



## Biochemical and psychometric evaluation of Self-Healing Qigong as a stress reduction tool among first year nursing and midwifery students



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### A B S T R A C T

#### Keywords:

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Depression  
Anxiety  
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Cortisol

**Background:** Qigong, a traditional Chinese exercise, has a potential role in the management of stress.  
**Objective:** To examine the influence of Qigong training on depression, anxiety and stress.  
**Design:** A randomised control trial among first year student participants.  
**Methods:** Qigong was practised twice a week by the study group ( $n = 18$ ) while a control group ( $n = 16$ ) had no intervention. The Depression, Anxiety and Stress (DASS-21) and Patient Health Questionnaires (PHQ) were administered. Salivary biomarkers were also measured over a 10-week period.  
**Results:** After 10 weeks, only the Qigong group showed a statistically significant improvement in their depression, anxiety and stress scores. Similarly, increases in secretion rates of salivary immunoglobulin-A, and decreases in salivary cortisol concentrations were seen only in the Qigong group.  
**Conclusions:** The practice of Qigong improves psychological states and mucosal immunity; as indicated by psychometric tests and biochemical markers of stress.

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### 1. Introduction

High levels of stress have been associated with studying nursing and midwifery, particularly in the first year of courses [1]. The causes of this stress may be linked to the transitions to a university life, coping with academic and clinical challenges as well as personal problems [1]. Manageable levels of stress may increase performance, but excessive stress can cause anxiety, depression and impaired immune function which in turn may progress to the development of chronic diseases [2]. Stress amongst first year nursing students has doubled in the last 15 years [3] and is becoming a global concern [4]. It has important economic implications, in many countries, through the losses to future nursing workforce [5]. Stress impacts upon academic performance [6], attrition rates [7] and poor attendance at lectures and clinical sessions [8]. The causes and consequences of stress are well known amongst nursing and midwifery students but less is known about effective ways of reducing stress-related problems [9]. Reducing stress in the nursing profession, at the student level, is therefore of interest to educators and administrators concerned with the

personal and professional development of individuals entering the health care delivery professions.

First year nursing and midwifery students' experienced more negative emotions compared with other students [10]. Academic stressors are considered to be particularly high for nursing [4,11] and midwifery [12] students. Both groups of students reported elevated somatic symptoms of stress; such as migraine and headache [13], poor sleep quality [14,15].

These professional-academic programs normally have a practical clinical element to them. Studies have shown that this clinical stress is significant for students of nursing [16] and midwifery [17]. Withdrawal from course has been linked to student's experiences with anxiety in their clinical placement [18]. However, in Brunei Darussalam and Malta it has been shown that students' were more stressed by the academic demands of the course rather than their clinical placements [4]. Further to these aspects that are specific to life in higher education, personal stress such as life events [19] and family pressure [1] are commonly encountered in this setting [10]. The prevalence of depression has also been found to be high among these students which is a trend that continues throughout their training [20].

Research into the sources of stress for trainee nurses and midwives has highlighted the importance of investigating stress preventive interventions. The most effective stress management tools

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for student nurses are techniques which provided skills for relaxation, reduction of stressors and coping with their stress [21]. Meditation techniques have been found to reduce students nurses' stress, anxiety and depression [22]. Stress intervention studies for nurses [23] have included techniques such as; yoga, tai chi and Qigong [21].

Qigong is a traditional Chinese mind-body exercise which has the potential as a stress management intervention as it has all of these key elements described above. Common to other Qigong techniques, Self-Healing Qigong is a combination of movements, deep abdominal breathing and mind focussing activities [24]. Such activities are comparable to techniques used in behavioural medicine, psychotherapy and counselling [25]. These Qigong activities are similar to other types of mind-body interventions such as tai chi [26] and the Alexander Technique [27]. Studies using psychometric measurements evaluating the effects of Qigong have shown stress reduction in elderly [28] and in association with chronic illness [29]. Qigong practitioners have reported a reduction of perceived pain and stress [30] and significant improvement in neck pain [31]. Studies have reported reduced psychological distress and stress for school children [32] and significant decreased in cold and flu symptoms for elite university swimmers [33] with Qigong administration. Physiological parameters have also been shown to be influenced by Qigong. Blood biomarkers such as; cortisol, adrenocorticotrophic hormone (ACTH) and aldosterone [34] and neutrophils levels [35] have been shown to be effected by Qigong. Similarly, changes in salivary biomarkers [36] have been associated with Qigong practice.

Mental states and stress induced somatic symptoms may be evaluated using psychometric self-administered questionnaires such as Depression, Anxiety and Stress Score-21 (DASS-21) [37] and Patient Health Questionnaire-15 (PHQ-15) [38]. DASS-21, is an instrument designed to measure negative emotional state and moods; comprising of 21 items which assess the three subscales of; depression, anxiety and stress. PHQ-15 consists of 15 items assessing major somatic symptoms or operational indicators. Physiological responses to stress may be evaluated using salivary cortisol and salivary IgA [39,40]. The aim of this study was to evaluate the effects of a course of structured Self-Healing Qigong classes on levels of stress among diploma in nursing and midwifery freshmen using psychometric questionnaires and salivary biomarkers.

## 2. Methods

### 2.1. Design

This was a randomised control trial design. 46 participants were assigned a specific participant code and were randomised into the control or Self-Healing Qigong group. All participants were assessed on depression, anxiety and somatic symptoms as well as levels of salivary cortisol and secretory immunoglobulin (IgA) before starting the study and then again at week 6 and week 10 of the study.

### 2.2. Setting and participants

16 participants from the control group and 18 participants from the Qigong group completed the full 10 weeks of the program. Participants were first year nursing and midwifery diploma students studying at university Brunei Darussalam. Recruitment took place during their 2nd week of semester one. The inclusion criteria were: (1) first year nursing and midwifery diploma students from the intake of 2012, (2) able to stand for at least 45 min; (3) accept both genders. Participants were excluded from the study if they (1)

had recent injury or surgical operations; (2) were actively practicing Qigong or other similar relaxation methods. All participants gave written informed consent before commencing the study.

### 2.3. Intervention

Subjects were taught Self-Healing Qigong for an hour two times a week for 10 weeks duration. The instructor was one of the research members with 20 years of experience in Qigong, meditation and acupressure.

Each Self-Healing Qigong session consisted of three stages: warm-up, Qigong exercise and cooling-down stage. The actual exercise stage has four parts which are: (1) tensing and relaxing of the hands; (2) standing still; (3) scanning front part of the body with palms; and (4) gentle bending and stretching of the spine. Qigong activities were normally approximately 45 min in duration, excluding the warm-up and cooling-down stages. Those in the control group were offered Qigong training in the next semester.

### 2.4. Measurements

Self-administered questionnaires and saliva specimen collections were carried out at standardised times. On all occasions Qigong classes took place from the time of 14:30 to 15:30. Saliva specimens were collected from all participants, both control group and study group, before the Qigong class. Saliva specimens and self-administered questionnaires were collected within the 30 min period before the class.

All participants completed a structured questionnaire including demographic information and Cough and Cold Questionnaire (indicating the presence of an upper respiratory infection; URTI) as well as the DASS-21 and Patient Health Questionnaire (PHQ) questionnaires. The Qigong group completed two more questions related to their practice of Qigong at home. Dr Kroenke granted permission to remove one statement relating to 'painful sexual intercourse' in the PHQ-15 because of cultural and religious sensitivities associated with the country in which the study was performed.

DASS-21 and PHQ were piloted twice with diploma nursing students in order to check their understanding of English language as this was not their mother tongue. Three students from the first group in the pilot study did not understand 'wind down' out of 21 statements in the DASS-21 questionnaire. In the second pilot study, we added 'relax' next to 'wind down' in the questionnaire. 2nd pilot study was conducted on five diploma nursing students in a different cohort. They had no problem understanding the piloted questionnaires.

The original version of the PHQ-15 consists of 15 items [38] where participants rated how much they have been bothered by each symptom during the past month on a 0 (not at all) to 2 (bothered a lot). However for our modified version the total score range is rated from 0 to 28 instead of 0 to 30 as stated in the original questionnaire. An item relating to menstrual pain was also omitted for male participants. Results were expressed as a ratio; the total score summed from 14 items (females) or 13 items (males) divided by the highest achievable score 28 (female) or 26 (male).

### 2.5. Procedure

Ethical approval was granted from the Research Scientific Committee at University Brunei Darussalam. Participants' were explained about the purpose of the study, research methodology including a short demonstration of saliva collection and saliva protocol relating to no food intake for at least an hour before saliva collection. They had the right to withdraw from the study anytime.

**Table 1**  
Demographics of study participants.

		Control (n = 16)	Qigong (n = 18)
Sex	Male, Female	2, 14	5, 13
Age (years)		18–21	19–28
Course of study	Nursing	12	14
	Midwifery	4	4
Marital status	Single	16	18
	Married	0	0
Residence while studying	University Hostel	7	4
	Family Home	9	14

We also gave them an instruction sheet to reinforce the verbal information. We emailed the participants and reminded them about the saliva protocol prior to saliva samplings and completion of questionnaires for the 1st, 6th and 10th week of the intervention. Prior to saliva collection, we gave them bottles of water to rinse their mouth. During saliva taking we created a relaxing conducive environment with soft music in the background. Saliva specimens were stored frozen in the freezer at  $-70^{\circ}\text{C}$ .

### 2.6. Data analysis

Data was analysed using Minitab (version 14). Summary statistics using median (minimum–maximum) were calculated for biomarker values and questionnaire scores for the two study groups. Chi Square was used to analyse frequency of upper respiratory tract infection for Qigong and control group. Wilcoxon Signed-Rank and Friedman tests were used to compare medians between the various time points for psychometric scores and biomarker values.

## 3. Results

### 3.1. Demographic profile

A total of 46 participants were originally recruited onto the study and randomised into control and Qigong groups. 12 participants dropped out of the study (26%), seven from the control group and five from the Qigong group. The majority of participants were female (79%) and the most of them lived at their family home (68%), and all participants were single. Some of the demographic details of the participants are summarised in Table 1. Participants were surveyed as to whether they were experiencing symptoms of an Upper respiratory tract infection (URTI) at the three time point of data collection. There were no statistical differences in the frequency of URTIs between the two groups or

across the any of the three time points: week 1, week 6 and week 10 (see Table 2).

### 3.2. The effect of Self-Healing healing Qigong on depression, anxiety, stress and somatic symptoms

After 10 weeks, the median DASS-21 scores for the Qigong group were statistically significantly lower than those measured at week 1 of the study for all three subcategories of depression ( $p = 0.010$ ), anxiety ( $p = 0.016$ ) and stress ( $p = 0.009$ ). Median DASS-21 scores were also lowered over the 10 week period for the control group. However, this change was not statistically significant for the control group ( $p > 0.05$ ). No statistically significant changes were seen for any of the subcategories, for the control group or the Qigong group at week 6.

There were no statistically significant changes in the median values of the overall PHQ scores for either of the two groups at week 6 or week 10. All but one of the 14 somatic symptoms showed no statistically significant changes over the 10 week period in both the Qigong and control groups. "Trouble falling or staying asleep, or sleeping too much" was the only symptom which showed a statistically significant improvement after 10 weeks in the Qigong group, but not the control group ( $p = 0.010$ ). All scores are summarised in Table 2.

### 3.3. The effect of Self-Healing Qigong on salivary biomarkers

There was a significant reduction in median concentrations of salivary cortisol from week 1 to week 10 ( $p = 0.012$ ), in the Qigong group. However, there was no statistically significant change at week 6. The control group showed no statistically significant change ( $p > 0.05$ ) in salivary cortisol across any of the time points; weeks 1, 6 and 10.

Both control and Qigong groups showed an increase in median secretion rates of salivary IgA over the three time points. This increase was not statistically significant for the control group over the 10-week period. In contrast, for the Qigong group, there was a statistically significant increase in the salivary IgA section at week 6 ( $p = 0.018$ ) and at week 10 ( $p = 0.018$ ) as compared to week 1. Median and ranges of cortisol concentration and IgA secretion rates are summarised in Table 2.

## 4. Discussion

Our findings show that 10 weeks of Qigong intervention reduces depression, anxiety and stress among newly enrolled nursing and midwifery students; based upon evidence from psychometric evaluations. This is further supported by biochemical analysis. It

**Table 2**  
Psychometric scores, biomarker levels and frequency of, self-reported, upper respiratory tract infections (URTI) at weeks 1, 6 and 10 for control group and Qigong group.

		Control (n = 16)			Qigong (n = 18)		
		Week 1	Week 6	Week 10	Week 1	Week 6	Week 10
DASS	Depression	8 (2–22)	6 (0–18)	2 (0–20)	10 (2–26)	4 (0–30)	4 (0–14) <sup>a</sup>
	Anxiety	8 (0–16)	8 (0–22)	6 (0–20)	11 (2–28)	6 (0–24)	5 (0–20) <sup>a</sup>
	Stress	12 (0–20)	9 (0–20)	8 (2–24)	13 (0–26)	6 (0–22)	5 (0–18) <sup>a</sup>
	Total DASS-21	27 (4–50)	25 (6–58)	17 (2–64)	37 (4–64)	18 (0–64)	13 (2–50) <sup>a</sup>
PHQ		0.23 (0.07–0.50)	0.30 (0.00–0.46)	0.21 (0.00–0.43)	0.308 (0.12–0.54)	0.28 (0.00–0.64)	0.18 (0.00–0.46)
Saliva	Flow rate (ml/min)	2.0 (0.5–11.5)	2.1 (0.5–8.8)	2.0 (0.4–4.3)	1.2 (0.4–3.5)	1.7 (0.4–5.1)	2.0 (0.8–6.0)
	IgA ( $\mu\text{g}/\text{min}$ )	58.9 (15.1–210.3)	63.6 (12.4–183.7)	67.4 (20.0–223.0)	43.8 (12.4–187.3)	54.9 (16.4–305.8) <sup>a</sup>	72.9 (36.6–205.8) <sup>a</sup>
URTI	cortisol (nmol/l)	4.4 (1.1–25.9)	4.8 (1.7–15.1)	4.3 (1.9–7.7)	4.3 (1.9–12.5)	4.0 (1.3–12.7)	3.3 (1.0–11.7) <sup>a</sup>
	Current URTI	2 (12.5%)	6 (37.5%)	2 (12.5%)	2 (11.1%)	3 (16.7%)	3 (16.7%)
	Recent URTI	3 (18.8%)	4 (25%)	1 (6.3%)	6 (33.3%)	3 (16.7%)	0 (0.0%)
No URTI	11 (68.8%)	6 (37.5%)	13 (81.3%)	10 (55.6%)	12 (66.7%)	15 (83.3%)	

<sup>a</sup> Values showed a statistically significant ( $p < 0.05$ ) difference from values at week 1.

was shown that salivary cortisol, a biomarker of stress, was reduced in response to Qigong sessions. In addition there were improvements in mucosal immunity; as indicated by changes in salivary flow rates of IgA. However the Qigong programme did not induce significant improvements in somatic symptoms as assessed by the Patient Health Questionnaire, although this questionnaire did reveal improvements in sleep patterns for the Qigong group. The overall findings of this study suggest that Qigong is a strong candidate stress management technique for new university students.

Our findings have implications for new students studying at the university. Health issues among students are now well recognised as a major topic [20,41,42]. The causes of stress among freshmen nursing students may be linked to the transitions to a university life, coping with academic and clinical challenges [16,18] as well as personal problems [1]. The potential problems that stress poses to the quality and quantity of nurses and midwives that finally go on to graduate and enter the profession impacts upon the economy, the health burden and the general society. Self-Healing Qigong, at the start of university life, may be employed as a relatively inexpensive health promotion exercise which can be used in conjunction with other stress management tools such as counselling and aerobic exercise. It is an alternative method of exercise for individuals who prefer gentle movement and for those in poorer states of physical fitness due to lack of exercise.

This is the first report to describe improvements in DASS-21 scores in response to Self-Healing Qigong among for university students. These findings reflect those of a previous study on the effects of Qigong with middle aged adults that showed similar changes in DASS-21 scores and salivary cortisol study [43]. Other studies have also shown similar findings for anxiety, depression and stress reduction, in relation to Qigong practice, using psychometric instruments other than DASS-21 [32,44,45]. Our findings are also in agreement with studies that have associated Qigong practice with improvements in psychological states with the elderly [29,46] and school children [32].

It has previously been shown that somatic symptoms of stress may be reduced by a Qigong training programme for patient and healthy volunteers [30,31] and patients with depressive disorder [47]. However our study showed merely marginal changes in PHQ score in response to Qigong exercise. Qigong did seem to be associated with changes in sleep patterns. A similar finding was reported in elderly participants practicing Qigong [48]. This finding raises further research issues. Disturbed sleep patterns are associated with several psychopathologies. The influence of Qigong practice and sleep patterns may be elucidated by further studies employing more elaborate instruments to evaluate the quality and duration of sleep.

Although the number of participants in this study was relatively small the results suggest that Qigong exercise sessions have a positive influence on depression, anxiety and stress assessments among first year nursing and midwifery students. This small number may be considered to be a limitation to this study.

## 5. Conclusion

Self-Healing Qigong exercise improves psycho-physical health status. A 10-weeks programme of Qigong maybe a cost effective means to manage stress and improve mood states and immune function among nursing and midwifery students.

## Conflict of interest

None declared.

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