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



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## KEYWORDS

Laughter;  
Humor;  
Adolescent health;  
Qigong;  
Stress;  
Coping;  
Mood states

## 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”.<sup>1</sup> 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<sup>2</sup> and psychoneuroimmunology.<sup>3</sup> These two fields, focusing on positive mental health and the effects of emotions on physiology, respectively, have engendered a new field of research: *gelotology*,<sup>4</sup> the study of laughter. Gelotology examines the notion that laughter attenuates biochemical markers of stress in the body.<sup>5–7</sup>

## Literature review

Comprehensive reviews<sup>8–11</sup> investigating the link between humor and health make distinctions between humor and laughter. Martin<sup>9</sup> and Bennett and Lengacher,<sup>8</sup> 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.<sup>10</sup> 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,<sup>12</sup> increased self-efficacy for those in the workplace,<sup>13</sup> and decreased pain for arthritis sufferers.<sup>14</sup> 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,<sup>15</sup> self-esteem,<sup>16</sup> self-efficacy,<sup>13</sup> and depression,<sup>17–19</sup> Though results are still inconclusive,<sup>20,9,11</sup> it seems that positive mood states accompanying laughter result in positive psychological effects, as well as possible analgesic or immunoenhancing<sup>21</sup> effects.

## Immunological effects of laughter

Immunological effects of laughter involve the neurophysioanatomical pathway.<sup>22,23</sup> 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,<sup>24</sup> and the sympathetic-adrenomedullary (SAM) system.<sup>9</sup> The effects of laughter on these systems include reductions in serum cortisol levels.<sup>25,6</sup>

## Physiological effects of laughter

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

## 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,<sup>32,33</sup> and many more practice around the world to treat a host of diseases and ailments: cancer,<sup>34,35</sup> fibromyalgia,<sup>36</sup> psychological symptoms,<sup>37</sup> mood,<sup>38</sup> cardiopulmonary effects,<sup>39</sup> lung functioning,<sup>40</sup> and BP.<sup>41</sup>

## 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,<sup>42,10</sup> investigating simulated laughter programs. From Tehran<sup>18</sup> to Canada<sup>23</sup> to Korea,<sup>19</sup> 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).<sup>43</sup> 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<sup>44</sup> and fluctuating mood states,<sup>45</sup> and suggests that a laughter program can reduce associated stresses. During adolescence, a time when coping strategies and personality traits are being formed,<sup>46</sup> 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;<sup>47</sup>) is a 10-item measurement of self-esteem with high internal consistency ranging from .86 to .93<sup>48</sup> and test-retest reliability over a 2-week period of .85.<sup>49</sup> 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.<sup>50</sup>

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 ( $r=0.81$ ; <sup>51</sup>). The FS has become widely accepted and is an effective nonverbal method for conveniently assessing moods.<sup>52</sup> 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).<sup>53</sup>

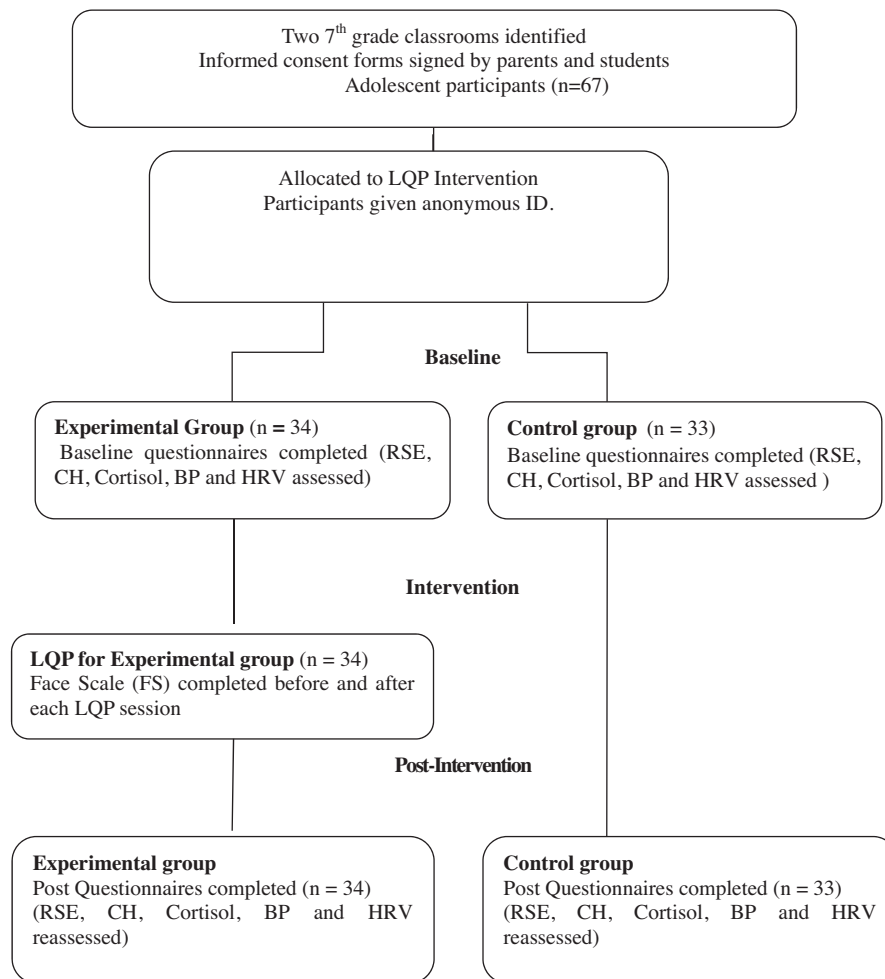


Fig. 1 LQP study protocol.

### 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.<sup>54</sup>

### 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 the experimental 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 P
	Pre-test		Post-test		t-test p	Pre-test		Post-test		t-test p	
	Mean	SD	Mean	SD		Mean	SD	Mean	SD		
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 ( $\pm 12.53$ ) to 38.50 ( $\pm 13.10$ ) 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 ( $63.68 \pm 9.11$  to  $55.24 \pm 12.90$ ;  $p = .007$ ); LF ( $36.32 \pm 9.11$  to  $44.76 \pm 12.90$ ;  $p = .007$ ) and LF/HF ratios ( $.610 \pm .274$  to  $.942 \pm .745$ ;  $p = .036$ ) 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<sup>9</sup>; 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<sup>28</sup> 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,<sup>55,25,56</sup> 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 ( <i>n</i> = 34)					Control ( <i>n</i> = 33)					ANCOVA <i>P</i>
	Pre-test		Post-test		<i>t</i> -test <i>p</i>	Pre-test		Post-test		<i>t</i> -test <i>p</i>	
	Mean	SD	Mean	SD		Mean	SD	Mean	SD		
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"<sup>9</sup> 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,<sup>57,13</sup> 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<sup>46</sup> 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,<sup>25</sup> 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.<sup>58</sup> 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<sup>59</sup> 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.<sup>60</sup> Given the unexpected

results of the control group in this study, the suggestion for two control groups,<sup>9,42</sup> 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<sup>9</sup> 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 1<sup>st</sup> time for 1-2 seconds fairly quickly; the 2<sup>nd</sup> time, 3-5 seconds, still quick; and the 3<sup>rd</sup> time for 8 seconds, more slow and drawn out. The 3<sup>rd</sup> 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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