Professional Association, a private agency in Korea. The nurse planned the programs of laughter therapy, and carried out the programs with the participants in the laughter therapy group. The laughter therapy group received 1 h of laughter therapy once a week for 4 weeks. The participants in the laughter therapy group gathered in a community center while those participating in the blind study were contacted individually. During the programs, we restricted participation of other people to prevent the spread of intervention to the control group.

At the first meeting, the moderator explained the effects of laughter and showed a video of practical laughter therapy that the participants could understand easily. Then, the moderator directed them to relax their facial muscles, clap their hands, say hello to each other and laugh aloud clapping their hands. The meeting finished off with a laughter meditation session.

The subjects re-gathered after 1 week; the moderator made them laugh through dancing and singing. Then, the moderator led them in exercises training pelvic muscles with Kegel's exercise. They also watched the video of laughter therapy again and laughed aloud clapping their hands as with the last meeting. The second meeting finished off with singing a "trot" song and dancing.

The third meeting started with the singing of a song. The moderator taught them the effects of positive thinking and strategies on how to think positively; repeating positive words like good, happy, delightful, nice, and so on. As before, they watched the video of laughter therapy and then laughed aloud clapping their hands. The meeting finished off with a laughter meditation session like in the first meeting.

The fourth and final meeting also started with the singing of a song, and then they laughed while trying to pronounce "Ah-E-I-Oh-Woo" with a large gape. The moderator taught them how to express their own laughs; loquacious laughs, laughing with clapping, laughing like a lion, laughing like a balloon, laughing like a fine lady, and so on. They massaged each other's shoulders and said "I love you" to each other. They sang songs loudly while laughing and finished off the meeting with a laughter meditation session.

Psychometric assessment instruments

All questionnaires were examined by two researchers, who were expert doctors belonging to one university hospital. The researchers assessed the results of the psychometric assessment instruments.

For the evaluation of depressive moods, the 15-item Geriatric Depression Scale (GDS-15)[13] was used. The GDS is a 15-item questionnaire, scoring from 1–15. The higher the score in GDS, the more depressive tendencies subjects might have. The Korean version of the Mini-Mental State Examination (MMSE-K)[14,15] was used to evaluate the grade of cognitive impairment. Scores on the MMSE-K range 0–30, and scores lower than 23 indicate cognitive impairment. For functional evaluation, the Korean Activities of Daily Living (K-ADL) scale[16] ranging 7–21, and the Korean Instrumental Activities of Daily Living (K-IADL) scale,[17] ranging 10–32, were used, respectively. In principle, the lower the scores in K-ADL and K-IADL, the better biological function subjects have.

Health-related quality of life (HRQOL) was assessed by means of Medical Outcomes Research 36-item Short-Form Health Survey (SF-36), which has been certified as a valid and reliable means of measuring physical and mental health constructs.[18] The SF-36 survey consists of 36 questions integrating eight multi-item scales: 10 questions on physical function (PF); two questions on social function (SF); four questions on role limitations caused by physical problems (RP); three questions on role limitations cased by emotional problems (RE); five questions on general mental health (MH); four questions on vitality, energy and fatigue (VT); two questions on bodily pain (BP); five questions on general health perceptions (GH); and one question about changes of health status. The scales and summary components ranged 0–100, with higher values denoting better function and fewer limitations.

The Insomnia Severity Index (ISI),[19] a brief instrument measuring insomnia, was used to evaluate perceived sleep difficulties. The ISI comprises seven items; each item is rated on a 0–4 scale and the total score ranges 0–28. A higher score suggests more severe insomnia. The Pittsburgh Sleep Quality Index (PSQI),[20] a self-rated questionnaire which assesses sleep quality and disturbances, was used. The PSQI consisted of seven components; each component is rated 0–3 and the sum of scores for these seven components range 0–21. A higher score suggests poorer sleep quality.

Statistical analysis

Statistical analyses were performed with SPSS ver. 14.0 for Windows. We used an independent Student's t-test and Pearson's χ^2-test to compare each of the baseline characteristics between the laughter therapy group and control group. Paired-samples Student's t-test and ANCOVA were used to clarify the effects of laughter therapy in GDS and MMSE. $P < 0.05$ was considered statistically significant.

Results

Sample characteristics

The demographic characteristics are summarized in Table 1. Their mean ages were 76.33 in the laughter therapy group and 73.92 in the control group. In general terms, in the laughter and control groups, there was a high rate of women (79.2% and 70.5%, respectively), the majority of them had no formal education (66.7% and 55.7%, respectively), most of them were in a poor economic state (85.4% and 83.6%, respectively) and most had one or more physical diseases (95.8% and 91.8%, respectively). Including prior characteristics, there were no significant differences in other demographic characteristics between the two groups.

As shown in Table 2, there were also no significant differences in GDS, MMSE, ADL, IADL and SF-36 between the two groups before laughter therapy.

Table 1 Baseline demographic data and clinical characteristics of the subjects

Variables	Laughter therapy group (n = 48)	Control group (n = 61)	P*
Age (years)	76.33 ± 6.44	73.92 ± 7.79	0.086
Sex			
Male	10 (20.8)	18 (29.5)	0.303
Female	38 (79.2)	43 (70.5)	
Educational status			
Illiteracy	32 (66.7)	34 (55.7)	0.246
Above Elementary	16 (33.3)	27 (44.3)	
Cohabitant			
Alone	25 (52.1)	24 (39.3)	0.184
Present	23 (47.9)	37 (60.7)	
Smoking			
Smoker	7 (14.6)	15 (24.6)	0.422
Ex-smoker	3 (6.3)	4 (6.6)	
Non-smoker	38 (79.2)	42 (68.9)	
Alcohol			
Regular	3 (6.3)	4 (6.6)	0.949
Under once/week	9 (18.8)	10 (16.4)	
None	36 (75.0)	47 (77.0)	
Regular exercise†			
Yes	15 (31.3)	12 (19.7)	0.165
No	33 (68.8)	49 (80.3)	
Economic status			
Fair	7 (14.6)	10 (16.4)	0.796
Poor	41 (85.4)	51 (83.6)	
Physical disease			
Absent	2 (4.2)	5 (8.2)	0.394
Present	46 (95.8)	56 (91.8)	
Bodyweight loss‡			
Absent	44 (91.7)	57 (93.4)	0.724
Present	4 (8.3)	4 (6.6)	
Religion			
Absent	8 (16.7)	12 (19.7)	0.687
Present	40 (83.3)	49 (80.3)	

*Independent Student's t-test for continuous variables, and Pearson's χ^2-test for discrete variables. †Regularly exercised for more than 30 min and more than three times a week. ‡Unintended loss of bodyweight of more than 10% over 6 months. Data is presented as mean ± standard deviation or number (%).

Effects of laughter therapy on depression and cognitive function

Mean GDS score was significantly decreased from 7.98 ± 3.58 to 6.94 ± 3.19 in the laughter therapy group after laughter therapy ($P = 0.027$). There was, on the contrary, no significant change of mean GDS scores in the control group before and after laughter therapy (from 8.08 ± 3.96 to 8.43 ± 3.44, $P = 0.422$). ANCOVA, controlling for pre-experimental GDS scores and other variables, showed statistical significance in the effect of laughter therapy on GDS ($P = 0.011$).

Mean MMSE scores were increased 0.81 in the laughter therapy group and 0.97 in the control group, which were not significant in both groups. ANCOVA, controlling for pre-experimental MMSE scores and other variables, did not show statistical significance either ($P = 0.071$; Table 3).

Effects of laughter therapy on HRQOL

Mean HRQOL scores were decreased 2.56 in the laughter therapy group and 2.22 in the control group, which were not significant ($P = 0.347$ and $P = 0.392$, respectively). In the laughter therapy group, the MH, VT and GH scales were significantly increased (7.00, 8.85 and 6.50, respectively). In the control group, however, there were no significant differences in all HRQOL scales

Table 2 Baseline psychometric test results of the subjects

Variables	Laughter therapy group (n = 48)	Control group (n = 61)	P*
GDS	7.98 ± 3.58	8.08 ± 3.96	0.889
MMSE	23.81 ± 3.90	22.74 ± 4.00	0.163
ADL	7.13 ± 0.39	7.36 ± 1.10	0.159
IADL	11.06 ± 2.02	12.11 ± 3.33	0.057
SF-36			
Mean	54.77 ± 17.63	52.54 ± 21.31	0.560
PF	47.81 ± 20.13	44.43 ± 28.00	0.482
SF	78.79 ± 22.87	70.92 ± 25.49	0.097
RP	51.56 ± 42.96	38.52 ± 43.44	0.121
RE	75.00 ± 41.55	76.49 ± 40.09	0.850
MH	58.92 ± 16.25	59.87 ± 19.83	0.788
VT	39.58 ± 19.29	38.44 ± 20.18	0.766
BP	54.04 ± 25.99	57.20 ± 26.53	0.535
GH	32.38 ± 20.39	33.61 ± 25.10	0.783

*Pearson's χ^2-test. All data is presented as mean ± standard deviation. ADL, activities of daily living; BP, body pain; GDS, Geriatric Depression Scale; GH, general health; IADL, instrumental activities of daily living; MH, mental health; MMSE, Mini-Mental State Examination; PF, physical function; RE, role limitations – emotional; RP, role limitations – physical; SF, social function; SF-36, 36-item Short Form health survey; VT, vitality.

Table 3 Differences of mean values for depression and cognitive function between two groups after laughter therapy

	Pre-test	Post-test	P*	R^2	P**
GDS					
Laughter therapy group	7.98 ± 3.58	6.94 ± 3.19	0.027	0.364	0.011
Control group	8.08 ± 3.96	8.43 ± 3.44	0.422		
MMSE					
Laughter therapy group	23.81 ± 3.90	24.63 ± 3.53	0.168	0.319	0.071
Control group	22.74 ± 4.00	23.70 ± 3.85	0.068		

*Paired Student's t-test; **ANCOVA adjusted for age, sex, educational status, cohabitation, smoking, alcohol, exercise, economic status, physical disease, pre-test GDS, and pre-test MMSE. All data is presented as mean ± standard deviation. GDS, Geriatric Depression Scale; MMSE, Mini-Mental State Examination.

before and after laughter therapy. ANCOVA, controlling for each of the HRQOL scales of pre-experiment and other variables, showed statistical significance in BP (P = 0.028); whereas other factors did not show significance (Table 4).

Effects of laughter therapy on sleep

The total ISI scores were decreased from 8.00 ± 6.29 to 7.58 ± 5.38 in the laughter therapy group (P = 0.327) and increased from 8.36 ± 6.38 to 9.31 ± 6.35 in the control group (P = 0.019) after laughter therapy. ANCOVA, controlling for pre-experimental ISI and other variables, showed statistical significance in the effect of laughter therapy on ISI (P = 0.015).

The total PSQI scores were decreased from 6.98 ± 3.41 to 6.04 ± 2.35 in the laughter therapy group

(P = 0.019). In the control group, however, there was no significant change of total PSQI scores (P = 0.847). ANCOVA showed statistical significance after controlling for pre-experimental PSQI scores and other variables (P = 0.047; Table 5).

Discussion

This study is a randomized, prospective, experimental research designed to determine the effects of laughter therapy on depression, cognition, sleep and quality of life among elderly people. Our study demonstrated that depression, insomnia and sleep quality improved in the laughter therapy group, while they worsened or showed no significant change in the control group.

Table 4 Differences of mean values for health-related quality of life between two groups after laughter therapy

SF-36	Pre-test	Post-test	P*	R²	P**
Mean					
Laughter therapy group	54.77 ± 17.63	52.24 ± 20.89	0.347	0.257	0.728
Control group	52.54 ± 21.31	50.32 ± 19.66	0.392		
PF					
Laughter therapy group	47.81 ± 20.13	42.08 ± 25.11	0.136	0.250	0.381
Control group	44.43 ± 28.00	38.20 ± 27.46	0.058		
SF					
Laughter therapy group	78.79 ± 22.87	73.63 ± 24.97	0.201	0.059	0.940
Control group	70.92 ± 25.49	72.72 ± 24.94	0.673		
RP					
Laughter therapy group	51.56 ± 42.96	38.02 ± 45.54	0.089	0.145	0.728
Control group	38.52 ± 43.44	32.54 ± 40.80	0.265		
RE					
Laughter therapy group	75.00 ± 41.55	54.85 ± 49.82	0.006	0.097	0.270
Control group	76.49 ± 40.09	65.59 ± 45.13	0.123		
MH					
Laughter therapy group	58.92 ± 16.25	65.92 ± 21.29	0.020	0.150	0.227
Control group	59.87 ± 19.83	61.97 ± 21.27	0.455		
VT					
Laughter therapy group	39.58 ± 19.29	48.44 ± 26.68	0.017	0.169	0.146
Control group	38.44 ± 20.18	43.69 ± 21.95	0.065		
BP					
Laughter therapy group	54.04 ± 25.99	56.06 ± 17.86	0.550	0.168	0.028
Control group	57.20 ± 26.53	49.66 ± 23.31	0.050		
GH					
Laughter therapy group	32.38 ± 20.39	38.88 ± 21.60	0.042	0.153	0.836
Control group	33.61 ± 25.10	37.18 ± 20.83	0.247		

*Paired Student's *t*-test; **ANCOVA adjusted for age, sex, educational status, cohabitation, smoking, alcohol, exercise, economic status, physical disease, pre-test geriatric depression scale, pre-test Mini-Mental State Examination, and each pre-test SF-36 scales. All data is presented as mean ± standard deviation. BP, body pain; GH, general health; MH, mental health; PF, physical function; RE, role limitations – emotional; RP, role limitations – physical; SF, social function; SF-36, 36-item Short Form health survey; VT, vitality.

Table 5 Differences of insomnia severity index and sleep quality between two groups after laughter therapy

	Pre-test	Post-test	P*	R²	P**
ISI					
Laughter therapy group	8.00 ± 6.29	7.58 ± 5.38	0.327	0.775	0.015
Control group	8.36 ± 6.38	9.31 ± 6.35	0.019		
PSQI					
Laughter therapy group	6.98 ± 3.41	6.04 ± 2.35	0.019	0.403	0.047
Control group	7.38 ± 3.70	7.30 ± 3.74	0.847		

*Paired Student's *t*-test; **ANCOVA adjusted for age, sex, educational status, cohabitation, smoking, alcohol, exercise, economic status, physical disease, pre-test geriatric depression scale, pre-test Mini-Mental State Examination; and pre-test ISI for ISI, pre-test PSQI for PSQI. All data is presented as mean ± standard deviation. ISI, Insomnia Severity Index; PSQI, Pittsburgh Sleep Quality Index.

The results of depression in this study are similar to previous studies that demonstrated that a sense of humor is correlated with increased self-esteem and decreased depressive features.[12,21] Though laughter therapy had a positive effect on depression and sleep, it is unclear whether improvement of depression led to improvement of sleep or laughter therapy influenced depression and sleep independently. In our study, being

incompletely blind to laughter therapy for the control group, may have had an influence on low compliance and high complaints with the study. It may have led to slight increases of the depression scale in the control group. Moreover, we did not exclude positive effects of the group meeting themselves; thus, the effects of group meeting may have contributed to the improvement of depression in the laughter therapy group.

In general, scores higher than or equal to 6 in GDS are used to judge whether depressive symptoms are present.[22] In this study, mean GDS score were 7.98 and 8.08 in both groups, respectively, which showed high tendencies of depression. Considering the factors influencing geriatric depression,[2,3,23] a high rate of women, poor economic state, single living and the presence of comorbidities may influence high GDS scores. The subjects also showed ISI scores above 8,[19] sub-threshold insomnia and PSQI scores above 6,[20] each of which indicate poor sleep quality. It is possible to say that there must be a correlation between depression and insomnia, based on the results of research work. Insomnia is a major risk factor of depression in the elderly,[24] and depressive mood is associated with development of insomnia symptoms.[25]

The MMSE scores were similarly increased in both groups after laughter therapy, which was not statistically significant. These results are considered to have been influenced by two factors: simplification of the follow up questionnaire and the same items of MMSE that they had already done during the first investigation made them easier to answer the second time. When using MMSE-K, the threshold of 23 points or less is generally used to indicate cognitive impairment,[15] mean scores were 23.81 and 22.74 in both groups, respectively, which demonstrated mild cognitive impairment. In this study, there were multiple factors which related to cognitive impairment;[2,26,27] the subjects were relatively advanced in age, there was a high rate of women, a majority of them had no formal education and most of them were of poor socioeconomic status. In addition, the fact that there is a strong relation between cognitive function and depression[28,29] could explain how high tendencies of depression might influence low cognitive function of the subjects.

Our study did not demonstrate significant changes of HRQOL in both groups after laughter therapy except BP. The BP scores were increased in the laughter therapy group and decreased in the control group. This might suggest that the use of laughter diminishes pain and moderates a patient's response to pain.[30] The study by Walter et al.[10] showed significant improvement of quality of life in patients with late-life depression after humor therapy; the study was of inpatients with major depressive disorders using the Anamnestic Comparative Self Assessment Scale (ACSA) to measure quality of life. On the other hand, our study was of community-dwelling people using SF-36 to measure quality of life. These differences are considered to have influenced the contrary results between the studies.

In general, mean HRQOL scores tend to be low before and after laughter therapy in our study. Considering the results of recent studies,[31,32] relatively older age, low socioeconomic status, high depression scores and presence of comorbid chronic illness may have influenced the low HRQOL in this study. According to Tsai et al.,[33] HRQOL is a predictor of mortality among the community-dwelling elderly; thus, we must be concerned about the high rate of elderly people in Korea.

We investigated the hypothesis that laughter therapy may affect depression, cognitive function, sleep and quality of life of community-dwelling elderly people. Our study demonstrated that laughter therapy had positive effects on geriatric depression, insomnia and sleep quality, but no significant effects on cognitive function and HRQOL. There are several limitations of these results. The sample size was relatively small; initial subjects were 200 but 52 in the laughter therapy group and 39 in the control group were excluded, and the high ratio of dropout is a significant limitation. There could be selection bias because the subjects were all of lower socioeconomic status, advanced age and their residency was limited to one city. Incomplete blinding for the control group may have influenced the results. We did not exclude positive effects of the group meetings themselves that might have had some affect on the depression scale. Also, the laughter therapy was performed for only 1 month, limiting to generalized results. From now on, further studies are needed that control these limitations and follow up more frequently as well as for a long-term period.

Laughter therapy provides various methods of and information on humor, is of low cost, and it can be easily performed without regard of place and time; therefore, it is a very effective and practical intervention. Further studies with higher frequency, long-term laughter therapy and larger samples may provide better results in the understanding of therapeutic advantages of laughter therapy in the treatment and prevention of depression and cognitive function decline of the elderly.

Acknowledgment

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The effect of laughter Yoga on general health among nursing students

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Abstract

Background:

Promotion and provision of individuals' health is one of the bases for development in societies. Students' mental health is very important in each society. Students of medical sciences universities, especially nursing students, are under various stresses in clinical environment, in addition to the stress they experience in theoretical education environment. With regard to the importance of nursing students' general health and considering the various existing strategies to promote general health components, use of complementary treatments is more considered because of their better public acceptance, low costs, and fewer complications. One of the new strategies in this regard is laughter Yoga. The present study was conducted with an aim to define the effect of laughter Yoga on general health among nursing students.

Materials and Methods:

This is a quasi-experimental two-group three-step study conducted on 38 male nursing students in the nursing and midwifery school of Isfahan University of Medical Sciences in 2012. In the study group, eight 1 h sessions of laughter Yoga were held (two sessions a week), and in the control group, no intervention was conducted. The data of the present study were collected by Goldberg and Hiller's General Health Questionnaire and analyzed by SPSS version 12.

Results:

The findings showed a significant difference in the mean scores of general health before and after laughter Yoga intervention in the two groups of study and control.

Conclusions:

The findings showed that laughter Yoga had a positive effect on students' general health and improved the signs of physical and sleep disorders, lowered anxiety and depression, and promoted their social function. Therefore, laughter Yoga can be used as one of the effective strategies on students' general health.

Keywords: Health, laughter, nursing students, Yoga

INTRODUCTION

Goldberg and Hiller defined general health as an individual's physical and mental health which includes a collection of physical signs, anxiety and insomnia, social dysfunction, and depression.[1] The World Health Organization (WHO) defines health as physical, mental, social welfare and not just lack of diseases and disability. One of the criteria to assess societies' health is the mental health status. Mental health plays an important role in dynamism and efficacy of each society.[2]

As observed in our study, one of the important reasons for development in the developed counties is the focus and effort on training innovative and efficient human resources. The students of human sciences are the key elements who form the most vulnerable social groups. Many of them may act as the future managers and strategy makers of the country, and their academic achievement is among the basic goals of educational programs.[3] Since a major part of an individual's life is spent at work or educational environment, with completely different conditions from home, many of the events and life activities have a lot of effects on their physical and mental health. University students are predisposed to lose mental health and need appropriate interventions in this regard due to their special conditions including being far from their families, entering a big and distressful community, facing economic problems and lack of adequate income, high volume of lessons, and tight competitions.[4]

Students of medical universities, especially nursing students, are also under clinical environment stress, in addition to the stress related to theoretical education environments. Hospitals are considered as one of the most stressful working environments where it is the case of human life or death. The tension in these environments can not only lead to low academic achievement but also affect students' personality growth and cause many inappropriate behaviors among them.[5] As the dimensions of general health are associated with all the individuals' daily life and the disorder in any of these dimensions can lead to disturbance in general health, and consequently, individuals' mental health disorder, conducting appropriate interventions to improve each of these dimensions is of great importance. Rezaei *et al*. in their study on investigation of nursing students' mental health in the nursing school of Amol showed that 30.6% of the studied students had mental disorders.[6] The research shows that the prevalence and intensity of mental disorders have increased among students compared to a non-student community. Based on National Mental Health Association report, the results of the recent studies conducted in London Welfson Health Sciences Institute show that 46% of male students and 64% of female students suffer from anxiety while 12% of male students and 15% of female students suffer from depression. The counselors in the above-mentioned institute reported an increase in students' referrals to counseling centers from 2.4 out of 100,000 students in the year 1995 to 9.7 out of 100,000 in the year 2000.[7] The research results show that individuals' leisure time activities can lead to expansion of thoughts, personality growth and development, prevention of crimes, an increase in social participation, and a feeling of responsibility, and improves individuals' physical mental health. On the other hand, Iranian students' daily leisure time is 3-4 h. 58% of the students have their leisure time activities in the evening and night and 69.5% have these activities at dormitory or home. They only spend 5.5% of their leisure time at cultural or recreational sports centers. It reveals a shortage in healthy leisure time among the Iranian students, resulting in their predisposition to diminished academic achievement and mental problems.[8] One of the other variables of general health is sleep, so sleep disorder is one of the most common problems among adults. Sleep disorders (falling sleep and waking up) cause physical and mental disorders and negatively affect educational function, resulting in a drop in students' academic achievement. Shamsaei and Cheraghi, in a study on the assessment of sleep disorders' prevalence among nursing and midwifery students in Hamedan, showed that one-third of the students suffer from insomnia, with a higher prevalence among female students compared to males and among nursing students compared to midwifery students.[9] Numerous strategies have been indicated for improvement of general health components. Among these strategies, complementary treatments have been considered more by researchers in recent years due to their public acceptance, low costs, and fewer complications.[10] Nowadays, modern medicine has clearly been directed toward complementary medicine, so the WHO named the year 2005 as the year of complementary and alternative medicine.[11]

These methods include stress management,[12] physical exercises, relaxation and psychological counseling, education of social skills,[13] Yoga,[14] and laughter therapy.[15] Various methods of complementary medicine enable the nurses to help their patients control their anxiety.[16]

Meanwhile, psychiatric nurses play an efficient and numerous roles in complementary medicine related interventions and are considered as administrators of this type of medicine.[10,17] Some of the strategies to promote and develop individuals' general health include laughter, humor therapy, and laughter Yoga. [18] Laughter has a valuable and specific position in psychology which can help in maintaining mental balance in humans and contributes to their mental health.[19]

Laughter Yoga is a method in which there is a combination of unconditional laughter with Yoga breathing exercise (Pranayama) and was firstly suggested by Madan Kataria, an Indian doctor, in 1995. In this

method, everybody can laugh by telling a joke of humor. As a matter of fact, laughter is first artificial, but is quickly changed to natural laughter and increases the O_2 saturation of brain and body. Enhanced feeling of security and self-belief, positive energy, and distraction from negative thoughts are among the positive treatment effects of laughter Yoga.[20] As this strategy was started 16 years ago, there is limited research in this filed. Nagendra *et al*. (2007), in a study on the efficacy of laughter Yoga on the professionals to overcome professional stress in India, found a significant improvement in stress parameters including blood cortisol level after the intervention.[21] The results of the study of Ko and Youn (2011) in Korea on the effects of laughter therapy on depression, cognition, and sleep among community dwelling elderly showed that laughter therapy was an efficient, cost-effective, and available intervention which resulted in positive effects on depression, insomnia, and sleep quality of the elderly.[15] As the students of various medical sciences courses including nursing students will be responsible for provision and promotion of public health in future, they should be cared for to be able to play their role well as an educated and professional human resource.

With regard to nursing students' general health, making motivations in medical universities seems crucial. This study aimed to define the effect of laughter Yoga on the general health of nursing students in the nursing and midwifery school of Isfahan University of Medical Sciences in 2012.

MATERIALS AND METHODS

As the effect of the independent variable of laughter Yoga on the dependent variable of general health was investigated in the present study, it was a quasi-experimental two-group three-step design. Study population comprised male BS nursing s tudents of Isfahan University of Medical Sciences in 2012.

Sampling was firstly convenient sampling through which the male nursing students (in semesters 2-6) who were interested to participate in the study were invited to attend a primary laughter Yoga orientation session, and then, 42 of them meeting the inclusion criteria were selected. The list of the subjects was made and numbered from which the odd and even numbers were randomly assigned to control and study groups by lottery. Inclusion criteria were: Being single; studying in semesters 2-6 of bachelor's degree of nursing; no history of probation in the past semester; being interested in participating in the research; no concurrent participation in other complementary medicine methods; no cardiac diseases, hernia, acute hemorrhoid (accompanied with bleeding), hypertension, chronic coughs, incontinency, epilepsy, acute low back pain, acute mental disorders, consumption of antipsychotic drugs; and no history of any surgery in the past 3 months.

Exclusion criteria were: No interest to continue in the study, absenteeism for more than two sessions, consumption of medications affecting general health components (depression, anxiety, sleep, and social function, and physical signs) during the study, facing acute stressful events like immediate relative's death. Based on the exclusion criteria, two subjects in control and two in the study group were excluded from the study, and 38 subjects were considered as the final number (19 in the study group and 19 in the control group). Data were collected by a questionnaire of demographic characteristics and Goldberg and Hiller's General Health Questionnaire, which were filled prior to the study, immediately after the intervention, and 1 month after the intervention by the students in study and control groups.

Demographic data questionnaire included four questions on subjects' personal and familial characteristics.

Goldberg and Hiller's General Health Questionnaire contained 28 four-point questions investigating the four domains of physical signs, anxiety and sleep disorder, social function, and depression. Reliability of the General Health Questionnaire has been confirmed in translation of various cultures. Shigemi and Toshihide reported Cronbach's alpha of >0.9 in their study on Japanese employees.[22] Goldberg and Blackwell calculated the validity of General Health Questionnaire through a clinical interview checklist filled for 200 patients in the surgery ward in England. Based on their study, this questionnaire could sort out the subjects as diseased and healthy individuals with >90% accuracy.[23] Laughter Yoga sessions (a total of eight sessions) were held at 7.00-8.00 a.m., twice a week, and the duration was 1 h for each session.

The researcher conducted the sessions, in which the first 10 min were devoted to relaxation techniques, deep breathing exercises, and warm up. For warm-up exercises, for example, the subjects held their palms

parallel to each other while clapping, so that their palms and fingers thoroughly clapped. This stimulated palm pressure points and increased the level of energy and coordination in the group. Rhythm of 1, 2, 3, and 1, 2 was added to clapping while bending the knees and shaking the head, which made clapping very joyful and left everybody in a good mood for laughing and smiling. Then, laughter Yoga techniques were practiced for 30 min. Next, there were 10 min of rest, and finally, 10 min of laughter meditation was administrated. General framework of laughter meditation was such that the subjects comfortably sat down on the ground in a way they could stare at one another's eyes. The researcher warned them not to talk or use other communicational methods like imitation, changing location, and making other noises, as they would involve the subjects' superego. The subjects had to sit calmly with closed eyes and concentrate on their breathing. They gradually started artificial laughter until one subject started natural laughter. If not so, the subjects continued Pranayama breathing exercise to start natural laughter by stimulation of diaphragm. Group leader invited the group to reduce the intensity of laughter and meditation was gradually restarted. In the end, the group leader asked the subjects to concentrate on their breathing to leave meditation and invited them to peace and relaxation. No concurrent intervention was conducted in the control group and the subjects just filled the General Health Questionnaire three times.

The research location for administration of laughter Yoga sessions was Etehad sports hall located in Shahid Movahedi sports complex of Isfahan University of Medical Sciences. Data were analyzed by independent *t*-test, repeated measures analysis of variance (ANOVA), and least significant difference (LSD) *post-hoc* using SPSS version 12.

RESULTS

The results showed that there was no significant difference in the two groups concerning demographic characteristics including age, students' semester, their present residential location, and the parental aliveness ($P > 0.19$).

As presented in Table 1, the mean scores of general health before intervention showed no significant difference in the two groups, but there was a significant difference in the mean scores of general health immediately after and 1 month the after intervention in the two groups of study and control. Repeated measure ANOVA test showed no significant difference in the mean total scores of general health at three time intervals in the control group ($P = 0.33$), but there was a significant difference concerning the above issue in the study group ($P = 0.01$). LSD (Least Significant Difference).*post-hoc* test showed a significant difference between the mean total scores of general health before intervention and the scores immediately after ($P = 0.004$) and 1 month after ($P = 0.003$), but there was no significant difference between these scores immediately after and 1 month after intervention ($P = 0.55$).

As presented in Tables 2–4, the mean scores of four domains of general health including physical signs, anxiety and sleep disorder, social function, and depression showed no significant difference before intervention in the two groups, but the mean scores of these four domains showed a significant difference immediately after and 1 month after intervention in the two groups.

DISCUSSION

As shown by the findings, laughter Yoga positively affected the general health of nursing students, which is almost consistent with the results of some studies. The findings of Nagendra *et al*. concerning the efficacy of laughter Yoga on IT professionals to overcome professional stress in India showed that there was a significant improvement in stress parameters including the level of blood cortisol.[21] Shahidi *et al*., in their study comparing the effects of laughter Yoga and group sport program on the depressed elderly women, reported that laughter Yoga not only had positive effect similar to sport program on the reduction of depression but also imposed positive effects on the feeling of life satisfaction among the elderly women. [24]

The findings of the above-mentioned study are in line with the positive effect of laughter Yoga on the dimensions of depression and social function in general health obtained in the present study. On the other hand, a study was conducted by Kong *et al*. to investigate the effects of a stress management program, based on meditation, on stress, anxiety, and depression of nursing students in Korea in 2006. Their results revealed a significant difference concerning the scores of stress and anxiety in the two groups after

intervention, but the difference in depression scores after intervention in the two groups of study and control was not significant.[25]

The above-mentioned study result was consistent with that of the present study concerning the variable of anxiety which is one of the general health dimensions; but for the dimension of depression, it yielded different results, possibly due to it being a different type of study. Rezaei, in a study on the effect of a stress management educational program on the level of students' depression, anxiety, and stress in Isfahan University of Medical Sciences in 2010, reported that the mean scores of stress, anxiety, and depression were reduced in the study group after administration of a stress educational program, and this reduction was significant compared to the control group.[12] The findings of his study confirm similar effect of intervention on the dimensions of general health. The only difference is that in the present study, all the dimensions of general health were measured, while in the above-mentioned study, only two dimensions of general health (anxiety and depression) were studied. The findings of Ko and Youn on the effects of laughter therapy on depression, cognition, and sleep among the elderly in Korea showed that laughter therapy is an efficient, cost-effective, and available intervention which has positive effects on depression, insomnia, and sleep quality among the elderly.[15] The authors believe that as the subjects in the present study are different from those of other studies, further research is needed to support the present study. As the present study was conducted on male university students, it is suggested to conduct another study on female students to be able to compare these effects in these two groups, in order to use laughter Yoga for promotion of students' general health and improving their educational function in all medical universities.

CONCLUSIONS

The findings showed that laughter Yoga had a positive effect on students' general health and improved the signs of physical and sleep disorders, lowered anxiety and depression, and promoted their social function. Therefore, laughter Yoga can be used as one of the effective strategies on students' general health.

ACKNOWLEDGMENTS

Footnotes

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Figures and Tables

Table 1

Mean score	Study		Control		Independent t-test	
	Mean	SD	Mean	SD	P value	t
Before intervention	24.5	15.1	23.2	11.2	0.75	0.32
After intervention	13.9	9.2	25.1	11.04	3.39	0.002
One month after intervention	12.8	10.6	24.4	14.5	2.81	0.008

SD: Standard deviation

Comparison of mean scores of general health in the two groups of study and control

Table 2

Mean score	Study		Control		Independent t-test	
	Mean	SD	Mean	SD	P value	t
Physical signs	5.4	3.3	5.2	3.4	0.846	0.19
Anxiety and sleep disorder	7.1	5.3	6.1	4.3	0.51	0.66
Social function	7.2	3.1	7.5	2.5	0.78	0.28
Depression	4.7	5.3	4.3	3.9	0.81	0.24

SD: Standard deviation

Comparison of mean scores of general health in the two groups of study and control before intervention

Table 3

Mean score	Study		Control		Independent t-test	
	Mean	SD	Mean	SD	P value	t
Physical signs	3.7	2.4	5.7	3.5	0.03	2.05
Anxiety and sleep disorder	3.7	3.19	6.8	4.5	0.02	2.44
Social function	4.2	2.84	7.26	2.9	0.003	3.25
Depression	2.2	2.9	5.3	2.8	0.002	3.26

SD: Standard deviation

Comparison of mean scores of general health in the two groups of study and control after intervention

Table 4

Mean score	Study		Control		Independent t-test	
	Mean	SD	Mean	SD	P value	t
Physical signs	3	2.5	5	3.7	0.04	1.98
Anxiety and sleep disorder	4.1	4.1	6.9	5.4	0.04	1.98
Social function	4	3.1	7.4	3.6	0.004	3.07
Depression	1.7	2.4	5.1	3.3	0.001	3.55

SD: Standard deviation

Comparison of mean scores of general health in the two groups of study and control 1 month after intervention

Effect of laughter therapy on happiness and life satisfaction among elderly

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A quasi experimental study was conducted in Mumbai city with an objective to evaluate the effect of laughter therapy on the happiness and life satisfaction among elderly. There were total 80 participants (40 from laughter therapy group and 40 from non-laughter therapy group) from age group of 60-75 years. Participants of the laughter therapy group were chosen on the criteria of completing at least six months of active participation in laughter therapy sessions. The present study shows a positive effect of laughter therapy on happiness and life satisfaction among elderly, and a positive correlation between happiness and life satisfaction was also found.

Keywords: laughter therapy, subjective happiness, life satisfaction, elderly

Our physical, social and cultural environments decide our attitude towards our health and health related behaviours. Different age groups show different kinds of health related behaviours, which could be positive or negative, or both. These health behaviours determine our health outcomes. Positive health behaviours promote healthy living patterns and attitudes.

Similarly, even in the elderly, a strong relationship has been seen between health beliefs and health behaviour changes (Ferrini, Edelstein, & Barrett-Connor, 1994).

Ageing is a natural and dynamic process which causes many physical, psychological and social transformations. After going through the innocence of childhood, the struggles of adolescence and adult life, the stagnation experienced at late adulthood, one finally reaches to reap the benefits of old age. Retirement from work life and perceived inactive social life, surplus time for various hobbies and activities can be the markers for this age. However, research has shown that many elders suffer from psychological disorders like depression, physical ailments like arthritis, hearing impairment and other illnesses. In India, the Union Health Ministry estimates that the people belonging to the 60 plus age group would increase to 100 million in 2013 and 198 million in 2030. It has been estimated that one elderly in every four suffers from depression. (India, 2012).

Perceived happiness and satisfaction is subjective. Life satisfaction may be defined as expectation and perceptions of outcomes for salient components of life such as social situations, relationships, self-worth and finances across multiple and broad domains and long time periods (Kane & Kane, 2000). Life satisfaction perspective helps to explain why people with differing life styles and values can successfully adapt to ageing (Rudinger & Thomae, 1990). Happiness is a major precursor to life satisfaction. Many factors can contribute towards dissatisfaction among the elderly. Retirement may lead to psychological and financial insecurities, ageing can cause growing physical ailments and cognitive impairments, and old age may make the elderly feel socially vulnerable and helpless. It has also been observed that ageing can bring negative changes in self-concept and life satisfaction, increase in emotionality and rise in frustration tolerance (Abrams, 1991).

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Laughter therapy is a type of therapeutic intervention which uses humour to relieve the person off their psychological distress. One kind of laughter therapy was developed by Dr M. Kataria, an Indian physician, called Laughter Yoga (Hasya Yoga). It combines laughter with yoga, wherein laughter is elicited by body exercise in group. Real and fake laughter both can bring similar effect on the body (Kataria, 2005). Laughter therapy is cost effective and does not require any special place or preparations. It can be used as a complementary therapy with other psychopharmacological treatments. Research has also shown that laughter therapy helps in relaxation of muscles and decreased skeletal muscle tone (Paskind, 1932). During laughter, various muscles groups are activated for periods of seconds at a time, while the period immediately after the laugh leads to general muscle relaxation. Laughter may reduce stress and tension, enhance quality of life and produce a general sense of well-being (Berk & et al, 1989). Past research has shown considerable positive effect of laughter therapy on depression, insomnia and sleep quality of the elderly (Hae-Jin & Chang-Ho, 2011). Laughter therapy helps in eliminating negative strains and eliciting positive thoughts and attitudes which has a positive impact on the physiological health of the elderly. Humour therapy has helped create a positive effect on those elderly affected by depression (Hirsch, Junglas, & Konradt, 2010).

Objective of the study

The present study aims to explore the benefits of Laughter Therapy. Its objective is to study the effect of humour as a therapeutic intervention on the overall perceived happiness and subjective well-being of the elderly. For the same, Satisfaction With Life Scale (SWLS) and Subjective Happiness Scale (SHS) were used. The SWLS (Diener, Emmons, Larson, & Griffin, 1985) is a short 5 item instrument designed to measure global cognitive judgements of satisfaction with one's life. The SHS (Lyubomirsky & Lepper, 1999) is a 4 item scale designed to measure subjective happiness.

Hypothesis of the study

The present research aimed to study the following hypotheses:

- "There will be no difference in the scores obtained by participants from the laughter therapy group and non laughter therapy group".
- "There will be no association between Subjective Happiness and Life Satisfaction".

Method

Participants

Quasi experimental design was used in this study. The sample (n=80) consisted of males and females above the age of 60 years from north Mumbai. 40 participants belonged to the Control Group who had no prior exposure to Laughter therapy. 40 participants belonged to Experimental Group, who had been practising Laughter therapy for past six months. The age group of the sample ranged from 60- 75 years and the mean age obtained was 68.5. The kind of sampling used was Purposive, as the participants were sought from active laughter clubs and then Snowball sampling technique was employed to get other suitable respondents from amongst their acquaintances.

Instruments

The Satisfaction With Life Scale (SWLS) is a measure of life satisfaction developed by Ed Diener and colleagues (Diener, Emmons, Larson, & Griffin, 1985). Life satisfaction is one of three constructs which makes up subjective well-being. This 5 item scale allows individuals to rate their degree of agreement or disagreement on a 7 point Likert type scale for the stated questions. SWLS does not focus on specific areas such as loneliness, as it is intended to measure general/global satisfaction on a 7-point scale (1=Strongly disagree, 7=Strongly agree). A maximum score is 30 with the degree of life satisfaction increasing as the score increases. Score ranges from 5 to 9 exhibits someone who is 'extremely dissatisfied with life', 15 to 19 indicates 'slightly dissatisfied with life,' 21 to 25 indicates 'slightly satisfied' whereas a score of 26 to 30 represents 'high satisfaction'. A neutral point on the scale is located at a score of 20 and explains that the participant is neither satisfied nor dissatisfied with life.

The Subjective Happiness Scale (SHS) is a 4-item scale of global subjective happiness (Lyubomirsky & Lepper, 1999). Two items ask respondents to characterize themselves using both absolute ratings and ratings relative to peers, whereas the other two items offer brief descriptions of happy and unhappy individuals and ask respondents the extent to which each characterization describes them.

Procedure

Before an informal interview, the participants' consent was taken and they were asked to fill the Satisfaction With Life Scale and the Subjective Happiness Scale. The participants were later debriefed.

Statistical analysis

Statistical analysis was performed with SPSS ver 17.0 for Windows. We used Independent Student's t test and Pearson's c2 test to compare the dependent variables.

Results

The mean age of participants was ± 68.5, ranging between 62 to 75 years (Table 1). The mean of score of the participants from the Laughter therapy group on the SHS was 16.425 and SD of 3.92. The mean score of the participants from the Non Laughter therapy group on the SHS was 14.475 and SD of 2.73. The mean score of the participants from the Laughter therapy group on the SWLS was 24.875 and SD of 5.76. The mean score of the participants from the Non Laughter therapy group on the SWLS was 21.075 and SD of 3.61 (Table 2). The t value obtained for the SHS was 2.579, which was found to be significant at 0.012 levels (Table 3 a). The t value

obtained for SWLS was 3.533, which was found to be significant at 0.001 levels (Table 3 b). The correlation of the tests was found to be significant at 0.01 levels. Hence, the following null hypotheses, i.e. "There will be no difference in the scores obtained by participants from the laughter therapy group and non-laughter therapy group" and "There will be no association between Subjective Happiness and Life Satisfaction" were rejected.

Table 1: Baseline Age Characteristics of Participants

Age group	Range	Minimum	Maximum	Mean	SD
62-75	13	62	75	68.5	4.183

Table 2: Mean and SD scores of Laughter Therapy Group and Non Laughter Therapy Group

	n	Mean	SD
SHS (Laughter therapy Group)	40	16.425	3.921
SHS (Non Laughter therapy Group)	40	14.475	2.736
SWLS (Laughter therapy Group)	40	24.875	5.765
SWLS (Non Laughter therapy Group)	40	21.075	3.611

Table 3 (a): Happiness Scores Between Groups

	n	t	df	Signi.
Laughter therapy Group	40	2.579	78	0.012
Non Laughter therapy Group	40			

Table 3 (b): Life Satisfaction Scores Between Groups

	n	t	df	Signi.
Laughter therapy Group	40	3.533	78	0.001
Non Laughter therapy Group	40			

Discussion

The results obtained show replication of previous research done on the effect of Laughter therapy. Laughter therapy has been found to have beneficial effects on the cognitive, emotional and physical health of the elderly. Socio-emotional selectivity theory contends that while people may become better emotional regulators as they age, they do not necessarily have higher positive affect (Ehrlich & Isaacowitz, 1996). Subjective Wellbeing has both an affective and a cognitive component. The affective component of subjective wellbeing involves people's moods and emotions that represent their feelings about their current experiences. The cognitive component of subjective wellbeing is primarily an evaluation (or mental judgment) concerning how well one's life has turned out. This judgment reflects the degree to which people are satisfied with their lives (Diener, Lucas, & Smith, 1999) . In gerontology, general subjective wellbeing has most often been assessed with measures of life satisfaction, happiness, and self-esteem. Decline in advanced old age to health related problems and illnesses that preclude typical functioning, cause older people to be less able to perform everyday tasks and activities. It is posited that lower levels of negative affect do not equate to increased subjective wellbeing. Laughter therapy is a natural, drugless way of healing, which utilises laughter exercises to help people with physical and mental illnesses. It encourages use of natural physiological process of laughter to release painful emotions of anger, anxiety and boredom. It is a cost effective therapy with minimal side effects. Present study was successful in replicating the past research on Laughter therapy and its effect.

Conclusion

The present study was able to establish the positive effects of Laughter therapy on the life satisfaction and subjective happiness of the elderly. The participants undergoing laughter therapy for past six months, showed better adjusted and higher sense of wellbeing and happiness, than participants who did not report using laughter therapy. However, the present study failed to consider the gender differences in the data obtained. Women under 45 years of age tend to be happier than men; however, older women are less happy (Inglehart, October 2002). Living arrangements can also have a strong impact on the subjective wellbeing of the elderly. Thus, spousal death, perceived sense of independence and control can affect the happiness and subjective wellbeing in older adults. The present research did not include a detail study of the frequency of participation in the laughter therapy of the participants from the Experimental group. Also, the informal interview preceding the questionnaire, did not acquire enough information regarding the mental status of the participants and whether they were indulging in any other alternative therapeutic interventions. The limitations to this study provide a pronounced prospect for further research.

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A comparison of the cardiovascular effects of simulated and spontaneous laughter

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ABSTRACT

Objectives: Laughter has long been regarded as beneficial for health, but the mechanisms are not clearly understood. The current study aimed to compare the acute cardiovascular effects of spontaneous and simulated laughter.

Design: A mixed factorial experiment was performed to examine changes in cardiovascular variables in response to experimental tasks across conditions.

Interventions: A sample of 72 participants were randomised to one of three 6 min interventions. Participants in the simulated laughter condition were asked to generate fake laughter, the spontaneous laughter condition viewed a humorous video, and the control condition watched a non-humorous documentary. This was followed by a laboratory stress task.

Main outcomes measures: Heart rate and heart rate variability (as indexed by rMSSD) were monitored continuously throughout the experiment using ECG.

Results: The simulated laughter condition had a significantly higher heart rate ($p < .001$, $\eta_p^2 = .26$) and lower rMSSD ($p < .001$, $\eta_p^2 = .13$) during the laughter task compared to the other two conditions. Follow-up hierarchical regressions indicated that the difference in heart rate was due to the fact that the simulated condition produced more laughter. The difference in rMSSD, however, was unique to the simulated condition even when controlling for the amount of laughter. The simulated laughter condition had a significantly lower mean HR during the stress task but this was not significant after controlling amount of laughter produced.

Conclusions: Laughter leads to increased heart rate and reduced heart rate variability, which is similar to the effects of exercise. This finding is more pronounced in simulated laughter.

1. Introduction

In popular culture, laughter is perceived as being beneficial for one's health, and some research supports this. Different forms of laughter have been found to improve mood,[1] reduce depression,[2] improve immune function,[3] decrease pain,[4] and reduce stress hormone concentrations.[5,6] However, other studies have shown that laughter may be detrimental to people with particular health conditions in the short-term, including asthmatics.[7] and those with chronic obstructive pulmonary disease[8]

Research has focussed on two main types of laughter; simulated and spontaneous laughter.[9] Spontaneous laughter, commonly referred to as 'real' laughter, is triggered by external humorous stimuli, and occurs in the presence of positive emotions. Spontaneous laughter is unique as it elicits involuntary contractions of the orbicularis oculi muscles in the eye socket, a phenomena known as the Duchenne Smile.[10] In contrast,

simulated laughter is triggered by oneself at will and therefore is not elicited by humorous stimuli or positive emotions.[9] This form of laughter is commonly known as 'fake' or voluntary laughter and involves laughing on command. Simulated laughter can be performed by any individual using controlled vocal sounds (e.g. ha, he, ho) and is gaining popularity as a form of therapy.[11] For example, the Laughing Qigong Programme uses a combination of simulated laughter and qigong techniques as a standardised therapy which has been shown to improve mood and decrease stress markers.[12]

It has been theorised that laughter is beneficial because it is a form of aerobic exercise. Like exercise, laughter is stimulating: it increases heart rate and blood pressure, enhances immune functioning and exercises skeletal muscle.[13] Laughter activates internal oblique muscles to similar levels as crunches and back lifting exercises.[14] Laughter also consistently causes changes in respiration levels similar to exercise: lung volume decreases, respiration rate increases, and compression is

applied to the airways.[15] The parallels drawn between laughter and exercise demonstrate a possibility that the health effects of laughter are merely due to exercise effects, rather than from anything unique to laughter. Therefore, the act of laughter itself is the critical component, even in the absence of humour.[9] This mechanism implies there is little need to distinguish between spontaneous and simulated laughter as both should produce the same physiological effects on the body.

A related theory is the Motion Creates Emotion Theory. Dr. Kataria, the founder of laughter yoga, argues that both simulated and spontaneous laughter can lead to the same physiological and psychological health benefits.[16] This theory states that while the human mind can tell the difference between simulated and spontaneous laughter, the human body cannot.[10] However, simulated and spontaneous laughter have never been compared within the same study.

An important indicator of how well the body responds to a stimulus, and in particular exercise, is heart rate (HR) and heart rate variability (HRV). HRV is the normal rhythmic variations in consecutive heart beats that index the cardiovascular system's ability to meet demands.[17] HRV represents both the sympathetic and parasympathetic effects on the heart. Stress or exercise triggers parasympathetic withdrawal and subsequently sympathetic activation. This leads to increased HR and decreased HRV as the underlying dynamic switches from inhibitory to excitatory dominance to allow the system to meet the challenge at hand.

The effects of laughter on the cardiovascular system have been investigated in only a few studies to date. Laughter produced by watching a humorous video increased sympathetic nervous system arousal as indexed by increased galvanic skin resistance, increased heart rate (HR) and decreased finger temperature.[18] Similarly, watching a humorous video produced a significant increase in HR and blood pressure, compared to watching a control video.[19] These studies demonstrate that laughter can produce changes in cardiovascular function.

To test the theory that both simulated and spontaneous laughter are forms of exercise that can stimulate the cardiovascular system similarly, this study aimed to compare the acute cardiovascular effects of simulated and spontaneous laughter. The study also compared the ability of these two types of laughter to buffer the cardiovascular stress response to a laboratory stress task. Lastly, the study investigated whether the effects observed were correlated with the amount of laughter produced. This final aim was included as past research on laughter has failed to actually correlate laughter with health outcomes.

It was hypothesised that simulated and spontaneous laughter would have similar cardiovascular effects (increased HR and decreased HRV) during the laughter task, and these cardiovascular responses would be significantly larger than the control condition. It was expected that the simulated and spontaneous laughter conditions would exhibit similar cardiovascular responses to the stress task but smaller cardiovascular responses (decreased HR and increased HRV) compared to the control condition. It was further hypothesised that the amount of laughter produced during the laughter task would predict the cardiovascular outcomes above and beyond the effect of condition and adding condition as a predictor would not significantly increase the amount of variance explained.

2. Method

2.1. Design

A 7 (task) × 3 (condition) mixed factorial experiment was performed to examine the acute changes in cardiovascular variables overtime in response to experimental tasks across conditions (spontaneous laughter vs. simulated laughter vs. control).

2.2. Sample

A sample of 72 adults (48 female, 24 male; average age 24.15 years,

SE = 1.00) was recruited from advertisements to the general public and University students. Inclusion criteria were those aged 18–64 who could give informed consent. The exclusion criteria included: people with cardiovascular conditions, those taking regular medication which may affect the cardiovascular system, women who were pregnant, those with asthma and those with clinical depression or anxiety. Participants were randomised to one of the three conditions prior to the experimental setting on a 1:1:1 basis. The experimenter was not blinded to condition allocation.

Ethics Approval was granted by the University of Auckland Human Participants' Ethics Committee, and participant written informed consent was obtained.

2.3. Cardiovascular measures

The primary outcome was cardiovascular functioning as measured by heart rate (HR, bpm) and heart rate variability (HRV). HR and HRV were continually measured throughout the experiment using a standard 3-lead ECG attached to the participants chest. Data was collected using Mindware Bio lab 3.02 software with a 1000 Hz sampling rate and was analysed using Kubios HRV version 2.2 software. Root Mean Square of the Successive Differences (rMSSD) was used as an index of vagally-mediated HRV, which was calculated by analysing the intervals between the R-Spikes during each time period. rMSSD reflects the parasympathetic activity on the heart, as opposed to an overall measure of HRV.

2.4. Laughter intensity and frequency scale (LIFS)

The amount of laughter produced by each participant was observationally coded to check whether the changes in the cardiovascular variables were correlated with the actual occurrence of laughter as this has been a limitation in past laughter research. A systematic coding schedule was designed, the Laughter Intensity and Frequency Scale (LIFS), adapted from Bennett's[20] Humour Response Scale, with more clearly operationalised definitions of laughter[21] Each participant was rated by the lead researcher on two separate scales for intensity (0 = no laughter to 3 = nearly continuous laughter) and frequency (0 = no laughter to 3 = belly laughter) at the end of each one minute period. Scores for each minute were totalled for each scale to get an overall intensity and frequency scale out of 18. These scores for each scale were then combined to give an overall score for the six minutes ranging from 0 to 36. The full scale is provided in the Appendix A.

2.5. Procedure

All participants were asked to avoid exercise, alcohol, tobacco and caffeine the 24 h before the experiment and to refrain from eating and drinking two hours prior. Participants were seated in front of a computer which prompted the experimental tasks. The procedure is shown in Fig. 1. During the resting periods, participants were asked to sit as still as possible and not to move, talk or close their eyes, in order to measure resting cardiovascular activity.

During the intervention period, participants were asked to perform a task, specific to their allocated condition which lasted six minutes. The participant's responses to the task were video-recorded for later analysis. Those in the simulated laughter condition were instructed to generate as much simulated laughter as they could for six minutes. Participants in the spontaneous laughter condition viewed a six minute stand-up comedy routine on video. Lastly, participants in the control condition viewed a six minute documentary on Paua farming which was deemed by the researcher to be interesting, yet emotionally neutral.

After their assigned intervention, participants were exposed to a shortened version of the Trier Social Stress Test (TSST).[22] Participants were given three minutes to prepare and three minutes to present a speech to convince the experimenter to give them their dream job.
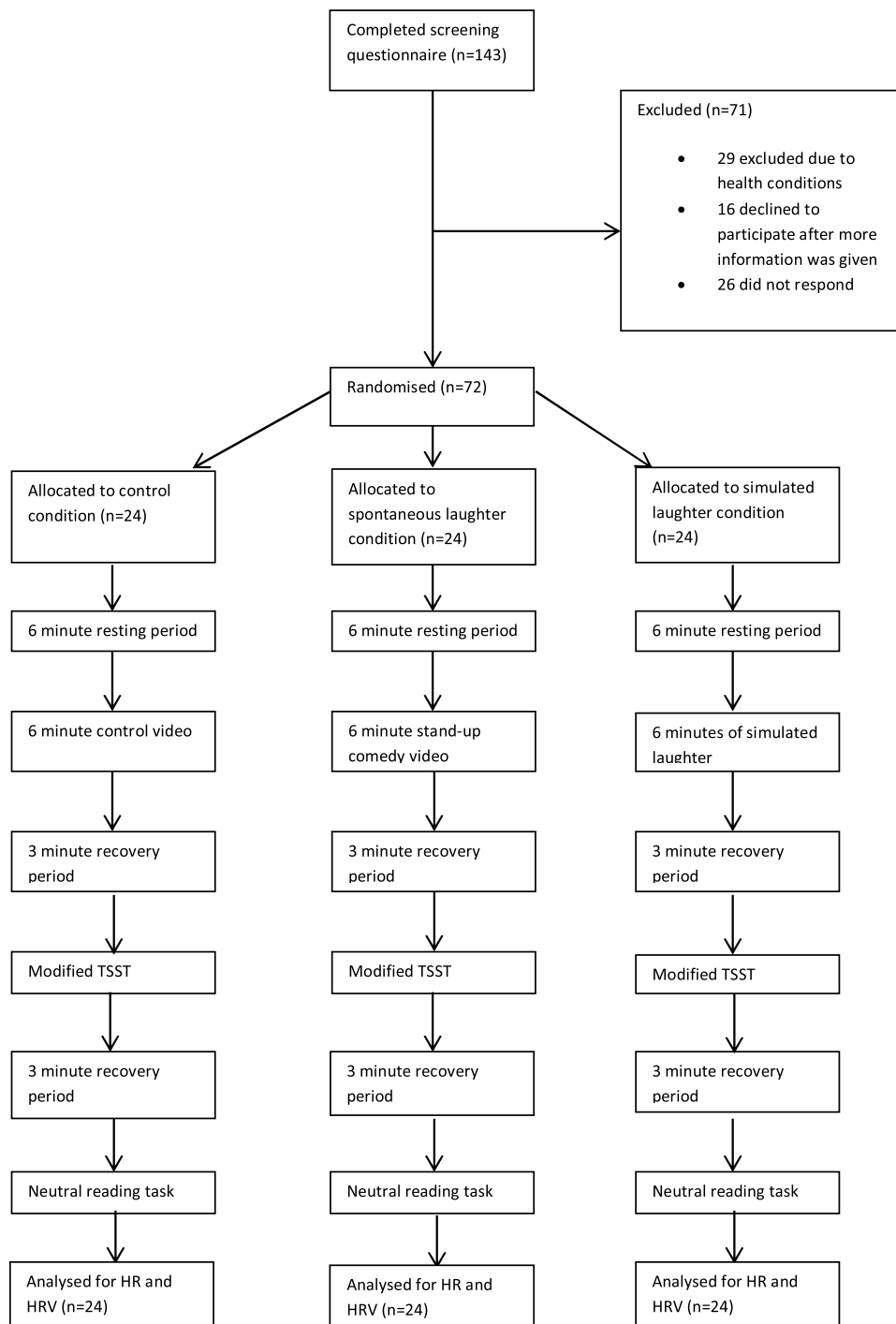
Fig. 1. Flow chart showing the procedure of the study.

Participants were told their speech would be recorded and that a panel of judges would review it and award the best speech with a $100 voucher.

Lastly, participants read an affectively neutral document (a set of washing instructions) out-loud for three minutes as a manipulation check to ensure the physiological and psychological responses caused by the TSST were due to the stressful nature of the task as opposed to just the effect of speaking.[23]

2.6. Statistical analysis

Data were analysed using IBM SPSS Statistics 22. Mixed factorial ANOVAs were completed to analyse the interaction and main effects of task (baseline, laughter task, laughter recovery, speech preparation, speech presentation and reading) and condition (simulated, spontaneous and control) on HR and rMSSD.

rMSSD violated the assumption of normality for ANOVAs and therefore was transformed using a natural log transformation and logged values were used in analyses. All tests were reported using the Greenhouse-Geisser adjustment due to violations in sphericity.[24] All significant interaction effects were followed up using simple pairwise comparisons with bonferroni corrections.

A 3-step hierarchical regression was conducted for all significant interactions to determine the amount of variance predicted by both the

Table 1
Summary of Demographic and Baseline Characteristics of Participants across Condition.

Baseline variable	Simulated	Spontaneous	Control	p-value
Age (years) M(SE)	27.25(2.21)	21.54(0.71)	23.67(1.77)	.060[a]
Gender (%)				.472[b]
Female	16(67%)	14(58%)	18(75%)	
Male	8(33%)	10(42%)	6(25%)	
Ethnicity (%)				.118[b]
NZ European/Pakeha	10(14%)	6(8%)	13(18%)	
Non-European/Other	14(20%)	18(25%)	11(15%)	
BMI M(SE)	25.15(1.33)	22.83(0.80)	23.71(0.71)	.251[a]
Alcohol (drinks/week)M (SE)	3.17(0.80)	0.71(0.34)	2.17(0.53)	.016[a]
Caffeine (cups/day) M(SE)	1.70(0.42)	0.79(0.23)	1.00(0.26)	.108[a]
Sleep (hours/night) M(SE)	7.13(0.16)	7.42(0.20)	7.79(0.19)	.045[a]
Base HR (bpm) M(SE)	73.75(2.51)	77.78(2.39)	78.10(2.31)	.383[a]
Base rMSSD (ms) M(SE)	37.69(4.15)	42.32(6.14)	43.75(4.38)	.773[a]

Note: M = Mean, SE = Standard error, % = percentage of participants in that category. P-value was calculated by one-way ANOVAs[a] and Chi-square tests[b.]

amount and type of laughter. In the first step of the model, covariates known to affect the cardiovascular system were included, including BMI, alcohol, age, gender and exercise. The second step included the LIFS scores to determine the variance in the outcome predicted by the amount of laughter produced. In the third step, condition was included to determine if the type of laughter task predicted any further variance on top of the amount of laughter. Due to the categorical nature of the conditions, condition was dummy coded before being added into the analysis. A *p* value of .05 was maintained.

3. Results

3.1. Baseline characteristics

A shown in Table 1, significant group differences at baseline were found for sleep, ($F_{(2,68)} = 3.24$, $p = .045$) and alcohol consumption ($F_{(2,69)} = 4.38$, $p = .016$). The group differences in the average amount of alcohol consumed per week was moderate to large and previous research has found that alcohol can have a large effect on cardiovascular reactivity.[25] Therefore, alcohol consumption was included as a covariate in all remaining analyses. The analyses were repeated with sleep as an additional covariate, but this made no difference to the significance of the results, and for reasons of simplicity, analyses are reported without sleep as a covariate.

3.2. Manipulation checks

A one-way ANOVA was conducted to examine whether scores on the LIFS differed across conditions. Significant group differences were found for LIFS score ($F_{(2,69)} = 139.30$, $p < .001$). The control condition ($M = 0.13$, $SE = 0.61$) had significantly lower mean LIFS score

than both the simulated ($M = 28.21$, $SE = 1.29$, $p < .001$) and spontaneous conditions ($M = 12.00$, $SE = 1.61$, $p < .001$). The simulated condition had a significantly higher mean LIFS score than the spontaneous condition ($p < .001$).

As another manipulation check, a series of simple Pearson's correlations were conducted in order to check whether changes in the cardiovascular variables were correlated with LIFS scores, irrespective of condition. Both mean HR ($r = .48$, $p < .001$) and rMSSD ($r = -.38$, $p = .001$) during the laughter task were significantly correlated with LIFS scores.

3.3. Differences across conditions

A series of 3(condition) × 7(task) mixed factorial ANCOVAs were conducted to evaluate the effects of condition and task on HR and lnrMSSD whilst controlling for the effect of alcohol. No significant main effects were observed for the effect of condition on HR ($F_{(2,68)} = 0.39$, $p = .677$, $\eta_p^2 = .01$) or lnrMSSD ($F_{(2,68)} = 1.23$, $p = .30$, $\eta_p^2 = .03$). Significant main effects of task were found for HR ($F^{3,200} = 56.90$, $p < .001$, $\eta_p^2 = .46$) and lnrMSSD ($F_{(4,261)} = 10.24$, $p < .001$, $\eta_p^2 = .13$). Means, standard errors and post-hoc comparisons between the tasks for each cardiovascular variable are provided in Table 2.

As shown in Fig. 2, there was a significant interaction effect on HR while controlling for the effects of alcohol ($F_{(6,200)} = 15.74$, $p < .001$, $\eta_p^2 = .32$). Follow-up comparisons indicated significant differences between conditions during the laughter task ($F_{(2,68)} = 11.85$, $p < .001$, $\eta_p^2 = .26$). The simulated condition ($M = 91.14$, $SE = 2.47$) had a significantly higher HR during the laughter task than both the spontaneous ($M = 77.73$, $SE = 2.50$, $p = .001$) and control conditions ($M = 75.29$, $SE = 2.41$, $p < .001$). The spontaneous and control conditions did not significantly differ from each other in mean HR during the laughter task.

The conditions also significantly differed in mean HR during speech presentation ($F_{(2,68)} = 4.52$, $p = .014$, $\eta_p^2 = .12$). The simulated laughter condition had a significantly lower mean HR during the speech presentation ($M = 85.70$, $SE = 2.77$) than both the spontaneous ($M = 96.75$, $SE = 2.79$, $p = .024$) and control conditions ($M = 95.26$, $SE = 2.70$, $p = .046$). The spontaneous and control conditions did not significantly differ from each other. The other tasks did not show any significant differences in mean HR across conditions.

As can be seen in Fig. 3, a significant interaction effect for task and condition on lnrMSSD was observed ($F_{(8,261)} = 5.02$, $p < .001$, $\eta_p^2 = .13$). Follow-up ANCOVAs demonstrated that the conditions differed significantly in lnrMSSD during the laughter task only ($F_{(2,68)} = 9.61$, $p < .001$, $\eta_p^2 = .22$), with the simulated condition having significantly lower mean lnrMSSD during the laughter task ($M = 3.02$, $SE = 0.12$) than both the spontaneous ($M = 3.57$, $SE = 0.12$, $p = .005$) and control conditions ($M = 3.70$, $SE = 0.11$, $p < .001$). The spontaneous and control conditions did not differ ($p > .05$).

Table 2
Summary Statistics and Post-hoc Comparisons for Cardiovascular Variables across Tasks Averaged across Groups.

Task		Baseline	Laughter task	Laughter recovery	Speech preparation	Speech presentation	Speech recovery	Reading
Cardiovascular Variables	HR(bpm) M (SE)	76.76(1.37) b**d**e**g**	81.39(1.39) a**c**d**e**f**	75.63(1.25) b**d**e**g**	86.19(1.48) a**b**c**e**f**g**	92.57(1.56) a**b**c**d**f**g**	75.21(1.20) b**d**e**g**	79.67(1.16) a**c**d**e**f**
	rMSSD(ms) M(SE)	39.88(2.73) d*e**f*	36.67(2.60) c*e**f**	41.57(3.07) b*d**e**	33.55(2.31) a*c*f**g*	28.94(1.75) a**b*c**f**g**	44.92(3.43) a*b*d**e**g*	36.86(1.95) d*e**f*
	lnrMSSD M (SE)	3.53(0.07) d*e**f*	3.43(0.07) c*e**f**	3.57(0.07) b*d**e**	3.37(0.06) a*c*f**g*	3.24(0.06) a**b*c**f**g**	3.64(0.07) a*b*d**e**g*	3.51(0.05) d*e**f*

Note: a = different to baseline, b = different to laughter task, c = different to laughter recovery, d = different to speech preparation, e = different to speech presentation, f = different to speech recovery, g = different to reading, *p < .05, **p < .001
Note: Values for rMSSD variables have been reported as both absolute and log values. This is due to the fact that rMSSD was positively skewed and thus have been logged transformed for analysis.
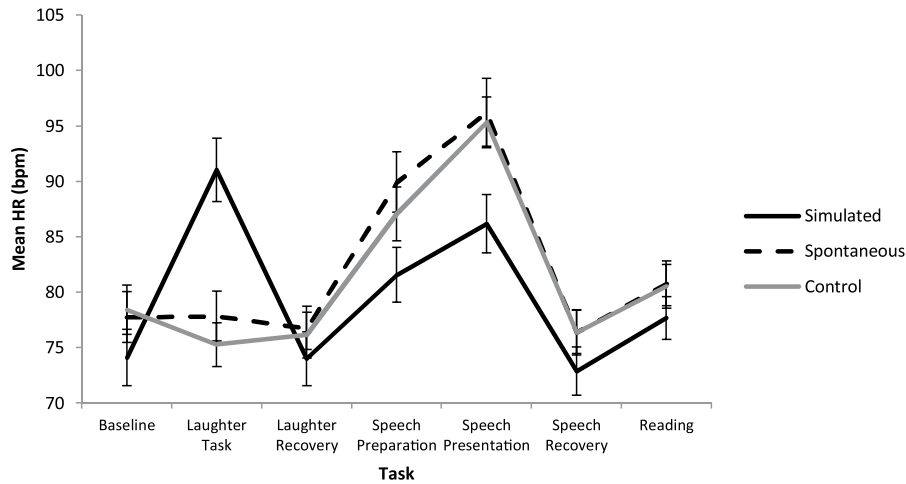
Fig. 2. Mean HR across tasks split by condition.

3.4. Regressions

A hierarchical regression assessed the effect of LIFS score and condition on mean HR during the laughter task. Step 1 of the regression model (containing the known covariates of BMI, alcohol, age, gender and exercise) was not significant ($F_{(5,66)} = 2.13$, $p = .073$, $R^2 = .14$). Step 2 (with the addition of LIFS score) was significant ($F_{(6,65)} = 6.61$, $p < .001$, $R^2 = .38$, $\Delta R2 = .24$) explaining 38% of the variance in mean HR during the laughter task. LIFS score was a significant predictor when controlling for known covariates ($b = 0.53$, $\beta = .51$, $t^{65} = 5.01$, $p < .001$). This indicates that a higher LIFS score predicted higher HR during the laughter task. Step 3 of the model (with the addition of condition) was significant ($F_{(8,63)} = 6.56$, $p < .001$, $R^2 = .45$) explaining 45% of the variance in mean HR during the laughter task. However, neither dummy variable was found to significantly predict any variance in mean HR during the laughter task when controlling for the known covariates and LIFS scores ($ps > .05$). This indicates that condition did not significantly explain any further variance in HR when controlling for the amount of laughter produced.

Another hierarchical regression analysed the effects of LIFS score and condition on mean HR during speech presentation. Step 1 (containing known covariates) was significant ($F_{(5,66)} = 3.22$, $p = .012$, $R^2 = .20$) indicating that the covariates predicted 20% of the variance in mean HR. Step 2 (with the addition of LIFS score) was also significant ($F_{(6,65)} = 3.26$, $p = .007$, $R^2 = .23$) explaining 23% of the variance in mean HR during speech presentation. However, LIFS score was not a significant predictor when controlling for the covariates ($b = -0.21$,

$\beta = -.19$, $t^{65} = -1.72$, $p = .090$). Therefore, the amount of laughter produced by each participant was not a significant predictor of mean HR during speech presentation. Step 3 (with condition) was significant ($F_{(8,63)} = 2.72$, $p = .012$, $R^2 = .26$) explaining 26% of the variance in mean HR during speech presentation. However, condition did not significantly predict any variance in mean HR during speech presentation when controlling for known covariates and LIFS scores ($ps < .05$).

A third hierarchical regression was conducted to examine the effects of LIFS score and condition on lnrMSSD during the laughter task. Step 1 of the model (containing known covariates) was not significant ($F_{(5,66)} = 1.56$, $p = .183$, $R^2 = .11$). Step 2 (with the addition of LIFS score) was significant ($F_{(6,65)} = 3.64$, $p = .004$, $R^2 = .25$) explaining 25% of the variance in lnrMSSD during the laughter task. LIFS score was a significant predictor of lnrMSSD when controlling for the effects of the covariates ($b = -0.02$, $\beta = -.40$, $t^{65} = -3.56$, $p = .001$). A 1 point increase in LIFS score predicts a 0.02 unit decrease in lnrMSSD. Adding LIFS score to the regression model explained a further 18% of variance in lnrMSSD during the laughter task ($\Delta R^2 = .18$). This finding indicates that the amount of laughter produced in the laughter task predicted a decrease in rMSSD. Step 3 (with the addition of condition) was significant ($F_{(8,63)} = 34.00$, $p = .001$, $R^2 = .34$) explaining 34% of the variance in lnrMSSD during the laughter task. The simulated dummy variable was found to be a significant predictor when controlling for the covariates and LIFS score ($b = -0.80$, $\beta = -.61$, $t^{63} = -2.29$, $p = .026$). The simulated condition had 0.80 units of lnrMSSD lower than the control condition during the laughter task when controlling for covariates and LIFS scores. The spontaneous group
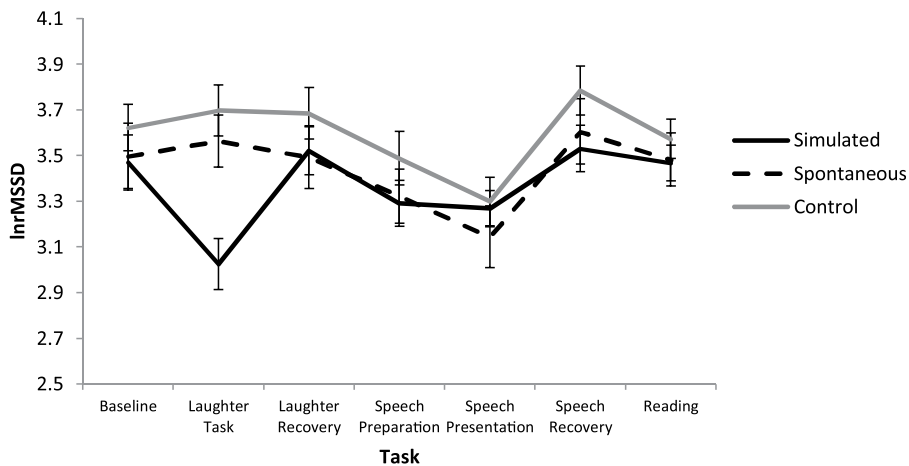

Fig. 3. Mean lnrMSSD across tasks split by condition.

was not a significant predictor ($b = -0.10$, $\beta = -.08$, $t^{63} = -0.49$, $p = .626$). Adding condition to the model explained an additional 9% of variance in lnrMSSD during the laughter task ($\Delta R^2 = .09$). This step indicates that condition explains further variance in lnrMSSD during the laughter task when controlling for known covariates and the amount of laughter produced.

4. Discussion

This study hypothesised that the cardiovascular effects of spontaneous and simulated laughter would be the same. Contrary to this hypothesis, simulated laughter resulted in a larger increase in HR and decrease in rMSSD than spontaneous laughter. It was also hypothesised that both forms of laughter would attenuate the stress response compared to a control condition. However, only the simulated laughter condition had an attenuated stress response to the TSST as represented by a smaller increase in HR than the other two conditions.

The amount of laughter produced was higher in the simulated laughter condition, and significantly predicted both HR and rMSSD. It was shown that simulated laugher increased HR more than spontaneous laughter because of the amount of laughter produced. However, the effects of simulated laughter on rMSSD were not fully explained by the differences in laughter production. During the stress task, neither the amount nor type of laughter were significant predictors of HR or rMSSD. These findings only partially support the hypothesis that the amount of laughter would predict the cardiovascular outcomes and adding condition as a predictor would not augment the predicted variance.

It appears that during laughter, the intensity and frequency of laughter increases the body's energy expenditure causing an elevated HR, akin to the effects of exercise.[26] It is known that the more exercise produced, the greater the cardiovascular changes that will occur.[27] This suggests that if the spontaneous laughter task was performed at the same frequency and intensity as the simulated laughter task, a similar increase in HR could be expected. Past research on laughter's effects on HR has only considered the effect of spontaneous laughter. For example, Averill[18] and Sugawara and colleagues[19] found that spontaneous laughter acutely increased HR. The results of this study add to previous research by suggesting that simulated laughter may have stronger effects on HR and HRV than spontaneous laughter, and the reduction in rMSSD may not be solely due to the amount of laugher produced. More research is needed to corroborate these findings.

A stress buffering effect of laughter was observed; the simulated laughter condition appeared to have an attenuated increase in HR in response to the TSST. However, this finding could not be explained by either group allocation or LIFS scores. This finding could be explained by the law of initial values which states that the extent of a physiological response is dependent on the initial level of that response[28] The simulated condition had significantly increased HR during the laughter task. As the heart was already working hard during the laughter period; the physiological stress response from the TSST may have been blunted. Past research into the stress buffering effects of laughter has only explored how laughter leads to a reduction in circulating stress hormone levels.[5,6]

There is a natural relationship between HR and HRV called cycle-length-dependence, which could partially explain the decreases in rMSSD which accompanied the increases in HR.[29] However, during the speech task, rMSSD did not decrease alongside the increase in HR, suggesting that there is an effect of laughter on HRV beyond cycle-length-dependence.

These findings do not support the Motion Creates Emotion Theory, as differences in cardiovascular effects of spontaneous and simulated laugher were observed that could not be fully explained by the amount of laugher produced. The findings, however, do support the theory that laughter acts on the cardiovascular system in a similar way to physical exercise. Laughter increased HR and decreased rMSSD, as would be expected by exercise. As the amount of laughter produced increased, so did the changes in the cardiovascular variables. This study has several limitations. The sample was young and mainly derived from University students and the results may not generalise outside this population. The laboratory setting limited the ecological validity of the task. It is also likely the participants in the simulated condition found it uncomfortable laughing in a laboratory room in front of a camera. This may have increased stress and embarrassment and therefore minimised the effects observed and may be another possible explanation for the increased HR in this group. Further research could remove the camera to reduce this possibility or measure embarrassment as a possible mediator.

More research is needed to fully elucidate the mechanisms behind the effects of laughter on cardiovascular variables. Future research could also examine whether there are any long-lasting effects on the body caused by the accumulated effects of laughter from multiple sessions over time, rather than just one short session. A replication of this study with a patient group could also extend the generalisability of the results to patient samples.

5. Conclusion

In conclusion, this study provides initial evidence that simulated laughter produces stronger cardiovascular responses than spontaneous laughter. The findings support the theory that laughter acts as a form of exercise, with more frequent and intense laughter producing a greater exercise effect on the body as indicated by increased HR and decreased rMSSD.

Appendix A. Laughter and Intensity Frequency Scale (LIFS)

Laughter and Intensity Frequency Scale (LIFS)

Rate each subject's responses in 1 min time intervals across the 6 min period of time using the 2 scales below. Total the 6 ratings in each scale to get an estimate of both the intensity and frequency of laughter. An overall laughter score can then be determined by combining the totalled frequency and intensity scores.

Laughter Frequency Scale

0 = No laughter
1 = Rare laughter (4 or less laughs)
2 = Intermittent laughter
3 = Nearly continuous laughter

Laughter Intensity Scale

0 = No laughter
1 = Giggle/snicker (first emergence of laughter sound but still controllable)
2 = Laugh (involves facial and thoracic muscles and originates within the chest)
3 = Belly laughter or other involuntary body responses alongside laughter

Subject Number	Scale	0–1:00	1:00–2:00	2:00–3:00	3:00–4:00	4:00–5:00	5:00–6:00	Scale Total	Overall Total
	Frequency								
	Intensity								
	Frequency								
	Intensity								
	Frequency								
	Intensity								

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Simona Krebs, Špela Stanegler Herodež, Majda Pajnkihar: COMMUNICATIONAL METHOD OF IMPACT OF „EXERCISE OF LAU-GHTER YOGA" ON THE ELDERLY BEHAVIOUR

135   Informatol. 47, 2014., 2-3, 135-144

COMMUNICATIONAL METHOD OF IMPACT OF „EXERCISE OF LAUGHTER YOGA" ON THE ELDERLY BEHAVIOUR

KOMUNIKATIVNA METODA UTJECAJA „VJEŽBANJA JOGE SMIJEHA" NA PONAŠANJE STARIJIH OSOBA

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Abstract

Watching the entertaining facilities is one of the effective methods of promoting laughter, which in turn affects the blood pressure values and well-being. The purpose of the study was to determine how laughter yoga, which does not depend on understanding humor, effect on blood pressure and well-being.

Research Methodology: In this study, we used the technique of promoting laughter, called laughter yoga which does not depend on understanding humor. It includes respiratory-laughing fun exercises that encourage laughter very quickly. The study involved fifty-two randomly selected volunteers whose average age was 52.5 years. Volunteers were based on a questionnaire on health divided into those who take medications and those who do not. Their well-being, before and after exercise, was assessed using non-standardized numerical nine-stage questionnaire with a scale of 1 to 10. Research was conducted in 2012 in the Laughter yoga club in Maribor, once a week for sixty minutes (ten weeks).

Results: The results showed that laughter yoga has statistically significant effect on the level of blood pressure by volunteers who did not take any medications (N = 41; systolic: 7.73% (p <0.0001), diastolic: 5.83% (p <0.0001)). In volunteers who took medications (N = 11), we observed a drop decrease in the value, without statistically significant differences (systolic: 2.70% (p = 0.86), diastolic: 1.41% (p = 0, 25)). Statistically significant differences (p <0.05) were observed in the average change in enthusiasm, optimism, connectivity, energy levels, mood, muscle relaxation, breathing awareness, the ability to laugh for no reason. The biggest change was measured in the sense of stress after laughter yoga exercise (60%).

Conclusion: From presented results we can conclude

Sažetak

Gledanje zabavnih sadržaja je jedna od najučinkovitijih metoda promicanja smijeha, što pak utječe na vrijednosti krvnog tlaka i blagostanje. Svrha istraživanja bila je utvrditi kakav učinak na krvni tlak i blagostanje ima joga smijeha, koja ne ovisi o razumijevanju humora.

Metodologija: U ovom istraživanju smo koristili tehniku promicanje smijeh, zvanu joga smijeha koja ne ovisi o razumijevanju humora. To uključuje respiratorno-smiješne zabavne vježbe koje vrlo brzo potiču smijeh. U studiji je sudjelovalo pedeset dva nasumično odabrana volontera čija je prosječna dob 52,5 godine. Volonteri su, na temelju upitnika o zdravlju, podijeljeni na one koji uzimaju lijekove i one koji to ne čine. Njihova dobrobit, prije i nakon vježbanja, procijenjena je pomoću nestandardiziranog upitnika sa devet faza i skalom od 1 do 10. Istraživanje je provedeno 2012. u Yoga klubu smijeha u Mariboru, jednom tjedno u šezdeset minuta (deset tjedana).

Rezultati: Rezultati su pokazali da joga smijeha ima statistički značajan utjecaj na razinu krvnog tlaka kod volontera koji nisu uzimali nikakve lijekove (N = 41; sistolički: 7,73% (p <0,0001), dijastolički: 5,83% (p <0.0001). Kod volontera koji su uzimali lijekove (N = 11), primjetili smo pad pad vrijednosti, bez statistički značajnih razlika (sistolički: 2,70% (p = 0,86), dijastolički: 1,41% (p = 0, 25)). Statistički značajne razlike (p <0,05) zabilježene su u prosječnoj promjeni entuzijazma, optimizma, povezivosti, razini energije, raspoloženju, opuštanju mišića, svjesnosti disanja, sposobnost da se smije bez razloga. Najveća promjena je izmjerena u smislu stresa nakon vježbanja joge smijehom (60%).

Zaključak: Iz dobivenih rezultata može se zaključiti da joga smijeha može biti učinkovita adjunktivna metoda za prevenciju povišenog krvnog tlaka kod

that laughter yoga may be an effective adjunctive method for the prevention of high blood pressure in those who did not take any medications. For those who took them, it will be necessary to do further research on a larger number of people and to examine the influence of drugs. By all volunteers we observed a positive and statistically significant changes (p <0.05) in well-being. Most stood out the stress reduction (60.32%).

INTRODUCTION

According to the World Health Organization /**1**/ chronic diseases (heart disease, stroke, cancer, diabetes and chronic obstructive pulmonary disease) are the leading cause of death in the world, representing 63% of all deaths. Cardiovascular diseases, according to the WHO, are in a great advantage, because 17.3 million people per year die of them, that represents 30% of all deaths. The data in Slovenia is not more optimistic. Institute of Public Health /**2**/ lists the information that in year 2010 compared to the year 2009, died in Slovenia 3% more people with cardiovascular diseases, that means 40% of all deaths. In view of these facts which confirm that chronic diseases in the world and in Slovenia are on the rise, some scientific articles by various authors (Bennett, 2003; Bennett, & Lengacher, 2006a, 2006b, 2009; Berk et al ., 1977; Fry, & Savin, 1988; Lefcourt, Davidson - Katz & Kueneman, 1990, Miller, & Fry, 2009) demonstrate the impact of humor and laughter on health and well-being . Norman Cousins described in his book Anatomy of an Illness as prescribed by the patient /**3**/ the power of laughter on the basis of his own experiences. He has facilitated his disease with thirty minutes of laughter, high doses of vitamin C and at least two hours of sleeping. This magic combination helps him to relieve pain and strengthen faith in life.

A new method of promoting laughter, called Laughter yoga /**4**/, has already been implemented in more than seventy countries around the world. It is a combination of laugh-breathing exercises. In this study, we focused to measure the impact of Laughter yoga on blood pressure and well-being of participants in a free laughter yoga club, which operates once a week. Many of the literature reflect a positive and scientifically proven effect of laughter and humor on well-being in many chronic diseases which include high blood pressure /**5**/.

onih koji nisu uzimali nikakve lijekove. Za one koji su ih uzimali, biti će potrebno napraviti daljnja istraživanja na većem broju ljudi te istražiti utjecaj lijekova. Kod svih dobrovoljaca bilježimo pozitivne i statistički značajne promjene (p <0,05) u blagostanju. Najviše se isticalo smanjenje stresa (60.32%).

Laughter is also a form of aerobic exercise. Mc. Irrespective of all, the existing results speak about the positive effects of laughter and almost no results talk about its side effects. Also interesting is the statement by the gentleman who had cancer and was told that because of the anger, reactions and depression in relation to his diagnosis he became very unpleasant for him-self and the surrounding area. Now, is he due to laughing therapy much more open to new ideas, he is also kinder to others and within him-self even slightly stronger. Laughter for no reason or Laughter yoga /**6**/ is not well known in our society and is a relatively new method, which some accepted, others not. Hasan, H., & Hasan, TF /**7**/ in their study found a statistically significant connection between personal satisfaction and the ability to laugh, which means that the people who were laughing, were emotionally more satisfied. The effects of laughter on the disease and well-being were also written by the Cousins /**8**/ and Adams & Mylander /**9**/. Cousins effectively influences his illness with a regular activity of laughter in different ways (humor, laugh like that, video funnies) as specific therapy. Adams's in his Gesundheit Clinic introduces a method of laughter and humor as an important complementary technique in the treatment of patients. He argues that positive attitude and laughter play a significant effect on attitude to the disease and relationship to the medical staff. Bennett et al. /**10**/, /**11**/, /**12**/, /**13**/, /**14**/ describe the importance of laughter for well-being, which in turn may also affect treatment. Returning to stress, which can cause many diseases, it can be seen in the literature review, that laughter reduces stress hormones and stimulates the immune system (Berk et al., 1989; Lefcourt, Davidson - Katz & Kueneman, 1990; Kataria, 2002; Bennett et al., 2003). If we feel better, we are optimistic, we have a higher level of energy, less stress, more relaxed muscles and we are more excited. In our body are triggered biochemical

processes that may affect our mental and physical health /**15**/, /**16**/. Berk et al. /**17**/ poin out that laughing reduces stress hormones, such as epinephrine, cortisol, noradrenaline, which may affect a number of disease complications, as for example, in cardiovascular diseases /**18**/ and type 2 diabetes /**19**/, and to have feelings of great importance in the development of many diseases /**20**/. Kataria /**21**/, who was developed this technique together with his wife, on the basis of scientific papers concluded that our body does not distinguish between sincere and done laughing. Endorphins are released with both. And because the laughter yoga is a combination of a beautiful smile-playful exercises, which include breathing /**22**/, and because we do not need a reason for it, the result is, viewed from the point of view that the people were more able to laugh for no reason after the exercise, extremely positive. Nowadays, this technique is somewhat unusual, because we all are used to laugh with a reason - laugh for no reason with exercises, can make by adult unserious impression and for many people this is inappropriate. For this reason, the exercise in group is much easier because individual is more easily drawn into the action.

METHODOLOGY

In this study, we used the technique of promoting laughter, called Laughter yoga, which does not depend on the understanding of humor, but includes breathing - laughing fun exercises, which quickly lead to laughter. The study included randomly selected volunteers who attend the Laughter Yoga Club in Maribor. They have signed the statement on the participation and completed a questionnaire on health, through whom we wish to know the health status of volunteers. In this study we also want to know how people feel before and after the regular exercise of laughter yoga. For that reason we included non-standardized numerical nine-stage questionnaire about well-being. Parameters by volunteers evaluated were: enthusiasm, sense of stress, optimism, connectedness, energy levels, mood, muscle relaxation, breathing awareness, the ability to laugh for no reason. The questionnaire was structured so that the people evaluated mentioned parameters before and after exercise on a scale 1 to 10.

Number 1 represented at least and number 10 represented the most.

Sample
The study included randomly selected volunteers who attend the Laughter Yoga Club in Maribor. They have signed the statement on the participation and completed a questionnaire on health (about medicines and disease they had or have). Condition for participation in the study was the minimum age of eighteen years. Upward age was not limited. The study involved fifty-two randomly selected volunteers (four men and forty-eight women), their mean age was 52.5 years. The youngest volunteer was twenty-four, the oldest was seventy-six. Volunteers were, based on a questionnaire on health, divided into those who take some drugs (N = 11) and those who do not take them (N = 41).

Methodology
The study was based on a quantitative methodology by which we carried out measurements of blood pressure before and after 1 hour Laughter yoga workout. Research was performed in 2012 in the Laughter Yoga Club in Maribor, once a week for ten weeks. In the study we were interested to find out how Laughter yoga impact on blood pressure and well-being by participants who take some drugs and how by those who do not take them. We compared the effects of both.

Blood pressure measurements on the brachial artery were performed before and after exercise. At the same time we also want to know how people feel before and after the regular exercise of Laughter yoga. For that reason we included non-standardized numerical nine-stage questionnaire about well-being. With it volunteers evaluated: enthusiasm, sense of stress, optimism, connectedness, energy levels, mood, muscle relaxation, breathing awareness, the ability to laugh for no reason, before and after exercise on a scale 1 to 10. Number 1 represented at least and number 10 represented the most.

The methods of collecting and processing data
After reviewing the relevant literature, we designed the study. Research was performed in 2012 in the Laughter Yoga Club in Maribor, once a week on Thursdays at 19.30, for ten weeks. For each participant, who has a voluntary approach to

research by signing the statement on the participation, we have prepared the folder in which the data was collected. At the first training all participants completed a questionnaire on health (about medicines and diseases they had or have). Blood pressure measurements were performed by automatic measuring instruments. With non-standardized numerical nine-stage questionnaire about well-being volunteers evaluated: enthusiasm, sense of stress, optimism, connectedness, energy levels, mood, muscle relaxation, breathing awareness, the ability to laugh for no reason, before and after exercise on a scale 1 to 10. Number 1 represented at least and number 10 represented the most. The obtained data was processed with the program VassarStats. The first part of the statistical analysis consisted of basic descriptive statistics, which obtained information regarding the frequency, average value, standard deviation (SD) and dispersion of the sample. A more detailed analysis, we made with the bilateral t-test for dependent and independent samples. In order to assess the applicability of the chosen method, we used the calculation of odds ratios (OR) at 95% confidence interval (CI). P-values <0.05 were considered statistically significant.

RESULTS

Table 1: Average values of blood pressure (BP) measurements (mmHg) before and after Laughter yoga exercise of volunteers who do not take any medications (N = 41) and their statistical significance.

N = 41	Before exercise	After exercise	Difference	95% CI; p-value*
	BP (mmHg) ± SD	BP (mmHg) ± SD		
Systolic BP	133,15 ± 18,94	120,65 ± 14,79	9,39 %	12,48 ± 2,54; p < 0,0001
Diastolic BP	87,75 ± 12,86	81,42 ± 10,90	7,21 %	6,38 ± 2,48; p < 0,0001

* t-test

Table 1 shows the change in blood pressure at volunteers who did not take any medications (N = 41). By these volunteers, we observed that the systolic blood pressure decreased on average by 12.48 mmHg or 9.39%, diastolic blood pressure by 6.38 mmHg or 7.21%. We get a statistically significant difference (p <0.0001) between the mean values of observed variables.

Figure 1: Average values of blood pressure measurements (mmHg) before and after laughter yoga exercise of volunteers who do not take any medications (N = 41).
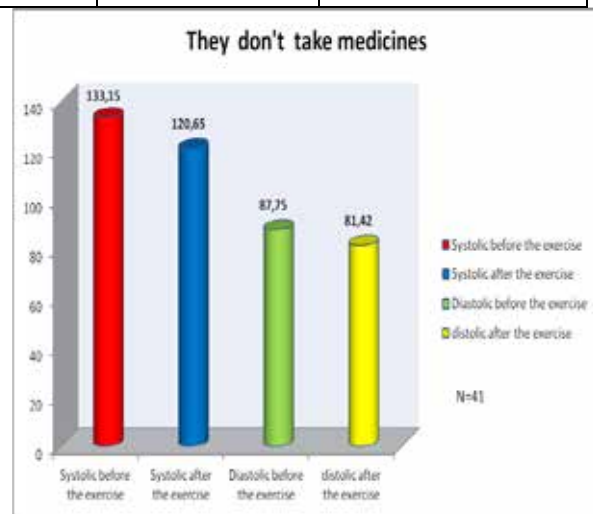

Figure 1 shows the mean change in systolic and diastolic blood pressure at volunteers who were not taking medications (N = 41). Systolic blood pressure decreased on average by 12.5 mmHg. It was reduced from the measured average value of 133.15 mm Hg to 120.65 mmHg. The change in diastolic blood pressure was slightly lower. It decreased from 87.75 mm Hg to 81.42 mm Hg, which is an average of 6.33 mmHg.

Table 2: Average values of blood pressure (BP) measurements (mmHg) before and after laughter yoga exercise of volunteers who take medications (N = 11) and their statistical significance.

N=11	Before exercise	After exercise	Difference	95% CI; p-value*
	BP (mmHg) ± SD	BP (mmHg) ± SD		
Systolic BP	141,54 ± 22,89	137,72 ± 23,23	2,70 %	3,83 ± 4,09; p = 0,06
Diastolic BP	90,18 ± 8,80	88,90 ± 8,33	1,41 %	1,25 ± 6,18; p = 0,66

* t-test

Table 2 shows the change in average systolic blood pressure at volunteers who take medications (N = 11) from 141.54 mmHg to 137.72 mmHg, which represents 2.70% (p = 0.06), and the change in the average diastolic blood pressure from 90.18 mmHg to 88.90 mmHg, which corresponds to 1.41% (p = 0.66).

Figure 2: Average values of blood pressure measurements (mmHg) before and after laughter yoga exercise of volunteers who take medications (N = 11).
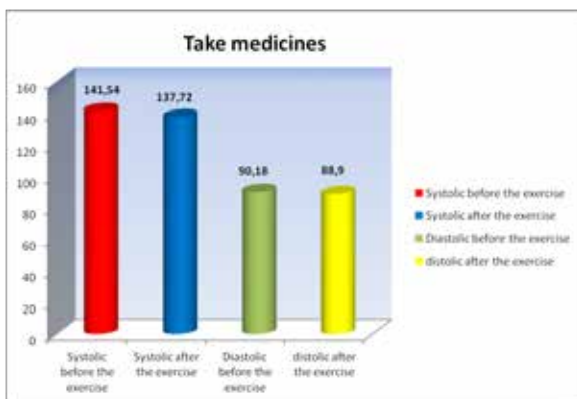

Figure 2 shows the changes in systolic and diastolic blood pressure at volunteers who take medications. From the presented results it can be seen that the average systolic blood pressure decreased by 3.81 mmHg (from 141.54 to 137.72

mmHg). Average diastolic blood pressure also decreased from 90.18 mmHg to 88.90 mmHg, which means an average of 1.28 mmHg.

Table 3: Average differences of well-being changes before and after laughter yoga exercise of volunteers who do not take any medication (N = 41) and their statistical significance.

Do not take any medication N = 41		Change (%)	Average ± SD	p-value	95% CI
enthusiasm	before	33,27	6,73 ± 1,91		
	after		8,97 ± 1,54	p < 0,0001	2,26 ± 0,59
sense of stress	before	63,25	5,17 ± 2,44		
	after		1,9 ± 1,56	p < 0,0001	3,30 ± 0,71
optimism	before	28,77	7,08 ± 1,86		
	after		9,12 ± 1,12	p < 0,0001	2,02 ± 0,43
connected-ness	before	37,40	6,18 ± 2,31		
	after		8,49 ± 1,85	p < 0,0001	2,23 ± 0,49
energy level	before	42,64	6,07 ± 1,89		
	after		8,65 ± 1,83	p < 0,0001	2,73 ± 0,51
mood	before	40,83	6,57 ± 1,88		
	after		9,25 ± 1,6	p<0,0001	2,52 ± 0,62
muscle relaxation	before	38,41	6,42 ± 2,15		
	after		8,89 ± 1,12	p < 0,0001	2,45 ± 0,64
breathing awareness	before	45,99	5,71 ± 2,16		
	after		8,34 ± 1,76	p < 0,0001	2,64 ± 0,86

the ability to laugh for no reason	before	39,32	6,49 ± 1,99		
	after		9,04 ± 1,29	p < 0,0001	2,54 ± 0,60

Table 3 shows the changes in well-being and statistical processing of data by volunteers who did not take any medication (N = 41). From the date we can observe that volunteers were after laugh-

ter yoga in less stress (63.25%), that they had more energy (42.64%) and that they are more aware of breathing (45,99%). All parameters were after exercise statistically significant (p <0.0001).

Figure 3: Average values of well-being changes before and after laughter yoga exercise of volunteers who do not take any medication (N = 41).
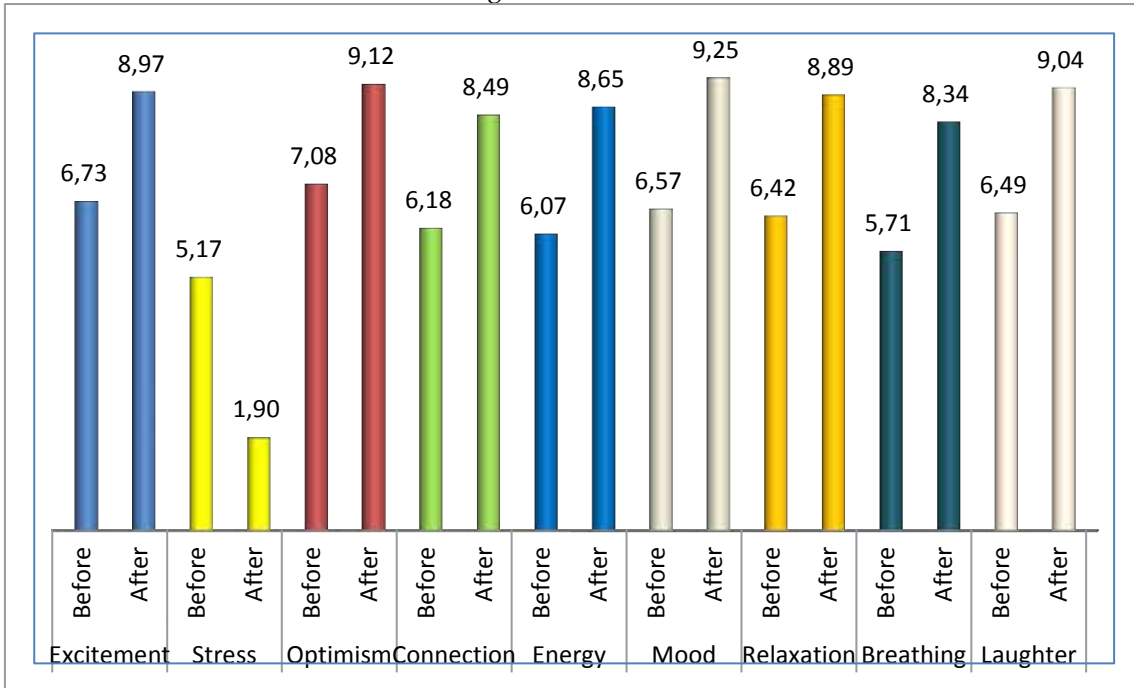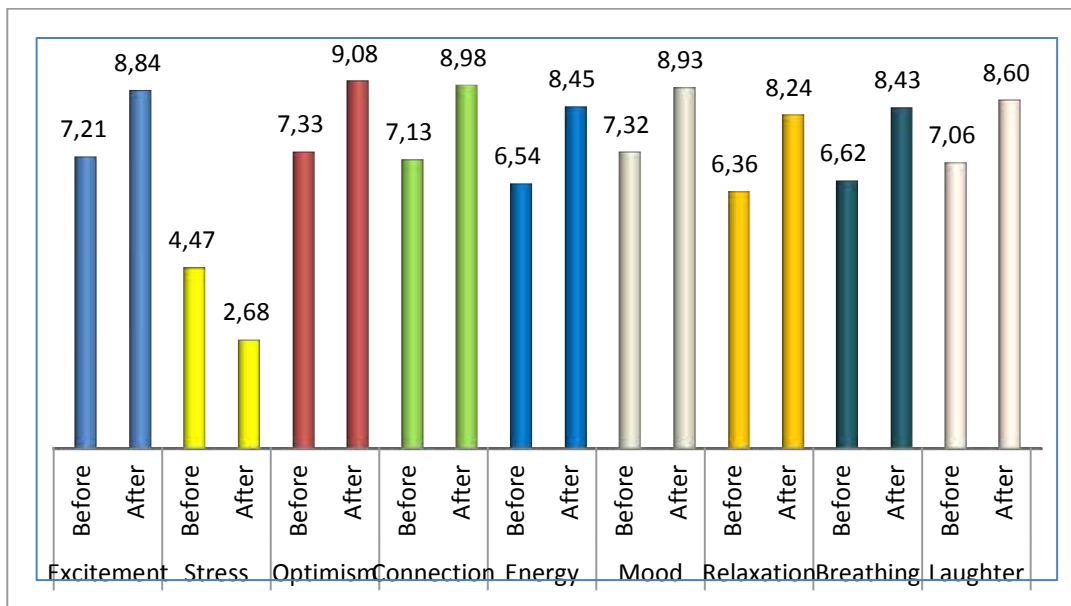

Figure 3 shows the average value of well-being changes before and after exercise, as assessed on a scale of 1 to 10. We can see that the enthusiasm increased for 33.27%. The feeling of stress stood out and was reduced to 63.25%. After exercise optimism increased for 28.7%, also connectedness by 37,40%. The energy level was higher after exercise for 42.64%, while the mood for 40.83%. Volunteers also feel more relaxed muscles, namely 38.41%, their breathing was after the workout for 45,99% more intensive than before the workout. After training they had a feeling of being easier to laugh, for 39.32%.

Table 4: Average differences of well-being changes before and after laughter yoga exercise of volunteers who take medications (N =11) and their statistical significance.

Do not take any medication N = 11		Change (%)	Average ± SD	p-value	95% CI
enthusiasm	before	22,68	7,24 ± 1,97		
	after		9,17 ± 1,08	0,0008	2,00 ± 0,95
sense of stress	before	40,01	4,48 ± 2,78		
	after		2,09 ± 1,72	0,007	2,36 ± 1,57
optimism	before	23,92	7,81 ± 2,31		
	after		9,39 ± 1,07	0,01	1,54 ± 1,17
connected-ness	before	25,90	7,37 ± 2,36		
	after		9,33 ± 1,12	0,002	2,00 ± 1,12
energy level	before	29,27	6,79 ± 2,14		
	after		8,9 ± 1,42	0,001	2,00 ± 0,99
mood	before	21,96	7,22 ± 2,02		
	after		9,29 ± 1,08	0,0007	2,00 ± 0,97

muscle relaxation	before	29,62	7,18 ± 3,39		
	after		8,81 ± 2,01	0,04	1,72 ± 1,72
breathing awareness	before	27,24	6,74 ± 2,56		
	after		8,91 ± 2,07	0,001	2,09 ± 1,01
the ability to laugh for no reason	before	21,80	7,44 ± 2,11		
	after		9,04 ± 1,52	0,001	1,72 ± 0,90

Table 4 the average change of well-being of volunteers who take medications (N = 11). It can be seen that stand out changes of stress feeling (40,01%), the level of energy (29.27%), and a muscle relaxation which has changed for 29.62%. All parameters were after exercise also statistically significant (p <0.0001).

Figure 4: Average values of well-being changes before and after laughter yoga exercise of volunteers who take medications (N =11).

Figure 4 shows the average values of well-being changes before and after laughter yoga exercise of volunteers who take medications (N =11). Excitement has increased by 22.68%, feeling the stress by 40.01%, optimism rose up to 23.92%. Volunteers after exercise also had a better sense of connectedness, namely 25.90%. Energy level has increased by 29.27%, while the mood by 21.96%. Volunteers have a sense of greater muscle relaxation, namely 29.62%. Awareness of breath after exercise rose up to 27.24% and the ability to laugh up to 21.80%.

Figure 5: Average values of well-being changes before and after laughter yoga exercise for all volunteers (N = 52).
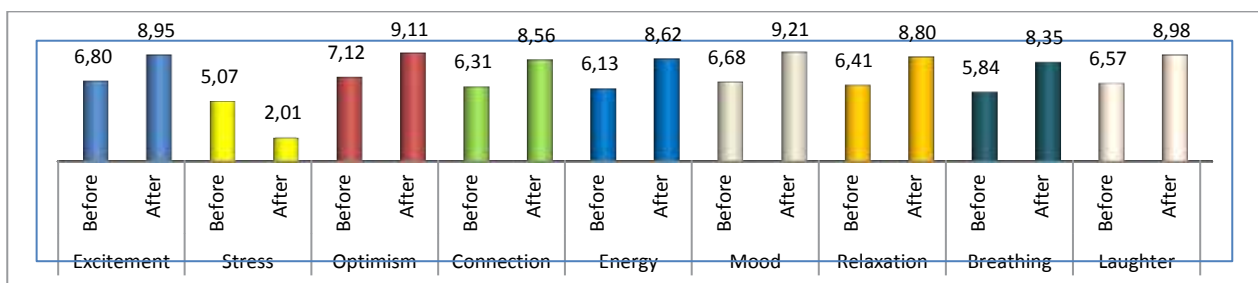

It can be seen that excitement was raised up to 31.67%, the feeling of stress decreased to 60.32%, sense of optimism increased for 28.06%, also the feeling of connectedness for 35.54%. After a workout raise the level of energy for 40.60% and 37.87% for mood. Volunteers had a greater sense of relaxation of muscles, namely 37.16%. From figure 5 it can also be seen that the volunteers become more aware of breathing, by 42.96%, and

that they can better laugh without reason (36.63%).

Figure 6: Average values of the differences in well-being changes before and after laughter yoga exercise for all volunteers (N = 52) expressed in percentages.
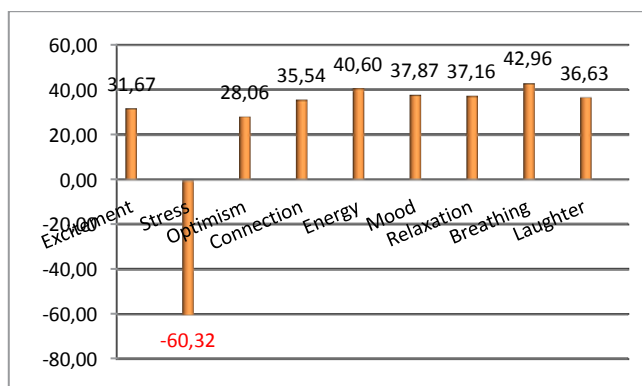
From figure 6 it can be seen that most changed the feeling of stress, which fell by 60.32%, also stand out the feeling of awareness of breathing, which grew 42.96%, and the feeling of energy after a workout rise, namely 40.60%. This is followed by other parameters. It is interesting that the volunteers before exercise did not have as great ability to laugh without reason, as they had after exercise (it rose up to 36.63%).

DISCUSSION

In the study we were interested to find out how Laughter yoga impact on blood pressure and well-being by participants who take some medications and how by those who do not take them. For that reason we performed blood pressure measurements on the brachial artery before and after exercise. We also included non-standardized numerical nine-stage questionnaire about well-being. With it volunteers evaluated: enthusiasm, sense of stress, optimism, connectedness, energy levels, mood, muscle relaxation, breathing awareness, the ability to laugh for no reason, before and after exercise on a scale 1 to 10. Number 1 represented at least and number 10 represented the most.

In our study, we found that systolic blood pressure after exercise of laughter yoga by all participants, on average, decreased by 10.44 mmHg and diastolic by 5.15 mmHg. Both parameters were after exercise also statistically significant (p

<0.0001). At the same time in the study volunteers were separated into those who take medications and those who do not take them. We found that the systolic blood pressure in those who take medications decreased from 133.15 mmHg to 120 mmHg (9.39%, p<0.05). On the other hand diastolic blood pressure also decreased from 87.75 mmHg to 81.42 mmHg (7.21%, p<0.05). For those who take the medications we observed on existing small sample reduction of systolic blood pressure on average by 2.7% (p>0.05), and diastolic by 1.4% (p>0.05).

Research has shown that laughter yoga has statistically significant effect on lowering blood pressure in those volunteers who do not take medicines (p<0.05). For those who take them, reduced blood pressure was not statistically significant (p>0.05). Based on these results we should not make any conclusion by volunteers who take medicines. It should be carefully studied, which medications they take and if they affects blood pressure. Nevertheless, it can be observed that the blood pressure after laughter yoga exercise decreased.

Results of the non-standardized numerical nine-stage questionnaire about well-being showed that all studied parameters have been statistically significant different. The maximum mean that we noticed was estimated on the issue of stress, which decreased by 60.32%. Extremely important is the fact that the volunteers after exercise of laughter become more aware of breathing, at an average of 42.96% - some have even stated that they feel easier to breathe. High score has also energy, since after a workout of laughter, its level rose on average by 40.54%. Despite the relatively high average change was slightly lower result in a sense of optimism, which is an average increase of 28.06%. It is important that the volunteers had the sense of connectedness, regardless of the fact that they did not know before exercise. From this follows that such type of exercise relatively quickly weaves new acquaintances and connects people - perhaps even creates new friendships.

Laughter for no reason in our society is not known and is a relatively new method, which some accepted, others not. In the performed research, we found that the volunteers after exercise

of laughter could easier laugh for no reason, namely for 36.63%. All observed values were statistically significant (p <0.05). We noticed the differences between the effects on those who take medications and those who did not. By those who did not take medications these changes were being much higher than by those who take medications. This changes were also statistically significant (p<0.05).

Statistically, we demonstrated that one-hour laughter yoga once a week has statistically significant impact on the enthusiasm, optimism, connectedness, energy levels, mood, muscle relaxation, breathing awareness and the ability to laugh for no reason. Irrespective of this, we can also conclude that in our study the impact of laughter on the population with medications was by the evaluation of well-being slightly lower. To comment this fact more specifically **this medications should be carefully studied**. Now we can only assume that these volunteers feel a little worse and that specific medications may affect their well-being and possibly also the result.

In any case, it is necessary for people who are in therapy with medications to do further analysis, to deepen parameters and find out the effects of drugs and then on the basis of accurate statistical analysis derive conclusions.

CONCLUSION

Based on the performed research we can conclude that laughter yoga is an effective method to improve the well-being and that regular exercise can influence the improvement of blood pressure. We have also seen that people after exercise were much closer, which means that they are easier to contact the other. This is particularly important for building and maintaining social networks. People also immediately feel better, they had a sense of optimism, new energy, and above all they felt stress reduction. Nevertheless, the question arises how to optimally organize laughter yoga at the national level, how to involve as many people as possible and how should this practice acquired its promotion on Social and Health level for the population and for a whole system.

Notes

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EFFECTIVENESS OF LAUGHTER THERAPY ON BLOOD PRESSURE AMONG PATIENTS WITH HYPERTENSION

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ABSTRACT

Objective: Hypertension is a major non-communicable disease prevailing globally. This study was conducted to determine the effectiveness of laughter therapy on blood pressure among patients with hypertension at a selected hospital, in Kancheepuram District.

Methods: A quantitative approach of pre-experimental one group pre- and post-test design was chosen for this study. A total of 50 samples were included in the study using purposive sampling technique. Pre-test was done using the structured instrument, and laughter therapy was implemented following which post-test was done for all the study group participants. Both descriptive and inferential statistics were used for analysis.

Results: The distribution of demographic variables depicted that each 17 (34%) study participants were aged from 39-42 to 43-45 years, respectively. On the count of gender, male and female study participants were equal in numbers that is each 25 (50%). The distribution of level of blood pressure in pre- and post-test disclosed that all the 50 (100%) study group participants had Stage I systolic and diastolic hypertension in the pre- test whereas in post-test 45 (90%), had pre-hypertension systolic and diastolic, only 5 (10%) had Stage I systolic and diastolic hypertension. There was a statistically significant difference between pre- and post-test systolic and diastolic blood pressure within study group participants at level $p<0.001$.

Conclusion: This study findings implied that laughter therapy was effective to sustain the blood pressure within the optimal level among patients with hypertension.

Keywords: Hypertension, Laughter therapy, Blood pressure.

INTRODUCTION

The human race has one really effective weapon, and that is laughter.

- Mark Twain

Hypertension is an important medical and public health issue. It exists worldwide at epidemic rates affecting an estimated 1 billion people. Worldwide, raised blood pressure is estimated to cause 7.5 million deaths, about 12.8% of the total of all deaths WHO [1]. The prevalence of hypertension in Indians is 25% in urban and 10% in the rural population. According to estimates, there are nearly 31.5 million hypertensive in rural and 34 million in urban populations. Projections show that by 2030, an additional 27 million people could have hypertension. Hypertension is directly responsible for 57% of stroke deaths and 24% of coronary artery disease deaths in India according to Bhushan *et al.* [2].

Laughter is a natural part of life and is the best medicine. Laughter is a powerful antidote to stress, pain, and conflict. Laughter lightens the burden, inspires hopes, connects someone to others, and keeps the individual, focused and alert. With so much power to heal and renew, the ability to laugh easily and frequently is a tremendous resource for surmounting problems, enhancing relationships, and supporting both physical and emotional health. Laughter helps to control blood pressure by reducing the release of stress-related hormones and bring relaxation. As far as lowering the blood pressure, studies showed that people who laugh heartily on a regular basis have lower standing blood pressure than the average person. Hence, a study was conducted to identify the effectiveness of laughter therapy on blood pressure among patients with hypertension at a selected hospital in Kancheepuram District. The objectives of the study were the identification of the effectiveness of laughter therapy on blood pressure among patient with hypertension and association of demographic, health and clinical variables with the level of blood pressure in the post-test among patients with hypertension.

METHODS

A quantitative research approach of pre-experimental one group pre- and post-test design was used for this study. Ethical Committee approval was obtained from the institutional ethical committee. The hypothesis H1: "There is a significant difference in the systolic and diastolic blood pressure between pre and post test among patients with hypertension who were subjected to laughter therapy."

A total of 50 study participants were recruited for the study using purposive sampling technique. The inclusion criteria were patients of both male and female diagnosed to have primary hypertension with the blood pressure ranging from 140-180 to 90-110 mm of Hg, aged between 35 and 45 years and who were able to talk and understand Tamil or English.

Patients with mental illness, either visual or hearing impairment, disorientation, unable to follow the instructions, diagnosed to have Ischemic heart disease, aneurysm, cerebrovascular accident and tuberculosis, and with a history of recent pelvic or abdominal surgery, who experience acute orthopedic distress such as rib or shoulder fracture, were excluded from the study.

The structured instrument was developed by the investigator included Part I-IV.

Part-I was demographic variables which included age, sex, marital status, religion, educational status, occupational status, and income.

Part-II was health variables which encompassed body height, weight, BMI, sleeping pattern, dietary pattern, history of smoking, history of alcoholism, and history of chewing tobacco.

Part-III was clinical variables that consisted of comorbidity, time since diagnosis, use of anti-hypertensive medication, and duration of treatment.

Part-IV was assessment and classification of blood pressure as shown in Table 1.

Data collection procedure

The data were collected using structured instruments Part I-IV. Pre-test was performed for all study participants. During the pre-test, demographic, health variables were collected by interview method, except height and weight by anthropometric measurements and clinical variables were obtained from the clinical records. The blood pressure was measured using calibrated sphygmomanometer and stethoscope. The design was divided into pre-test on day 1 and practice of laughter therapy for 2 weeks from day 2 to 15 which was taught for the patients with hypertension to maintain the blood pressure within normal limit. Post-test was done on day 15 for all study participants. Teaching was done by lecture cum demonstration method with audio-visual aids which included general information about hypertension and demonstration of laughter therapy after pre-test on day 1. Each bout of laughter should last for 30-40 seconds, followed by relaxation. It consists of 10 steps and two deep breaths are encouraged after every laughter exercise. This was practiced by the study participants along with routine care which was only antihypertensive medications.

Total duration: 20 minutes.

Initiation: Bend forward swing your hands in front of your body, inhale and exhale fully (2 minutes).
- Step 1: Deep breathing with inhalation through the nose and prolonged exhalation (3 times). (1 minute 30 seconds)
- Step 2: Hearty laughter - Laughter by raising both the arms in the sky with the head tilted a little backward. Feel as if laughter is coming right from your heart while laughing chant "Aaa" (1 minute 30 seconds)
- Step 3: Hearty laughter - Laughter by raising both the arms in the sky with the head tilted a little backward. Feel as if laughter is coming right from your heart while laughing chant "Eee" (1 minute 30 seconds)
- Step 4: Hearty laughter - Laughter by raising both the arms in the sky with the head tilted a little backward. Feel as if laughter is coming right from your heart while laughing chant "Uuu" (1 minute 30 seconds)
- Step 5: Silent laughter (with mouth closed) - Laughter with closed mouth and a humming sound, while humming keep on moving in the group and shaking hands with different people. (1 minute 30 seconds)
- Step 6: Greeting laughter - Joining both the hands and greeting in Indian style (namaste) or shaking hands in Western style with at least 4-5 people in the group. (1 minute 30 seconds)
- Step 7: Appreciation laughter - Join your pointing finger with the thumb to make a small circle while making gestures as if you are appreciating your group members and laughing simultaneously. (1 minute 30 seconds)
- Step 8: Swinging laughter - Stand in a circle and move toward the center by chanting Aee...Eeee...Oooo...Uuuu... (1 minute 30 seconds)
- Step 9: Lion laughter: Extend the tongue fully with eyes wide open and hands stretched out like the claws of lion and laugh from tummy. (1 minute 30 seconds)
- Step 10: Argument laughter - Laugh by pointing fingers at different group members as if arguing. (1 minute 30 seconds).

Relaxation: Sitting calmly. (3 minutes).

Table 1: Classification of blood pressure

Classification of blood pressure	Systolic (mm of Hg)	Diastolic (mm of Hg)
Normal	<120	And <80
Prehypertension	120–139	Or 80–89
Stage 1 hypertension	140–159	Or 90–99
Stage 2 hypertension	≥160	Or ≥100

*National institute of health, seventh report of the national committee (2008), AHA.[3] AHA: American Heart Association

Table 2: Distribution of demographic variables among study group (n=50)

S. No.	Demographic variables	n (%)
1	Age (years)	
	35–38	16 (32)
	39–42	17 (34)
	43–45	17 (34)
2	Gender	
	Male	25 (50)
	Female	25 (50)
3	Marital status	
	Unmarried	2 (4)
	Married	35 (70)
	Widow/widower	8 (16)
	Separated	5 (10)
4	Religion	
	Hindu	39 (78)
	Muslim	6 (12)
	Christian	5 (10)
5	Educational status	
	Primary school	14 (28)
	High school	12 (24)
	Higher secondary school	10 (20)
	Graduate	7 (14)
	Post-graduate	5 (10)
	Vocational training	2 (4)
6	Occupational status	
	Labor	12 (24)
	Former	17 (34)
	Government employee	5 (10)
	Private employee	14 (28)
	Business	2 (4)
7	Income per month (Rs.)	
	<5000/-	17 (34)
	5001–7500/-	12 (24)
	>7500/-	21 (42)

Statistical analysis

The data were analyzed by the statistical package for social sciences version 16. Both descriptive and inferential statistics were used for analysis. The paired t-test was computed to test the differences in the blood pressure within study group participants between pre- and post-test. The hypothesis H1: "There is a significant difference in the systolic and diastolic blood pressure between pre and post-test among patients with hypertension who were subjected to laughter therapy" was tested in this study.

RESULTS

TThe distribution of demographic variables as per Table 2 revealed that each 17 (34%) study participants were aged from 39-42 to 43-45 years, respectively. On the count of gender, male and female study participants were equal in numbers that is each 25 (50%). With regard to marital status, most of the 35 (70%) study group participants are married 8 (16%) were widow/widower, 5 (10%) were separated, and only 2 (4%) were unmarried. The majority of 39 (78%) study participant were Hindus, 6 (12%) were Muslims and only 5 (10%) were Christians. On the account of educational status 14 (28%),
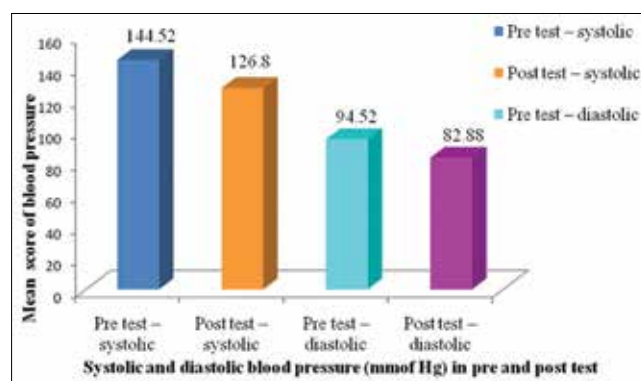
Table 3: Distribution of health variables among study group (n=50)

S. No.	Health variables	n (%)
1	Height (cm)	
	140–150	8 (16)
	151–160	17 (34)
	>160	25 (50)
2	Body weight (kg)	
	<45	5 (10)
	45.1–55	15 (30)
	55.1–65	19 (38)
	>65	11 (22)
3	Body mass index	
	18.5–24.9	18 (36)
	25–24.9	26 (52)
	30–34.9	4 (8)
	35–39.9	2 (4)
	>40	-
4	Sleeping pattern (h/day)	
	>6	7 (14)
	6–8	22 (44)
	>8	21 (42)
5	Dietary pattern	
	Vegetarian	14 (28)
	Nonvegetarian	36 (72)
6	History of smoking	
	Never	25 (50)
	Occasional	8 (16)
	Always	17 (34)
7	History of alcoholism	
	Never	25 (50)
	Occasional	13 (26)
	Always	12 (24)
8	History of chewing tobacco	
	Never	29 (58)
	Occasional	15 (30)
	Always	6 (12)

Table 4: Distribution of clinical variables among study group (n=50)

S. No.	Clinical variables	n (%)
1	Comorbidity	
	Yes	31 (62)
	No	19 (38)
2	Comorbid illness	
	No comorbid illness	19 (38)
	Diabetes mellitus	12 (24)
	Hypothyroidism	6 (12)
	Bronchial asthma	6 (12)
	Diabetes mellitus with bronchial asthma	4 (8)
	Diabetes mellitus with hypothyroidism	3 (6)
3	Time since diagnosis (years)	
	<1	14 (28)
	1–5	24 (48)
	>5	12 (24)
4	Use of anti-hypertensive medication	
	Yes	50 (100)
	No	-
5	Duration of treatment (years)	
	Since 1	14 (28)
	1–5	24 (48)
	>5	12 (24)

12 (24%), 10 (20%), and 7 (14%) study participants had primary school, high school, higher secondary school, and graduate level of education, respectively. The distribution of occupational status revealed that 17 (34%), 14 (28%), and 12 (24%) study participants were formers, private employees, and labors, respectively. Out of 50 study participants, 21 (42%) had the income of Rs. >7500/- month,

Fig. 1: Comparison of pre- and post-test mean blood pressure among study group

whereas 17 (34%) and 12 (24%) had Rs. < 5000 and Rs. 5001-7500 per month, respectively.

The distribution of health variables as illustrated in Table 3 among study group participants disclosed that 8 (16%), 17 (34%), and 25 (50%) study participants had the height with the range of 140-150, 151-160, and more than 160 cms, respectively. With regard to the body weight 19 (38%), study group participants were between 55.1 and 65 kg, whereas 15(30%) were between 45.1 and 55 kg. However, 11 (22%) study participants had the body weight of more than 65 kg and only 5(10%) had >45 kg. On calculation of body mass index, 26(52%), 18(36%), 4(8%), and 2 (4%) study group participants had between 25-29.9, 18.5-24.9, 30-34.9, and 35-39.9, respectively. On the account of sleeping pattern (hours/day) 22 (44%), 21 (42%), and 7 (14%) had 6-8 more than 8 and <6 hours/day. Most of the 36 (72%) study participants were non-vegetarians and only 14 (28%) were vegetarians. With respect to the history of smoking 17 (34%) were used to smoke "always" and 8(16%) used it "occasionally." Most of the 25 (50%) study group participants "never" used to smoke and drink alcohol. The distribution of history of alcoholism unveiled that 13 (26%) and 12 (24%) study participants used the alcohol "always" and "occasional," respectively. Out of 50 (100%) study group participants, 29 (58%) did not have the history of chewing tobacco whereas 15 (30%) and 6 (12%) used it "occasionally" and "always."

The distribution of clinical variables as shown in Table 4 disclosed that 31 (62%) study group participants had comorbid illness, among which 12 (24%), 6 (12%), 6 (12%), 4 (8%), and 3 (6%) had diabetes mellitus, hypothyroidism bronchial asthma, diabetes mellitus with bronchial asthma, and diabetes mellitus with hypothyroidism, respectively.

Out of 50 (100%) study group participants 24 (48%), 14 (28%), and 12 (24%) were diagnosed to have hypertension since 1-5 years, <1 year and more than 5 years, respectively. All the 50 (100%) study group participants were on treatment, among these 24 (48%), 14 (28%), and 12 (24%) were on treatment for 1-5 years, for 1 year and more than 5 years, respectively.

The distribution of level of blood pressure in pre- and post-test as mentioned in Table 5 disclosed that all the 50 (100%) study group participants had Stage I systolic and diastolic hypertension in the pre-test whereas in post test 45 (90%) had pre-hypertension systolic and diastolic ,only 5 (10%) had Stage I systolic and diastolic hypertension.

The comparison of pre- and post-test blood pressure within study group as shown in Table 6 and Fig. 1 disclosed that there was a statistically significant difference between pre- and post-test systolic and diastolic blood pressure within study group participants at level $p < 0.001$.

DISCUSSION

The distribution of level of blood pressure in pre- and post-test unveiled that all the 50 (100%) study group participants had Stage-I systolic

Table 5: Distribution of level of blood pressure in pre- and post-test among study group (n=50)

S. No.	Level of blood pressure (mm of Hg)	Study group			
		Pretest, n (%)		Post-test, n (%)	
		Systolic	Diastolic	Systolic	Diastolic
1	Normal	-	-	-	-
2	Prehypertension	-	-	45 (90)	45 (90)
3	Stage-I hypertension	50 (100)	50 (100)	5 (10)	5 (10)
4	Stage-II hypertension	-	-	-	-

Table 6: Comparison of pre- and post-test blood pressure within study group (n=50)

S. No.	Observation (mm of Hg)	Study group	
		Mean±SD	Paired t and p
1	Pre-test - systolic	144.52±5.37	17.785***
2	Post-test - systolic	126.80±5.17	p=0.000 (SS)
3	Pre-test - diastolic	94.52±2.93	17.956***
			p=0.000 (SS)
4	Post-test - diastolic	82.88±3.13	

The comparison of pre- and post-test blood pressure within study group disclosed that there was a statistically significant difference between pre- and post-test systolic and diastolic blood pressure within study group participants at $p<0.001$. ***Significant at level $p<0.001$. SS: Statistically significant, SD: Standard deviation

and diastolic hypertension, whereas in the post-test 45 (90%) had pre-hypertension systolic and diastolic blood pressure. The paired "t" value on a comparison of pre and post-test systolic and diastolic blood pressure within study group participants were 17.785 and 17.956 respectively which revealed the statistically significant difference at level $p<0.001$.

These study findings are further supported by another study conducted by Angeline and Madhavi [4]. The findings disclosed that the practice of laughter therapy for 20-30 minutes (one session per day for 5 days) by the patients with hypertension reduced the blood pressure to 125.15/82.25 mm of Hg, which was statistically significant at $p<0.05$.

These findings are substantiated by the study conducted by Nagoor and Dudekula which unveiled that laughter therapy reduced the systolic and diastolic blood pressure and there was a statistically significant difference between pre- and post-test at $p<0.01$ [5]. Another study carried out by Jalali *et al.* to evaluate the effect of laughter therapy on blood pressure among patients with hypertension disclosed that there was a statistically significant difference between pre- and post-test on blood pressure at $p<0.05$ [6].

All the above evidences proved that laughter therapy is very effective to reduce the blood pressure among patients with hypertension.

Non-pharmacological interventions are proved to be effective to maintain the blood pressure within normal limit. A study conducted by Sujatha and Judie on the effectiveness of a 12-week yoga program on physiopsychological parameters in patients with hypertension revealed that there was a significant reduction of blood pressure ($p<0.001$). This signifies the importance of nonpharmacological therapy to maintain the blood pressure within normal limit among patients with hypertension [7].

Hence H1 "There is a significant difference in the systolic and diastolic blood pressure between pre and post test among patients with hypertension who were subjected to laughter therpy" is accepted.

Hypertension and its treatment increase the economic burden (EB) and psychological burden which is evident from the study conducted by Ramanna *et al*. The result revealed that the cost of therapy was higher for DM+HTN and DM. The percentage of expenditure was higher in low-income group and burden of therapy was directly proportional to the number of tablets, poor educational and occupational status; and inversely proportional to income [8]. These study findings are substantiated by another study done by Nachiya *et al.* revealed that direct and indirect nonmedical costs have incurred high when compared with the other costs of prescription involved in the treatment of hypertension in rural inpatients at tertiary care teaching hospital. The annual average total direct (medical and non-medical) costs per patient and total cost of illness were ₹1,417,253.8 and ₹27,993,470.0, respectively [9].

It is evident from the above findings that prevention and control of hypertension is vital to reduce the cost of treatment and EB. This is further supported by the study conducted by Suhadi *et al*. which disclosed that the total therapy expenditure was likely to be influenced by hypertension comorbidity. The findings denoted that preventing hypertension comorbidity has the benefit to reduce total therapy expenditure. Thus, it proved that prevention is better than cure which has to be emphasized among people who is at risk to hypertension. Laughter therapy is very simple to practice by all age group of people which requires only attitude to adhere to it that will prevent hypertension [10].

CONCLUSION

Laughter therapy is an effective intervention to reduce the blood pressure among patients with hypertension. Since hypertension is a chronic disease, the regular practice of laughter therapy helps the patients with hypertension to sustain the blood pressure within normal limit throughout their survivorship. This will reduce the complications related to hypertension and cost of health care.

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ORIGINAL ARTICLE

The effect of laughter therapy on the quality of life of nursing home residents

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Aims and objectives. To evaluate the effect of Laughter therapy on the quality of life of nursing home residents.

Background. By improving the quality of life of residents living in nursing homes and allowing them to have a healthier existence, their lives can be extended. Therefore, interventions impacting the quality of life of older adults are of critical importance.

Design. Quasi-experimental design.

Method. The study was conducted between 2 March – 25 May 2015. The experimental group was composed of 32 nursing home residents from one nursing home, while the control group consisted of 33 nursing home residents from another nursing home in the capital city of Turkey. Laughter therapy was applied with nursing home residents of the experimental group two days per week (21 sessions in total). A socio-demographic form and the Short-Form Health Survey (SF-36) were used for data collection.

Results. After the laughter therapy intervention, general and subscales (physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional and spiritual health) quality-of-life scores of residents in the experimental group significantly increased in comparison with the pretest.

Conclusion. Laughter therapy improved the quality of life of nursing home residents. Therefore, nursing home management should integrate laughter therapy into health care and laughter therapy should be provided as a routine nursing intervention.

Relevance to clinical practice. The results indicated that the laughter therapy programme had a positive effect on the quality of life of nursing home residents. Nurses can use laughter therapy as an intervention to improve quality of life of nursing home residents.

What does this paper contribute to the wider global clinical community

- It is known that the older adult population is increasing worldwide. For this reason, the number of residents living in nursing homes is also increasing. Previous research has determined that the quality of life of older adults who live in nursing homes is low.
- Interventions are needed to improve the quality of life of older adults.
- Our results indicated that laughter therapy increased the quality of life of nursing home residents.
- Nurses can use laughter therapy as an intervention to improve the quality of life of nursing home residents. Nursing administration can make arrangements to use laughter therapy in nursing homes and laughter therapy also can be integrated into nursing education.

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Introduction

The World Health Organization (WHO) has stated that the population is increasingly ageing worldwide (WHO 2012). Two per cent of the total population was over the age of 60 in 2015; this rate is expected to increase by 3·2% every year (United Nations 2015). On the other hand, in Turkey, while the percentage of those aged 60 years or older in the total population was 8% in 2014, according to population projections, it estimated that this rate will rise to 10·2% in 2023 and 20·8% in 2050 (Türkiye İstatistik Kurumu 2014). A rapid increase in the aged population is related to various problems for older adults such as economic, environmental, social, health, housing and care issues (WHO 2015). In addition, lower quality of life among older adults is a major concern, because people tend to develop lower quality of life with age (Rejeski & Mihalko 2001). Moreover, research has determined that older adults who live in nursing homes experience more loneliness and have lower quality of life than those who live with their families (Drageset *et al.* 2008, Nikmat *et al.* 2013, Hedayati *et al.* 2014).

Background

Quality of life

Quality of life is an individual's perception of his/her life position in terms of aims, expectations and standards in their culture and values system (WHOQOL G 1995). Quality of life is a broad and complex concept influenced by physical, spiritual and social situations of individuals, personal faith, as well as relationship with the environment (WHO 1998). For this reason, it cannot be observed directly but can be measured by means of factors affecting it (Hanestad 1990). In quality-of-life research conducted with older adults, some individual factors such as age (Molzahn *et al.* 2010, Thompson *et al.* 2012), gender (Molzahn *et al.* 2010, Milte *et al.* 2015), education status and economic status (Baernholdt *et al.* 2012, Bielderman *et al.* 2015) had an effect on the quality of life of older adults. In addition, social factors such as family relationships (Langlois *et al.* 2013), social relations (Bilotta *et al.* 2012), loneliness (Theeke *et al.* 2012) and living alone (Bilotta *et al.* 2012), as well as living in a nursing home (Bilotta *et al.* 2011), health condition (Molzahn *et al.* 2010, Renaud *et al.* 2010, Baernholdt *et al.* 2012, Simpson *et al.* 2015), culture (Molzahn *et al.* 2011), physical activity (de Vries *et al.* 2012), free time for physical activity (Thompson *et al.* 2012, Langlois *et al.* 2013) and smoking (Thompson *et al.* 2012) were determined to be important variables affecting quality of life of older adults. Good quality of life is a necessity rather than a luxury for healthy ageing in all countries. Research has shown social support (Årestedt *et al.* 2013), better financial conditions and good relations with relatives (Webb *et al.* 2011) to be associated with increased quality of life among older adults. In addition, recent studies have indicated that initiatives such as pilates (De Siqueira Rodrigues *et al.* 2010), Tai Chi (Taylor-Piliae *et al.* 2014), yoga (Gonçalves *et al.* 2011), aerobic walking, exercise therapy (Awick *et al.* 2015), music, prayer, meditation, laughter and humour (Lindquist *et al.* 2013) can be used as interventions to improve the quality of life of older adults.

Laughter therapy

Laughter universally provides observable physiological advantages and has social functions (Pearce 2004). Laughter is primarily examined within three theories: superiority theory, incongruity theory and relief theory.

Superiority theory assumes that we reflect on our superiority by laughing at other people's unluckiness. Aristotle, Plato and Hobbes indicated that laughter involves finding and mocking imperfections in relationships between people (Morreall 1982). This theory was reformulated by Gruner in the 21st century, such that laughter requires a winner, a loser, incoherence in the present situation and an element of surprise (Morreall 1983, Gruner 2000, Mulder & Nijholt 2002). According to incongruity theory, laughter is a reaction to the violation of expectations. In incongruity theory, nonsense, unexpected events, discordant stress or irrelevant events are the basis for laughter. However, although this situation is necessary for laughter, it is not enough on its own (Hargie 1997, Kulka 2007). John Morreall (2011) describes the fundamental meaning of 'incongruity' as employed within incongruity theories as that which occurs when 'something or event we perceive or think about violates our normal mental patterns and normal expectations'. According to relief theory, laughter is generally accepted to involve nervous tension (Morreall 1983). According to Freud, psychic energy arises to overcome pent-up feelings about taboo topics such as death or sex. Moreover, laughter results not only when energy is released but also when one thinks about a taboo topic (Freud 1995).

Laughter therapy is an exercise composed of unconditional laughing exercises with yoga breathing techniques. It is a therapeutic method created by Dr Madan Kataria. Laughter therapy involves adding laughter exercises to yoga. During a session, laughter is feigned through physical

exercises, by providing contact with other members of the group and by playing children's games. Often, feigned laughter quickly turns into contagious laughter, because the human body cannot distinguish between fake laughter and real laughter (Kataria 2011). Humour and laughter are tools frequently used by healthcare personnel in the rehabilitation of disease related to stress and lifestyle and for the maintenance and improvement of health (Seaward 1992).

Laughter therapy has been used with different groups such as patients with type 2 diabetes (Hayashi *et al.* 2007), women receiving in vitro fertilisation (Chung 2011), breast cancer survivors (Cho & Oh 2011) and patients with atopic eczema (Kimata 2007). However, studies about the use of laughter therapy with older adults are limited and have not been conducted in Turkey. Thus, this is the first study conducted using laughter therapy in Turkey.

Methods

Design

For this study, a quasi-experimental design with pretest/posttest control group was used.

Sample and data collection

Sample

The study population comprised residents from two different private nursing homes. These nursing homes had the same organisational characteristics, management, social services care and care processes. G*Power was used to calculate the sample size. The estimated sample size was measured by predicting an average change in scores after therapy (experimental group before therapy 66.00 ± 11.84, after therapy 79.94 ± 12.03; control group before therapy 67.19 ± 13.54, after therapy 66.19 ± 11.17) (Cho & Oh 2011). It was calculated that 90% power could be achieved with a 95% confidence interval when 62 subjects (31 in each of the experimental and control groups) were selected. Exclusion criteria for participation were having severe hearing or perceptual deficits that impair communication, advance dementia, Alzheimer's disease, depression, uncontrollable diabetes, hypertensive disease and a surgical operation with risk of bleeding. Inclusion criteria were over age 50, maintaining independence in daily activities and agreeing to take part in the study. The study was carried out with 70 volunteer residents who met criteria for inclusion. Thirty-five residents from one nursing home formed the experimental group, while the control group was composed

of 35 residents from another nursing home. However, the experimental group was reduced to 32 residents because of the death of a participant and two residents who received treatment in an intensive care unit. In addition, the control group was reduced to 33 residents due to the death of one participant and another leaving the nursing home.

Data collection

The data were collected between 2 March – 25 May 2015. The socio-demographic form and the Medical Outcomes Study (MOS) 36-item Short-Form Health Survey (SF-36) were used for data collection.

Measures

Socio-demographic form

The socio-demographic form was created based on the literature and collected demographic information (gender, age, marital status, educational status, occupation, social security status, income status) (T.R. Prime Ministry State Planning Organization, 2007, Aksoydan 2009, Esendemir 2013, Hosseinpoor *et al.* 2013).

SF-36 health survey

The SF-36 Health Survey was developed to measure quality of life related to health. Developed in 1992 by Ware, the SF-36 is a self-assessment scale (Ware & Sherbourne 1992) that comprises 36 questions within two domains, includes a physical component score and mental component score, and eight subscales including physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional and spiritual health (Ware & Gandek 1998). Subscales are scored between 0–100 points, with 100 representing good health condition and 0 representing bad health condition (Burholt & Nash 2011). The scale can be used as a measure of quality of life both before and after a treatment intervention.

The validity and reliability of the Turkish version of the SF-36 has been studied in many countries and was confirmed for a patient group with rheumatic illness by Koçyiğit *et al.* (1999). Internal consistency measured using the Cronbach's alpha coefficient for each subscale was found to be within $0.73–0.76$ (Koçyiğit *et al.* 1999). Among cancer patients, a test–retest internal consistency Cronbach's alpha value of eight subscales was found (Pinar 2005). Yakar and Pinar (2013) re-examined the validity and reliability of the Turkish SF-36 and found a Cronbach's alpha value of 0.90 for the physical functioning subscale and 0.87 for the mental functioning subscale.

Pilot study

A small pilot study was performed to assess the content validity of the data collection forms and to evaluate the efficacy of the intervention at a private nursing home different from that of the study group. The researcher informed all participants about the aim of the study, and the pilot study was conducted with 10 nursing home residents who voluntarily agreed to take part in the research. Before the intervention, the socio-demographic form and SF-36 Health Survey were applied; each took 15 minutes to complete on average. Four sessions of laughter therapy were applied on 28 January and 29 January 2015. Following the therapy, the SF-36 Health Survey was administered again as a post-test. No changes were made to the study protocol as a result of the pilot study.

Laughter therapy programme

The researcher participated in a 'Laughter Yoga' course on 21 September 2014 and received a certificate for completion of the course. The laughter therapy programme was planned by the researcher. The programme comprised 21 sessions twice weekly. Each session took 30–45 minutes.

Sessions consisted of various combinations of the following:

- warm-up exercises (stretching of facial and body muscles) for 10 minutes
- hand clapping using the 1–2, 1–2–3, Ho–Ho, Ha–Ha–Ha rhythm
- deep breathing exercises
- laughter exercises (cell phone, admiration, hot soup laughter, hug laughter, bird laughter, dialogue with nonsense, speech exercises, laugh at one's own aches and pains exercises, milkshake laughter exercises, lion laughter, greeting laughter, argument laughter, bugi laughter techniques, brushing teeth and mouthwash exercises)
- watching a film (Patch Adams and Hababam Sınıfı)
- playing games (the first participant was asked to say her/his name, and then, the participant beside her/him was asked to share both her/his name and the name of the first participant; the children's game 'peekaboo')
- singing songs
- wishes (participants were asked to hold hands and make a wish and then to rejoice as if their wishes had come true after making a wish. It was observed that some older adults showed their happiness by smiling and others showed it by standing up)
- laughter meditation

When the sessions were completed, participation certificates were delivered to participants of the experimental and control groups for their attendance.

Data analysis

Means, standard deviations, frequencies, percentages, medians, minimums and maximums were the descriptive statistics calculated. Since the difference between the total scores of both the experimental and control group before and after laughter therapy showed normal distributions, these score differences were assessed by paired *t*-test. Mann–Whitney *U*-tests were used for some subscales (before laughter therapy: physical functioning, role functioning and emotional functioning; after laughter therapy: physical functioning, role functioning, emotional functioning, mental component score) that did not show a normal distribution. Independent two-sample *t*-tests were used for some subscales (before laughter therapy: bodily pain, general health, physical component score, mental health, social functioning, vitality, mental component score and total score; after laughter therapy: bodily pain, general health, physical component score, mental health, social functioning, vitality and total score) that showed a normal distribution. For all tests, $p < 0.05$ was the standard for statistical significance.

Ethical considerations

Hacettepe University Ethical Committee of Clinical Studies approved this study on 17 December 2014 (No. 16969557/18). Before the study began, all participants were informed about the study aim and procedures. Written informed consent was obtained from all participants.

Results

Socio-demographic characteristics of older adults who participated in the study are presented in Table 1. Half of the participants in the experimental group were women, and the other half were men, while the control group consisted of 15 women (45·5%) and 18 men (55·5%). Twenty-two (68·7%) residents in both the experimental and control groups were aged 60–79 years old. There were 16 widows (50%) in the experimental group and 15 widows (45·5%) in the control group. Most residents (*n* = 10, 31·3%) in the experimental group were high school graduates, while most (*n* = 16, 48·5%) participants in the control group were primary school graduates. For both the experimental and control groups, civil servant retirement funds were most common (*n* = 13, 40·6%; and *n* = 13, 39·4%; respectively). According to their own statements, 26 participants in the experimental group (90·6%) and 28 members of the control group (84·80%) had regular income.

Table 2 presents SF-36 scores before and after laughter therapy for the experimental and control groups. There was

Table 1 Descriptive characteristics of the study population

Characteristic	Experimental Group		Control Group	
	n	%	*n*	%
Gender				
Female	16	50·0	15	45·5
Male	16	50·0	18	55·5
Age				
50–59	3	9·4	6	18·2
60–69	13	40·6	9	27·3
70–79	9	28·1	13	39·4
80–89	7	21·9	5	15·2
Marital Status				
Single	2	6·30	7	21·2
Married	7	21·9	5	15·2
Widowed	16	50·0	15	45·5
Divorced	7	21·9	6	18·2
Education				
Illiterate	4	12·5	4	12·1
Literate	3	9·4	3	9·1
Primary school	5	15·6	16	48·5
Secondary school	4	12·5	4	12·1
High school	10	31·3	4	12·1
University	6	18·8	2	6·1
Occupational Status				
Sales and related	1	3·0	2	7·0
Casual worker	4	12·0	4	13·0
Professional	4	12·0	11	32·0
Civil servant	7	21·0	5	16·0
Unskilled worker	4	12·5	1	4·0
Unemployed	13	40·0	9	28·0
Social Security				
Social insurance institution	12	37·5	6	18·2
Green card	0	0·0	2	6·1
Self-employed institution	5	15·6	9	27·3
Retirement fund	13	40·6	13	39·4
No	2	6·3	3	9·1
Income Status				
Yes	29	90·6	28	84·80
No	3	9·4	5	15·20
Total	32	100·0	33	100·0

no significant difference (*p* = 0·892) between mean general quality-of-life scores for the experimental (89·32 ± 20·63) and control groups (90·06 ± 21·62). In addition, there was no significant difference between mean quality-of-life subscale scores of the experimental and control groups (*p* > 0·05). Therefore, before laughter therapy, quality-of-life scores of the experimental and control groups were similar. After laughter therapy, a statistically significant difference (*p* < 0·01) was found between mean general quality-of-life scores of the experimental group (125·18 ± 11·49) and control group (93·00 ± 20·78), respectively. Quality of life of the experimental group after

laughter therapy increased. After laughter therapy, a statistically significant difference was found between mean subscale scores for the experimental and control group (*p* < 0·05). All quality-of-life subscale scores of older adults in the experimental group increased after laughter therapy.

Discussion

Research evaluating the effect of laughter therapy on the quality of life of nursing home residents has been limited. In this study, the quality of life of nursing home residents increased after a laughter therapy intervention. Previous experimental and quasi-experimental studies have demonstrated that laughter therapy increases the quality of life and positive emotions of residents and that they feel better both physically and mentally after laughter therapy (Lebowitz 2002, Hirosaki *et al.* 2013, Ko & Hyun 2013, Ganz & Jacobs 2014, Cha & Hong 2015). Thus, findings of previous research are parallel to the findings of this study.

This study demonstrated a statistically significant difference between the physical functioning subscale scores of the experimental group before and after laughter therapy (Table 2). In a randomised controlled study by Keykhahoseinpoor *et al.* (2013), carried out with older adults with Parkinson's disease, a statistically significant difference in motor functions of older adults was found after a laughter therapy intervention. A Hatha Yoga programme, used with individuals aged 35–60 years old, positively affected the balance and elasticity of older adults (Galantino *et al.* 2004).

In this study, the experimental group's role-physical subscales scores were significantly different before and after the laughter therapy intervention (Table 2). Supekar *et al.* (2014) studied the role of laughter therapy clubs in increased social health and found significant differences between the role-physical subscale scores of the experimental and control groups. This result also supported the present research findings.

In this study, after laughter therapy, bodily pain subscale scores of residents were significantly different (Table 2). Tse *et al.* (2010) studied older adults in a nursing home and found that pain scores after a laughter therapy intervention decreased. In another study in which laughter therapy was applied, bodily pain of the experimental and control group showed statistically significant differences (Supekar *et al.* 2014), supporting the present study's results. Thus, it is possible that laughter therapy decreases nursing home residents' bodily pain through yoga exercises and regular exercise.

General health subscale scores of the experimental group were found to be significantly different after the laughter therapy intervention (Table 2). Ghodsbin *et al.* (2015)

Table 2 Short-Form Health Survey (SF-36) scores of the experimental and control groups before and after the laughter therapy intervention

SF-36 Scale	Experimental Group		Control Group		P value
	Pretest	Post-test	Pretest	Post-test	
Physical Functioning	21·63 ± 5·99	26·28 ± 3·97	21·76 ± 6·03	21·57 ± 5·31	0·000
Role Functioning	5·16 ± 1·68	7·62 ± 1·18	4·88 ± 1·57	5·09 ± 1·80	0·000
Bodily Pain	6·28 ± 2·75	10·18 ± 1·14	6·61 ± 2·24	7·60 ± 2·34	0·000
General Health	14·91 ± 3·56	18·18 ± 2·45	15·48 ± 3·76	14·93 ± 3·59	0·000
Physical Component Score	47·97 ± 10·69	62·28 ± 6·65	48·73 ± 10·87	49·21 ± 10·40	0·000
Mental Health	19·5 ± 6·04	25·40 ± 3·73	19·27 ± 5·65	17·9 ± 6·27	0·000
Emotional Functioning	3·84 ± 1·22	5·71 ± 0·728	3·88 ± 1·31	3·87 ± 1·36	0·000
Social Functioning	6·03 ± 2·20	9·12 ± 9·50	6·12 ± 1·40	6·66 ± 1·97	0·000
Vitality	12·00 ± 4·97	20·18 ± 3·93	12·06 ± 6·47	11·87 ± 6·04	0·000
Mental Component Score	41·38 ± 12·25	60·43 ± 7·22	41·33 ± 12·84	40·33 ± 13·36	0·000
General Score	89·34 ± 20·63	125·18 ± 11·49	90·06 ± 21·62	93·00 ± 20·78	0·000

evaluated the effect of laughter therapy on the general health of older adults and found that general health scores were significantly different after laughter therapy. Similarly, another study found a direct relationship between health status and humour, thus suggesting humour as a method to help older adults to stay healthy (Celso *et al.* 2003).

The spiritual health subscale of the SF-36 evaluates the calm, happy, relaxed, nervous and depressed moods of individuals. In this study, the spiritual health subscale of nursing home residents increased after the intervention. Lee and Eun (2011) assessed the relationships between sleeping, depression and pain on the quality of life of older adults living in long-term nursing homes. A significant effect of laughter therapy was found for depression. In studies of laughter therapy activities with patients with depressive symptoms, a decrease in depression and bad mood of older adults was seen after laughter therapy (Hirsch *et al.* 2010, Konradt *et al.* 2013).

The role-emotional subscale scores were also shown to differ after laughter therapy (Table 2). Likewise, research has shown statistically significant decreases in anxiety levels of older adults after laughter therapy (Houston *et al.* 1998, Marziali *et al.* 2008). Krebs *et al.* (2014) evaluated the effect of laughter therapy on the behaviours of older adults and found a decrease in stress scores when spiritual condition and energy significantly were increased. This research supports the findings of the present study.

Although old age brings about physical constraints, older adults can still be active (Lewis 2003). In this study, social functioning of residents increased after the intervention. An increase in interactions among older adults has been shown in studies evaluating laughter therapy (Everard *et al.* 2000, Low *et al.* 2013). Laughter therapy performed as a group activity also increases interactions among older adults (Kataria 2011).

In this study, the vitality subscale scores of residents in the experimental group were significantly different after laughter therapy (Table 2). Deshpande and Verma (2013) study, which reviewed the effect of quality-of-life therapy on happiness and life satisfaction, found that life satisfaction and happiness scores of older adults in an experimental group were significantly higher than those in a control group. In other research, negative feelings scores after laughter therapy were lower and life satisfaction scores were higher (Song *et al.* 2013).

Conclusion

In this study, after laughter therapy, quality-of-life total and subscale scores (physical functioning, role-physical, role-emotional, bodily pain, general health, spiritual health, social functioning, vitality) increased among residents living in a nursing home. According to these results, it can be said that laughter therapy can be used to increase the quality of life of nursing home residents. Future research to evaluate the effect of laughter therapy on the quality of life of residents should employ a randomised control group experimental design. In addition, a wider sample of participants from nursing homes with different socio-cultural structures will aid generalisability of findings.

Relevance to clinical practice

The results indicated that the laughter therapy programme had a positive effect on the quality of life of nursing home residents. Nurses can use laughter therapy as an intervention to improve the quality of life of residents living in nursing homes.

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Conflict of Interest

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Laughter and humour interventions for well-being in older adults: A systematic review and intervention classification

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ABSTRACT

Objectives: To assess the potential of laughter and humour interventions to increase well-being in a general population of adults aged 60 plus; and to develop a classification to compare approaches and potential benefits of different intervention types.
Design: A systematic search of Web of Science, PubMed/MEDLINE, PsychInfo, AMED, and PsychArticles used inclusive terms relating to laughter and humour interventions. A realist synthesis approach enabled heterogeneous interventions to be compared pragmatically.
Setting: Five laughter interventions, and one humour intervention, using one or more outcome related to well-being, were considered for inclusion after screening 178 primary research papers. The five laughter interventions, representing a sample of 369 participants, were retained.
Main outcome measures: Well-being related outcome measures reported in each intervention informed efficacy; Joanna Briggs Institute tools appraised design; and a realist approach enabled heterogeneous interventions to be measured on their overall potential to provide an evidence base.
Results: Well-being related measures demonstrated at least one significant positive effect in all interventions. Confounding factors inherent in the intervention types were observed. Individual participant laughter was not reported.
Conclusions: Laughter and humour interventions appear to enhance well-being. There is insufficient evidence for the potential of laughter itself to increase well-being as interventions contained a range of confounding factors and did not measure participant laughter. Interventions that isolate, track, and measure the parameters of individual laughter are recommended to build evidence for these potentially attractive and low-risk interventions. The classification proposed may guide the development of both evidence-oriented and population-appropriate intervention designs.

1. Introduction

The high prevalence of chronic disease, multi-morbidity, and psychosocial issues in older people necessitates action, including prioritising well-being according to the World Health Organisation (WHO)[1]. Well-being, defined by the WHO (Five) Well-being Index[2] to include feeling cheerful, active, relaxed, rested, and interested in life, is thought to buffer physical and mental disease[3], and benefit health maintenance in older adults[4]. Laughter is a universal sign of joy[5]. It is contagious and likely evolved prior to language to communicate and elicit mirth[6]. As the psychological and physiological effects of laughter can increase mood, optimism, energy, and cognitive function, and decrease anxiety, stress, loneliness, depression, and tension[7,8] laughter interventions are of interest.

A systematic review of interventions that elicit laughter in older adults would enable more insight into the effectiveness of using laughter to increase well-being. This review was conducted as none was found, notwithstanding Dr. Mora-Ripoll's[7] encouraging narrative review of the potential of simulated (self-induced) laughter in a range of populations. The International Prospective Register of Systematic Reviews listed three ongoing relevant reviews: 1) humour and laughter therapy for people with dementia[9]; 2) the use of humour in palliative care[10]; 3) the effects of laughter yoga on mental health[11].

Therapeutic laughter has a long history[12], however the scientific study of laughter (gelotology; *gelos* is Greek for laughter) dates to 1964 when Dr. William Fry, a humour researcher[13], founded the Institute of Gelotology at Stanford University[14]. Fry highlighted the value of humour and laughter in the aging process[15], and demonstrated the benefits of laughter on blood pressure and the cardiovascular system[16]. As evidence of the ability of laughter to reduce stress and pain, relax

muscles, and benefit the cognitive and immune systems emerged[8,17] laughter therapies were legitimized and developed. Most were based on humour and comedy, for example Patch Adams' clown therapy[18].

Laughter interventions dispensing with humour (humour though universal[19] is individual[20] and hard to sustain) were popularized by Dr. Madan Kataria in India. Kataria added joke telling to his yoga classes in 1995 to harness the health benefits of laughter. When the jokes ran out he advised participants to 'laugh for no reason'[21]. The idea of 'faking' laughter as therapy was not new[22], but the scale was. According to Kataria thousands of laughter yoga clubs exist[23] combining breathing techniques with clapping and playful exercises[21]. Laughing qigong, promoted for health in Taiwan since 1998, uses principles of Chinese medicine and emphasizes breathing and core strength[24].

Laughter is freely available, and has few contraindications[7], making interventions that elicit laughter attractive for aging populations. European demographics are predicted to catch up with Japan, where over 30% of people are aged 60 plus, by 2050[1]. This research aimed to: 1) ascertain whether laughter and humour interventions are effective in increasing well-being in a general population of older adults; 2) create a practical classification of interventions (none was found) to compare approaches and potential benefits among intervention types, and guide future intervention designs.

2. Methods

Search, appraisal, and synthesis methods were chosen for explicitness, reproducibility and to enable pragmatic comparisons[25,26]. A Web of Science search was undertaken in September 2017 to capture an extensive range of publications in English, since 1970, linking laughter to health. This search was both general, to anchor the review within the overall literature, and targeted. Targeted searching was also undertaken in PubMed/MEDLINE, PsychINFO, AMED and PsychARTICLES between September and November 2017. A PICOS framework[26] supported targeted searching: Population (adults 60 years plus), Intervention (actively involving laughter), Comparison (control trial), Outcome (well-being), Study design (all). Results were exported into Covidence[27] to facilitate data management.

Duplicate papers were eliminated to identify 796 individual papers. The preferred reporting items for systematic reviews and meta-analyses (PRISMA)[28] flow chart (Fig. 1) documents the screening process and exclusion criteria. Papers with content relating indirectly to laughter and health, and to pathological, drug-induced, and stimulated (e.g., by tickling) laughter, were excluded. The remaining 442 papers were screened to exclude non-primary research papers and interventions that did not aim to elicit participant laughter; 178 papers were eligible, almost a third relating to adults aged 60 plus.

Six papers focusing on a general population (i.e., not intentionally on specific health issues), with outcome benefits relating to increasing well-being, and mentioning participant laughter, were initially retained: one randomised control trial (RCT), one randomised trial, and four using a quasi-experimental design (QED).

Data extraction was undertaken to compare the papers (Table 1 summarises the five papers retained). A classification of interventions was created to analyse intervention approaches (Fig. 2). Intervention appraisal tools from the Joanna Briggs Institute[29,30] facilitated comparisons between design types and were used to evaluate methodological quality, including data validity and potential biases. One paper, the only defined as a humour intervention[31] and including a laughter 'prescription', was eliminated as it met less than half of the QED appraisal criteria[30]. Analysis of the five papers was conducted using a realist synthesis approach[25] due to intervention heterogeneity.

3. Results

3.1. Overview of interventions

Selected results, and variations in intervention design and type, are illustrated in Table 1. All interventions demonstrated statistically significant and beneficial changes in at least one outcome measure relating to well-being. Intervention types differed, and were analysed using the classification.

3.2. Classification of interventions

The quadrant diagram classification of laughter and humour interventions (Fig. 2) facilitated comparisons. Classification differentiates intervention type and approach in 1) how laughter is induced (humour-induced versus self-induced); and 2) the participant activity content (laughter as the main activity versus laughter as one of multiple activities). Each quadrant represents a different approach. Quadrants to the left (1 and 3) use humour to elicit laughter; those to the right (2 and 4) use self-induced laughter. The top quadrants (1 and 2) use laughter as the main participant activity; the bottom quadrants (3 and 4) are 'busy' as laughter is one of multiple participant activities.

The interventions reviewed were all defined as laughter interventions: laughter yoga (Paper 1[32]), a laughter and exercise program (Paper 2[33]), laughter qigong (Paper 3[34]), and laughter therapy (Paper 4[35], and Paper 5[36]). Four interventions, classified in quadrant 4, used self-induced laughter, and were 'busy' (Paper 1[32], Paper 3[34], Paper 4[35], and Paper 5[36]). Paper 2[33] comprised two elements, one using humour-induced laughter with laughter as the main activity, classified in quadrant 1, and the second a separate exercise program; overall its approach was 'busy'.

Interventions can be hybrid, and include external non-laughter elements, as with Paper 2[33], or include, or exclude, elements from the different quadrants. Paper 1[32] did not include laughter meditation, recommended in laughter yoga interventions[21]. Paper 4[35] included laughter meditation, but that element could not be classified as the approach was not reported: laughter meditation can include stretching[37] (quadrant 4), or, just laughing as recommended in laughter yoga (quadrant 2). The humour intervention that was screened and rejected[31] included a laughter 'prescription' that also could not be classified as the approach was not reported.

3.3. Result details

The majority of sample sizes were small. The 369 participants, recruited using convenience or purposive sampling, were split between experimental (212), and control (157) groups. Paper 1[32] and Paper 2[33] had no control. High attrition occurred in Paper 4[35], with 91 of 200 participant results omitted due to 'insincere' responses. This impacted the final sample size, which was reduced to 273; 158 in the experimental, and 115 in the control groups.

The sample was split almost equally between community dwellers and those in residential care. Various sample biases were observed. Paper 1[32] included only women, half of whom had a dementia diagnosis, despite the paper not focusing on dementia. Paper 4[35] reported low socio-economic status and no formal education in the majority of participants. Paper 2[33] excluded participants with disabilities, and Paper 3[34] participants with disease-induced physical discomfort.

All five interventions appeared to use consistent and reliable outcome measures, and appropriate statistical analysis for evaluation. Measurements were taken once pre-test and post-test in all interventions, with the exception of Paper 1[32] which also measured at three points during the interventions. Paper 2[33] took a second post-test measurement. Paper 1[32] and Paper 2[33] had no control, although Paper 2[33] used a second delayed treatment group in a partial crossover design. None of the interventions recorded whether individual participants
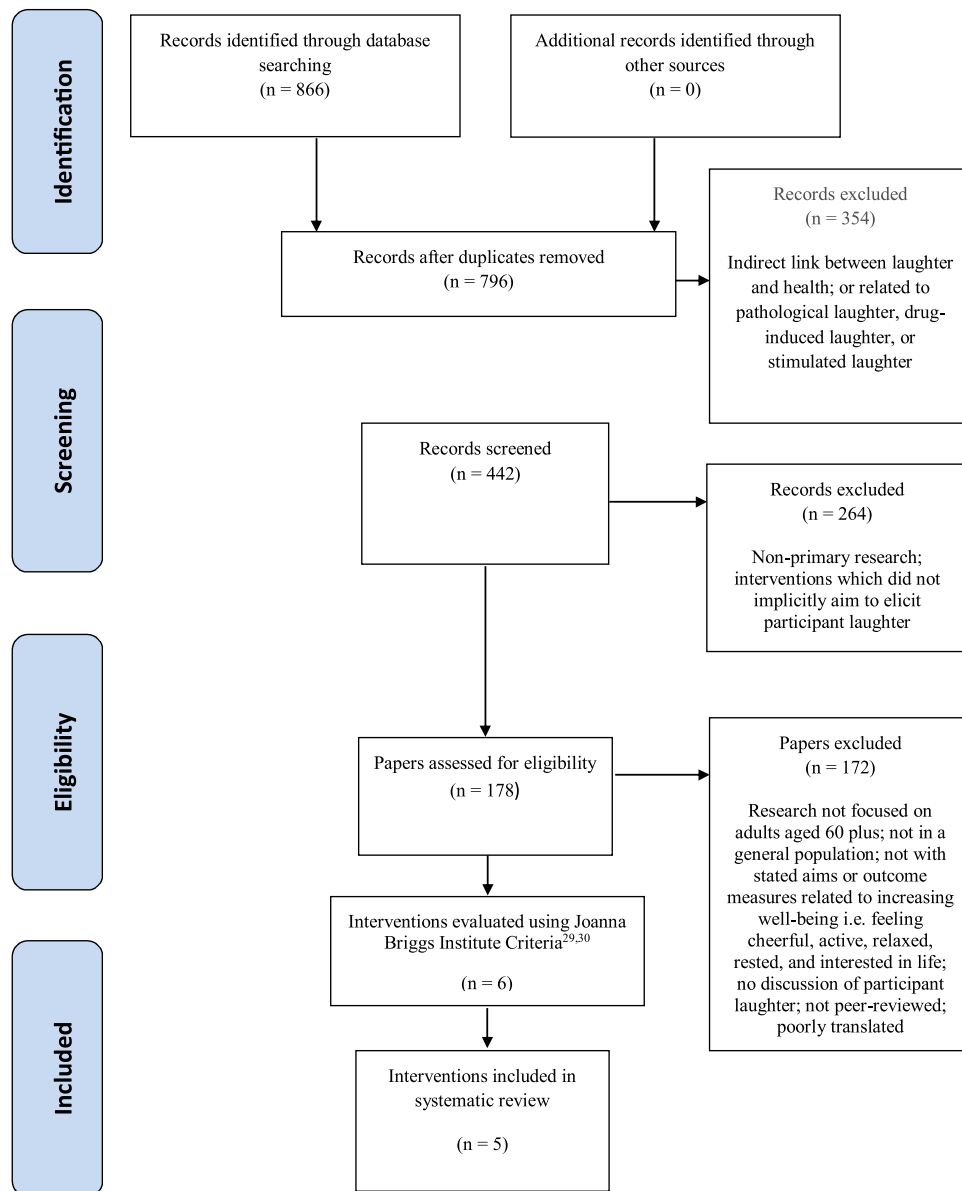
Fig. 1. PRISMA Flow Chart.

laughed.

Interventions reported beneficial changes in a range of outcome measures relating to well-being. Three used the Geriatric Depression Scale (GDS), enabling a closer comparison of results (Table 2). This showed a positive effect from baseline scores in the experimental groups (i.e., a decrease in score). In Paper 2[33] improvement was only seen in the first treatment group.

Systematic errors[39] threatening the validity of results in interventions with a control or second treatment group were partially addressed. Selection bias was addressed by randomisation (Paper 2[33], Paper 4[35]), matched treatment groups (Paper 3[34]), or being controlled for (Paper 5[36]). Attrition bias occurred in Paper 4[35] as more attrition occurred in the experimental than in the control group. Performance bias was addressed by Paper 5[36], and partially by Paper 4[35] where incomplete blinding was reported.

Funding is unlikely to have biased results. Paper 1[32] was not funded; Paper 2[33] was supported by Osaka Gas Group Welfare Foundation;

Paper 3[34] was funded by the National Science Council of Taiwan; Paper 4[35] was supported by Kyungpook National University; Paper 5[36] mentions no funding.

4. Discussion

The aim of this systematic review was to ascertain whether laughter and humour interventions increased well-being in a general population of older adults. All interventions demonstrated at least one significant and beneficial well-being related outcome which was promising. Methodological limitations, mainly resulting from convenience sampling, prevented the possibility of generalising results. A range of confounding factors made cause and effect conclusions problematic. Laughter measurements were not taken, excluding an evidence-based link between laughter and well-being.

Table 1
Selected Details and Results of Interventions Reviewed.

Authors	Location and recruitment	Intervention type and aim	Design type and duration	Sample size (control)	Participant demographics	Outcome Measures	Well-being related results
Paper 1[32] Ellis, Ben-Moshe, & Teshuva, 2017	Australia Convenience: residents in care homes	Feasibility study of a laughter yoga program	Non-experimental pre-test, post-test (or quasi-experimental) 3 h over 6 weeks (30 min once a week)	Initial: N = 28 (0) Final: N = 28 (0)	Aged 61–96 23 women; 13 with a dementia diagnosis	Positive and Negative Affect Scale (PANAS); General Happiness Scale (GHS); enjoyment questionnaire; blood pressure	Significant positive improvements: PANAS, GHS; blood pressure lowered
Paper 2[33] Hirosaki et al., 2013	Japan Convenience: community dwellers	Effects of a laughter and exercise program on psychological and physical health	Randomized trial 20 h over 10 weeks (2 h once a week incl. 50 min watching comedy)	Initial: N = 27 (0) (14 immediate treatment, 13 delayed) Final: N = 26 (0)	Aged 60 plus 74% women; no disabilities	Geriatric Depression Scale (GDS-30); self-rated health; a range of blood measurements	Significant increases in self-rated health and correlations to GDS
Paper 3[34] Hsieh, Chang, Tsai, et al., 2015	Taiwan Purposive matched groups: residents in long-term care	Effects of laughter qigong on raising mood and lowering depressive tendencies	Quasi-experimental Up to 8 h over 4 weeks (50 min to 1 h over a week)	Initial: N = 66 (33) Final: N = 62 (30)	Aged 65 plus 53% women; none suffering physical disease discomfort	Faces Scale (FS); GDS-15; salivary cortisol	Significant positive improvements in FS, GDS, and cortisol
Paper 4[35] Ko & Youn, 2011	South Korea Convenience: community dwellers	Effects of laughter therapy on depression, sleep, cognition, and quality of life.	Randomized control trial 4 h over 4 weeks (1 h per week)	Initial: N = 200 (100) Final: N = 109 (61)	Aged 65 plus over 70% women; majority low socioeconomic status and no formal education	GDS-15; Short Form Health Survey (SF-36) Insomnia Severity Index (ISI); Pittsburgh Sleep Quality Index (PSQI)	Significant positive improvements: GDS, SF-36, ISI and PSQI
Paper 5[36] Song et al., 2013	South Korea Convenience: residents in long term care	Effects of laughter therapy on negative mood and life satisfaction	Quasi-experimental 8 h over 4 weeks (1 h twice a week)	Initial: N = 48 (24) Final: N = 48 (24)	Aged 65 plus; 58% women	Profile of Mood States Brief; Life Satisfaction scale	Significant improvements in mood state and life satisfaction

4.1. Limitations

4.1.1. Methodological issues

Small sample sizes, raised as a limitation by most authors, threatened the reliability of the findings. Unrepresentative samples were also an issue: women and participants with no formal education over-represented. In line with a general population of this age[1], a representative sample would include participants with at least one chronic condition; however such participants were excluded by several papers. Conversely, Paper 1[32] reported almost half of participants had a dementia diagnosis. Sample biases likely impacted the high attrition rate in Paper 4[35]; the authors related it to low participant socio-economic status, although lack of formal education may also have been at cause.

Some flaws in intervention design threatened internal validity. Two interventions had no control. Although one of these used randomized treatment groups, posterior randomization cannot address biases resulting from convenience sampling. Apart from Paper 1[32], interventions only took pre- and post-intervention measurements, reducing the possibility of exploring outcomes. The authors of Paper 5[36] raised the need to take multiple measurements; indeed, additional measurements may have indicated that the inconsistent GDS scores observed in Paper 2[33] were an exception.

4.1.2. Confounding factors

A variety of confounding factors existed. Had a sufficient number of papers of one type of intervention been available, these may have been reduced. Nevertheless variation within intervention type is not unusual. For instance 'gibberish', or nonsense-speak is recommended in laughter yoga to 'drain out stress'[21], and some interventions use it[41], although Paper 1[32] did not, nor did it use laughter meditation that is also often included[21].

Intervention intensity and length varied from 30 min per week over 6 weeks (Paper 1[32]), to 2 h per week over 10 weeks (Paper 2[33]). All interventions took place in groups, viewed, for instance, as an important aspect in laughter yoga[21]. However, as socialising can elevate mood, participant well-being may have increased due to being with peers[40].

Interventions were 'busy' with participants taking part in a range of activities. Four papers using self-induced laughter in quadrant 4 differed in content: laughter yoga (Paper 1[32]) included a 'Tapping body laugh' and chanting, while the laughing qigong (Paper 3[34]) used stretching and the venting of negative emotions. The two laughter therapies also differed. Paper 4[35] included singing, meditating, performing Kegel pelvic muscle exercises, and shoulder massages, while Paper 5[36] used a laughing dance and various games. Fundamentally incompatible approaches were also evident: laughing qigong does not engage in 'childlike play'[34], a key component of laughter yoga[21]. The laughter element of Paper 2[33] in quadrant 1 used humour-induced laughter which can be confounding as sense of humour varies; it also included a separate exercise element.

The exercise content in the interventions was confounding as the relationship between exercise and well-being is strong[43]. Laughter's ability to benefit body and brain chemistry, including the release of endorphins, to increase well-being and reduce stress[17,42,44] is also linked to exercise[45]. An intervention comparing laughter yoga, exercise therapy, and a control in depressed women found laughter yoga and exercise therapy to be superior to the control, but equally beneficial[41]. The authors of Paper 2[33] questioned whether the beneficial effects of their intervention were due to laughter or exercise, and raised the need to investigate the effects of laughter itself.

4.1.3. Absence of laughter evaluation

Measurements of individual participant laughter were not reported, including whether, how often, how intensely, or for how long, each participant laughed. To be fair these interventions were not designed

Table 2
Comparison of Geriatric Depression Scale Results.

Paper	Scale	Pre-test			Post-test		
		Experimental	Treatment2	Control	Experimental	Treatment2	Control
Paper 2[33]	GDS-30	8.7	8.3	NA	7.1	8.8	NA
Paper 3[34]	GDS-15	4.91	NA	5.69	3.39	NA	6.37
Paper 4[35]	GDS-15	7.98	NA	8.08	6.94	NA	8.43

with this in mind, rather they provided useful insight into the positive effects of laughter interventions in group settings and discussed laugher from a group perspective.

The types of intervention used did not facilitate a direct association of outcomes to laughter. Most were situated in quadrant 4, and all were 'busy', including the intervention in quadrant 1 due to it also including a physical exercise element. An approach using laughter as the main activity may have oriented intervention measurements and outcomes to laughter itself.

It may be that laughter is not being taken seriously enough in some intervention designs focused more on good mood in general. For instance, a humour therapy RCT[46] and associated observational study[47] using 'Laughter Bosses' (elder clowns) screened for this review did not mention participant laughter.

4.2. Future research and implications

Data validity and reliability issues observed in these interventions could be addressed by using more representative samples and strengthening intervention methodology. To build evidence for laughter interventions, it would be necessary to identify the effects of laughter itself. Interventions located in the bottom half of the classification, including quadrant 4 where most of the interventions reviewed were located, are prone to confounding factors due to the range of activities they include. Interventions located in the top half of the classification largely avoid this. Interventions located in quadrant 2 (self-induced laughter as the main activity), may be preferable to those in quadrant 1 (humour-induced laughter as the main activity), as a humour stimulus can affect people differently.

Isolating, tracking, and measuring participant laughter could be helpful to: 1) inform an overall evidence base for the use of laughter to
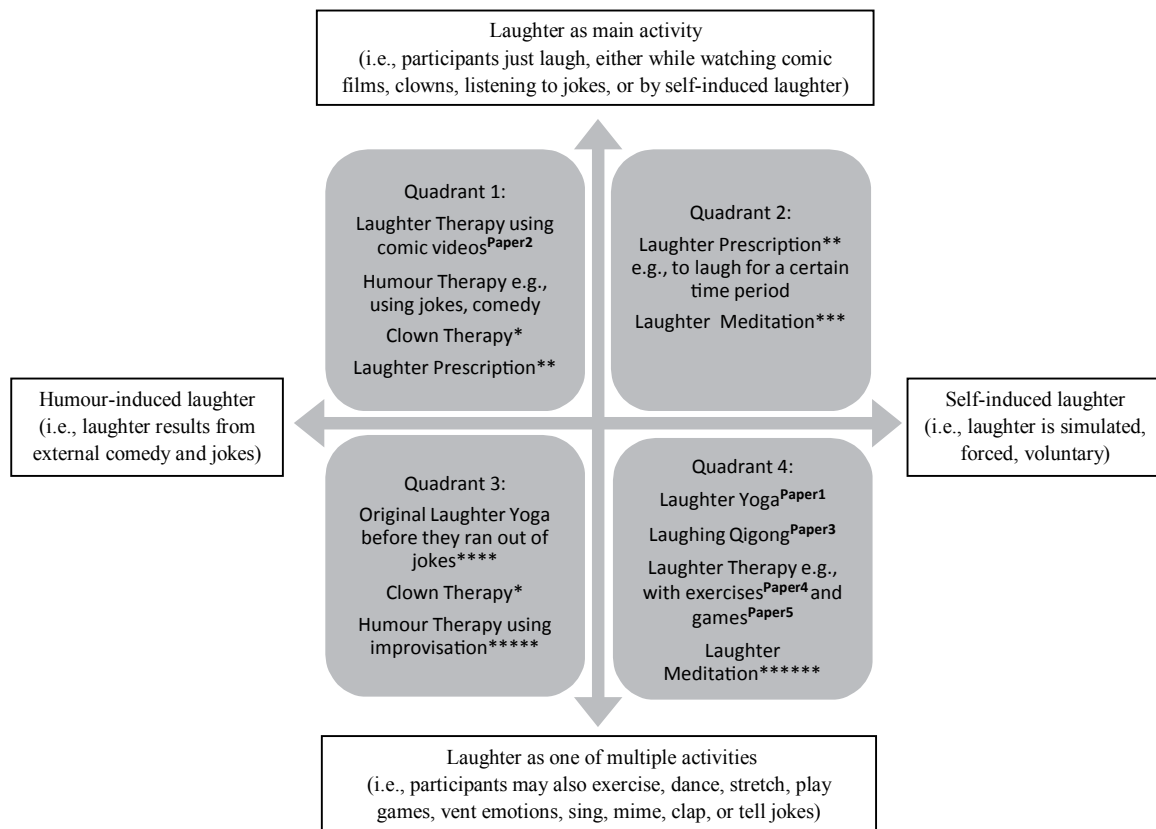

Fig. 2. Classification of Laughter and Humour Interventions.
Note. *Clown Therapy approaches can differ[18]; **Laughter Prescriptions, e.g., as reported, but not defined, in the humour intervention[31] can use different approaches; ***Kataria's laughter meditation involves only laughter[21]; ****as recounted by Kataria[21]; ***** e.g., used as an intervention for Parkinson's[38]; ******includes stretching as defined by the Chopra Centre[37]

promote health and well-being; 2) explore relationships between laughter parameters and health benefits; 3) design suitable laughter interventions for different populations and settings. A laughter measurement tool, for instance to measure the frequency (occurrence), intensity, and duration of participant laughter, could enable data to be collected and evaluated. Although the parameters of laughter have been explored, gelotology is still in its early stages[48,49]. An easy-to-use laughter measurement tool may be useful for future research.

A qualitative approach to gather knowledge to guide the design of therapies could also be helpful. Almost half of people worldwide aged 60 plus suffer from a disability[50], and therapies designed with a focus on laughter as the main activity (in quadrants 1 and 2), may be particularly relevant. Laughter-focused data could support a more strategic approach to future applied gelotology by illuminating the most efficient ways of employing laughter in population-appropriate interventions.

5. Conclusions

Laughter interventions can have a positive effect on well-being in adults aged 60 and over. Nevertheless cause and effect inferences are inconclusive due to intervention designs containing too many confounding factors, and not being oriented to measuring laughter. Future interventions designed to isolate, track, and measure individual participant laughter may provide more conclusive data to inform an evidence base. The laughter and humour intervention classification proposed may guide future intervention designs. New and more practical interventions eliciting and measuring participant laughter, and beneficial to both participants and researchers, may support future research into the positive effects of laughter.

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Effect of Laughter Yoga on Mood and Heart Rate Variability in Patients Awaiting Organ Transplantation: A Pilot Study

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ABSTRACT

Context • Research shows that laughter has myriad health benefits, yet the medical community has not implemented it formally as a treatment. Patients awaiting organ transplantation have significant physical disabilities and are at risk for psychological distress. Attenuated heart rate variability (HRV) is a risk factor for a negative long-term outcome in some patients.

Objective • The study intended to evaluate the clinical utility of laughter yoga in improving psychological and physiological measures in outpatients awaiting organ transplantation. Positive results would indicate promising areas to pursue in a follow-up study.

Design • Six participants met for 10 sessions over 4 weeks. The research team measured each participant's heart rate, HRV, blood pressure (BP), and immediate mood before and after the laughter and control interventions. The team assessed participants' longer-term mood (anxiety and depression) at the study's initiation, after a no-treatment control week, and at the end of the study.

Setting • The study occurred at the Department of Surgery and Medicine at the University of Arizona Health Sciences Center, Tucson.

Participants • Participants were patients awaiting transplants (three heart and three lung), two women and four men (ages 51-69 y). Participants had received no major surgery in the 3 months prior to the intervention, did not have a hernia or uncontrolled hypertension, and did not fall into the New York Heart Association function class 4.

Intervention • The 20-minute laughter intervention involved breathing and stretching exercises, simulated laughter (ie, unconditional laughter that is not contingent on the environment), chanting, clapping, and a meditation. The 20-minute control intervention involved the study's personnel discussing health and study-related topics with the participants.

Outcome Measures • The research team measured BP, heart rate, and HRV and administered the Profile of Mood States, Beck Anxiety Inventory, and Beck Depression Inventory-II to evaluate immediate and longer-term mood. The team had planned quantitative statistical analysis of the data at the study's initiation but did not complete it because the number of enrolled participants was too low for the analysis to be meaningful. The team visually examined the data, however, for trends that would indicate areas to examine further in a follow-up study.

Results • Participants showed improved immediate mood (vigor-activity and friendliness) and increased HRV after the laughter intervention. Both the laughter and control interventions appeared to improve longer-term anxiety. Two participants awaiting a lung transplant dropped out of the study, and no adverse events occurred.

Conclusion • This pilot study suggests that laughter yoga may improve HRV and some aspects of mood, and this topic warrants further research. (*Altern Ther Health Med.* 2012;18(4):53-58.)

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"Laughter is the best medicine": Empirical research on laughter supports this folk wisdom, showing that laughter can have a variety of psychological and physiological health benefits, including improved coping skills, enhanced mood and feelings of well-being, decreased discomfort, and a higher pain tolerance as well as reduced neuroimmune and stress markers.[1-6] Laughter can increase natural killer cell activity,[1,7] endothelial-dependent vasodilatation,[8] and heart rate, respiration rate, and oxygen consumption.[9] Considering the variety of health benefits, researchers Christie and Moore think that humor might be an excellent clinical intervention.[6] Most controlled research on laughter has involved exposing participants to humorous videos. It remains unclear whether laughter associated with other conditions, including simulated laughter (ie, unconditional laughter that is not contingent on the environment), might have similar results.

Practitioners in India developed the practice of laughter yoga, and it combines unconditional laughter with *pranayama* (the rhythmic control of breath), stretching, and meditation.[10] Individuals can practice it in a group setting or alone. Madan Kataria, MD, an East Indian physician and founder of Laughter Yoga International, developed a popular form of laughter yoga. The research team based the current intervention on his teachings, and the methods section describes this practice more fully. Practitioners have attributed a variety of health benefits anecdotally to laughter yoga; however, investigators have performed minimal controlled research on it. One study showed significant improvements in workplace stress levels and self-efficacy.[11] A therapeutic intervention based on laughter yoga is potentially an ideal intervention because patients can practice it alone, in a short time period, and without the need for other resources.

Heart rate variability (HRV) is a measure of the balance between the parasympathetic nervous system, which decreases the heart rate and increases the relaxation response via the vagus nerve, and the sympathetic nervous system, which increases both the heart rate and the activation response. These systems are the two arms of the autonomic nervous system. Each arm produces different frequency oscillations of the heart rate, allowing for a comparison of their relative contributions in regulating heart rate. Karemaker and Lie found that attenuated HRV, which reflects more sympathetic activity, is related to reduced vagal activity.[12] Attenuated HRV is a risk factor strongly associated with poor long-term outcomes, including mortality, in cardiac patients.[13]

The current study was an effort to evaluate the clinical utility of laughter yoga in improving psychological and physiological measures in outpatients awaiting organ transplantation. These patients have significant physical disabilities and are at risk for psychological distress[14]; thus they potentially could benefit from such an intervention. The research team also chose this population because the participants were within the realm of the researchers' clinical expertise and were accessible. The team hypothesized that the practice of laughter yoga would increase HRV, decrease blood pressure (BP), and improve immediate and longer-term mood. If the researchers were to find positive results, they would interpret them as encouraging areas to pursue in a follow-up study.

METHODS

Participants

Over a period of approximately 3 months, the research team recruited participants who were patients of the Department of Surgery and Medicine at the University of Arizona's Health Sciences Center, Tucson. Participants were adults awaiting solid organ transplantation (three heart and three lung), two women and four men (ages 51-69 y). Participants had received no major surgery in the past 3 months, did not have a hernia or uncontrolled hypertension, and did not fall into the New York Heart Association function class 4. None of the participants were on vasopressors or intravenous ionotropes. The University of Arizona's internal review board approved the study, and the research team obtained informed consent from each participant prior to the study.

Procedures

Participants formed one group who received control and laughter yoga interventions over a period of 4 weeks. The study started with a control period of 1 week during which the participants completed control interventions at the beginning and end of this week. After the control period, participants completed seven laughter yoga sessions over a period of 3 weeks. The research team thought that this time period was the minimum amount of time necessary to see clinical results from the practice and also to be feasible for patients' participation. After the laughter yoga treatment period, participants completed one additional control intervention at the termination of the study.

Interventions

Laughter Yoga Intervention. A laughter yoga therapist, certified by Laughter Yoga International, conducted the intervention. The 20-minute laughter yoga sessions consisted of three parts: (1) simple breathing and stretching exercises (5 min); (2) alternation of laughter exercises (eg, imitating laughter on a cell phone) with rhyhmic clapping, chanting, movement while maintaining eye contact with others, gentle stretching, and deep breathing (10 min); (3) quiet, seated, deep breathing and guided meditation (5 min).

Control Intervention. The control intervention

consisted of participants and research team members sitting in a circle and discussing topics in an open format for 20 minutes. Topics included (1) the study's procedures and logistics; (2) personal introductions, including personal backgrounds; (3) participants' medical histories and experiences with stress; and (4) closing remarks and review of participants' experiences in the study.

OUTCOME MEASURES

On all three control days and on two of the treatment days (weeks 3 and 4), the research team administered the Profile of Mood States[15] questionnaire to participants and measured their BP, heart rate, and HRV immediately before and after the relevant intervention. Participants additionally turned in the Beck Anxiety Inventory[16] and the Beck Depression Inventory-II[17] at the study's initiation, after the initial control week, and at the conclusion of the study.

Psychological Measures

To determine the state of participants' psychological functioning, the research team administered questionnaires to measure the following:

Fluctuations in Current Mood. The research team used the Profile of Mood States, which is a self-report survey with 65 items in seven different scales: (1) tension-anxiety, (2) depression-dejection, (3) anger-hostility, (4) vigor-activity, (5) fatigue-inertia, (6) confusion-bewilderment, and (7) friendliness.

Anxiety. The research team used the Beck Anxiety Inventory, which is a self-report scale of anxiety over the prior week, with 21 items contributing to a total score ranging from 0 to 63.

Depression. The research team used the Beck Depression Inventory-II, which is a self-report scale of depression over the prior 2 weeks, with 21 items contributing to total score ranging from 0 to 63.

Physiological Measures

To determine participants' physiological states, the research team measured the following:

Systolic and Diastolic Blood Pressure. The research team measured this function using a digital BP monitor with a wrist cuff.

Heart Rate. The research team measured this function using a blood-volume pulse sensor (emWavePC, HeartMath LLC, Boulder Creek, California) attached to the participant's earlobe.

Heart Rate Variability. The research team measured this function using the free Kubios HRV Version 2.0 software available online at http://kubios.uku.fi, which calculates HRV from the standard deviation of the beat-to-beat interval obtained from the heart-rate data (SDNN). The team also calculated the root mean square of successive differences in beat-to-beat intervals (RMSSD), an established measure of vagal activity.

DATA ANALYSIS

The research team had planned quantitative statistical analysis of the data at the study's initiation but did not complete it because the number of enrolled participants was too low for the analysis to be meaningful. The researchers visually examined the data, however, for trends that would indicate areas to examine further in a follow-up study. The team compared predata and postdata—from immediately before and after the intervention—on control days vs laughter days. For the Profile of Mood States questionnaire, pre-to-post changes in scores were calculated for each of the seven factors, averaged across day type (control vs laughter) and compared.

RESULTS

Participants were four men and two women who were awaiting either lung or heart transplantation (Table 1). No patients met the exclusion criteria, so the team excluded no one. One heart patient previously had undergone heart transplantation 10 years prior to the study. The enrolled

Table 1. Participant Characteristics and Outcome Data			
No.	**Gender**	**Age, y**	**Transplant Type**
1	M	51	Heart
2	M	69	Lung
3	M	67	Heart
4	F	54	Lung
5	F	59	Lung
6	M	59	Heart

number of participants was lower than planned due to an unanticipated limited pool of available patients at the time of the study's recruitment. Two lung participants dropped out of the study for medical and personal reasons.

Psychological Measures

Immediate Mood. The Profile of Mood States produced a snapshot of mood immediately before and after the intervention. Substantial increases on the vigor-activity and friendliness factors occurred on the laughter days compared to the control days (Table 2). For the vigor-activity factor, scores increased by an average of 8 on laughter days, while they decreased by an average of 9.33 on control days (difference of 17). This factor includes the following descriptions: lively, active, energetic, cheerful, alert, full of pep, carefree, and vigorous. For the friendliness factor, scores increased an average of 9 on laughter days, while they decreased by 1.66 on control days (difference of 10.66). This factor may be related statistically to the vigor-activity factor, but it still provides useful information. It includes the following descriptions: friendly, clear-headed, considerate, sympa-

Table 2. Profile of Mood States

Factor	C1	C2	C3	CM	I1	I2	IM	CM vs IM
Tension-anxiety	–18	–8	–4	–10	–10	–1	–5.5	–4.5
Depression-dejection	–12	0	9	–1	–1	–2	–1.5	0.5
Anger-hostility	–1	3	–4	–0.66	2	0	1	–1.66
Vigor-activity	–5	–7	–16	–9.33	7	9	8	–17.3
Fatigue-inertia	–16	–1	–4	–7	–5	–11	–8	1
Confusion-bewilderment	–9	2	2	–1.66	–7	0	–3.5	1.84
Friendliness	2	7	–14	–1.66	7	11	9	–10.66

Abbreviations: C, Pre-to-post change in scores across participants by control day (1-3) and mean (m); I, pre-to-post change in scores across participants by intervention day (1-2) and m; CM vs IM, m control change score vs m intervention change score.

Table 3. Beck Anxiety Inventory

ID	Baseline	Post-control	Post-intervention
1	4	2	3
2	25	17	9
3	(18)	(12)	—
4	(23)	(8)	—
5	24	13	11
6	6	8	6
mean (n = 4)	14.75	10	7.25

Table 4. Beck Depression Inventory

ID	Baseline	Post-control	Post-intervention
1	5	1	2
2	19	29	13
3	(4)	(3)	—
4	(23)	(23)	—
5	15	17	21
6	2	6	5
mean (n = 4)	10.25	13.25	10.25

thetic, helpful, good-natured, and trusting.

Both the control and laughter interventions produced improvements on the fatigue-inertia and tension-anxiety factors. The changes were comparable for fatigue (decreases of 7 for control and 8 for laughter; difference of 1), while for tension, the control days actually showed greater reductions (decreases of 10 vs 5.5; difference of 4.5). Of note, the largest changes on the control days occurred on the first and last days of the study. No meaningful pre-to-post differences in scores existed between the groups on the factors depression-dejection, anger-hostility or confusion-bewilderment.
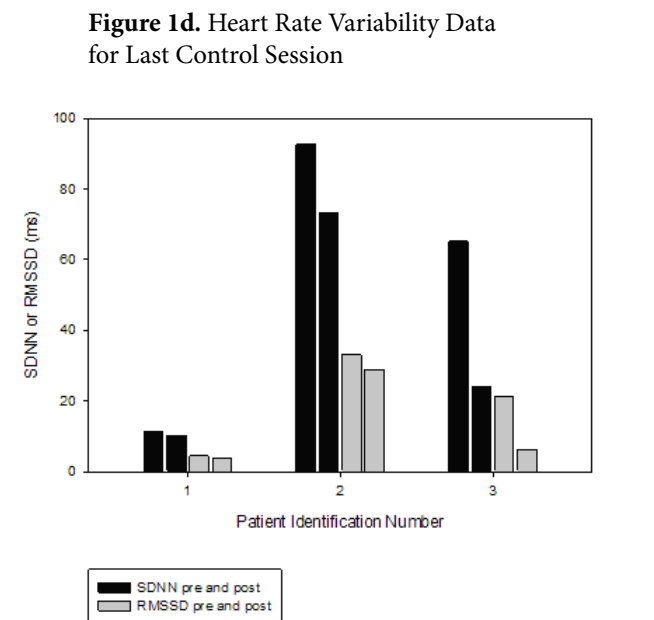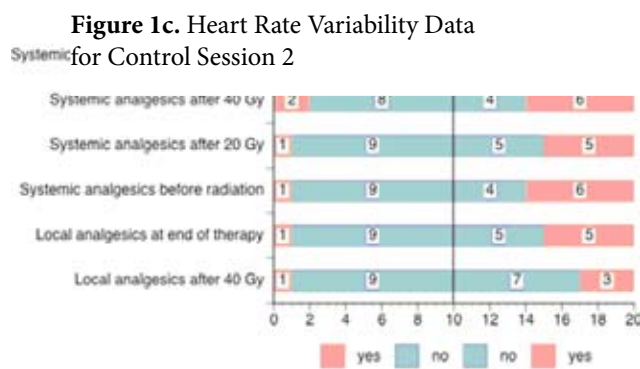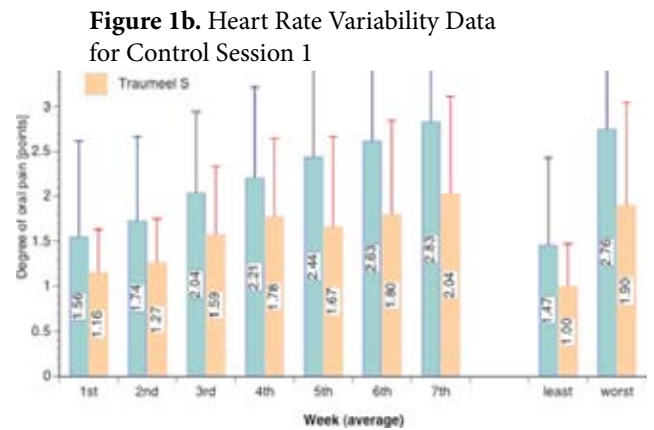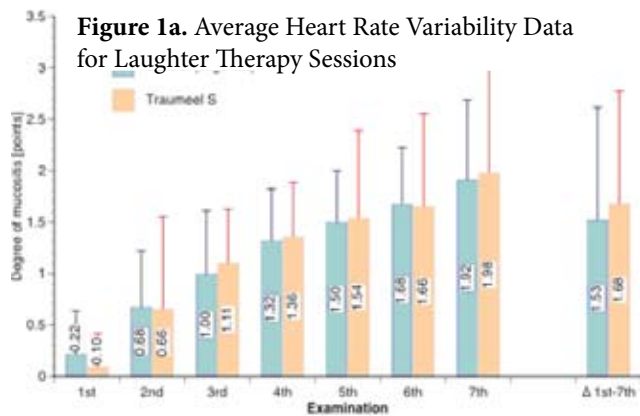
Longer-term Mood. The Beck Anxiety Inventory revealed mild reductions in anxiety across the study, showing a mean score of 14.75 at the study's initiation, 10 after the control week, and 7.25 at termination (Table 3). There were no meaningful differences in scores on the Beck Depression Inventory-II (mean score of 10.25 at study initiation, 13.25 after control week, and 10.25 at termination) (Table 4). Researchers should note that two of four participants began the study with minimal levels of anxiety and depression, and no room for improvement existed for these participants.

Physiological Measures

Heart rate data were available for only three participants (all heart) because one participant was not present for all of the measurements. In these participants, consistent pre-to-post increases occurred in both of the HRV measures after the laughter therapy intervention. Considering that the results were similar across days, the data were averaged for ease of interpretation (average of 2 laughter days: SDNN increased by 56% and RMSSD by 32%; Figure 1a). The results for the control days were variable (Figures 1b-1d), with consistent increases on the first control day (SDNN by 38% and RMSSD by 47%), no consistent changes on the second control day, and decreases on the last day (SDNN by 31% and RMSSD by 35%). Additionally, all participants consistently showed a small increase in diastolic BP after the laughter therapy days (ranging from 3% to 23%). No other consistent changes in BP or heart rate occurred.

DISCUSSION

Prior research has recorded HRV in healthy volunteers to average 48 mean (m) ± 22 (standard deviaiton [SD]) for

Figure 1a. Average Heart Rate Variability Data for Laughter Therapy Sessions

Figure 1b. Heart Rate Variability Data for Control Session 1

Figure 1c. Heart Rate Variability Data for Control Session 2

Figure 1d. Heart Rate Variability Data for Last Control Session

Abbreviations: RMSSD, root mean square of seccesive differences; SDNN, standard deviation of beat-to-beat interval.

SDNN and 43 m ± 29 (SD) for RMSSD.[18] In the current study, the participants often had baseline SDNN scores at the low end or below this value. Additionally, RMSDD was considerably below normal for all participants, suggesting reduced vagal stimulation (Figure 1b). The research team's results showed that participation in the laughter yoga intervention increased HRV measures for both SDNN and RMSDD so that participants' scores were within or closer to the normal ranges. Atrial stretch from increased venous return and/or some sympathetic reinnervation after transplantation may have caused the improved HRV in the participant with the transplanted heart.[19] Considering the association of attenuated HRV with mortality in cardiac patients,[13] these results suggest some potential therapeutic significance.

The study's results also suggested that laughter yoga may increase feelings related to liveliness, activation, cheerfulness, and friendliness. This finding was unique to the laughter intervention, as during the control days, overall decreases occurred in these areas. Improvements in tension and fatigue (immediate mood) and anxiety (longer-term) related to participation in the study also occurred. These reductions may have been due to general participation in the study, however, rather than being uniquely associated with the laughter condition.

In addition to the encouraging findings associated with laughter yoga, the control days had interesting physiological and psychological results. The first control day, which involved introductions to the study and the other partici-

pants, appeared to have some positive health benefits because the participants showed increases in HRV and decreases in tension, fatigue, confusion, and depression. It is likely that hope for the study's benefits had some therapeutic qualities that influenced these areas. By the second control day, however, these changes were absent for all measures except tension. On the final control day, decreases in HRV, vigor, and friendliness and increases in depression occurred. This result may have been due to a slight feeling of loss and disappointment that the study was ending. In future studies, it might be useful to consider these skewed treatment effects and to use controls that fall in the middle of the study.

The results did not show consistent improvements in heart rate or BP. A previous study suggested that post-laughter decreases in BP were small and highly time sensitive.[9] Also, no consistent improvements in immediate depression, anger, or confusion or in longer-term depression occurred. The general lack of initial mood elevations in these areas may have influenced the lack of changes in these domains.

The research team's findings of improved HRV and some aspects of mood after participation in the laughter intervention are consistent with prior research that has shown improved physiological and psychological benefits to laughter. It is not possible to determine which specific component of the laughter yoga intervention—laughter, breathwork, stretching, meditation, or some combination of these—was the underlying factor for the positive findings in the study. As the research team hoped to develop a new clinical intervention, we were more interested in the therapeutic utility of laughter yoga as a whole rather than in the specific mechanisms involved.

CONCLUSION

The study's findings provide preliminary evidence that laughter yoga could indeed be a beneficial therapeutic practice. Considering the small sample size, limited follow-up period, and lack of quantitative statistics, researchers should interpret the results with caution. Nevertheless, the findings are encouraging and suggest the need for further research. Future studies may borrow from the methodology outlined here, perhaps targeting other populations with attenuated HRV and increased risk for mood disturbances. Future studies might also explore the specific mechanisms that underlie the observed clinical benefits.

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Embodied Emotion Modulates Neural Signature of Performance Monitoring

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Abstract

Background: Recent research on the "embodiment of emotion" implies that experiencing an emotion may involve perceptual, somatovisceral, and motor feedback aspects. For example, manipulations of facial expression and posture appear to induce emotional states and influence how affective information is processed. The present study investigates whether performance monitoring, a cognitive process known to be under heavy control of the dopaminergic system, is modulated by induced facial expressions. In particular, we focused on the error-related negativity, an electrophysiological correlate of performance monitoring.

Methods/Principal Findings: During a choice reaction task, participants held a Chinese chop stick either horizontally between the teeth ("smile" condition) or, in different runs, vertically ("no smile") with the upper lip. In a third control condition, no chop stick was used ("no stick"). It could be shown on a separate sample that the facial feedback procedure is feasible to induce mild changes in positive affect. In the ERP sample, the smile condition, hypothesized to lead to an increase in dopaminergic activity, was associated with a decrease of ERN amplitude relative to "no smile" and "no stick" conditions.

Conclusion: Embodying emotions by induced facial expressions leads to a changes in the neural correlates of error detection. We suggest that this is due to the joint influence of the dopaminergic system on positive affect and performance monitoring.

Introduction

It has been shown that people who are adopting an emotion-specific posture report to experience this emotion [1], show behavior congruent with the emotion [2], or show emotion-specific changes in autonomic nervous system activity [3]. For example, people rate cartoons to be funnier when they have a pen between their teeth in a way that leads to contraction of the musculus zygomaticus major, a muscle essential for smiling [2], compared to a control condition requiring to hold the pen vertically between the lips. The latter posture prevents participants from smiling. Similarly, Havas, Glenberg, & Rinck [4] observed that the amount of time to judge the valence of a sentence is influenced by the kind of emotion that is induced from holding a stick in the mouth. For both positions of the stick in the mouth (between the teeth, i.e. smiling, between the lips, i.e. frowning) judgment times were faster when facial posture and sentence valence matched than when they were incongruent. Intriguingly, people are not usually aware that they are smiling [2]. This excludes alternative explanations based on people's self-perception, for example that people perceive themselves to be smiling and infer to be happy. However, one might argue that people are set in an emotional state, because they feel silly or funny when holding a pen in the mouth during an experiment. Strack and

colleagues [2] elegantly excluded this alternative by introducing the "hold the pen with the lips" condition (see figure 1 for assumed facial expression): here, participants are prevented from smiling, but there is no reason to assume that they feel less silly or funny compared to the "pen between the teeth" condition. All in all, these findings suggest that by assuming a facial expression of a body posture, the corresponding affect is induced. This "embodying of emotion" [1] is thought to be brought about by the fact that reinstantiation of an activation pattern in one system (e.g., facial muscles typically active when "happy") can cascade down to other systems to install the full activation pattern associated with the particular emotion. In some sense the recent interest in embodying of emotions echoes the classical work by James [5] and Lange [6]. In his 1884 paper, James [5] ascertained that a "*mental state is not immediately induced… [but] that the bodily manifestations must first be interposed between, and that the more rational statement is that we feel sorry because we cry, angry because we strike, afraid because we tremble, and not that we cry, strike, or tremble, because we are sorry, angry, or fearful, as the case may be. Without the bodily states following on the perception, the latter would be purely cognitive in form, pale, colourless, destitute of emotional warmth.*"

The question arises how this embodiment of emotion in the sense of James [5] and, more recently, Niedenthal [1] is brought about. Importantly, recent data on the so-called mirror neuron
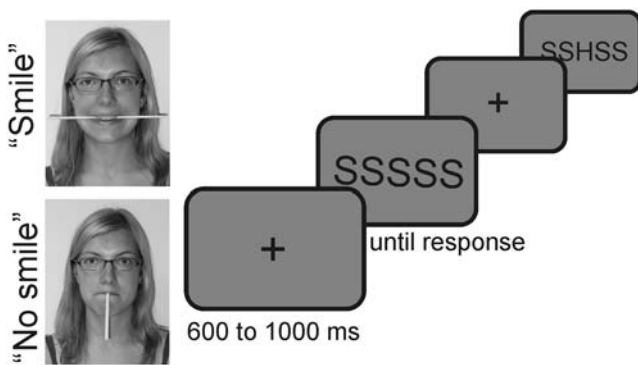
Figure 1. Experimental setup. The photos show the typical facial expressions induced by the chop stick in the smile and no-smile conditions.

system (MNS) have pointed to a role of this system in social cognition [7–10] and more specifically in emotion recognition [11]. The MNS has been first identified in monkeys: mirror neurons located in the inferior frontal cortex but also in a number of other brain areas fire not only when an action is performed by the monkey but also when the same action is observed. Recently, fMRI studies in humans have shown a relation of brain activity in regions harboring mirror neurons and an individual's empathic feelings [12–14] likely because activity of the MNS allows the recognition of an emotion. The link to the aforementioned literature on embodied emotions is provided by studies that have implied the MNS in the spontaneous mimicry of emotional facial expressions [15] in order to internally simulate the perceived emotion and to aid its understanding. For example, the prevention of facial mimicry impairs the detection of a change in emotional facial expressions [16]. Another crucial experiment was reported by Oberman et al. [17]. These authors tested recognition of facial expressions (happy, disgust, fear, sad) and blocked mimicry by having their participants either bite on a pen or chew a gum. The bite manipulation in particular interfered with the recognition of happiness suggesting that assuming a facial expression is necessary for its recognition and, by extension, its experience.

In the present investigation we go a step further by examining the influence of assumed facial expressions thought to induce positive affect on performance monitoring. Indeed, positive affect makes people react differently. There is accumulating evidence that positive affect facilitates problem solving [7,8], memory performance [9], executive attention [10], and a variety of other cognitive task. Ashby and colleagues [11] argue that positive affect is associated with an increased brain dopamine level in a variety of dopaminergic structures, among them the mesocorticolimbic system, prefrontal cortex and anterior cingulate cortex. These structures are involved in reward and reward prediction (e.g., the ventral tegmental area, which is highly interconnected to the Nucleus Accumbens) [12–15] as well as cognitive control [16–18]. The mesencephalic dopamine structures and their interactions with the prefrontal cortex are also central in research on performance monitoring, which includes the detection and correction of errors and the adaptation of behavioral strategies to minimize errors in subsequent trials. According to the reinforcement learning hypothesis of error processing [19], inspired by earlier work on animals [20,21], error commission results in decreased activation of the mesencephalic dopamine system. This, in turn, leads to a phasic disinhibition of the anterior cingulate cortex, which is reflected by brain activation to error

trials in choice reaction time tasks [22–24] as well as by an increased negative amplitude of event-related brain potentials (ERP). Specifically, when ERPs are obtained time-locked to choice errors, an "error related negativity" (ERN, sometimes also Ne, for error negativity) emerges [25,26] which onsets around the commission of the error and peaks around 100 ms with a medio-frontocentral maximum.

The ERN can be modulated by motivational and emotional factors. It is increased in participants scoring high on scales for anxiety and worry [27,28], in participants suffering from obsessive-compulsive disorder who often have comorbid depressive symptoms [29–31] and after presentation of negative IAPS pictures [32,33]. In contrast, if and how positive emotions influence performance monitoring is not known. Possible indirect evidence comes from drug studies but has to be regarded with caution: Alcohol, which induces pleasant feelings, and oxazepam, a benzodiazepine derivative with anxiolytic properties, reduce ERN amplitude [34,35].

The present study therefore examines how induced facial expressions modulates ERN amplitude. Following Ashby and colleagues [11], we hypothesized that induced smiles (positive affect) increases dopaminergic activity in various brain regions, among them the mesencephalic dopamine system and the prefrontal cortex. This increase in dopaminergic activity should offset the phasic decrease in this neurotransmitter induced by performance errors and, hence, we expected a decreased ERN amplitude in a smile vs. a no-smile condition. Normal participants were studied in a typical flanker experiment (see figure 1) in three conditions (stick between the teeth: "smile", stick held with the upper lip: "no smile", control "no stick"). Since participants were to remain naïve regarding the intended emotional modulation, the effectiveness of the facial feedback procedure was tested in a separate sample.

Results

Induction of emotion

a) In the behavioral sample: After the experiment, subjects of the "non-smile" condition scored lower on the EWL-60-S-scale "general well-being", whereas subjects of the smile condition scored higher (t(28) = 2.3, p<0.03). There were no differences on the scales "extraversion/introversion" and "anxiety" (figure 2). Gender differences could not be examined in detail due to the limited number of male subjects in the sample.

b) In the ERP sample: No formal assessment of induced mood was conducted to leave the participants naïve with regard to the emotion induction manipulation. After the experiment, participants were asked informally whether they felt differently with varying stick positions. While three participants reported that they felt "positive", "good" or "happy" in the "smile"-condition, no such response was obtained in the "no smile"-condition.

Behavioral data. Reaction times and error rates are given in table 1. Erroneous responses were faster than correct responses, but the three facial feedback conditions did not influence reaction times (*correctness*: F (1,21) = 339.4, p<.001; *expression: F (2,42) = 2.3, p<.11*, interaction: *F (2,42) = 1.45, p<.24*). Responses were faster following congruent flankers (HHHHH and SSSSS) compared to incongruent flankers (HHSHH and SSHSS) but the congruency effect was not modulated by *expression* (*congruency*: F (1, 21) = 265.1; p<.001; *expression: F (2,42) = .87, p<.42; congruency by expression: F (2,42) = .78, p<.45*). However, facial feedback modulation had a
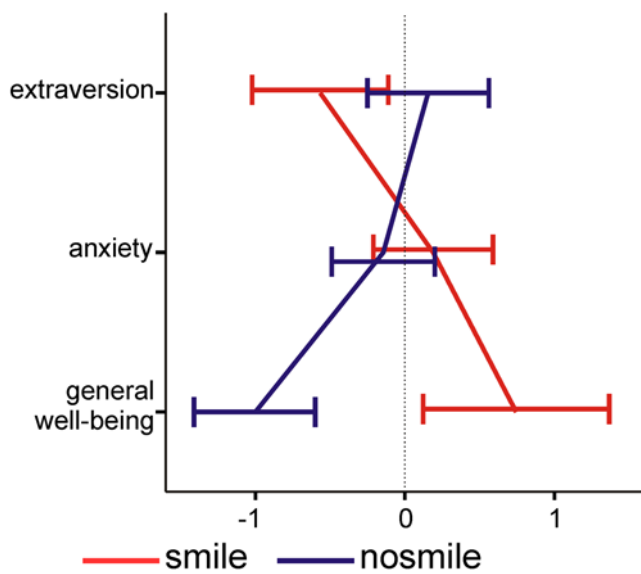
Figure 2. Results of the EWL-60-S questionnaire; Data were collected on a separate sample, Facial Feedback group is coded by line color. Items summarized according to the EWL-60-S-manual. Scores are based on difference post-experimental EWL-60-S minus pre-experimental EWL-60-S results; positive values indicate that people loaded higher on this scale after completion of the EEG experiment. Error bars indicate $+/-1$ SE.
doi:10.1371/journal.pone.0005754.g002

small, but significant impact on error rates (*congruency*: F (1, 21) = 251.95; p<.001; *expression:* F (2,42) = 4.7, p<.014; *congruency×expression: F (2,42) = 2.47, p<.10*) mean error rates: congruent flanker: 5.6%; incongruent flanker: 18.9% see table 1 for detailed error rates. However, post hoc comparison revealed that the difference was seen between the smile and the no-stick condition (t = 3.2; p <.005). There were no differences between the smile and the non-smile condition.

Participants showed significant post error slowing (F (1,21) = 28.99, p<.001) but this was not modulated by *expression* (F (2,42) = 0.61, p<.94, see table 2).

Response-locked ERPs

Response-locked averages showed a typical ERN response that peaked at about 70 ms post stimulus (figure 3) and was most pronounced over the medial frontal scalp (electrodes Fz, Cz, FC1, FC2). Visual inspection indicated a considerably smaller ERN amplitude in the smile condition, whereas the ERPs to the correct stimuli were not modulated by facial expression. Moreover, spline

Table 2. Post-error slowing.

Errors	Overall	smile	no-smile	no stick
Postcorrect trials	391	393	392	389
Posterror trials	418	417	416	421

Correct responses following erroneous responses (posterror trials) are compared with correct responses following response-matched correct responses (postcorrect trials). Reaction times are given in milliseconds.
doi:10.1371/journal.pone.0005754.t002

interpolated isovoltage maps of the ERN did not reveal differences in scalp distribution between conditions (see figure 4).

Statistical analysis was conducted separately for correct and erroneous responses (mean amplitude 20 to100 ms; Fz, Cz, FC1, FC2). The reduced ERN for the smile condition led to a main effect of expression for the error trials (F (2,42) = 5.20; p<.01), with post-hoc comparisons showing that the smile condition was different from both, the no-smile and no-stick condition (both p<0.05). No significant effect of *expression* was seen for correct trials (F (2,42) = 1.76; p<.19).

Discussion

Inducing a smiling facial expression by holding a pen between the teeth led to an increase in general well-being (behavioural sample) and to an increase in error rate accompanied by a reduction of the error-related negativity (ERN), a prominent neurophysiological marker of performance monitoring. Thus, the experimental manipulation was successful with regard to our main target of observation and the direction of amplitude change conformed to our expectations derived from the reinforcement learning theory of the ERN [19]. This theory specifies that error detection involves the dopaminergic midbrain and that a performance error is associated with a phasic decrease of dopamine that is transmitted to the medial prefrontal cortex, where the ERN is released. Recent invasive measurements corroborated this account by showing that error-related activity is also present in the Nucleus accumbens, a structure heavily innervated by dopaminergic activity [31].

In their model of dopamine and positive affect, Ashby and coworkers [11] propose that positive affect leads to an increased dopamine release in the midbrain (nigrostriatal and mesocortico-limbic system) and in frontal brain regions. Thus, inducing positive mood elevates the tonic dopamine level. Following work on the embodying of emotion [1,2,4] and in particular investigations examining the facial feedback hypothesis [36–40] we assume that

Table 1. Reaction times and error rates.

		overall	smile	no-smile	no stick
Reaction times in ms	**Correct**	395	394	395	397
	Correct/congruent	379	377	379	381
	Correct/incong.	424	424	423	425
	Error	336	333	337	338
Error rates in percent	**Errors**	10.9	11.5	10.8	10.4
	Errors/congruent	5.6	5.9	5.3	5.6
	Errors/incongruent	18.9	19.9	19.1	17.6

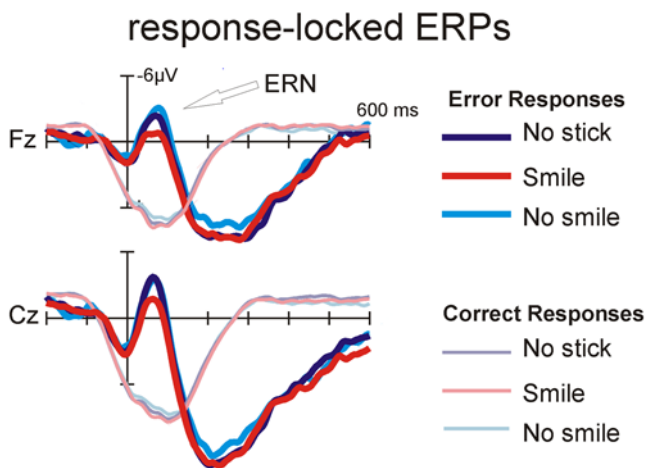doi:10.1371/journal.pone.0005754.t001

Figure 3. Response-locked ERPs on midline electrodes FZ and CZ for correct (thin lines) and erroneous (thick lines) responses. Stick-positions are coded by line style.
doi:10.1371/journal.pone.0005754.g003

Figure 4. Spline-interpolated isovoltage maps depicting the mean amplitude in a time window 20 to 100 ms of the difference wave "error" minus "correct". Relative scaling is used with lighter shades representing more negative amplitudes.
doi:10.1371/journal.pone.0005754.g004

our manipulation led to mildly positive affect. As a consequence, the dopamine level in the anterior cingulate cortex (ACC) should be tonically increased [11]. Increased dopamine levels in the midbrain and in the ACC due to the induced positive affect might counteract the phasic reduction in dopamine activity [19] and cause a weaker disinhibition of the ACC. This might be the neural mechanism that leads to the decreased ERN-amplitude we observed in the "smile"-condition of the current experiment. Ashby and Casale [41] proposed a computational model that simulates the tonic dopamine increase by positive affect. They showed that their model is able to generate results like the one we obtained here by simply changing the numerical value of the two parameters assumed to be affected by the dopamine level (parameters $K_{ampa}(Da)$ and $K_c(Da)$ in the model).

The present study supplements earlier findings from our group [32,33] where short-term presentation of negative IAPS-pictures prior to the execution of a flanker task lead to an increase in ERN-amplitude. In our earlier work, positive IAPS-pictures presented immediately prior to the flanker stimuli did not lead to a change in ERN-amplitude. This might be explained by the computational model mentioned above [41], according to which positive affect must last at least 30 s to affect dopamine level.

The clear reduction of the ERN amplitude in the smile condition was accompanied by an increase in error rates, which fits with previous notions that positive affect is associated with decrements in performance quality [42,43]. By contrast, facial expression had no influence on other behavioral measures in the flanker task such as reaction times and post error slowing. A dissociation of behavioral measures and ERN changes has been reported repeatedly (e.g. [27–29]) and it remains to be shown whether a more profound positive mood change would affect reaction times and post-error slowing in addition to error rates.

The present ERP experiment involved only female participants. Several lines of evidence indicate that emotional expressions might differ between male and female. For example, it has been shown that woman generate facial electromyographic pattern of greater magnitude and report stronger experience of emotion while imagining emotional situations [44]. Thus, if emotional experience corresponds more strongly to facial expressions in women, manipulation of facial expression might also lead to a stronger emotional response in women. Others have argued, however, that
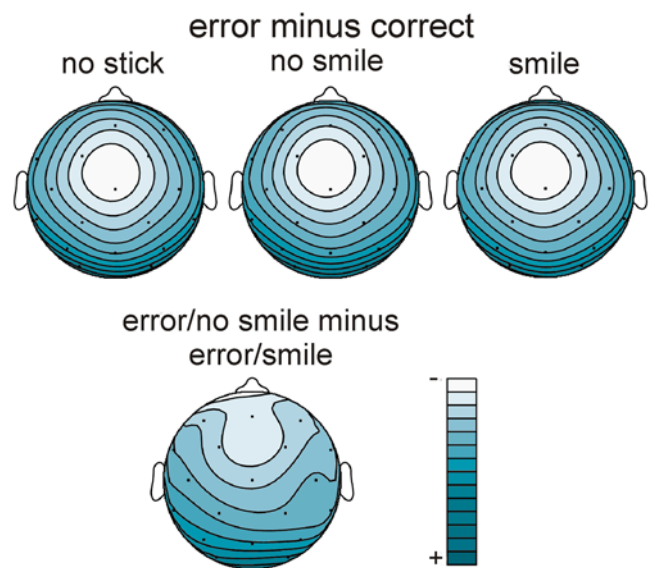
facial feedback might be more powerful in men than women, because the former might be more sensitive to physiological changes [45]. Facial feedback effects have been previously described in a female only sample [46]. Thus, it remains to be explored whether the ERN effects might be generalized to a male population as well.

To sum up, the present study for the first time shows that induced facial expressions known to lead to positive affect leads to reduced activity of the performance monitoring and error detection system. Previous research has shown that positive affect may lead to increased cognitive flexibility [42,43]. The present results are compatible with this earlier finding: positive affect might lead to less emphasis on error avoidance and thus allow the subject more flexible behavior.

Materials and Methods

Participants

ERP study: Twenty-five right-handed women took part in the experiment. Data from 3 participants had to be excluded (two participants due to high and uncorrectable artifact levels, one participant mixed up stick-positions (see below)). Thus, data were analyzed from 22 women (mean age 22 years, range 17 to 28) all having normal or corrected to normal vision. As previous research on mood induction (for example using pictures with emotional content) has revealed gender differences and more pronounced effects in women, we included only female participants in the ERP study. Please note that this also ensured comparability with previous research on emotional modulation of the ERN [32,33].

Behavioral sample: There was a separate sample to assess changes in short-term psychological state, consisting of 30 participants (21 female, mean age 25, range 19 to 53).

Participants received course credit or €6.50 per hour after completion of the experiment and gave written informed consent. The study protocol was approved by the ethics committee of the University of Magdeburg.

Stimuli and Procedure

Flanker-task. A trial consisted of the following sequence, timing is provided in brackets: fixation cross (600 to 800 ms, mean 700 ms), flanker stimulus until response (see Fig. 1). Flanker stimuli consisted of black capital letters ("Courier new" font) H or S presented in front of a gray background (128, 128, 128 in RGB color space). A congruent flanker string was either HHHHH or SSSSS; incongruent flanker strings were SSHSS or HHSHH. Flankers were presented in random order. There were 60% congruent and 40% incongruent trials. They covered 2.1° of visual angle in width. Participants were asked to respond as fast and as correct as possible to the central letter of the flanker string. They responded with a left-hand button to the H and with a right-hand button to the S.

The experiment consisted of 2100 trials. A feedback screen was presented after every 30 trials, informing the participants whether they had been faster or slower than in the previous 30 trials. This procedure was introduced to keep participants attending and to maintain fast responses. Participants terminated the feedback screen by button press. After 210 trials (1 block), there was a break for 15 seconds. Participants could request longer breaks if necessary.

Induction of facial expression. Affective state was modulated on a block-wise basis. At the beginning of each block, participants were asked to either

- hold a Chinese disposable chopstick horizontally between the teeth ("smile"-condition),
- hold a stick vertically with the upper lip only ("no-smile"-condition) or
- have no stick in the mouth ("no stick"-condition).

Three blocks of each condition were performed in a quasi-randomized manner (restriction: the same condition could not be performed in two successive blocks). Thus, $3 \times 210 = 630$ trials were obtained for each condition.

Sham story. Participants were not informed about the intended affective modulation. Thus, to explain why they were required to hold a chopstick with either the lips or between the teeth, the following sham story was introduced: Participants were told that the present ERP study examines how facial muscle artifacts influence ERP recordings. To demonstrate muscle artifacts, the experimenter presented the participants with their own EEG on the presentation computer prior to the beginning of the experiment. Participants were asked to blink and to move the eyes so that clearly detectable blink artifacts were visible in the EEG-tracings. Now that participants knew that eye artifacts severely impact ERP recordings, they were told that researchers know how to handle eye artifacts, but that little is known about how to handle muscle artifacts generated by the mouth and ervated by different chop stick positions. At the end of the experiment, a questionnaire asked the participants to explain the purpose of the experiment. None of them was suspicious about the cover story. After the completion of the experimental session, participants were debriefed.

Assessment of emotional state. Since it was intendedby the cheek muscles. Thus, to examine this in detail, mouth and cheek muscles will be inn to leave the participants naïve regarding the emotion induction procedure, it was necessary to test the effectiveness of the facial feedback procedure on a separate sample. Thirty subjects, all participants of another ERP study in our lab, were asked to fill out the EWL-60-S [47,48] after completion of the ERP setup procedure. The EWL-60-S is an established German questionnaire to assess short-term changes in psychological state; it is a shortened version of the German adjective list "Eigenschaftswörterliste" [48] and well-suited to before and after treatment [47]. The EWL-60-S consists of 60 items, summarized to 6 scales. In the present study, we restricted to the scales "extraversion/introversion" (in this context, extraversion is not treated as a personality trait, but refers to a person's present mood state [49]), "general well-being" and "anxiety", each consisting of two subscales and 8 items. After completion of the questionnaire, participants received the same sham story as the ERP sample of the current experiment. They were randomly allocated to hold the chopstick for five minutes either in the "smile" position or in the nonsmile position. After that, they filled out a rearranged version of the EWL-60-S.

Data recording and analysis

Recordings were conducted in an electrically shielded recording chamber equipped with a Neuroscan EEG amplifier. Participants were seated in a comfortable chair at a distance of 80 cm to the screen. Stimuli were presented on a 19 inch analog monitor. Chamber illumination was slightly dimmed.

The electroencephalogram (EEG) was recorded from 29 positions including all 19 standard locations of the 10/20 system with tin electrodes mounted in an elastic cap relative to a reference electrode placed on the tip of the nose. Eye-movements were recorded with electrodes affixed to the right and left external canthi (horizontal electrooculogram (hEOG), bipolar recording) and at the left and right orbital ridges (vertical electrooculogram (vEOG), bipolar recording). Impedances of all electrodes were kept below 10 kΩ. Biosignals were amplified with a band-pass from 0.05 to 30 Hz and stored with a digitization rate of 250 Hz. Prior to ERP data analysis, all trials containing eye artifacts were corrected using a blind component separation [50]. Artifacts on recording channels were rejected based on individual peak-to-peak amplitude criteria using a special purpose program with individual thresholds between 50 and 100 μV. Stimulus-locked ERPs (onset of emotional picture and onset of flanker stimulus) were averaged for epochs of 1024 ms starting 100 ms prior to stimulus onset for stimulus-locked data analysis and 200 ms prior to response for response-locked analysis. The pre-stimulus period served as a baseline for ERP-computation. All ERP figures and all ERP statistics are based on unfiltered data (except band-pass from 0.05 to 30 Hz during recording).

ERPs were generated relative to a 200 ms pre-response baseline. Consistent with previous research [51], only responses given within 200 to 800 ms after flanker stimulus onset were included in ERP analysis and behavior data. Statistical analysis was based on the factors *correctness* (correct vs. erroneous responses) and *expression* (stick position; "smile", "no smile", "no stick"). The ERN was quantified by a mean amplitude measure (20–100 ms) for frontocentral electrodes (averaged across electrodes FC1, FC2, Fz, Cz).

Reaction times (only reactions given in a 200–800 ms post stimulus window) and error rates (percentage) were obtained and entered into ANOVA statistics. We also examined post error slowing. This term refers to the fact that often correct responses directly following an erroneous response (post-error trials) are slower relative to trials that follow correct responses (post-correct trials; e.g. [52,53]). However, since responses for erroneous trials are usually faster than for correct trials, this effect could be caused by regression toward the mean. As fast responses are relatively rare, it is more likely that a fast response is succeeded by a slower response. To distinguish between post-error effects caused by regression towards the mean from "pure" error-induced RT slowing, a subset of correct trials was selected that matched the

erroneous trials in terms of reaction time and total number (see [27] for a similar procedure). Thus, the selected correct trials belong to the faster responses among all correct trials. Reaction times of correct trials given directly after those response-matched correct trials (post-correct trials) and response times of correct responses given directly after an erroneous response (post-error trials) provide the basis for post-error slowing analysis.

Emotional state in separate sample: EWL-60-S-scales were compared between the "smile" and the "no-smile" group via independent t-tests based on the difference post-treatment-score minus pre-treatment-score.

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Laughter Yoga for Patients with Hypertension, India

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Abstract

Objective: To evaluate the effects of laughter Yoga on selected haemodynamic variable of hypertensive patients.

Design: quasi experimental design.

Setting: Magalir Maruthava Maiyam Veeriamplayam, Coimbatore.

Sample: Forty samples diagnosed to have hypertension were selected for the study, of which 20 were assigned to the control group.

Outcome measures: Haemodynamic variables namely blood pressure pulse and mean arterial pressure were measured before each session of laughter Yoga and after laughter Yoga and recorded.

Intervention: laughter Yoga techniques were practiced by the patients for 20-30 minutes. It was given at one session per day for 5 days.

Results: Subjects who received laughter Yoga reported significant reduction in blood pressure of 125.15/82.2.25 mm of Hg than 140.50/91.50mm of Hg in control group, pulse 79.86 than87.6 in control group, MAP of 97.79 than 108.33 in control group. There was no association between haemodynamic variable and demographic variables of age, sex and BMI.

Conclusion: The results supported that the incorporation of laughter Yoga as one of the best alternative therapy to reduce hypertension.

Keywords: Laugh Therapy; Hypertension

Introduction

Nearly seventy percent of the diseases have their roots in stress. There are many ways to remove the stress. Laughter is one of the great ways to distress. Laughter harmonizes all the sense organs in a moment of total concentration. There is no human being who never wishes to laugh [1]. It is a simple form of stress busting and very effective self care tool [2]. Hypertension is one of the important causes of mortality and morbidity in the elderly in India. Nearly 60-80% of the elderly population has high blood pressure for which early identification and adequate treatment of hypertension is of prime necessity [3]. The American Accreditation Health Care Commission reports that inadequately controlled hypertension are the major factor for the higher mortality rate from heart disease. It adds on further stating that nearly one billion people worldwide have hypertension. Less than half of

these people are on medication and only half of this group has their blood pressure under control with such agents. Prolonged blood pressure elevation eventually damages blood vessels through the body. The high prevalence of hypertension in the general population makes the identification and treatment of affected patients, a top priority for clinicians [4,5]. Laughter Yoga is now recognized as one of the suitable alternative therapy in lowering hypertension. A hundred laughs a day is equal to 10minutes of morning jogging or workout on a rowing machine or 15 minutes on a stationery exercise making it an excellent aerobic workout.

Need for the Study

The prevalence of hypertension has been increasing in developing countries; and community surveys have documented that it is more prevalent among the Indians between the third and sixth decades of their life. Hypertension is a major modifiable risk factor for cardiovascular disease, which accounts for 57 and 24% of all deaths due to stroke and coronary heart disease respectively Around 5.3 lakh Indians die of hypertension related coronary disease every year and the figure is likely to double each year. It has been found in a study from Northern India that incidence of hypertension increased from 3.98 per cent in 1963 to 26.78 in 2000 among men while the incidence rate role from 6.647 per cent to 27.65 per cent among women [4-7]. In this 21st century the attention is focused on alternative therapies like relaxation, meditation, laugh therapy, aroma therapy along with pharmacological management. The investigator during the clinical experience found that more number of hypertensive patients was visiting the hospital that had poor psychological well-being too. Many articles and reports provide generalized statements on the benefits of laugh therapy in various disorders. Hence forth the investigator was motivated to create empirical evidence on the efficacy of laugh therapy in hypertension and psychological well-being. This will also provide a sound scientific base principle for implementing this laugh therapy as a nursing intervention for hypertensive patient's clients to provide a holistic care. With this motive the investigator embarked a rigorous research to test the efficacy of laugh therapy on selected haemodynamic variables and psychological well-being of hypertensive patients [8].

Statement of the Problem

Effect of Laughter yoga Therapy on Selected Haemodynamic Variables of Patients with Hypertension at, Veeriampalayam, Coimbatore.

Objectives of the Study

1. To assess selected haemodynamic variables of patients with hypertension before and after laughter yoga.
2. To compare the selected haemodynamic variables of hypertensive patients who receive laughter yoga with those who do not receive laughter yoga.
3. To associate the selected demographic variables with changes in haemodynamic variables.

Methodology

Research Approach

Experimental research approach was adopted for the study as it was intended to assess the effectiveness of effects of laugh therapy on selected haemodynamic variable and psychological well-being of hypertensive patients

Research Design

The present study was a quasi experimental study in nature as it involves manipulation and matched control without randomization.

Study Setting

The study was conducted at Magalir Maruthuva Maiyum, Veeriampalayam Ciombatore. This rural centre is an annexure of Kovai Medical Center and Hospital, a multi-user speciality hospital in Coimbatore. The rural centre runs with an outpatient department from 9:00am to 5:00 pm and adequately equipped to treat in patients with minor ailments. About 40 patients in around Veeriampalayam, Kalapatti, and Karuparayanpalayam visit the outpatient department every day. Nearly 80 patients have been identified to have hypertension in that locality who visits the outpatient department for treatment.

Study Population

The population of the study included patients visiting the rural centre who were identified to have primary hypertension

Sample and Sample Size

Male and female patients visiting the rural centre who were identified to have primary hypertension and those who fulfill the criteria, where selected as sample. The sample size of the study was 40 patients out of which 20 patients were assigned to the control group and 20 were assigned to experimental group. The groups were

matched for variables such as age and intake of antihypertensive agents.

Criteria for Sample Selection

The following were the criteria set for the selection of sample for this study.

Inclusion Criteria

1. Patients who were diagnosed to have primary hypertension with the blood pressure ranging from 140-180/90-110mm of Hg.

2. Both male and female those who were above the age of 20

Exclusion Criteria

1. Patients with coexisting disease like IHD, bronchial asthma, cerebrovascular accident, tuberculosis and other respiratory infections.

2. Patients with known psychiatric illnesses.

3. Patients with either visual or hearing impairment.

Sampling Technique

The samples who met the inclusion criteria during the data collection were selected using Convenient sampling technique.

Procedure for Data collection

The data collection as planned was done for a period of one month. The formal permission to conduct the study was obtained from the medical officer of Veeriampalayam Magalir Maruthuva Maiyam. The patients were selected on the basis of selection criteria. The data was collected in the following pattern. List of clients who had primary hypertension were obtained. The investigator established good rapport with the patients and the purpose of the study was explained to the subjects to ensure their cooperation. In the control group the pretest and post test measures of the haemodynamic variables were obtained for 5 days between 10-11 A.M. which was most convenient time for all the patients. The control group was on the routine treatment during this period. In the experimental group the haemodynamic variables were measured 15-20 minutes before and after laughter yoga. Each subject received 5 session of laughter yoga therapy for 5 days. The blood pressure was measured using calibrated sphygmomanometer and stethoscope. The same sphygmomanometer and stethoscope was used for all the subjects throughout the study. The pulse was measured by palpating the left radial artery. The mean arterial pressure was measured using the derived formula. The pretest psychological well- being score was obtained on day one and the post test score was obtained on day five after the laugh therapy based on the responses to the questionnaire. During this period, the amount of anti hypertensive drugs and its half life period also was considered by the investigator recording the time of intake of the antihypertensive drug.
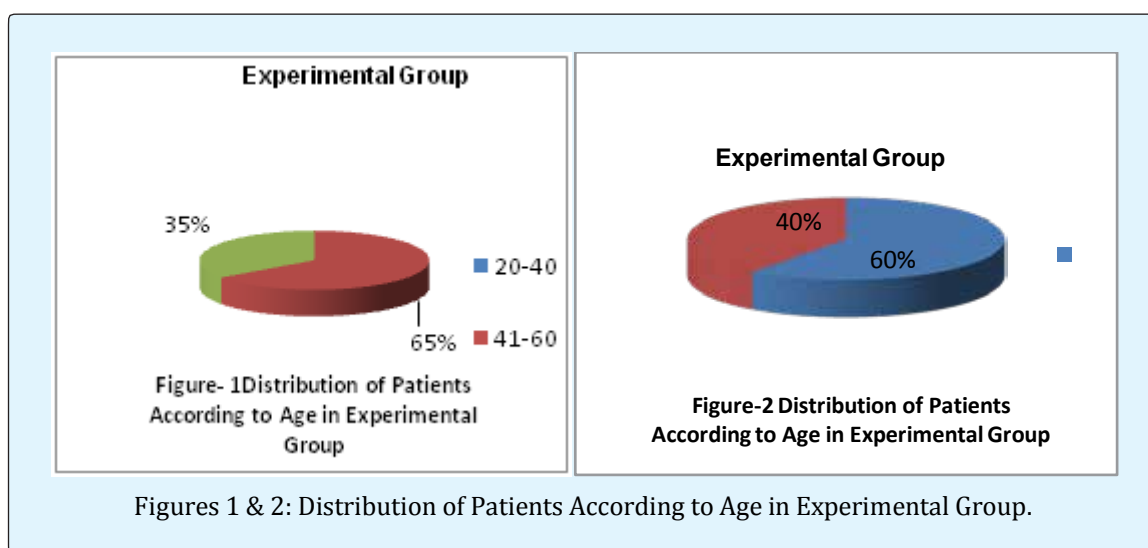
Results

Background Variables

The mean pretest measures of systolic BP were 141.35 and 142.70 in control and experimental group. The 't' test for the mean difference of systolic blood pressure was 0.742 at df (28) which was not significant. The mean post test measure of systolic BP was140.5, 125.5 in control and experimental group respectively. The 't' test for the mean difference between systolic blood pressure of control and experimental group was 6.855 df (38) was highly significant at.01 level (Tables 1-10, Figures 1-3).

The mean pretest diastolic blood pressure of control group was 92.1 and 93.1in experimental group. The mean post test diastolic blood pressure measure in control group and experimental group was91.50 and 82.25 respectively. The 't' test value for the mean difference between the posttest measure of diastolic blood pressure of control and experimental group was 9.885at df (38) which was highly significant at 0.01 level.

- The mean pretest pulse measure of control was an experimental group was88. 9. The mean post test pulse measure of control group was 87.86and in experimental group was 79.86. The 't' value for the mean difference between posttest pulse of control and experimental group 8.145 at df (38) was highly significant at.0.1 level.

- The mean pretest mean arterial pressure of control group and experimental group was 110.03. The mean post test MAP measure of control group was 108.33 and experimental group was97.79. The 't' value for the mean difference between posttest measure of MAP of control and experimental group 9.742 at d6 (38) was highly significant at 0.01 level.

- There was no significant association found in post test measures of blood pressure and psychological well- being with age, sex and body mass index in the experimental group.

S.No.	Characteristics	Control Group N = 20		Experimental Group N = 20	
		Frequency	Percentage	Frequency	Percentage
1.	Age in years a) 20-40 b) 41-60 c) above 60	- 13 7	- 65 35	- 13 7	- 65 35
2.	Sex a) Male b) Female	8 12	40 60	12 8	60 40
3.	Marital Status a) Single b) Married c) Widow	- 20 -	- 100 -	- 18 2	- 90 10
4.	Educational Status a) Illiterate b) Primary c) High School d) Collegiate	16 4 - -	80 20 - -	13 7 - -	65 35 - -
5.	Occupation a) Health Professional b) Others	- 20	- 100	- 20	- 100
6.	Religion a) Hindu b) Muslim c) Christian d) Others	20 - - -	100 - - -	20 - - -	100 - - -
7.	Income status per month in Rs. a) < 2000 b) 2001-5000 c) > 5000	3 13 4	15 65 20	9 11 -	45 55 -

Table 1: Frequency and Percentage Distribution of samples with demographic variables:

Figures 1 & 2: Distribution of Patients According to Age in Experimental Group.

S.No.	Characteristics	Control Group N = 20		Experimental Group N = 20	
		Frequency	%	Frequency	%
1.	Record of BP (previous month record) a) 140-150/90-100 b)151-160/101-110 c) 161-180/111-120	11 9 -	55 45 -	10 10 -	50 50 -
2.	Height in cm a) 145-150 b) 151-155 c) 156-160	6 12 2	30 60 10	3 11 6	15 55 30
3.	Weight in kg a) 35-45 b) 46-55 c) 56-70	- 8 12	- 40 60	- 10 10	- 50 50
4.	Body mass index a) >18 b) 18-25 c) <25	- 11 9	- 55 45	- 10 10	- 50 50
5.	Habit of Alcohol consumption(male alone) a) Yes b) No	- 8	- 100	- 12	- 100
6.	Habit of smoking (male alone) a) Yes b) No	1 7	12.5 87.5	2 10	10 90
7.	Intake of Medication a) Antihypertensive b) Diuretics c) Nil	8 - 12	40 - 60	8 - 12	40 - 60
8.	Intake of contraceptive pills (female alone) a) Yes b) No	- 12	- 100	- 8	- 100

Table 2: Frequency and Percentage Distribution of samples with clinical variables.

S. No.	Group	N	Mean	S.D	't' value	Level of significance
	Systolic blood pressure					
1	Control Group	20	141.35	7.541	0.742	N.S.
2	Experimental Group	20	142.7	3.0625		
	Diastolic blood pressure					
1	Control Group	20	92.1	2.198	0.71	N.S.
2	Experimental Group	20	93.9	1.9973		
	Pulse					
1	Control Group	20	88.9	2.6938	0	N.S.
2	Experimental Group	20	88.9	2.6938		

Angeline K and Madhavi R. Laughter Yoga for Patients with Hypertension, India. J Cardiol 2018, 2(2): 000120.

Mean Arterial Pressure					
1	Control Group	20	110.103	2.3323	0	N.S.
2	Experimental Group	20	110.103	2.3323		

Table 3: Description of the Pretest Measures of Haemodynamic Variables in the Control and Experimental group.

Systolic BP Measurement	N	Mean	S.D	't' value	Level of significance
Pre test	20	142.7	3.0625	18.42	**0.01**
Post test	20	125.15	4.9126		

Diastolic BP Measurement	N	Mean	S.D	't' value	Level of significance
Pre test	20	142.07	3.0625	8.559	0.01
Post test	20	82.25	2.6532		

Pulse Measurement	N	Mean	S.D	't' value	Level of significance
Pre test	20	88.9	2.6938	14.394	0.01
Post test	20	79.86	2.2110		

MAP Measurement	N	Mean	S.D	't' value	Level of significance
Pre test	20	110.1030	2.3323	14.934	0.01
Post test	20	97.79	4.3488		

Psychological well being score	N	Mean	S.D	't' value	Level of significance
Pre test	20	27.20	3.8058	35.639	0.01
Post test	20	61.25	3.670		

Table 4: Description of the pretest and posttest measures of haemodynamic variables in experimental group

S.No.	Group	N	Mean	S.D	't' value	Level of significance
1.	Systolic BP Control Group	20	140.5	8.7268	6.855	0.01
2.	Experimental Group	20	125.15	4.9126		

S.No.	Group	N	Mean	S.D	't' value	Level of significance
1.	Diastolic BP Control Group	20	91.50	3.2363	9.885	0.01
2.	Experimental Group	20	82.25	2.6532		

S.No.	Group	N	Mean	S.D	't' value	Level of significance
1.	Pulse Control Group	20	87.86	3.7953	8.145	0.01
2.	Experimental Group	20	79.86	2.2110		

S.No.	Group	N	Mean	S.D	't' value	Level of significance
1.	MAP Control Group	20	108.33	2.1172	9.742	0.01
2.	Experimental Group	20	97.79	4.3488		

Table 5: Description of the post test measures of haemodynamic variables and scores of psychological well being in control and experimental group.
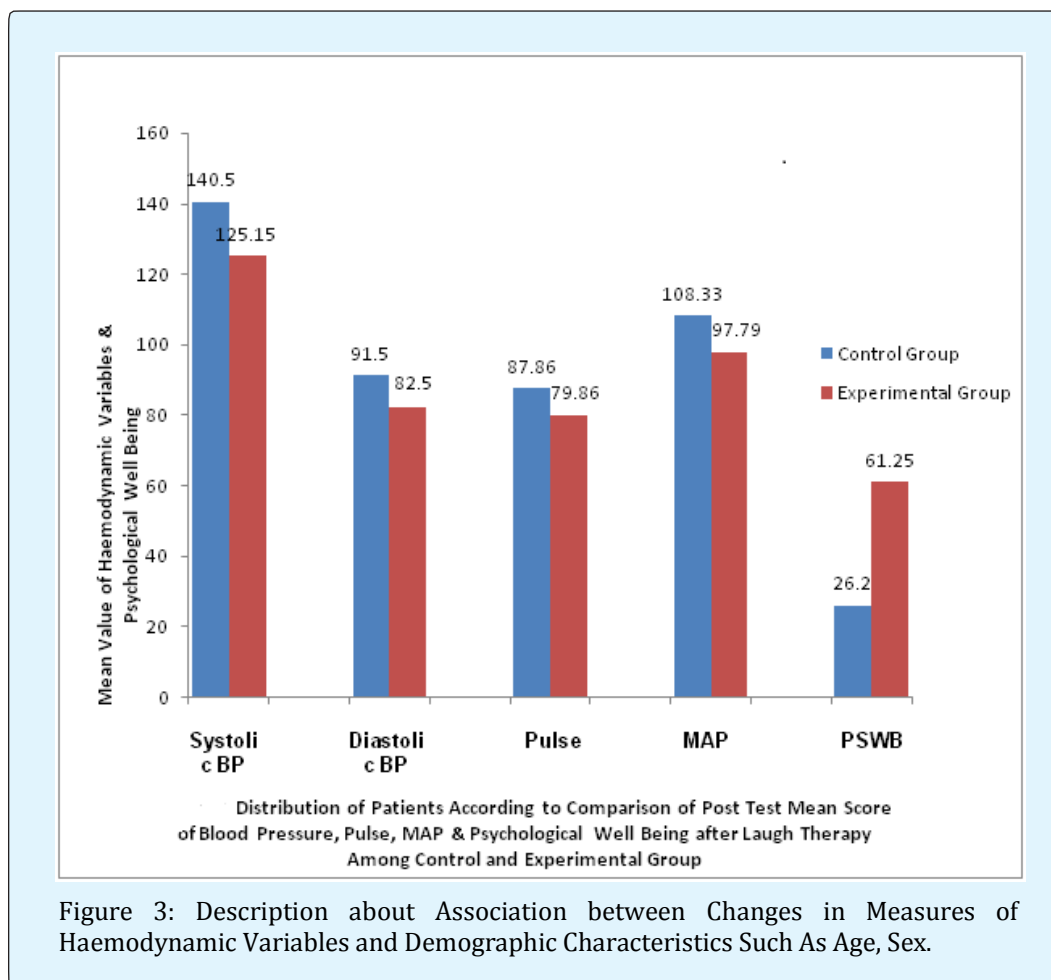

Figure 3: Description about Association between Changes in Measures of Haemodynamic Variables and Demographic Characteristics Such As Age, Sex.

Characteristics	Systolic BP				Diastolic B.P				
Age (in years)	N	Mean	S.D	't' value	N	Mean	S.D	't' value	Level of significance
41-60 above 60	6 14	124.66 126.142	5.853 4.588	0.395	6 14	82.33 82.85	3.829 2.143	0.608	NS

Table 6: Association between posttest measures of systolic and diastolic B.P in different age group in experimental group.

Characteristics Age (in years)	N	Mean	S.D	't' value	Level of significance
41-60 above 60	6 14	60.833 61.571	2.994 4.164	0.390	NS

Table 7: Association between posttest measures of psychological well-being in different age group in experimental group.

Characteristics	Systolic BP				Diastolic B.P				
Sex	N	Mean	S.D	't' value	N	Mean	S.D	't' value	Level of significance
Male Female	8 12	122.75 127.66	4.399 4.292	2.485	8 12	80.75 84.00	1.488 2.486	3.306	NS

Table 8: Association between posttest measures of systolic and diastolic B.P in different gender in experimental group.

Characteristics Sex	N	Mean	S.D	't' value	Level of significance
Male Female	8 12	59.25 62.58	3.240 3.423	2.178	N.S.

Table 9: Association between posttest scores of psychological well-being in different gender in experimental group.

Characteristics	Systolic BP				Diastolic B.P				
Body mass Index	N	Mean	S.D	't' value	N	Mean	S.D	't' value	Level of significance
18-25 <25	10 10	127.2 124.2	4.211 5.266	1.407	10 10	82.8 82.6	2.485 2.951	0.164	NS

Table 10: Association between posttest measure of systolic and diastolic BP in different BMI in experimental group.

Discussion

The first objective was to assess the selected haemodynamic variables of patients with hypertension before and after laughter yoga. The mean score of pretest and posttest mean arterial pressure in control group was 110.13, 108.33 and 110.13, 97.79 respectively in experimental group. The second objective of the study was to compare the selected haemodynamic variables of hypertensive patients who receive laugh therapy with those who do not receive laugh therapy. In the present study the 't' value for the mean difference in the post test scores of systolic blood pressure, diastolic blood pressure, pulse and MAP in control and experimental group are 6.885, 9.885, 14.8 and 9.742 respectively at (p<0.01) which is highly significant. These findings are attributed to the effect of laugh therapy. The above finding strongly implies that laugh therapy is effective in lowering blood pressure pulse and mean arterial pressure.

- The third objectives of the study were to compare the changes in psychological well-being of hypertensive patients who receive laugh therapy with those who do not receive laugh therapy. The mean post test score of psychological well being was 26.20 and 61.25 in control and experimental group. The 't' test analysis showed higher level of significance as the 't' value was 21.80 at (p<0.01). The mean pre test and post test score of psychological well being in experimental group was 27.20 and 61.25. The obtained 't' value was 35.639 at (p<0.01) which was highly significant. The statistical evidence of the study can be strongly attributed to the effect of laugh therapy. Thus the finding implies that laugh therapy is effective in improving the psychological well being of the subjects.

- The fourth objective is to find out the association between selected demographic variable with changes in haemodynamic variables and psychological well being in the experimental group. The present study revealed that age; sex BMI had no significant influence in the haemodynamic variables and psychological well being [9-13].

Conclusion

Bittman neurologist, cites research which found that laughter can diminish levels of cortisol, stress hormone that are responsible for triggering elevated blood pressure, heart rate and a host of other stress related responses.. The study findings also provide the statistical evidence which clearly indicates that laugh therapy is one of the best alternative therapies used to lower blood pressure and improve the psychological well-being of hypertensive patients. Blood pressure, pulse and mean arterial pressure were significantly reduced among patients those who received laugh therapy.

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210

The Impact of Laughter Yoga on the Stress of Cancer Patients before Chemotherapy

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Abstract

Background: Cancer is usually accompanied by considerable stress for the sufferer, and the stress has destructive effects on Chemotherapy treatment process. Therefore, the current research deals with the effect of yoga laughter on the cancer patients' stress before chemotherapy.

Methods: In this research, as the first step, 37 cancer sufferers , who had been hospitalized in Shohada Tajrish Hospital (Behnam Daneshpoor Charity Organization) and had the requirements necessary for being taken as research samples, were selected for data collection. The mentioned patients were classified randomly in experimental and control groups. Collected data were analyzed by the multi-variable covariance analysis test.

Results: The results show there is a meaningful difference in the stress average before and after interference in the test group ($p < 0.05$).

Conclusion: Laughter yoga can decrease the stress in cancer sufferers before chemotherapy.

Keywords: Laughter yoga; Stress; Cancer; Chemotherapy

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Introduction

In terms of social aspects, cancer disturbs daily functions and social activities of the sufferer, and alters his or her abilities to fulfill their normal roles and responsibilities, up to an extent that creates some new roles. The nature of the new-born roles may cause a feeling of inefficiency and social isolation in the sufferer [1]. In fact, after cancer is diagnosed, the patient will be hit by a crisis, his self-confidence will be at stake, his individual relationships will be disturbed due to uncertainty about future, the previous adaptation mechanisms will seem insufficient, and being hospitalized repeatedly, the patient will be flooded with solitude [2]. A set of factors mentioned above lead to psychological stress in the patient [3].Cancer is a prevailing, chronic, non-infectious disease [4]. The exact reason is unknown, but genetic and exterior factors like viruses and carcinogen chemicals are likely to be influential [5]. Taking anti-cancer medicines and chemotherapy are some treatments for tumors, though they can be mixed with operation and radiotherapy. Chemotherapy is very effective in treating tumors, and the effect is increasing nowadays by implementing newly-discovered anti-tumor medicines. Conducted studies indicate that cancer is the second cause of Americans' death after cardiovascular diseases. As an effective treatment for increasing life-expectancy in the patients, chemotherapy has a significant role [6]. Research shows that the patients get stressed before chemotherapy, and it causes body resistance against treatment and disturbs the process. Having done a set of tests about breast cancerous cells, researchers have found out that the protein created after stress helps the cancerous cells continue living, getting adapted and resisting against the treatment [7].

Research has shown that immune system is effective in controlling and healing cancer, in other words, a weakening immune system raises the potentials to develop various types of cancer. Stress has been discussed as a suppressing factor of the immune system, so there is a possibility of cancerous cell growth after stress. Studies have indicated that stressed people are more likely to develop breast cancer [1]. Therefore, looking for suitable methods of stress reduction seems necessary. One of non-medical ways of stress reduction is laughing and being in delightful environments. Laughter is a positive sensation, and

seems to be a useful and healthy way to overcome stress. Decreasing stress-making hormones floating in blood, laughter removes the effects of stress. Nowadays, there is evidence indicating that being humorous and exposed to funny stimuli can have a positive influence on the side-effects of some specific diseases. Laughter is an emotional reaction influencing human's individual and social life. It enjoys features that distinguish it from other humane emotional reactions. Happiness increases Cortisol hormone and boosts body immunity against diseases. Laughter creates a balance in the chemicals and hormones of the body [8]. Lidi maintains that fun and laughter decrease red globule sedimentation level and increase natural killer-cells' activity, reduce cortisol and blastogene lymphocytes and boosts monoglobin A as well [9]. Fri (1971) declares that laughter strengthens the immune system, facilitates phagocytosis process in the immune system and also helps the body to fight against infections. Dogan believes that biological functions of laughing and crying cause biochemical changes in the body and reduces the tension made by painful emotions like fear and anger. Tears and nasal discharge during laughing and crying contain humorous, steroids and toxins accumulated in the body during tension. Laughing and crying both increases coolamine production in the blood [10].

A way to make people laugh is laughter yoga, innovated by Kataria (1995) in India. Laughter yoga is the only way enabling people to laugh heartily without getting involved in logical thinking. This method puts wisdom and logic aside as natural laughter obstacles. The reason the Cataria named his innovative method as laughter yoga was that he had mixed the respiratory exercises of yoga –called paranayama- into laughter exercises. The former exercises are very strong and effective, and they have been applied for thousands of years to influence human body, psyche and emotions in a positive manner. Based on yoga philosophy, our life is subject to a flow of universal energy into our bodies via breathing. This is called Yaprama vital energy. As a result of stress and negative tensions, our respiration gets irregular and shallow, and this disturbs the flow of energy in our bodies [11].

It should be noted that the studies on this domain have examined laughter effects using the mentioned methods and other variables reducing stress, and all of these studies have regarded the long-term effects of laughter, while the short-term effects of laughter on the stress in patients with cancer is being dealt with in the current research using laughter yoga. Therefore, in this study, the question is if laughter yoga is effective on cancer-sufferers stress level before Chemotherapy.

Materials and Methods

Statistic population of the research was patients hospitalized in Shohada Tajrish hospital for chemotherapy in the period of May to August, 2013. Sample population data is presented in this part separately for control and experimental groups. Table 1 shows distribution of samples in terms of groups, education and genders for sampling, those qualified patients were selected for trial, which were randomly placed in experimental and control groups. The minimum population of sample for each of control and experimental groups is 15 in semi-experimental studies [12]. Accordingly, researchers had initially selected 25 samples to avoid sample drop, 2 patients in experimental group and 11 in control group were omitted from the sample list in pre-test due to leaving the hospital, moving to other clinics or lacking interest for taking part in the research. There ultimately remained 23 patients in experimental group and 14 in control group.

This study examined the effects of laughter yoga on the stress before chemotherapy.

Instruments

Stress measuring questionnaire: Questionnaire QSC-R23 (Questionnaire on Stress in Cancer Patients) was used in this research to measure stress (the questionnaire is attached). This questionnaire is specially related to specific diseases and evaluates psychological stress in cancer sufferers. Questionnaire articles were divided into 5 equal scales, including psych-physical complaints, fears, information defects, daily-life limitations and social conflicts. QSC was first formed in Germany after passing different phases, namely exact interviews, examining the initial versions of the questionnaire and measuring their validity and constancy by Herchbach. Cronbach's Alpha method of analysis was implemented to estimate tools constancy in the research. It includes 23 articles, showing daily-life potential stress in all perspectives. The answers to the questions included two parts: first, the article did not apply to the respondent (zero degree), second, respondent's conditions conformed to the specifications in the article. If the second part was selected, the answer should have determined the degree to which the subject matter of that article was

Table 1. It shows distribution of samples in terms of groups, education and genders.

Group	Education	Abundance	percentage	Gender	Abundance	percentage
	Elementary	4	17.4	Male	9	39
	Mid-school	5	21.7			
Experiment	High-school	7	30.4	Female	14	61
	University	7	30.4			
	Total	23	100	total	23	100
	Elementary	2	14.3	Male	5	35.7
	Mid-school	2	14.3			
	High-school	4	28.6	Female	9	64.3
Control	University	6	42.9			
	Total	14	100	total	14	100
	Elementary	6	16.2	Male	14	37.8
	Mid-school	7	18.9			
Total	High-school	11	29.7	Female	23	62.2
	University	13	35.1			
	Total	37	100	total	37	100

affecting him/her. This degree can be positioned on a scale of 1 (very small problem) to 5 (very serious problem).

Procedure

First, QSC-R23 questionnaire was administered to the patients accompanied by exact and complete explanations about it, and they were asked to fill it out in the researcher's presence. In case patients were unable to fill out the forms, the researcher took responsibility herself. Having the forms filled out in control and experimental groups, the experimental group was treated by laughter yoga by a trainer for 20 to 30 minutes under researcher's observation. After that, the tastes in both groups were asked to fill out the questionnaire again. Having conducted the research, laughter yoga was performed in control group as well to conform to the ethics. The data obtained was then analyzed by descriptive statistic methods such as mean and deviation, and the multi-variable covariance analysis test was applied to examine the research hypothesis.

Results

According to table 2, there is a meaningful difference between the pre-test and the post-test average; however, in control group there is no difference between them. Finally, the results of multivariate covariance analysis between variables in both experimental and control groups are shown in table 3, in which there is no meaningful difference in Psych-physical complaints, Information defects and Total stress score.

Table 2. It shows Mean and Standard Deviation of studied variables for the pre-test and the post-test in each group.

Variables	Pre-test / post-test	experiment group		Control group	
		Mean	SD	Mean	SD
Psych-physical complaints	Pre-test	1.7	1.3	1.5	0.9
	Post-test	1.1	1.1	1.5	1.1
Fear	Pre-test	2.4	1.2	2.8	1.5
	Post-test	1.7	1.6	2.7	1.8
Information defects	Pre-test	2.3	1.3	1.9	1.5
	Post-test	1.5	1.1	2	1.6
Daily-life limitations	Pre-test	2.5	1.2	2.5	1.2
	Post-test	2	1.3	2.4	1.4
Social conflicts	Pre-test	1	1.2	0.7	0.7
	Post-test	0.5	0.8	0.6	0.8
Total stress score	Pre-test	8.9	4.4	8.5	3.8
	Post-test	6.1	4.2	8.4	4.4

Table 3. It shows the results of multivariate covariance analysis between variables in both experimental and control groups.

Dependent variable	square	Freedom degree	Mean square	F	Significant
Psych-physical complaints	1.4	1	1.4	4.3	0.05
Fear	2.2	1	2.2	2.4	0.13
Information defects	3.7	1	3.7	6.9	0.01
Daily-life limitations	0.8	1	0.8	1.2	0.28
Social conflicts	0.4	1	0.4	1.5	0.23
Stress total score	29.8	1	29.8	4.9	0.03

Discussion

Findings show that the intervention was effective in making a meaningful difference in three sub-scales of psych-physical complaints, fear, information defect and total score of stress in the two groups. It indicates that laughter yoga reduces stress in cancer sufferers before chemotherapy.

The result of this research is in line with silva [13], Chaya and crew [14], Marcon [15] and Beke [16], and contrary to Omrani [17].

According to the research, stress increases cancerous cells activity to a meaningful extent, and causes the involved cells to resist against chemotherapy. Using a method to decrease the patient's stress is of a huge prominence.

Conclusion

The findings of the research have shown that as a natural gift, laughter can reduce the stress in cancer sufferers before chemotherapy. Laughter plays an important role in reducing stress, which is done by Endorphin Secretion resulting in mental and physical relaxation. Chronic Stress impacts Limbic system and Hypothalamus continuously and leads to Adrenaline secretion and causes disruption in immune system. Indeed, Laughter balances sympathetic and parasympathetic system; moreover, it functions as an anti-stress. Furthermore, laughter increases Endorphin in brain. Endorphin seems to be the most easily linked structure to morphine, both function in the exhilaration and lessening of pain.

To illustrate this according to the study background, it can be noted that laughter not only creates good spirits in patients and the hospital staff, but also it can reduce the stress in patients and improve the treatment process without any harmful side-effects by creating a happy environment at hospitals.

Examining the data brings us to conclusion that laughter has a significant effect on the spirits of patients and their stress.

Suggestion for Further Research

In this study, the questionnaire QSC-R23 was applied as the measuring tool. It is strongly suggested that the study under the same title should be conducted using other tools, such as pulse and heart beat measuring in addition to self-reporting to undermine the effect of the samples on the result. Moreover, according to the role of laughter in reducing stress, hospitals had better be equipped with laughter rooms. Doctors and nurses must be trained to be on duty smiling, and finally, comedy shows should be played for the sufferers.

Conflict of Interest

The authors have no conflict of interest in this study.

Authors' Contribution

Shadi Farifteh designed and wrote this article and collected and analyzed the data, with the help of supervisor, Alireza Mohammadi Aria and advisor, Alireza Kiamanesh. All authors read and approved the final manuscript.

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THE INHIBITORY EFFECT OF LAUGHTER YOGA ON THE INCREASE IN POSTPRANDIAL BLOOD GLUCOSE IN TYPE 2 DIABETIC PATIENTS

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Key words: diabetes mellitus,
postprandial blood glucose,
type 2 diabetes,
laughter yoga

SUMMARY

The aim of the present study was to determine the impact of laughter therapy on the blood glucose level in type 2 diabetic patients. For this purpose, we used laughter yoga, which includes respiratory laughing and fun exercises. The study involved 211 participants, of which 110 were involved and 101 were not involved (control group) in laughter yoga. In both groups, the level of blood glucose was measured at arrival after they had standard brunch, a total of 250 Kcal. A 90-minute lecture was followed by 30-minute intense workout for those participants who had laughter yoga included in the program. In both groups, the level of blood glucose was measured after 120 minutes. We found the inhibitory effect of laughter on the increase in postprandial blood glucose (P<0.05). Our study indicated the importance of daily opportunities for laughter in patients with diabetes.

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INTRODUCTION

Diabetes mellitus is associated with considerable morbidity and mortality in the elderly and is the most prevalent metabolic disease and one of the significant medical and socioeconomic problems all over the world. It is a chronic disease, which needs long clinical observation and constant adherence to medication. Negative emotions such as anxiety, fear and sorrow are known to be factors that elevate the blood glucose level (1). Conversely, positive emotions such as laughter have been reported to modify the levels of neuroendocrine factors involved in negative emotions and to modulate immune function (2-4). In 1995, the Indian cardiologist Madan Kataria decided to bring laughter to the humanity as close as possible. He founded the Laughter Yoga School.

A study of the influence of laughter on the blood glucose level in diabetic patients was published in 2003 (5). The study found a significantly reduced increase of sugar levels after meal. The cause could be the muscular work because of laughter. Counter regulatory hormones or neuroendocrine system (4) could also be the cause. Laughter yoga was also beneficial as exercises in elderly depressed women (6). The group, which practiced laughter yoga twice a week for twelve weeks, showed lowering of blood

pressure, fat reduction and regulation of the blood glucose level. Therefore, laughter yoga is recommended for diabetics to improve their long-term regulation of glucose (7). A long-term study also found hormonal and genetic changes that had a favorable effect on blood glucose levels (8,9). Humor also has a positive effect in post-stroke rehabilitation (10).

Our study elucidated the inhibitory effect of laughter yoga on the increase in postprandial blood glucose and suggested the importance of daily opportunities for laughter in patients with diabetes. The results obtained indicated that in the future, laughter therapy could be used as a new nonpharmacological approach for improving glycemic control in patients with type 2 diabetes.

MATERIALS AND METHODS

Study participants

This randomized controlled study involved 211 participants with type 2 diabetes not receiving insulin therapy. They were referred to the Department of Internal Medicine, Section of Endocrinology, University Clinical Centre Maribor, because of the newly discovered diabetes. Of them, 110 were involved in laughter yoga and 101 were not included (control group). Both groups were subdivided into those taking medicines for hyperglycemia reduction and those not taking these medicines (Table 1). An informed consent was obtained from all participating individuals and ethics approval was granted prior to conducting the study.

Study design and protocol

On experimental day, we measured the level of blood glucose at arrival (fasting blood glucose, FBG), then the participants ate the same 250 Kcal meal (30 g brown bread (1 food unit, FU), 150 g apples (1 FU), 15 g of butter (2.5 FU) and 200 mL of unsweetened tea). A 90-minute lecture was followed by 30-minute intense workout for those with laughter yoga included in the program. The level of blood glucose was then measured upon completion of the workout (120 min)

(2-h postprandial blood glucose, PPBG). Control subjects listened to a lecture instead of 30-minute laughter yoga. In this group, PPBG was also measured after the lecture (120 min). Blood glucose was measured from the fingertip by enzyme colorimetric assay using a blood glucose self-measurement apparatus.

For the purpose of this study, we created a nine-tiered questionnaire about the influence of laughter yoga on the well-being of participants. Enthusiasm, positive attitude, better breathing, energy level, mood, ability to laugh for no reason, optimism, stress level, physical and mental relaxation were assessed only by the participants included in the laughter yoga program, led by a certified laughter yoga teacher. The laughter yoga program included clapping, walking, laughing, stretching and breathing exercises. Their well-being was evaluated before and after 30-minute program using a 1-10 scale (1 indicating minimum and 10 maximum).

Statistics

Statistical analysis was performed with the VasserStats software. For various means of FBG and 2-h PPBG, odds ratio (OR) and 95% confidence interval (CI) were calculated. Differences between the experimental group and control group were assessed by the t-test.

Figure 1. **Overall well-being of participants involved in laughter yoga: assessment of well-being before and after laughter yoga.**
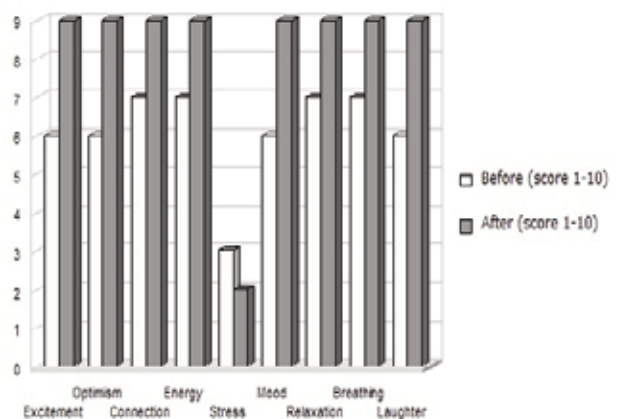
Table 1. **Number of participants divided into those taking and not taking medicines for hyperglycemia reduction**

	Number of participants	
	Laughter yoga	Without laughter yoga (controls)
Without medicines	44	40
With medicines	66	61
∑	110	101

Table 2. **Mean blood glucose levels before and after exercise, and statistical significance**

	Mean blood glucose level (mmol/L)				Control-based odds ratio (95% CI); *P*-value*	
	At arrival		After 120 min			
	Laughter yoga	Without laughter yoga	Laughter yoga	Without laughter yoga	Laughter yoga	Without laughter yoga
Without medicines	9.60	8.29	7.92	9.82	1.68±0.60;<0.001	-1.53±0.55; 0.001
With medicines	9.87	8.39	8.38	10.19	1.49±0.34;<0.001	-1.80±0.46; <0.001
∑	9.75	8.35	8.19	10.04	1.57±0.31;<0.001	-1.69±0.35; <0.001

P-value*, t-test

Table 3. **Mean levels of fasting blood glucose (FBG) with statistical significance**

	Mean FBG (mmol/L)		Control-based odds ratio (95% CI); *P*-value*
	Laughter yoga	Without laughter yoga	
Without medicines	9.25	8.98	0.27±1.51; 0.720
With medicines	8.65	8.90	0.12±1.14; 0.834
∑	8.97	8.93	0.04±0.91; 0.936

P-value*, t-test

Table 4. **Mean levels of 2-h postprandial blood glucose (PPBG) with statistical significance**

	Mean 2-h PPBG (mmol/L)		Control-based odds ratio (95% CI); *P*-value*
	Laughter yoga	Without laughter yoga	
Without medicines	8.34	10.05	1.71±0.81; <0.001
With medicines	8.66	9.78	1.12±1.03; 0.03
∑	8.53	9.88	1.35±0.81; 0.001

P-value*, t-test

RESULTS

Results of the study are presented in Tables 1-4 and Figure 1. Table 1 presents the number of participants divided into those taking medicines for hyperglycemia reduction (n=127) and those not taking these medicines (n=84). Of them, 110 (66 with medicines and 44 without medicines) had laughter yoga included in the program. The remaining 101 (61 with medicines and 40 without medicines) participants only listened to a lecture.

The mean levels of FBG and 2-h PPBG with statistical significance are presented in Table 2. The 30-minute workout had a favorable influence on all study parameters and also reduced the postprandial increase in the blood glucose level from 9.75 to 8.19 mmol/L (*P*<0.001). In the control group, 2-h PPBG increased from 8.35 to 10.04 mmol/L (*P*<0.001). Table 3 shows the mean levels of FBG with statistical significance and Table 4 the mean levels of 2-h PPBG with statistical significance. The mean level of FBG was not statistically significantly different between the

two groups (8.97 mmol/L and 8.93 mmol/L; *P*=0.936) (Table 3). After the meal, control participants had a statistically significantly higher level of blood glucose (9.88 mmol/L) than those exposed to laughter yoga workout (8.53 mmol/L; *P*=0.001) (Table 4).

Overall well-being of the participants before and after laughter yoga is illustrated in Figure 1. The questionnaire on well-being revealed strong effects on well-being, in particular on the feeling of stress, which decreased after laughter yoga.

DISCUSSION

In the present study, we found that a 30-minute intense laughter yoga workout significantly reduced the level of blood glucose in people with type 2 diabetes immediately after exercise, irrespective of whether or not using drugs to treat type 2 diabetes. At the same time, we found that laughter yoga had a favorable impact on the well-being of the individuals as it improved enthusiasm, positive attitude, breathing, energy level, mood, ability to laugh for no reason, optimism, stress level, and physical and mental relaxation. In particular, we point out that the feeling of stress decreased substantially after laughter yoga. There is no doubt that laughter yoga improved well-being of the individual and reduce the feeling of stress regardless of whether or not using antidiabetic drugs.

A study published in 2003 found that laughter significantly reduced the increase of blood glucose levels after meal. The authors concluded that the reason could be in the muscular work because of laughter (5). Shahidi *et al*. published a case study of elderly depressed women where laughter yoga proved very useful for solving the problems with negative emotions caused by depression (6). Other authors found hormonal and genetic changes associated with laughter, which had a positive effect on blood glucose levels (4,8,9).

However, there have been no studies on the effects of laughter yoga on PPBG. Hayashi *et al*. have published results suggesting a significant reduction of the increase in PPBG by watching comedy in patients with diabetes (5,8,9). We consider that laughter yoga is better choice than watching comedies due to the additional presence of intense yoga breathing and movement. Undisputed regular exercise improves metabolism, blood glucose levels, blood pressure, blood fat and helps in maintaining appropriate body weight, which is very important in the treatment of people with type 2 diabetes.

Numerous facts indicate that in the future, laughter therapy as laughter yoga could be used as a new nonpharmacological approach for improving glycemic control in people with type 2 diabetes.

CONCLUSION

Laughter yoga has proved to be an effective complementary and preventive therapy in reducing postprandial levels of blood glucose. Therefore, it contributes to long-term regulation of type 2 diabetes. Laughter is of preventive, psychological, physiological and therapeutic importance. However, it must be dealt by professionals (11,12). On the other hand, we know that stress is one of the major risk factors for cardiovascular disease. Actually, in our study, participants showed by the questionnaire that laughter yoga is an effective method to enhance positive mindset and effective tool of relaxation and networking among people. Given the fact that laughter yoga is a simple and effective method, which bypasses all intellectual systems and leads people to laugh, it could be used as nonpharmacological treatment in preventing chronic microvascular complications of type 2 diabetes.

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The effect of laughter yoga exercises on anxiety and sleep quality in patients suffering from Parkinson's disease

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Abstract

Background: The aim of the present study is to evaluate the effects of laughter yoga exercises on anxiety and sleep quality in patients suffering from Parkinson's disease. **Methods:** In the study a semi-empirical and applied research design was used, which involved a pre-test and post-test, and appropriate control group. The study consisted of 24 patients suffering from Parkinson's disease who were referred and admitted to Hazarate Raoul Allah Hospital in Tehran, Iran. The patients ranged in age from 55 to 75 and met the study criteria prior to entering the research study. The patients were randomly divided into two groups – control or experimental (n=12 per group). After completing exercises (laughter yoga), post-evaluation of anxiety and sleep quality of patients in both groups were conducted using questionnaires. For normalization of research data, the Mann-Whitney nonparametric test was used. Statistical analyses were conducted using the SPSS software, with the statistically significant level set at $P<0.05$. **Results:** The Mann-Whitney tests indicated that there was a significant difference between the average stress change as well as sleep quality in patients suffering from Parkinson's disease (versus control subjects) following laughter yoga exercises. Indeed, regarding sleep quality laughter yoga was only effective on the subjective quality of sleep and latency in sleeping. There was no observation of a significant effect on the duration of sleep, sleep efficiency, sleep disturbances, use of sleeping pills, or daily functions of the patients. **Conclusion:** The results of the present study demonstrate that laughter yoga exercises can reduce anxiety and improve sleep quality in patients suffering from Parkinson's disease. As a result, laughter yoga exercises may be beneficial as a complementary therapy with standard treatment methods to reduce anxiety and improve sleep quality in patients with Parkinson's.

Keywords

Anxiety, laughter yoga, Parkinson's disease, sleep quality, yoga

Introduction

Parkinson's disease is a chronic and progressive central nervous system disorder. It is classified among the motor system disorders (Yektamaram, 2010) which mostly affects elderly individuals (Yousefi, 2010) and is a common cause of disability in this age group (Afshar and Ghandehari, 2006). Movement disorders are neurological conditions which affect the control of movements. Activities such as walking or sipping a cup of tea may be difficult. In some cases, people cannot relax their bodies and some parts of their body remain in constant motion (Emsaki, 2010). British doctor James Parkinson was the first to describe the disease in 1817; he called the disease "shaking paralysis" and today it is known as Parkinson's disease (Abedzadeh, 2012).

In 1960, researchers found that the cause of this disease is a dysfunction in a particular area of the brain. Notably, the brain is unable to produce the chemical substance dopamine, a neurotransmitter which controls body muscle activities (Yaktamaram, 2009). Generally, Parkinson's disease occurs because of the reduction or loss of a major part of the nerve cells that produces dopamine in the region of the brain called the substantia nigra. Without dopamine, the brain cannot send motor messages (Yektamaram, 2010) leading to bradykinesia, tremors, mental deterioration and other dysfunctions of the automatic nervous system (Najarian, 2008).

Furthermore, psychological problems such as depression, anxiety, self-doubt, sleep disturbance, fear and shame can result from Parkinson's disease (Abedzadeh, 2012). Parkinson's disease has been seen in patients worldwide, affecting all ethnic groups and social classes (Moshfeghi, 2010). While many studies estimate the prevalence of the disease to be similar for men and women, some have reported it to be slightly more common (3:2 ratio) in men than women (Abargouei Azizi, 2011). The cause of this disease is still not fully understood but reports suggest an association with genetic factors (to a lesser extent) and environmental factors (to a greater extent), including agricultural jobs, drinking well water, village life and exposure to pesticides (Huang et al., 2014).

The main neuropathological sign of Parkinson's disease is destruction of dopamine-producing cells in the substantia nigra of the mid-brain. The decrease of dopamine levels and subsequent disruption of balance of dopamine and acetylcholine gives rise to a variety of movement disorders (Hartmann, 2005). In fact, clinical signs (e.g. movement disorders) of the disease are observable when loss of about 80% of dopamine-producing cells in the mid-brain occurs and when neurotransmission in the basal ganglia of the brain is disrupted. The most prominent movement dysfunctions of Parkinson's patients are reduced balance, loss of balance, lack of postural control and progressive reduction in the speed and range of motion (Morris, 2000). With an increased risk of falling, elderly patients with Parkinson's are prone to fractures, dislocations and serious soft

tissue damages (Robinson et al., 2005). In terms of physiology, the "balance" referred to above is defined as the interaction between levels of control mechanisms of balance; with respect to biomechanics, the "balance" is defined as the ability to maintain and return the center of gravity of the body within a stability that is determined by the base of support (Bellew et al., 2003). Postural instability, thus, can occur as a result of decreased muscle strength and in combination with other complications which result from the destruction of dopamine-producing cells in the basal ganglia (Tinetti, 2003).

Researchers have suggested that the main cause of balance problems in Parkinson's patients is the impairment of excitation/inhibition in the basal ganglia (which also impacts downstream effects through direct and indirect means) (Shannon, 2004). On the other hand, being sick and/or elderly can increase the complications of this disease (Dibble et al., 2006). With the onset of old age, changes occur in the musculoskeletal system, vestibular system, sensory system and visual system. The changes in the metabolic and physiological systems involved in balance can put elderly individuals at risk for serious injuries related to lack of balance, including fractures and long-term disabilities.

Researchers have categorized factors which affect postural control deficits in older adults into two categories: external (foreign) and internal (domestic) factors. External factors can be uneven ground and use of inappropriate shoes. Internal factors include dysfunctions of the physiological systems of the body (e.g. decreased muscle strength, decreased range of motion, and/or reduction of visual, vestibular and proprioceptive senses) (Giroux, 2007; Lord, 2003). Thus, aging and inactivity may lead to enhanced aggravation of primary and secondary symptoms in patients. There is abundant evidence which show that the number of falls by Parkinson's patients is significantly higher than those for healthy, elderly individuals (Nelson et al., 2002).

At present, elderly people constitute 7% of the population. Within the next 20 years, this percentage will expected to double; in 30-40 years the majority of the population will be elderly people (Heydari et al., 2010). With the elderly population expected to rise dramatically worldwide, so too is the number of patients expected to suffer from Parkinson's disease (Giroux, 2007). Due to the progressive process of Parkinson's disease in the absence of controls, everyday problems of these patients will be increased and the tangible outcomes are movement disorders, psychological problems and economic problems for society (Abargouei Azizi, 2011; Morris, 2000).

Depression and anxiety are two times more likely to occur in individuals recently affected by Parkinson's disease than in healthy individuals. The tremors and movement disorders caused by Parkinson's are well-known, but the disease actually begins in the brain, affecting various chemical compounds which trigger, initially, sleep dysfunctions and mild forms of depression. In fact, sleep disorders are commonly seen in patients suffering from Parkinson's disease. Studies show that the prevalence of sleep disorders in Parkinson's disease is 60 to 98%

(Covassin et al., 2012). This figure is higher than the prevalence of this disorder in people not suffering from Parkinson's disease in the same age and sex demographics (Scheller et al., 2008).

Parkinson's patients often experience sleep disturbances, excessive daytime sleeping, delay in falling asleep, and difficulty in maintaining sleep (Iranzo de RA, 2011). In addition, pulmonary disorders during sleeping, restless legs syndrome, mood and behavioral disorders, and rhythmic leg movements in sleep are common problems in the patients (Margis et al., 2009). Despite the obvious sleep disorders in these patients, studies have rarely addressed or evaluated them (Naismith et al., 2010). To date, various questionnaires have been prepared to assess the presence or absence of sleep disorders in order to provide treatment guidance. Indeed, treatment of non-motor disorders can improve the patient's quality of life (Najafi et al., 2012). The cause of insomnia in Parkinson's disease is multifactorial and includes older age, nocturnal motor symptoms, psychological disorders (including depression and hallucinations), and pharmacological effects.

The relationship between Parkinson's disease and severity of sleep disturbance has been studied and reported (Najafi et al., 2012). However, another study evaluating sleep quality in patients suffering from Parkinson's disease showed no significant correlation between the disease and duration or severity of sleep disturbance (Moshfeghi, 2010). In another study, sleep tests on patients with Parkinson's disease were conducted; the study conclusion was that the most common symptoms in these depressed patients were turmoil (43.2%), anxiety (43.3%), and irritability (40.1%) (Abedzadeh, 2012). Patients suffering from Parkinson's disease often experience feelings of anxiety or fear of attacks. Mood changes may also occur due to changes in drug levels (Soleimani, 2015). The most obvious manifestation of mental problems in patients suffering from Parkinson's disease is anxiety and depression, which are caused by physical symptoms and the resulting limitations associated with those. Tremors, slow movements and difficulty of movement can cause social isolation of the patient. Abnormal gait, trapped legs while walking, falling, problems with speech, and change in the patient's voice can all create a feeling of embarrassment in the patient, thereby reducing their motivation and willingness to participate in social activities (Pierce, 2008). Overall, these factors can affect the patient's quality of life. However, use of complementary therapies in combination with standard therapies may improve quality of life of individuals with Parkinson's.

In addition to drug therapy, exercise and physical activity can be used as complementary therapies (Keykhai Hosseinpour, 2013). Participation in sports is a beneficial means to achieve health and well-being. Engagement in exercise leads to physical, mental and social health. Indeed, physical activity/exercise is one of the main ways to prevent, delay or treat problems caused by the aging process, and has a profoundly positive impact on improving the quality of life of elderly people (Khorsand, 2016; Shaumway cook, 2007).

Of the exercises, "laughter yoga" is a relatively new complementary therapy with beneficial effects. Laughter yoga was invented in 1995 by a Hindi physician named Madan Katarya. It combines the standard yoga breathing exercises with laughing exercises, and includes a variety of fun sports too (Pezeshki, 2012). Laughter is an emotional reaction that affects human life and social life in a positive manner, and has characteristics that distinguish it from other emotional reactions (Pezeshki, 2012).

Extensive research from the past two decades across various countries has proven that laughter has a positive effect on the body and is involved in strengthening the immune system. Scientists have also found that laughter has a preventive and therapeutic value (Kataria, 2004). Laughter yoga includes mind-body techniques and combines different methods of laughing with breathing exercises (Hasan and Hasan, 2009; Keykhai Hosseinpour, 2013). People who are regularly practicing laugh yoga exercises have experienced improvements in their health, mental outlook and energy level (Pezeshki, 2012).

Studies have shown that when someone pretends to laugh or be happy, the body produces chemicals (e.g. dopamine, serotonin, etc.) that induce a state of happiness (Kataria, 2004). Thus, the laughter is powerful in inducing physiological changes in the body. According to the principle "motion creates emotion", if one puts his/her body in a state of happiness, the mind will follow to a happy state (Kataria, 2004). Currently, the increase in population of elderly people (due to a reduction in birthrate, improvement of health and increased life expectancy) has garnered greater focus on the problems of the elderly (Abedzadeh, 2012).

Aging is a natural and inevitable process that affects all biological and psychological aspects of humans. Growth and maturity are the center point of childhood and youth hood. During adulthood, particularly during middle age and elderly age, most physical and mental functions decrease or atrophy due to aging. However, a sedentary lifestyle also accelerates the aging process. Physical, psychological, social and economic problems in old age often increase by 2-fold (Abedzadeh, 2012). Due to the growing elderly population in the world, according to estimates by the mid-21st century the number of the elderly is projected to reach 3.1 billion. Thus, it is critical to find solutions to health issues (e.g. Parkinson's disease) of this important age demographic.

Due to the close relationship between body and mind, it is clear that declining physical abilities along with increasing social/economic problems in old age can create a fertile ground for physical and mental illnesses. Parkinson's and Alzheimer's are among the most common diseases. Although the motor ability of patients is affected, they predominantly suffer from cognitive and behavioral impairment. Depression, dementia and mental disorders have a major impact on the quality of life for both patients and their families (Abedzadeh, 2012). Laughter yoga, through release of neurotransmitters from brain cells, can help induce feelings of happiness and potentially alleviate depression. According to

modern medicine, disease originates from our minds (i.e. emotional thoughts and overall state of mind). Accordingly, it may be very beneficial to do laughter yoga exercise programs as a complementary step to treat the well-being of patients suffering from Parkinson's (Keykhai Hosseinpour, 2013).

Generally, the treatment of Parkinson's disease consists of three parts: surgery, medication and rehabilitation. Following selection of treatment plan, a detailed history of disease and clinical or para-clinical evaluations are conducted. Based on review of the literature on the role of treatment options for mental disorders in people with Parkinson's, the interventions/treatments are mainly pharmaceutical, nutritional and physiological; the role of physical activities and different sport activities in the treatment of Parkinson's have been less studied (Abedzadeh, 2012). As aforementioned, laughter exercises can impact organs and muscles, strengthen the immune system, induce blood biochemical changes, and affect oxygen; all of these play a significant role in the potential prevention and treatment of Parkinson's disease (Pezeshki, 2012). Therefore, we postulated that problems (e.g. depression, anxiety, loss of confidence, and sleep disorders) experienced by Parkinson's patients may be improved by laughter yoga exercises as a complementary treatment. We hypothesized that a course of laughter yoga exercises might improve anxiety and sleep quality of patients suffering from Parkinson's disease.

This study aimed to determine the effect of laughter yoga exercises on the severity of anxiety in patients with Parkinson's disease; and to determine the effect of laughter yoga exercises on sleep quality of patients with Parkinson's disease.

Materials-Methods

Methodology

This study was done with the purpose of studying a course of laughter yoga exercises on anxiety and sleep quality of patients suffering from Parkinson's.

Patients

For the present study there were initially 30 Parkinson's patients who were referred to Hazarate Raoul Allah hospital in Tehran, Iran. Patients ranged in age from 55 to 75 years old and each met the study requirements before entering into the research study.

Groups of investigation

Parkinson's disease is classified as Stage 1, 2 or 3, according to the Hoehn and Yahr Scale (H&Y). Parkinson's patients without chronic heart and respiratory disease, without open surgery in the inner region in the last six months, and

without high blood pressure who voluntarily participated in this study were randomly divided into two groups of 15. One group was the experimental group (laughter yoga exercises) and the other was the control group (no laughter yoga exercises). From those individuals, 6 were removed from the study due to lack of continuous training, setting the machine Deep brain stimulation (DBS), and withdrawal for work purposes. After exclusion of these 6 patients, the final study consisted of 12 patients in the experimental group and 12 patients in the control group.

The voluntary participation of Parkinson's patients as subjects in the study was reviewed and approved by physicians. Notably, before the study was initiated subjects from both groups agreed by written consent to participate in the research study; those in the appropriate group(s) agreed to engage in laughter yoga classes. Also, before the start of the study, all executive items were approved by a committee of the University University Research Committee (Islamic Azad University of Karaj).

Laughter yoga exercises

Firstly, as a pre-test, the anxiety and sleep quality of patients suffering from Parkinson's disease in both the experimental and control groups, were measured by the anxiety inventory of Beck (1988) and the sleep quality inventory of Pitezbourg (1989) (PSQI), respectively. Then the treatment group, in addition to standard medical treatment, performed laugher yoga exercises under the supervision of a laughter yoga instructor for 8 weeks (2 sessions per week, 45 minutes per session). Meanwhile, patients in the control group received their standard medical treatment and continued their typical daily activities but did not practice any laughter yoga exercises.

Statistical analysis

After completing the laugher yoga exercises, as a post-test, the anxiety and sleep quality of the patients in both experimental and control groups were measured using questionnaires. To normalize the research data, the Mann-Whitney nonparametric test was used. As well, all the analyses was done at a significance level of ($P<0.05$) using SPSS software.

Results

The Table 1 shows the mean and standard deviation of all variables in the pre-test evaluation, post-test evaluation, and the corresponding difference of pre-test and post-test values for the practice (experimental) and control groups.

Table 1. Mean and standard deviation of research variables of patients with Parkinson's disease

Variable	Group	Pre-test	Post-test	Difference of Pre-test & Post-test
Anxiety	Practice	21.5±7.4	1.86±6.6	-2.8±3.1
	Control	20.9±5.9	21.46.4±	0.50.79±
Sleep quality	Practice	9.414.6±	7.5±4.1	-1.9±1.3
	Control	8.5±4.1	9.25±5.1	0.75±1.2
Subjective quality of sleep	Practice	1.83±0.5	1.16±0.5	-0.66±0.4
	Control	1.330.4±	1.41±0.66	0.08±0.2
Delay in falling asleep	Practice	1.66±0.9	1.08±0.9	-0.580.5±
	Control	1.16±1.1	1.251.1±	0.080.28±
Sleep duration	Practice	1.58±1.1	1.51.08±	-0.08±0.2
	Control	1.41±1.08	1.51.1±	0.08±0.6
Amount of sleep efficiency	Practice	11.3±	0.75±1.2	-0.25±0.4
	Control	0.831.02±	0.911.08±	0.08±0.51
Sleep disorders	Practice	1.58±0.66	1.41±0.51	-0.16±0.3
	Control	1.5±0.52	1.83±0.71	0.330.4±
Use of sleep medications	Practice	0.58±1.1	0.581.1±	0
	Control	1.33±1.4	1.41±1.5	0.08±0.2
Daily functioning disorders	Practice	1.16±0.93	1±0.73	-0.16±0.5
	Control	0.91±1.1	0.91±1.1	0.00±0.4

Table 2 shows the relative frequency of gender; it can be seen that 58.3% of the participants were men and 41.7% were women. The Mann-Whitney test results in **Table 3** show that there is a significant difference between the average change in anxiety of patients suffering from Parkinson's disease in the laughter yoga practice (experimental) group (M=-2.83) versus the control group (M=0.50) (U=136, Z=3.76, P=0.000). Thus, the null hypothesis is rejected; in other words, a course of laughter yoga exercises led to a significant decrease of anxiety in patients suffering with Parkinson's.

Table 2. The relative frequency of gender in the study participants

Gender	Frequency	Relative frequency
Men	14	58.3
Women	10	41.7

Table 3. Results of Mann-Whitney test on anxiety

U	Z	Sig.
135	3.76	0.000

The Mann-Whitney test results depicted in **Table 4** show that there is a significant difference between the average change in sleep quality of patients suffering from Parkinson's disease in the laughter yoga practice (experimental) group (M=-1.91) versus the control group (M=0.75) (U=138, Z=3.88, P=0.000). Thus, the null hypothesis rejected; in other words, a course of laughter yoga exercises led to a significant increase of sleep quality in patients with Parkinson's. Note that on the basis of scoring, the lower the sleep quality scores the better the sleep quality.

Table 4. Mann-Whitney test results of sleep quality

U	Z	Sig.
138	3.88	0.000

Discussion

The Mann-Whitney test results in **Table 2** demonstrate that there is a significant difference between the average change in anxiety in patients with Parkinson's in the laughter yoga practice (experimental) group versus the control group. In other words, the course of laughter yoga exercises led to a significant reduction in the anxiety of patients suffering from Parkinson's disease. According to the literature, these results are consistent with study results of (Badr, 2014; Bagheri, 2011; Behzadi, 2010; Bennett et al., 2003; Eftekhari, 2004; Hassed, 2001; Hirosaki et al., 2013; Keykhai Hosseinpour, 2013; Kheirandish, 2014; Moshfeghi,

2010; Shahidi, 2008; Sook and Hee, 2011). However, they differ from the study results of Omrani (2010).

As the results of our study are consistent with the aforementioned studies, it would seem that the predominant mechanism by which laughter influences anxiety is through its ability to establish and sustain a positive emotional state. During a state of anxiety, the adrenal gland frees corticosteroid hormones, which are converted to cortisol in the bloodstream. It is cortisol that increases in response to stress. Brouk (1998) believed that positive emotions such as laughter can reduce the ordinary stress response and as a moderator, amend sympathetic stimulation after stress (Shahidi, 2008). Keykhai Hosseinpour (2013) conducted a research on the impact of laughter yoga exercises on the motor and mental factors of patients suffering from Parkinson's (Keykhai Hosseinpour, 2013). The results of his study indicated that laughter yoga exercises have a positive impact on reducing depression, thereby improving the patient's quality of life and increasing motion performance, flexibility and pain reduction. His study concluded that Parkinson's patients, as they have a lack of dopamine and serotonin, can use laughter yoga which help secrete hormones that help to reduce depression.

Depression and anxiety are among the most common mental problems of patients suffering from Parkinson's. They arise due to the physical symptoms of the disease and also from the patient's disability. To combat this, laughter can be induced to provide benefits to the overall health status. Health benefits obtained of laughter yoga including physical, mental and emotional stress management. When stress decreases, the immune system automatically becomes stronger. Laughter also increases the oxygen supply to cells of the body and increases blood circulation, thereby creating a positive state of health.

Given that the body can be influenced by a series of hormonal and physical changes which cause damage to the patient, any strategy that regularly reduces the level of stress hormones in the blood helps to increase health. Moreover, laughter is known to be a good stress inhibitor. In fact, joking and laughing can reduce the neuroendocrine hormones (epinephrine and cortisol) that are secreted in response to stress, causing the person to be calm (Keykhai Hosseinpour, 2013). Laughter is one of the best, most cost-effective and easiest ways to relieve stress and relax the muscles of the body. Laughing dilates blood vessels and transmits more blood to the farthest muscles throughout the body. Furthermore, a good laugh from the heart reduces the secretion of stress hormones, epinephrine and cortisol.

When we are laughing there is no thought in our minds; all our senses seem to be synchronized for a brief moment. We feel joy, peace and comfort (Behzadi, 2010). Also, according to the theory of emotional discharge, laughter is a socially acceptable way to release tension and stress. Provin (2000) argued that laughter in social interactions can be used as a stress relief mechanism. Spencer (according to the theory of drain excitement) believed that the emotional and

mental turmoil produce a kind of energy that somehow must be used. He suggested that nervous excitement tended to cause muscle tension and that laughter, as a kind of physical movement, can act as a stream of various forms of nervous energy. Moreover, Spencer created the idea of laughter to remove bad potential energy through the process of daily stress management, constantly stacking energy and release of excess energy by laughing after a stressful day (Provin, 2000).

Behzadi (2010) conducted a research study with the aim of evaluating the effectiveness of Katarya laughter therapy on increasing the general health of elderly residents in a nursing home of Shahid Hasheminejhad of Ray City (Behzadi, 2010). The results of that research data showed that Katarya laughter therapy was significantly effective in increasing public safety, improving physical symptoms, anxiety and insomnia, increasing social dysfunctions, and reducing depression. According to the findings of that study, it was concluded that Katarya Laughter therapy can improve the health of residents in nursing homes. Thus, this treatment method (laughter) may be used as replacement or supplement for improving overall health of elderly in nursing home.

Hased (2001) reviewed numerous clinical studies which all demonstrated that humor and laughter can reduce stress in all situations. Laughter can affect inflammatory disorders, asthma, cancer, and heart disease. In his article, he identified several psychological impacts, including reduction of stress and anxiety, and improvement of mood, self-esteem and coping skills. In addition, Hased described a positive psychological effect on pain and an increase in the safety of certain factors, e.g. immunoglobulin A and white blood cells.

Omrani (2010) conducted a research study on the effect of music therapy and laughter therapy to reduce anxiety in women prior to surgery. That study was a quasi-experimental study with pre-test and post-test assessments. In Omrani's study, the Katal anxiety test was used to measure stress; it was found that music therapy could reduce anxiety before surgery in women but that laughter did not have any therapeutic effect on anxiety of those women. In our study, however, laughter yoga exercises led to a significant increase in sleep quality of patients with Parkinson's disease (based on the scoring of the questionnaire on sleep quality). According to the literature, our study results are consistent with results of (Badr, 2014; Behzadi, 2010; Fotouhi, 2010).

As mentioned in Introduction, the quality of sleep of those afflicted with Parkinson's is influenced by factors such as anti-Parkinson's medications, Akintik pains, dystonia, restless legs syndrome, panic attacks, anxiety and depression, parasomnia, and sleep apnea. Laughter yoga is thought to impact all those factors, thereby improving sleep quality and ultimately alleviating the disorders. Akintik pains usually occur due to lack of mobility in these patients and often lead to sleep disorders. Extreme rigidity, fever, pain in muscles and joints, headaches, and occasional pain in all parts of the body are all typical symptoms (Soleimani, 2015).

Laughter improves health by reportedly inducing the secretion of endorphins that reduce pain and promote the feeling of happiness (Martin, 2001). In fact, laughing increases the level of endorphins, also considered to be natural painkillers. The secreted endorphins have been shown to help reduce pain in people suffering from arthritis, inflammation of the spine, and muscle spasms (Kataria, 2004; Pezeshki, 2012). Indeed, laughter is regarded as a pain management technique that can be used for most incurable diseases. People who are regularly practicing laughter therapy can secrete endorphins with a simple smile. A few minutes of real laughing can induce the equivalent results as rowing or stationary biking for 10-15 minutes (Keykhai Hosseinpour, 2013). For the elderly who are not able to exercise, laughter is indeed a good secondary treatment option (Keykhai Hosseinpour, 2013).

In addition to Akintik pains, other problems such as dystonia (i.e. involuntary muscle contractions of legs, fingers, wrists, ankles and feet) can cause painful cramps for Parkinson's patients (Soleimani, 2015). In this regard, laughter yoga can improve muscles of the face, chest and abdomen. Indeed, muscle power is important and useful for hospitalized patients and elderly people who move around in a wheelchair. Kazines (1979) described laughter as running internal organs; that is, it is effective even for muscles of the digestive system and can help speed up the rate of digestion (Keykhai Hosseinpour, 2013).

Another important advantage of laughter is decrease of muscle tension. Stress keep muscles in a contracted state. People who learn muscle relaxation methods can reach peace psychologically. In muscle relaxation methods, the therapist asks the patient firstly to perform of series of muscle contractions on his body muscles and then relax to feel the relaxation in those muscles. Laughter has been reported to decrease tension in the neck, shoulder and abdomen muscles (Keykhai Hosseinpour, 2013). Joking and laughing reduce the hormones epinephrine and cortisol (which typically rise in response to stress), thereby leading to relaxation (Keykhai Hosseinpour, 2013). As in the theory of emotional discharge, Freud believed that the release of energy is an enjoyable experience that is expressed as a laugh, thereby reducing tension and stress (Shahidi, 2008).

Behzadi (2010) conducted a research with the aim of studying the effectiveness Katarya laughter therapy on the effect of general health of elderly residents of a nursing home in Hasheminejhad of Ray City (Behzadi, 2010). Results of study showed that Katarya laughter therapy significantly increases public safety, improves physical symptoms, reduces anxiety and insomnia, and alleviates social dysfunction and depression. According to the findings of that study, it can be concluded that the method of Katarya laughter therapy is advantageous in removing negative thoughts, changing beliefs, creating positive emotional states, and reducing the symptoms of Parkinson's disease. Overall, the general health of the senior home residents was markedly improved after laughter therapy.

Among other activities which affect the quality of sleep in patients with Parkinson's disease is respiratory disorder. One of the benefits of laughter yoga is, thus, improvement of the respiratory system. Laughter provides exercise to the lungs and chest muscles, resulting in improved vital capacity and breathing. In normal breathing when person is relaxed, there is a balance between inhalation and exhalation. In the stress and disease states, not only does breathing become more shallow and slower but the level of oxygen becomes lowered too. There is a great amount of air that remains in the lungs. By keeping the air in the lungs, oxygen content decreases and water vapor and carbon dioxide levels increase. In this case, the more favorable conditions for bacterial growth and lung infections are created.

Laughter increases ventilation and removes mucous plugs to help maintain air exchange which increases oxygen levels in the blood. In fact, when we laugh the air is completely expelled from the lungs and following that, carbon dioxide and water vapor is also emitted and replaced with oxygen. The oxygen becomes available to blood cells. The effects of laughter can benefit middle-aged people with chronic respiratory diseases, such as emphysema, and reduce the risk of infection and inflammation of the lungs (Keykhai Hosseinpour, 2013). Therefore, laughter yoga can affect quality of sleep by improving the respiratory system.

Therefore, according to the benefits of laughter yoga, which include pain relief, muscle relaxation, reduced anxiety and depression, and improved respiratory system function, it can be concluded that laughter yoga does significantly improve sleep quality- either directly and indirectly- of patients with Parkinson's disease. The questionnaire (on sleep quality) by Peter Bourg evaluated 7 areas: sleep quality, sleep latency, sleep duration, sleep efficiency rate, sleep disturbances, use of sleeping pills, and daily functioning disorders.

Research limitations

All research studies have some limitations which are important to recognize and address for future insight. In this study, the limitations were as follows:

1. The number of individuals suffering from Parkinson's, who are willing to cooperate in the study and participate in the laughter yoga exercises was very low; this was one of the greatest limitations of the study (contributing to a low sample size of experimental and control groups).

2. There was no possibility of taking advantage of the questionnaire for patients with Parkinson's disease due to the lack of standardized questionnaires in Iran. In the beginning, some steps were taken to standardize the questionnaires by translating it and having patients fill them out, but due to lack of time taking advantage of the questionnaire in this study was not feasible.

3. Due to the lack of accredited and essential facilities, there was no possibility of holding meetings in the hospital; all meetings were held at a house.

4. Due to general limitations for holding laughter yoga classes in the houses of the neighborhood, and despite initial agreement on the presence of the patient at the house and same time for holding the classes for women and men, it was decided that classes be held flexibly and separately, as needed.

5. Due to the age requirements, specific issues of some Parkinson's patients and restrictions on the movements of these patients, not every patient could attend the regular meetings consistently.

Conclusion

In conclusion, laughter yoga significantly improves anxiety and sleep quality of Parkinson's patients and can serve as a beneficial complementary therapy to standard therapy.

Author contribution

AZ performed data acquisition, data analysis; AS performed designed the study, data analysis and manuscript preparation; SMB performed data acquisition, and manuscript preparation. All authors approved the manuscript.

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WORKPLACE LAUGHTER AND PERSONAL EFFICACY
(US STUDY)

REPORT FROM THE FIELD:

Effect of Workplace Laughter Groups on Personal Efficacy Beliefs

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Abstract

This study measured the impact of a purposeful aerobic laughter intervention on employees' sense of self-efficacy in the workplace. Participants were 33 employees of a behavioral health center. They met for 15-minute sessions on 15 consecutive workdays and engaged in a guided program of non-humor dependent laughter. The primary outcome measure was the Capabilities Awareness Profile, a self-report self-efficacy questionnaire. Employees demonstrated a significant increase in several different aspects of self-efficacy, including self-regulation, optimism, positive emotions, and social identification, and they maintained these gains at follow-up. Purposeful laughter is a realistic, sustainable, and generalizable intervention that enhances employees' morale, resilience, and personal efficacy beliefs.

Key Words: laughter, workplace wellness, self-efficacy

Effect of Workplace Laughter Groups on Personal Efficacy Beliefs

In today's world, individuals are bombarded with the idea that "laughter is the best medicine." There are accounts all over the popular media that proclaim the supposed physical, emotional, social, and spiritual benefits of laughter. Still, some researchers warn that our popular understanding about the positive effects of laughter has gotten ahead of the science that is investigating these claims (Martin, 2001; Provine, 2000; Salovey et al., 2000). They point out that the research investigations in this area have been subject to numerous methodological problems, such as the failure to distinguish between laughter and humor, the failure to confirm the presence of laughter, inadequate control conditions, and small sample sizes. There are not enough research findings for us to suggest that laughter is an all-around healing agent, but there is sufficient evidence for us to believe that laughter has some positive, quantifiable effects on certain aspects of health. This article describes a field study that examined the impact of laughter on individuals' sense of self-efficacy.

One of the biggest methodological problems in the research on laughter is the failure to distinguish between humor and laughter. Humor is a construct, while laughter is a physiological event (Mahony et al., 2002). While the effects of humor are cognitive (e.g., the recognition of some incongruity and perhaps an increase in perceived control), the effects of laughter are physical (e.g., increasing your circulation and exercising your skeletal muscles). Humor is a stimulus, and laughter is one of several possible behavioral responses to that stimulus (Fry, 1992). When this distinction is made, it is easier to see that humor and laughter are distinct (although often associated) events. Humor can occur without laughter, and laughter can occur without humor. In this study, the focus is on laughter that occurs in the absence of humor.

In the research that examines the hypothesis that laughter is beneficial to one's health, there are several purported pathways that link laughter with healthy outcomes (Martin, 2001; Salovey et al., 2000). First, laughter may lead to direct changes in physiological systems, and this may have a beneficial effect on health. Second, laughter may lead to more positive emotional states, which in turn may have a beneficial effect on health. Third, laughter may lead to more effective strategies for coping with stress, which may decrease the negative impact that stress can have on health outcomes. Finally, laughter may increase one's social support, which in turn may improve health.

There is some evidence to support these pathways, although most studies fail to separate out the effects of humor and laughter. Scientists have attempted to demonstrate the physiological benefits of laughter in the management of pain and discomfort (e.g., Cogan et al., 1987; Rotton & Shats, 1996; Weisenberg et al., 1998), the control of blood glucose levels in people with diabetes (Hayashi et al., 2003), the functioning of the immune system in normal subjects (e.g., Dillon et al., 1985; Labott et al., 1990; Lefcourt et al., 1990), the reduction of allergic responses in patients with atopic dermatitis (Kimata, 2001), and the functioning of blood vessels in healthy volunteers (Miller, 2005).

While some of these research attempts have been successful, others (for example, the immune system studies) have raised great controversy because of the failure to control for other experimental effects such as distraction (Provine, 2000). Critics have warned that the research on laughter and physical health does not acknowledge the complexity of physiological systems and the individual differences in the experience of laughter (Martin, 2001; Saper, 1988). Nor does the research differentiate between laughter's unique physiological profile and the profile of other active vocalizations such as shouting or cheering (Provine, 2000).

Researchers have examined the impact of humor and laughter not only on physical health, but also on emotional health. More specifically, researchers have

focused on aspects of emotional health such as perceived control, optimism, and acceptance of limitations. For example, Solomon (1996) asked 155 adults to complete questionnaires that measured their propensity to use humor and laughter, their satisfaction with the aging process, and their perceived control. The instrument that measured perceived control was comprised of three scales: personal efficacy, interpersonal relationship control, and sociopolitical control. The personal efficacy scale included statements such as "When I make plans, I am certain to make them work," and "When I get what I want, it's usually because I worked hard for it." The results of the study showed that laughter and humor affected participants' satisfaction with the aging process through the variable of perceived control. Solomon speculated that being able to laugh gave participants a sense of control over their situation, and it is known that people who have a sense of control over their daily life are more satisfied with their housing arrangements, lives, and selves, all of which are important to the process of aging well. In addition, having a sense of self-efficacy allows people to be capable of laughter. Or, as Solomon explained it, "People who believed they could make their plans work also believed that it is better to laugh than cry and that people are not too serious than is good for them..." (p.265).

Purpose

The present study was designed to expand the research that examines the impact of laughter on emotional health. The purpose of the study was to form workplace laughter groups and measure the impact of group participation on employees' sense of self-efficacy. The study is unique in that the intervention consisted of "laughter without humor;" that is, participants engaged in exercises designed to evoke the physiological act of laughter without relying on humorous stimuli. In this way, laughter was isolated as a pure independent variable, not confounded by the cognitive effects of humor. This study is also unique because to

our knowledge, there are no published studies that document the benefits of workplace laughter groups.

Self-Efficacy and Work Performance

Self-efficacy is the belief in one's ability to organize and carry out the courses of action necessary to achieve a goal or manage a situation (Bandura, 1986). This personal belief influences the choices people make, the effort they put forth in working toward a goal, how long they persist when confronted with obstacles, and how they feel in the process of working toward goals. There are four principle sources of information from which personal efficacy beliefs are constructed. First, individuals experience greater self-efficacy when they are successful in taking small steps toward their goals (i.e., mastery experiences). Second, vicarious experiences can increase self-efficacy when individuals observe the achievements of others who are similar to themselves. Third, verbal persuasion can increase self-efficacy when significant others express faith in an individual's capabilities and these positive appraisals lead to self-affirming beliefs. Finally, individuals are more inclined to make positive judgments of their capabilities when they are not bothered by aversive physiological or affective arousal (Bandura, 1986).

Self-efficacy beliefs affect performance in the workplace. Before workers initiate effort on a task, they weigh, evaluate, and integrate information about their perceived capabilities. When workers perceive a high sense of self-efficacy, they activate sufficient effort to get the task done well, and they likely produce successful outcomes. In contrast, workers who perceive a low sense of self-efficacy do not activate sufficient effort and likely fail on the task (Bandura, 1997).

Expectations of personal efficacy influence workers' resilience, as well. If workers perceive themselves as being highly capable, they are more likely to sustain their task-related effort in the face of obstacles or aversive organizational demands. They engage in problem-solving coping and determine ways to restructure their work

situations or manage their job demands better (Bandura, 1997). However, if they perceive low self-efficacy, the obstacles prompt them to cease their efforts prematurely and retain feelings of futility concerning their personal competence. The low self-efficacy workers engage in escapist coping, performing their work in an indifferent and superficial manner and withdrawing their involvement in the work life. Their self-debilitating expectations about their performance create a sense of defeat and perpetuate further self-debilitating expectations (Bandura, 1997).

A recent meta-analysis of research findings regarding the relationship between self-efficacy and work performance reviewed 114 studies and found a 28% gain in task performance due to self-efficacy (Stajkovic & Luthans, 1998). This gain in task performance far exceeds the estimated gain from goal setting (10.39%), feedback interventions (13.6%), and organizational behavior modification (17%) (see Stajkovic & Luthans for references). This suggests that organizational managers can improve the performance of their employees in an efficient and relatively inexpensive manner by enhancing employees' personal efficacy beliefs. They may accomplish this by creating a workplace environment that creatively fosters the four sources of self-efficacy described earlier.

Laughter and Self-Efficacy

Workplace laughter groups may be one mechanism for creating a workplace environment that fosters mastery experiences, vicarious experiences, verbal persuasion, and a reduction in aversive physiological and affective states. In the workplace laughter groups we designed, participants would complete a series of exercises that built upon each other and took small steps toward the goals of experiencing and sustaining laughter. In this way, participants would experience small successes early on and then enhance their sense of mastery over the course of fifteen days.

The laughter groups would naturally lead to vicarious experiences of success, as group members observe others achieving the benefits of laughter. The groups were designed to have a strong social component and to facilitate a safe environment by discouraging any derisive laughter. We posited that as coworkers began to relate to each other in a new and somewhat unconventional manner, they would strengthen their connections with each other. This social bonding is predictable based on what researchers call the "open-loop" nature of the brain's emotional centers, the limbic system. This line of research has found that one person transmits signals that can alter the emotions and physiology of another person, thereby making emotions "contagious" whenever people are near one another, even if the contact is nonverbal (Goleman et al., 2002).

The workplace laughter groups were designed so that verbal persuasion would be a prominent characteristic of the groups. The group leader would give generous praise to the participants for their efforts. She would also give frequent encouragement and express faith in the participants' capabilities.

When individuals make a judgment about their perceived efficacy, they rely partly on the somatic information contained within their physiological and emotional states. If they are tense and viscerally aroused, or if they perceive the physiological activation that accompanies negative mood states, they are less likely to expect success. In contrast, if they are not experiencing aversive arousal, they are more inclined to construct positive self-efficacy beliefs. The act of vigorous laughter energizes our physiology in much the same way that aerobic exercise does, increasing heart and respiration rate and activating various muscle groups. After an episode of laughter, however, our bodies enjoy a relaxation effect. It follows, then, that individuals who engage in workplace laughter groups would be likely to perceive less visceral arousal after practicing sustained episodes of laughter, thereby leading them to form more positive self-efficacy judgments than individuals who do not participate.

One of the factors that can be most debilitating to one's sense of self-efficacy in the workplace is the perceived inability to turn off disturbing ruminations about negative work experiences (Bandura, 1997). Bandura suggests that to counteract these ruminations, workers need to develop diversionary efficacy, or the ability to achieve recuperative breaks from the demands of work. Since laughter creates a positive emotional state and increases perceived control, it follows that individuals who engage in workplace laughter groups would be better able to interrupt ruminative thinking patterns that sustain negative emotions and to form more positive self-efficacy judgments than individuals who do not.

Hypotheses

The purpose of this study was to form workplace laughter groups and measure the impact of group participation on employees' perceived self-efficacy. The main hypothesis was that participation in regular workplace laughter would increase workers' sense of self-efficacy, especially in four dimensions: (1) self-regulation, or the perceived competence in managing and controlling thoughts and feelings under stress; (2) optimism, or the perceived ability to remain positive about the future even in the face of stress or obstacles; (3) positive emotions, or the perceived capacity to experience and sustain positive emotions; and (4) social identification, or the perceived capacity to feel connected with others.

Method

Participants

Participants were recruited from staff employed at a large behavioral and mental health facility in the Midwest. The institutional review board of the facility approved the project. All day staff in three specific offices of the facility received an e-mail message that explained the project in broad terms (i.e., examining laughter as an approach to stress management) without revealing the specific hypotheses of the

study. Participants volunteered by responding to the message. Participants received an informed consent form that explained possible risks and benefits, the process for ensuring confidentiality and anonymity of results, and the process of debriefing after the intervention. In total, 195 staff members were invited to participate. Of this group, 37 persons entered the study and completed the pre-test (a 19% response rate), and 33 completed the intervention and post-test (an 89% completion rate). Twenty-two individuals completed a 60-90 day follow-up assessment. Of the 33 participants who completed the intervention, there were 4 males and 29 females. The average age was 48. Participants represented a variety of professions including psychologist, physician, secretary, nurse, social worker, financial counselor, and switchboard operator.

Measures

The principle measure was the Capabilities Awareness Profile, a 124-item self-report self-efficacy questionnaire (Hays et al., 2003). The CAP is a reliable and valid instrument based on Bandura's research on self-efficacy (1986; 1997), and the instrument incorporates recent developments in the areas of emotional intelligence and positive psychology (Hays et al., 2003). The CAP contains 12 subscales measuring a variety of perceived competencies that group into three categories: self, relational, and role competencies. Self competencies include self-awareness, self-acceptance, self-actualization, self-regulation, adaptability, motivation, optimism, and assertiveness. Relational competencies include social identification, empathy, and positive emotions. Role competency is a single scale. Appendix A describes each of the scales. Participants completed the CAP as the pre-test (during the week before the groups commenced), the post-test (during the week after completion of the groups), and the 60-90 day follow-up assessment.

Design and Procedure

The current study used a pre-post, follow-up design. Laughter Links is a program teaching non-humor dependent, yoga-based, purposeful aerobic laughter in a group setting. It is based upon the work of Dr. Madan Kataria, a cardiologist in Mumbai, India who combined medical research, modern science, and yoga breathing to create his own laughter technique (Kataria, 1999). Workplace laughter groups made use of this technique and met for 15 consecutive workdays. A professional laughter coach who had direct training in Dr. Kataria's approach led the classes. The program began with a 45-minute orientation session covering the background and rationale for the intervention. The orientation session emphasized the following important points:

1. Humor is highly subjective due to each individual's tastes, preferences, values, language, and culture; therefore, it can be offensive to some.

2. Laughter, on the other hand, is instinctive behavior that comes from our biological being; therefore, it is accessible and acceptable to almost everyone.

3. It is important to practice laughter in an atmosphere that fosters respect for others.

4. Laughter produces an aerobic effect similar to that of moderate exercise. Participants with health issues should check with their physician before starting a laughter program.

For the next 14 days, participants spent 15 minutes before work or during their lunch break engaging in purposeful laughter. Each class began with participants practicing the basic yoga-based laughter stance (Kataria, 1999) and then some gentle stretching. Participants then engaged in guided exercises to practice abdominal laughter. The basic exercise started with a vocalization of "Ho-ho-ho, Ha-ha-ha, He-he-he" and then proceeded with hearty, unbounded laughter. More advanced exercises blended laughter with a variety of activities, such as shaking hands, looking each other in the eye, or playing interactive games. At no point was humor used to

facilitate laughter, although participants found humor in some aspects of the class. At times, the challenge of laughing on cue became the trigger for involuntary laughter. Individual attendance was tracked.

Analysis

To prepare data for analysis, raw scale scores from the CAP were adjusted for gender norms (Hays et al., 2003) and converted to standard scores (mean = 100, SD = 10), a process which allows comparison between scales. To determine the impact of the Laughter Links Program, within-subject change in standard scores was calculated for each pairwise comparison (pre/post, pre/follow-up, and post/follow-up). Change scores were then averaged for each comparison and divided by the standard deviation of the change scores to determine effect sizes for each comparison. Paired sample t-tests for comparison of means were used to evaluate the significance of change in standard scores. The Pearson product moment correlation was used to examine the relationship between attendance and change in self-efficacy scores. Finally, the Pearson product moment correlation was also used to examine the relationship between follow-up self-efficacy scores and frequency with which participants continued to use the skills learned in the class.

Results

Table 1 shows raw scores for the 12 subscales of the CAP at pre, post, and 90-day follow-up. Figures 1-3 graphically depict changes in standardized scores for the three CAP summary scores, for the self competency subscales, and for the relational competency subscales, respectively. Table 2 shows effect sizes and significance of two-tailed t-tests for each comparison. Power analyses adjusted for paired samples revealed that there was sufficient power to detect differences between pre- and post-test scores, pre- and follow-up scores, but not sufficient power to detect differences

between post- and follow-up scores. This was due to the small magnitude of change in this comparison as well as increased variability of scores and reduced sample size at follow-up.

Thirty-three participants completed the intervention. For these participants, there was a significant positive change in each of the four hypothesized CAP subscales immediately following completion of the three-week laughter group: self-regulation ($t = 5.91$, $p < .001$), optimism ($t = 5.07$, $p < .001$), positive emotions ($t = 5.32$, $p < .001$), and social identification ($t = 4.82$, $p < .001$). Twenty-two participants completed a 90-day follow-up CAP profile. For these participants there remained a significant positive change in the four hypothesized self-efficacy subscales after 90-days post intervention: self-regulation ($t = 5.40$, $p < .001$), optimism ($t = 4.00$, $p < .001$), positive emotions ($t = 3.07$, $p < .01$), and social identification ($t = 2.24$, $p < .05$).

The consistent trend that can be seen from Table 1 and Figures 1-3 is a considerable increase in self-efficacy immediately following the laughter group, followed by a small reduction in self-efficacy at 90-days post intervention. Pairwise comparisons (Table 2) showed a statistically significant increase in all 12 self-efficacy subscale scores from the beginning to the end of the laughter group, with effect sizes ranging from .59 (medium) to 1.03 (large). At 90-day follow-up all subscales showed some mild regression to the mean, although comparisons between pre and 90-day follow-up still showed significant improvements for all subscales except for empathy. Changes in self-efficacy between post and 90-day follow-up were non-significant with only one exception (self-acceptance).

With regards to the three overarching categories of self-efficacy (self, relational, and role competencies; see Figure 1), self competencies showed relatively larger positive gains than relational competencies following the laughter program, although gains in each category were significant. Individual subscales showing the strongest increases and maintenance of positive change were self-regulation,

motivation, optimism, and assertiveness, all of which are self competencies. The role compliance subscale showed a strong increase across the study, as well, and this has important implications for occupational health.

Correlation analyses showed no relationship between attendance and change in self-efficacy scores or between follow-up self-efficacy scores and frequency with which laughter exercises were utilized during the 90-day follow-up period. In addition, of the 22 people who completed a follow-up CAP, there was considerable variability in the frequency with which they utilized the laughter skills, making it less likely that follow-up CAP scores were differentially affected by attrition.

Discussion

The four hypotheses in this study were supported. Increases in self-regulation, optimism, positive emotions, and social identification were significant and maintained at 90-day follow-up. These results, coupled with significant changes in a broad array of self, relational, and role competencies, are encouraging for the context in which this study took place as well as for broader organizational wellness applications. The staff at this facility routinely face increased workloads, burnout, negative ruminations and anxiety about the future, and a sense of social disconnectedness as productivity expectations increase and organizational expansion separates people. That a daily, 15-minute intervention could produce such significant positive changes in key areas of self-efficacy without changing any other environmental factors is encouraging for the field of occupational health. It was surprising to find a significant increase in role compliance: individuals' belief in their capabilities to comply with the rules and regulations of their work. This was unexpected since another common theme in this workplace is increasing resentment about rules, regulations, paperwork, and compliance standards. The laughter program was a simple and effective way to

enhance compliance with organizational regulations and provided a refreshing adjunct to the punitive and labor-intensive efforts typically employed.

The finding that self competencies increased more than relational competencies is not surprising, may be specific to the population being studied, and is consistent with other findings in the behavioral health literature; namely, that helping professionals typically demonstrate stronger relational/helping competencies than self competencies. Note the common expressions "doctors make the worst patients" and "physician, heal thyself." This may help explain why participants not only began the study with relatively lower self competencies but also achieved greater gains in these areas. This is significant as it relates to organizational wellness in terms of helping people build resilience against burnout, set healthier boundaries, and focus on self-care. For example, one social worker commented that during the second week of the program, she began noticing a different attitude toward the piles of paperwork on her desk and found the motivation to begin a methodical effort to complete the work. A nurse who participated in the study was taken off all of his blood pressure medication during the third week of the program, and, one year later, he is still managing his blood pressure by daily use of the laughter exercises on his way to work.

Hays et al. (2003) have defined ranges of scores on the CAP that have clinical significance for interpretation based on the analysis of over 2,000 CAP profiles from clinical and non-clinical populations. Standard scores between 60-79 are categorized as "Growth Challenges" and suggest that a person may lack confidence in his or her abilities and function ineffectively in that area at least some of the time, especially under conditions of elevated stress. Scores between 80-99 are called "Growth Potentials" and indicate caution, as a person may tend to show some inconsistencies in perceived competence and effective functioning for that domain of self-efficacy. Growth Potentials are fertile areas for growth and development. Scores ranging from 100-120 are considered "Growth Assets" and suggest a person will be able to engage

in effective to enhanced functioning most of the time and will seek out opportunities to utilize this area of competency.

Examination of Figures 1-3 show that in all subscales except for empathy, participants began the study in the Growth Potential range and ended the study, even at 90-day follow-up, in the Growth Assets range. This clinically significant shift would be expected to manifest in daily workplace behaviors in four areas outlined by Bandura (1986): the choices people make, the effort they put forth in working toward a goal, how long they persist when confronted with obstacles, and how they feel in the process of working toward goals. Although not specifically assessed, anecdotal reports from participants and their colleagues supported this expectation.

This study had several limitations. First, the lack of a control group makes it difficult to rule out history and maturation effects, and the lack of adequate comparison groups makes it difficult to determine whether it was laughter specifically that led to the positive changes in self-efficacy, or whether it might have been some other aspect of the program (e.g., engaging in aerobic activity, engaging in a respiratory act, socializing with coworkers, finding humor in the experience, taking a break from the workday, etc.). Related to this was the fact that a single laughter leader led all of the groups, so it is difficult to differentiate specific intervention effects from the impact of the group leader's personal characteristics (warmth, charisma, or energy). A second limitation was that there were gains across all domains of self-efficacy, which makes it difficult to pinpoint any specific mechanisms of action that account for the success of the laughter program. However, the program was designed specifically to have maximum broad-ranging positive impact on internal (self) and social (relational) factors that impact workplace functioning and productivity.

A third limitation was potential bias in the sample due to the self-selection of study participants. For example, individuals with low personal efficacy may have refrained from volunteering for the laughter program because of a perceived lack of

benefits, and this may have biased the sample toward individuals who were more amenable to the intervention. A fourth limitation was the use of a self-report measure as the predominant outcome measure. This makes it difficult to sort out whether the demonstrated increases in personal efficacy were attributable to the intervention or, at least in part, to the expectations of the research team. Future studies should consider incorporating third party ratings, such as supervisor ratings of self, relational, and role competencies.

A strength of this study was the measurement of self-efficacy at 90 days after completion of the program. Positive findings at follow-up suggest that a time-limited intervention can have a lasting impact on self-efficacy. However, ongoing workplace laughter groups would likely have a stronger and more sustained impact.

A follow-up study that utilizes appropriate comparison groups, provides the intervention to several different workplace populations, and accounts for the impact of different group leaders would enhance scientific rigor and add substantially to the knowledge regarding the impact of such programs on occupational wellness and self-efficacy. A follow-up study should also consider whether actual changes in work behavior occur (i.e., changes in objective measures of productivity, health outcomes, benefit utilization) as a result of a laughter intervention. Nevertheless, this study presents the first step in looking at the impact of purposeful, non-humor dependent laughter on self-efficacy in the workplace.

The positive outcomes seen in this study lead to the preliminary conclusion that a workplace laughter group can appeal to a diverse range of employees, can be effective with minimal investment of time, and may have sustained positive effects on self-beliefs that have been shown to correlate with positive workplace behaviors.

Author Notes and Acknowledgments

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Table 1

Mean Raw Scores (Standard Deviations) for Subscales of the Capabilities Awareness Profile (CAP) at Pre-Test (N = 37), Post-Test (N = 33), and 90-day Follow-Up (N = 22)

CAP Subscale	Pre-Test Score	Post-Test Score	Follow-Up Score
Self Competencies:			
Self-Awareness	63.19 (13.34)	70.37 (14.42)	68.30 (15.68)
Self-Acceptance	64.56 (16.49)	73.41 (14.87)	69.20 (15.38)
Self-Actualization	63.86 (18.32)	71.30 (16.38)	68.56 (14.46)
Self-Regulation	54.88 (16.22)	65.62 (13.71)	62.84 (12.18)
Adaptability	60.30 (16.78)	68.11 (14.96)	64.77 (12.02)
Motivation	58.81 (17.33)	67.80 (15.05)	65.52 (13.53)
Optimism	62.05 (20.09)	72.63 (18.05)	68.18 (17.54)
Assertiveness	52.53 (17.40)	64.27 (14.36)	65.34 (11.16)
Relational Competencies:			
Social Identification	65.22 (15.31)	73.00 (14.89)	71.48 (14.04)
Empathy	71.13 (15.60)	77.27 (14.69)	75.00 (14.65)
Positive Emotions	63.36 (17.01)	74.59 (16.73)	71.69 (13.45)
Role Competency:			
Role Compliance	74.03 (16.81)	79.44 (14.43)	77.59 (13.91)

Table 2

*Effect Sizes for Pairwise Comparisons on Subscales of the Capabilities Awareness Profile (CAP). * = t-test for comparison of means significant to .05. ** = t-test for comparison of means significant to .01 *** = t-test for comparison of means significant to .001.*

CAP Subscale	Pre-Post (N = 33)	Post-Follow-Up (N = 22)	Pre-Follow-Up (N = 22)
Self Competencies:			
Self-Awareness	.75***	-.26	.59*
Self-Acceptance	.80***	-.45*	.50*
Self-Actualization	.62***	-.14	.46*
Self-Regulation	1.03***	-.28	1.15***
Adaptability	.70***	-.21	.58**
Motivation	.88***	-.19	.83***
Optimism	.88***	-.28	.85***
Assertiveness	.91***	-.09	1.08***
Relational Competencies:			
Social Identification	.84***	-.34	.50*
Empathy	.59**	-.15	.38
Positive Emotions	.91***	-.40	.64**
Role Competency:			
Role Compliance	.77***	-.41	.53*

Figure 1. Standardized scores for self, relational, and role competency at pre-test, post-test, and 90-day follow-up.

Figure 2. Standardized scores for self competency subscales at pre-test, post-test, and 90-day follow-up.
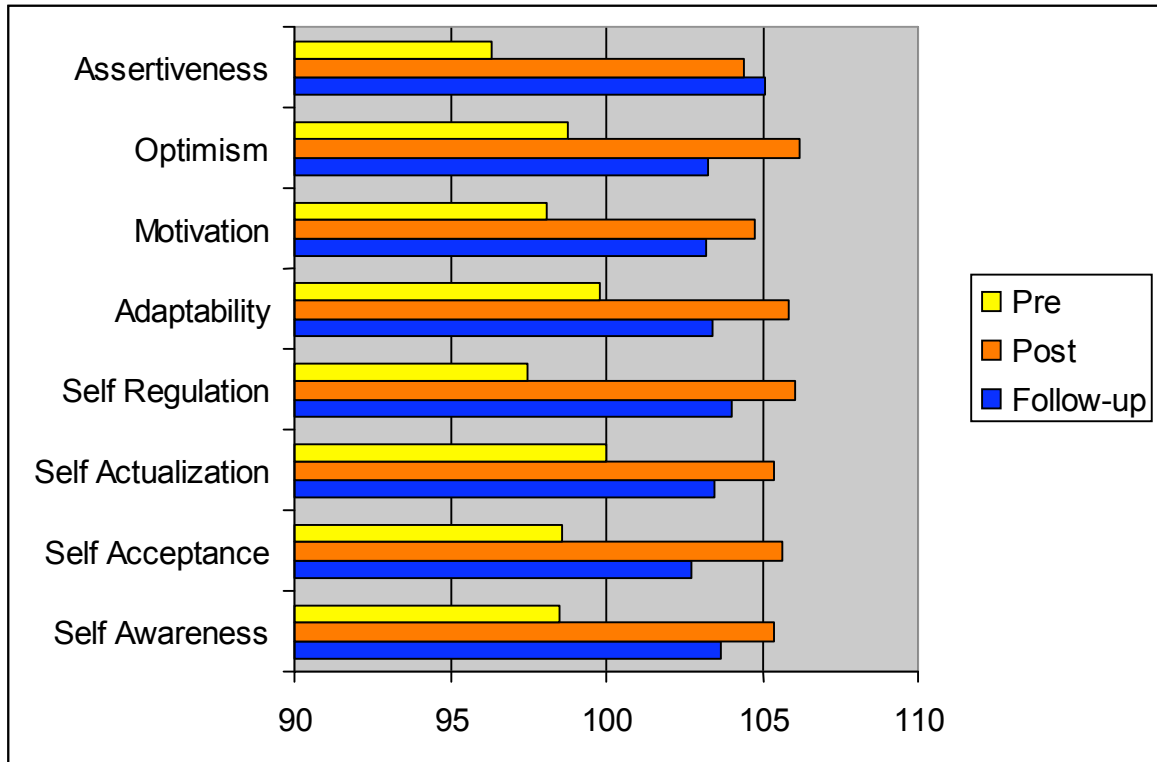
Figure 3. Standardized scores for relational competency subscales at pre-test, post-test, and 90-day follow-up.
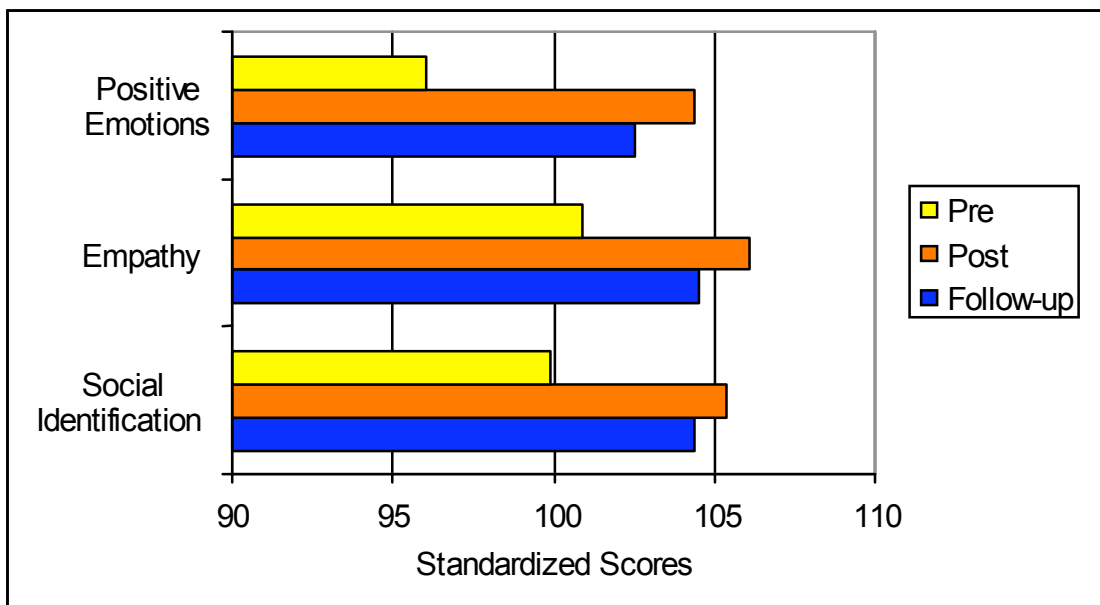
Figure 1
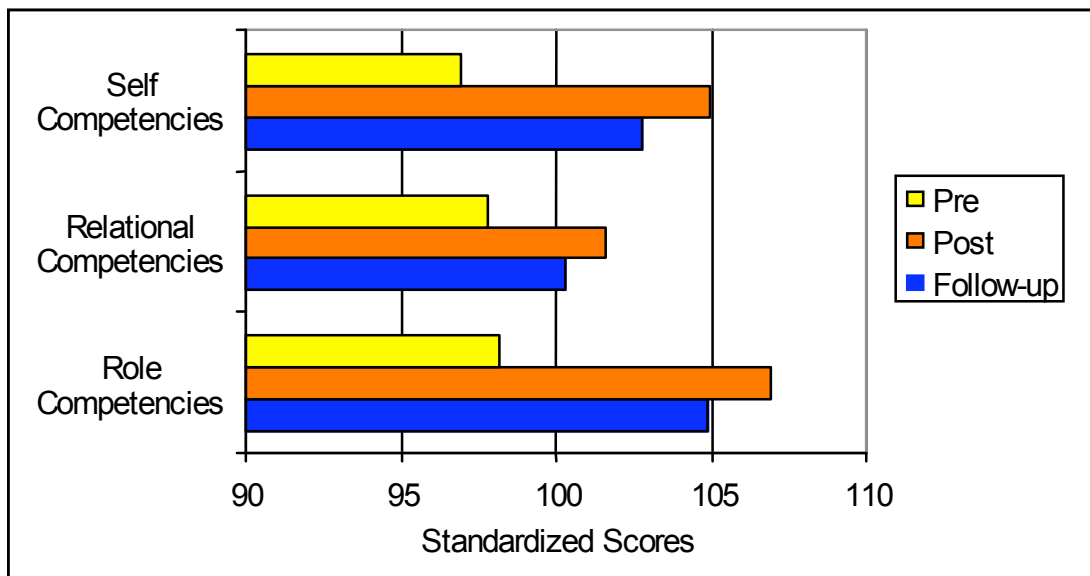
Note: Scale scores are standardized to account for norm differences and allow comparison across scales. All standard scores have a mean of 100, standard deviation of 10.

Figure 2

Note: Scale scores are standardized to account for norm differences and allow comparison across scales. All standard scores have a mean of 100, standard deviation of 10.

Figure 3

Note: Scale scores are standardized to account for norm differences and allow comparison across scales. All standard scores have a mean of 100, standard deviation of 10.

Appendix A

Subscales of the Capabilities Awareness Profile (CAP)

Self Competencies:

1. **Self-Awareness:** This scale assesses your awareness of your beliefs, values, expectations, needs, and feelings. It reflects your awareness of your limits and weaknesses, and your perceived ability to accept responsibility for your mistakes.

2. **Self-Acceptance:** This scale describes your ability to accept both positive and negative aspects of yourself. Not being critical of yourself, experiencing confidence in yourself, feeling good about yourself, and believing in yourself are characteristics of this scale.

3. **Self-Actualization:** This scale measures your ability to live up to your potential through the pursuit of challenging goals, setting high personal standards, and pursuing tasks that take you out of your comfort zone. It is associated with seeking activities and challenges that lead to a more meaningful and full life.

4. **Self-Regulation**: This scale describes your perceived competence in controlling thoughts and feelings under stress. It involves the capacity to remain calm and to work effectively under pressure.

5. **Adaptability**: This scale describes your ability to solve problems by being flexible, creative, and translating ideas into action. It is the ability to see the big picture, to look at situations from different viewpoints, and to prioritize problems based on their importance.

6. **Motivation:** This scale indicates the strength of your ability to begin and sustain behaviors to accomplish goals. An important part of coping with stress involves perseverance, and the ability to stick with difficult situations and tasks.

7. **Optimism:** This scale measures your ability to be positive and hopeful about the future even in the face of stress, setbacks, or disappointments. It reflects your capacity to look at the future with confidence and to maintain a positive attitude.

8. **Assertiveness:** This scale measures your ability to express your thoughts and feelings in a nondestructive manner. It reflects your capacity to communicate ideas and feelings in straightforward ways.

Relational Competencies:

1. **Social Identification:** This scale assesses your perceived capacity to feel connected with others. This is manifested through a sense of belonging, acceptance, and feeling secure with others.

2. **Empathy:** This scale reflects your ability to be aware of, sensitive to, and appreciative of others' thoughts and feelings. It reflects your ability to respond to others in an understanding and caring manner.

3. **Positive Emotions:** This scale assesses your capacity to experience positive emotions. The ability to experience and sustain positive emotions is associated with greater satisfaction and contentment in your work and personal life. People who are able to experience and sustain positive emotional experiences tend to be healthier and live longer.

Role Competency:

1. **Role Compliance:** This scale describes your capacity to comply with the rules and expectations of your work or school environment.

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Scientific Research on

LAUGHTER YOGA

Effect of Laughter Yoga in the Workplace on Personal Efficacy

US Study 2007

Researchers:

Heidi Beckman, Ph.D. UWHC-Health Psychology

Nathan Regier, Ph.D.

Judy L. Young Laughter Links

Objective of the Study

This study aimed to measure the impact of a purposeful aerobic laughter intervention on employees' sense of self-efficacy in the workplace as well as on their emotional health.

Hypotheses

The main hypothesis was that participation in regular workplace laughter would increase workers' sense of self-efficacy, especially in four dimensions:

● Self-regulation in managing and controlling thoughts and feelings under stress

● To remain positive about the future even in the face of all obstacles

● To experience and sustain positive emotions

● To feel connected with others

Design and Procedure

The current study used Laughter Links, a program of teaching non-humor dependent, yoga-based, purposeful aerobic laughter (Laughter Yoga) in a group setting.

It is based upon the work of Dr. Madan Kataria, a medical doctor in Mumbai, India who combined medical research, modern science, and yoga breathing to create his own laughter technique.

Method

Participants were 33 employees of a behavioral health center with average age of 48.

15 minute sessions on a guided program of non-humor dependent laughter for consecutive workdays was administered.

Participants engaged in exercises designed to evoke the physiological act of laughter without relying on humorous stimuli – it was 'laughter without humor'.

Capabilities Awareness Profile (CAP)

The primary outcome was measured by the Capabilities Awareness Profile, a self-report self -efficacy questionnaire of 124 questions, which measured different aspects of self-efficacy and relational competencies. Results showed significant increase in:

Self-Awareness: Participants showed an increased ability to assess beliefs, values, expectations, needs and feelings. It also improved the capability to understand the limits and weaknesses and to accept responsibility for own mistakes.

Self-Acceptance: Increased the ability to accept both positive and negative aspects of oneself.

Self-Actualization: Noticeable rise in the ability to pursue challenging goals, setting high personal standards, and pursuing tasks that take one out of comfort zone.

Self-Regulation: There was a rise in perceived competence in controlling thoughts and feelings under stress. It was seen that the group members remained calm and worked effectively under pressure.

Adaptability: The ability to solve problems by being flexible, creative, and translating ideas into action perceivably improved.

Motivation: There was a noticeable rise in perseverance, and the ability to stick with difficult situations and tasks.

Optimism: There was a significant rise in feelings of optimism about the future even in the face of stress, setbacks, or disappointments.

Assertiveness: The ability to express thoughts and feelings in a nondestructive manner also improved which resulted in better capacity to communicate ideas and feelings.

Improvement in Relational Competencies:

**Social Identification:** There was perceived improvement in the capacity to feel connected with others.

Empathy: Participants were more sensitive to and appreciative of others' thoughts and feelings, thereby reflecting the ability to respond to others in an understanding and caring manner.

Positive Emotions: It was seen that the members were able to sustain positive emotions which would help them to be more content, healthier and live longer.
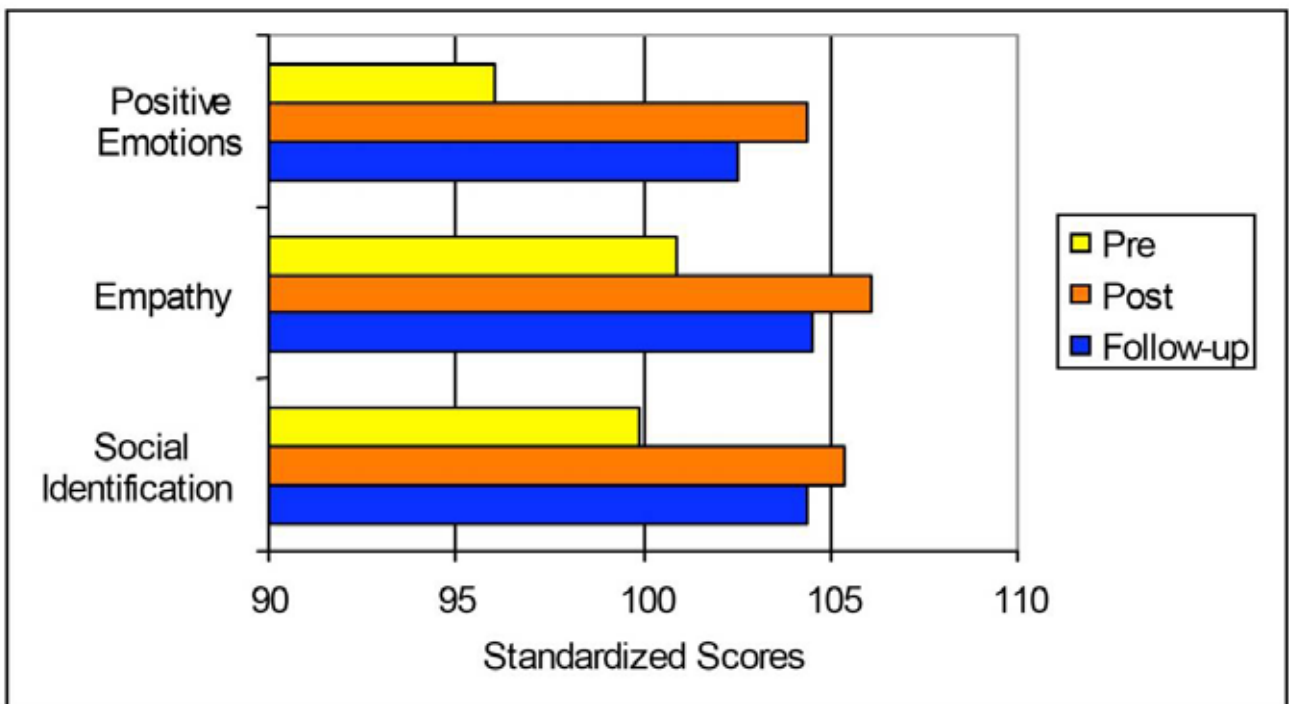
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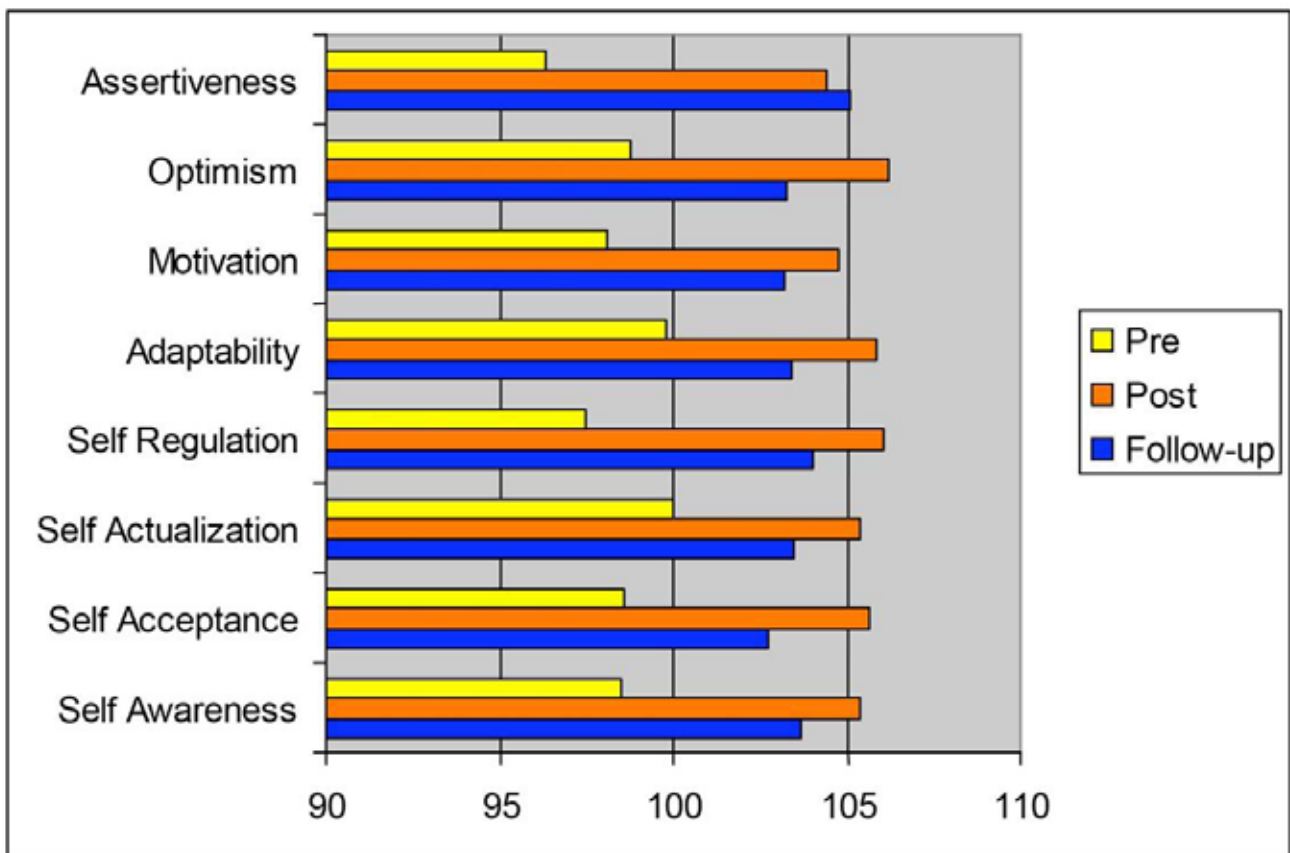
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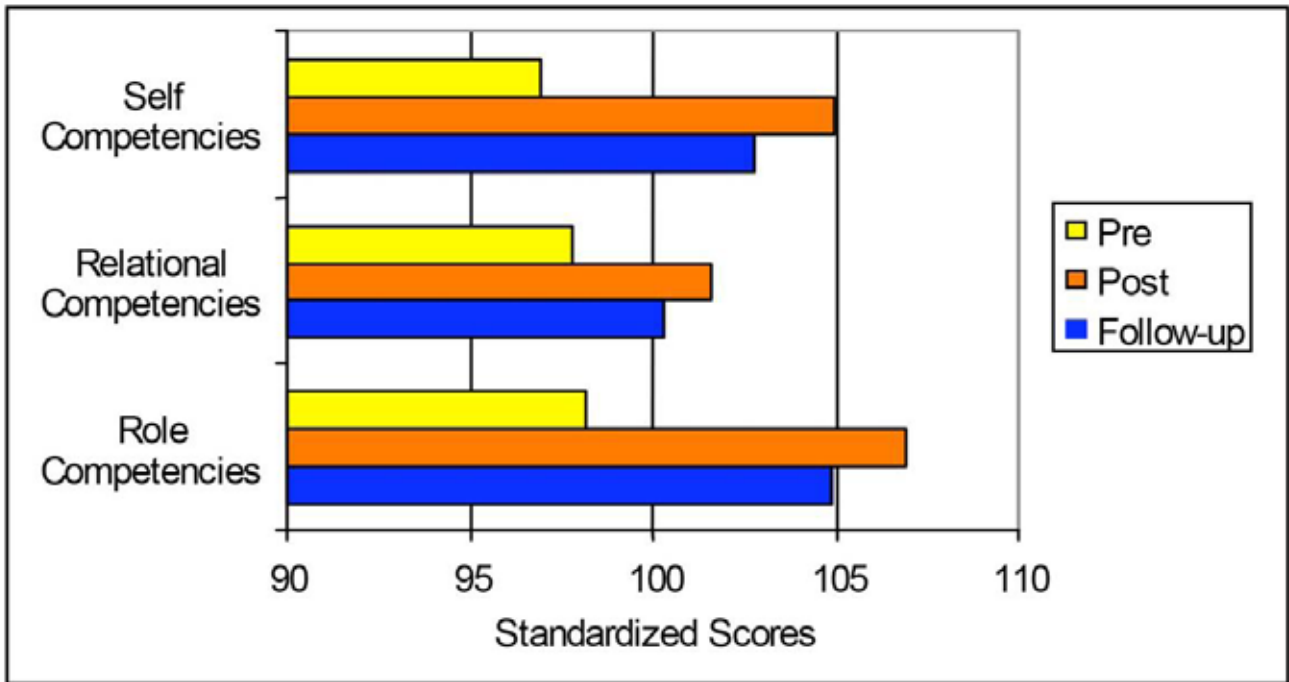
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Conclusion

Purposeful laughter is a realistic, sustainable and generalizable intervention leading to better work performance by improving the morale, enhancing resilience levels creating an awareness of personal efficacy and beliefs.

Thank You