THE SCIENTIFIC BASIS OF QIGONG AS MIND-BODY INTERVENTION TO REDUCE FOREIGN LANGUAGE ANXIETY

SO WING YAN

PhD

The Hong Kong Polytechnic University

2022

The Hong Kong Polytechnic University

Department of Rehabilitation Sciences

The Scientific Basis of Qigong as Mind-Body Intervention to Reduce Foreign Language Anxiety

So Wing Yan

A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy

August 2021

CERTIFICATE OF ORIGINALITY

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it reproduces no material previously published or written, nor material that has been accepted for the award of any other degree or diploma, except where due acknowledgement has been made in the text.

_____ (Signed)

_____So Wing Yan_____ (Name of student)

Abstract

Background: A growing number of ethnic minority families, many of whom do not speak Chinese, are immigrating to and residing in Hong Kong. To fully succeed in school and participate in school activities, ethnic-minority children must gain competence in the Chinese language. However, many of these children experience foreign-language anxiety, creating a hurdle in their learning process. This study has two aims: to help Non-Chinese Speaking (NCS) students reduce foreign-language anxiety through the use of qigong as a mind-body intervention, and to gain a deeper understanding of the neuroscientific mechanisms of qigong on reducing foreign-language anxiety.

Methods: A randomized controlled trial was conducted in a school setting, with NCS students recruited via convenience sampling and placed at random into an intervention group or a control group. The intervention group took part in a qigong program, while the control group continued with their usual routine. Assessments were conducted at baseline, post-intervention, and 6 months after intervention.

Results: This study did not identify significant differences in foreign-language anxiety or academic achievement in the Chinese language between or within the groups. However, a significant within-group difference in salivary cortisol level was noted for the intervention group. Participants' cortisol levels decreased significantly after the qigong intervention compared to measurements taken at baseline. A marginally significant between-group difference in salivary cortisol levels was also observed, with participants in the qigong group displaying lower cortisol levels than those in the control group at post-assessment. No significant differences were identified for stress-related physiological outcomes, including blood pressure, heart rate, and heart-rate variability.

Discussion and Implications: Although the results are inconclusive regarding the use of qigong to reduce foreign-language anxiety, this study provides evidence that qigong has an effect on the Hypothalamic-Pituitary-Adrenal (HPA) axis. This suggests that qigong can help children to regulate their emotions and that it may prevent hyper-activation of the HPA axis. Qigong was also found to alter the neuroendocrine system, a result that aligns with previous research. Non-

significant results in other physiological outcome measures may imply that short-term qigong training produces an effect on the HPA axis but not the autonomic nervous system. This study employs a form of qigong known as Baduanjin, and recommends its use for children, as the results have demonstrated that it can safely be used in educational settings as an intervention to relieve stress.

Publications arising from the thesis

Journals

So, W.W.Y., Cai, S., Yau, S. Y., & Tsang, H. (2019). The Neurophysiological and Psychological Mechanisms of Qigong as a Treatment for Depression: A Systematic Review and Meta-Analysis. *Frontiers in psychiatry, 10*, 820. https://doi.org/10.3389/fpsyt.2019.00820

So, W.W.Y., Lu, E.Y., Cheung, W.M.,Tsang, H.W.H. (2020). Comparing Mindful and Non-Mindful Exercises on Alleviating Anxiety Symptoms: A Systematic Review and Meta-Analysis. *Int. J. Environ. Res. Public Health, 17*, 8692. https://doi.org/10.3390/ijerph17228692

Conference

So, W.W.Y., Cai, S., Yau, S. Y., & Tsang, H. (November, 2018). The Neurophysiological and Psychological Mechanisms of Qigong as a Treatment for Depression. Presented at the 11th Pan-Pacific Conference on Rehabilitation, The Hong Kong Polytechnic University, Hong Kong.

So, W.W.Y. (September, 2019). Coping with foreign language anxiety in ethnic minorities children through qigong. Poster presentation at The Sixth International Institute on the Model of Human Occupation, Illinois, USA.

Acknowledgements

My sincere appreciation goes to

- Professor Hector Tsang, my supervisor, for his guidance and advice throughout my PhD journey. He has been very supportive and provided opportunities for me to develop as a scholar. He is willing to give valuable suggestions when needed and I have grown a lot under his supervision.

- Staff of the Department of Rehabilitation Scie nces, especially Dr Sonata Yau who taught me necessary skills on performing ELISA analysis. She has been very patientce and supportie. Also, Dr. Raymond Chung who are always there to answer questions on statistical analysis.

- Research personnel from Professor Tsang's team who helped with the implemention of qigong intervention and data collection.

- Principle Lo and Ms Sally Yip from Jordan Road Government Primary School who helped me arrange students to do assessments and participate in the qigong intervention. Also, they helped a lot in introducing this project to their parents and obtained their consent in order to let their children participate in this project.

- The participants of this study and their pareitns, without them I could not complete this PhD study.

- My family and friends for providing encouragement and emotional support througout the whole period of my PhD study.

Table of contents

Chapter 1: Introduction

1.1 Background to the study

A significant number of ethnic-minority families live in Hong Kong. The total population of Hong Kong is around 7 million, and the population of ethnic minorities is over 450,000 (Census and Statistics Department, 2011). The majority of ethnic minorities originate from Indonesia, the Philippines, India, and Pakistan. Hong Kong provides 12 years of free education for all school-age children, including ethnic minorities. After 12 years, all students decide whether they wish to continue to the post-secondary level of study. However, Non-Chinese Speaking (NCS) students have difficulties accessing post-secondary education. The percentage of NCS students who receive secondary education is 98.2, while only 76.2% receive post-secondary education. Lack of competence in the Chinese language is believed to be the cause of this phenomenon (Hong Kong Unison, 2015). 70% of non-degree tertiary education courses in Hong Kong require students to speak or write Chinese (S. Zhao, 2015).

All students in Hong Kong begin to learn Chinese when they enter primary school. However, studying Chinese classes can create significant stress for NCS students. During the foreign-language learning process, students may experience foreign-language anxiety. Foreign-language anxiety is defined as "a distinct complex set of perceptions, beliefs, feelings, and behaviors related to classroom language learning arising from the uniqueness of the language learning process" (E. K. Horwitz, Horwitz, & Cope, 1986).

Many research efforts have focused on the anxiety that people face when they learn English as a foreign language. Research that uses Chinese to explore foreign-language anxiety is sparse. Furthermore, some of the research investigating anxiety using Chinese as a foreign

language has not been conducted in a Chinese community. For example, Han (2014) investigated foreign-language anxiety using Chinese as a foreign language. However, participants were university students in the US who were taking a credit-bearing Chinese language course. A. Zhao, Guo, and Dynia (2013) did a study in a similar setting. In these situations, students could speak in their native language again after class was dismissed. Unfortunately, the situation is different in Hong Kong. After NCS students leave the classroom, they are still surrounded by people speaking Chinese. As a result, students may still experience foreign-language anxiety outside class. Specifically, situations that require oral production in a foreign language have been reported to induce significant anxiety (E. K. Horwitz, Tallon, M., & Cope, J., 2010). Other research supports this finding, and reports that second-language learners rate interaction with native speakers, for example in the classroom, during breaks, with school personnel or outside school, as the most anxiety-provoking activity (Rose, 2008). When foreign-language learners experience foreign-language anxiety, some of them use positive thinking (Kao & Craigie, 2013) or relaxation techniques (Woodrow, 2006)to cope with this anxiety. However, some of them chose to remove themselves from the anxiety-inducing situation. Focus-group participants in one study reported the frequent use of avoidance as a coping strategy. When the researcher asked what they did to avoid being anxious in the mainstream classroom, most of them replied that they did not speak in class (Pappamihiel, 2002). Avoidance is a short-term coping strategy and does not resolve anxiety. Feelings of anxiety will return whenever the person is exposed to a foreign-language environment. If this anxiety is not addressed, NCS students may eventually avoid all situations that involve social interaction with native speakers. This not only affects their social lives; Khodadady and Khajavy (2013) found that foreign-language anxiety also has a negative effect on foreign-language achievement.

In addition to the fact that research in this area focuses heavily on learning English as a foreign language, most of the research is conducted using adults as the target population. There is limited research on foreign-language anxiety using a population of children. Studies that do use children as the target population are mostly qualitative.

One of the most common methods for the treatment of anxiety is the use of medication. Although there is much debate on the use of medication, it remains the main treatment option for patients with anxiety (Cipriani et al., 2009). Many side effects may result from the use of medication. Examples are nausea, headaches, insomnia, joint and muscle pain, stomach upset, and diarrhea (Komaroff, 2012; Zoberi & Pollard, 2010). Regardless, patients may have few other options when their condition becomes severe. We should therefore help NCS students to manage their anxiety at an early stage. However, no research has ever been conducted to address the management of foreign-language anxiety, which is a rising problem in Hong Kong and countries with high levels of immigration.

Qigong has become more and more popular in Hong Kong and around the world as an exercise to promote wellness and to treat various diseases. According to Traditional Chinese Medicine (TCM) theory, qigong is a type of mind-body exercise that aims to enhance the flow of qi within the meridian channels in the body. It comprises a range of simple movements, which are performed in association with abdominal breathing and mindfulness elements. These practices enable individuals to enhance the function of qi (Jahnke, Larkey, Rogers, Etnier, & Lin, 2010).

Qigong has the potential to treat emotional disorders, including depression and anxiety. It has been effective in reducing anxiety symptoms (Yin & Dishman, 2014) and has been widely

used in treating anxiety across different populations (Y. Chow & Tsang, 2007; C.-W. Wang et al., 2013). Yin and Dishman (2014) found that in adults, there was a negative correlation between age and reduction in anxiety symptoms after qigong intervention. However, no research has been conducted on using qigong to reduce anxiety in a child population.

Another line of research focuses on changes in HPA activity after practicing qigong. This approach tends to involve the collection of saliva samples to measure cortisol and other related hormones as a way to gauge HPA activity after the qigong intervention. Earlier studies using this approach have targeted several populations, including undergraduate students (Chan et al., 2013), middle-aged adults (Jung, Shin, Kim, Shin, & Lee, 2006), and the elderly (H. Tsang et al., 2013). These studies showed that the saliva cortisol level decreased significantly after the qigong intervention. Tsang and Fung (2008) postulated that this is due to the reduction of stressful signals to the limbic system and a consequent reduction in the HPA activity, which eventually reduces the secretion of adrenal glucocorticoid. Finally, another group of studies focused on the effects on the body via the autonomic nervous system (ANS). For example, M.-Y. Chang (2015) investigated heart-rate variability after qigong intervention. Higher values of SDNN, low frequency, high frequency, and total power were reported after qigong intervention compared to the control group. Another study found that skin temperature increased while performing qigong (Kuo, Ho, & Lin, 2003). Furthermore, S. M. Lee, Pittler, Guo, and Ernst (2007) reported that compared to the waitlist control, blood pressure was reduced after qigong exercise. Unfortunately, these results cannot be generalized automatically to a child population, since no research has ever been done using children as the participants. To summarize, most of the theories and emerging evidence suggest that in adults and older adults practicing, qigong exerts

its effects on the mind and body via the nervous system; nevertheless, the knowledge related to this is still fragmented and in its infant stage.

1.2 Aim of the study

This thesis aims to evaluate the effectiveness of qigong in reducing foreign-language anxiety among NCS students in Hong Kong. In addition, this thesis aims to gain a deeper understanding of the mechanism of qigong on reducing foreign-language anxiety. In Chapter 2, I will review the concept of foreign-language anxiety and present a summary of the current situation of NCS students in Hong Kong. Interventions for foreign-language anxiety will also be discussed. In addition, the chapter provides details of qigong intervention and the potential benefit of qigong on reducing anxiety in children. Possible neuroendocrine and physiological mechanisms of qigong will also be discussed. Furthermore, two systematic reviews were conducted and they will be presented in Chapter 2. Chapter 3 and 4 describes the methodology and results of a randomized controlled trial. Chapter 5 provides discussion and future directions for further research on using qigong for anxiety. Last but not least, recommendations will be made for the implementation of qigong in the clinical setting for the purposes of prevention and early intervention.

1.3 Objectives

A theoretical framework has been created based on the literature review (Figure 1). Based on this framework, the specific objectives of this study are listed below:

1. To conduct a systematic review on the effect of qigong on the central and peripheral nervous system
2. To gain a deeper understanding of the neuroscience mechanism of qigong on reducing

foreign-language anxiety

3. To evaluate the effectiveness of qigong in reducing foreign-language anxiety among NCS children

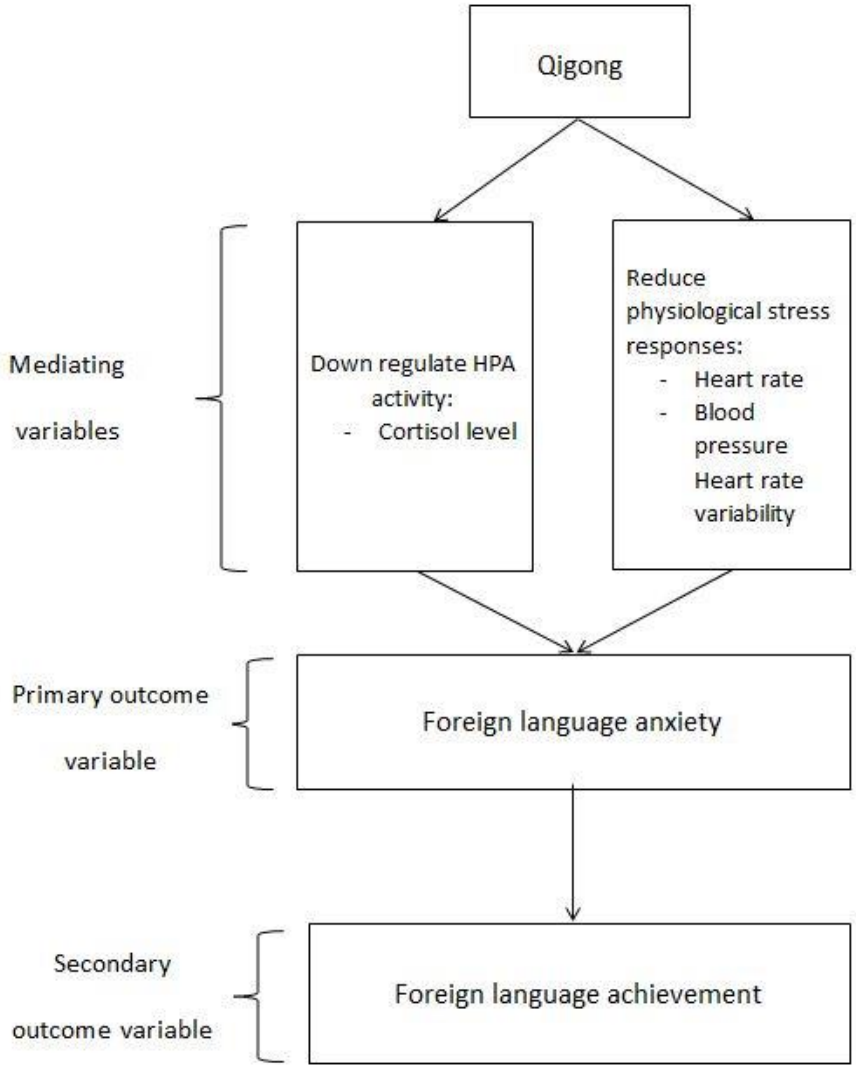

Figure 1. Theoretical framework

1.4 Project significance

This study is the first study to use qigong as a mind-body intervention to reduce anxiety in children. If this intervention is effective, it will provide an additional option for treating children with anxiety: in this case, language anxiety. Moreover, this is the first attempt to investigate the neuroendocrine and physiological changes in children after practicing qigong. This will give a fuller understanding of the underlying mechanism of qigong and present an opportunity to explore further possibilities of clinical applications for qigong. Most importantly, this intervention may help to alleviate the language anxiety of NCS students in Hong Kong. This may lead to higher academic achievement and increase their chance of receiving a higher education.

Chapter 2: Literature Review

2.1 Definition of foreign-language anxiety

Anxiety refers to "the subjective feeling of tension, apprehension, nervousness, and worry associated with an arousal of the autonomic nervous system" (Spielberger, 1983). Anxiety can be distinguished into two types: trait anxiety and state anxiety. According to Spielberger (1983), trait anxiety refers to a relatively stable personality characteristic, while state anxiety is a response occurring when a particular anxiety-provoking stimulus is presented. E. K. Horwitz et al. (1986) argued that foreign-language anxiety should be categorized into state anxiety. Foreign-language anxiety refers to "a distinct complex of self-perceptions, beliefs, feelings, and behaviors related to classroom language learning arising from the uniqueness of the language learning process" (E. K. Horwitz et al., 1986). It is unique and is different from general anxiety since it is specifically related to foreign-language proficiency (MacIntyre & Gardner, 1989). Foreign-language anxiety is a situation-specific anxiety that emerges throughout the foreign-language learning process.

Anxiety can be both facilitating and debilitating. On one hand, anxiety can motivate an individual and boost their performance, which results in positive outcomes. On the other hand, it may have a negative effect on performance, since students' anxiety prevents them from engaging with a situation to the best of their ability. It may even lead to dropout behaviors if individuals think that they are not able to overcome the anxiety. Similarly, in the case of foreign-language anxiety, learners could either master the material or drop out from the class (Sajedi & Sajedi, 2017). Indeed, many researchers have focused on the debilitating effects of foreign-language anxiety, since it is multifarious and psychologically intricate (Hewitt & Stephenson, 2012).

Among the language skills, language learners reported that oral activities are associated with higher levels of anxiety (Hewitt & Stephenson, 2012). Often, learners could not pronounce words correctly or generate grammatically correct sentences (Kruk, 2018). This may create unpleasant experiences, including confusion and embarrassment in the language learning setting, which leads to withdrawal behaviors. M. Liu and Jackson (2008) found that students' unwillingness to communicate was positively correlated with their foreign-language anxiety. In addition, both their unwillingness to communicate and their foreign-language anxiety were significantly correlated with their self-rated foreign language proficiency. This creates a vicious cycle that hinders language learners' performance.

2.2 Causes and outcomes of foreign-language anxiety

According to Naser Oteir and Nijr Al-Otaibi (2019), the causes of foreign-language anxiety may originate from the learner, the educator, or the instructional practice. From the learner's perspective, they are afraid of making mistakes. Students experienced particular stress when they were asked to present in front of teachers and peers (M. Liu & Jackson, 2008). Some students found it hard to accept when they made mistakes. They kept thinking they were falling far behind (Arnaiz & Pérez-Luzardo, 2014). Also, self-esteem was negatively correlated with foreign-language anxiety (Naser Oteir & Nijr Al-Otaibi, 2019). Low self-esteem and negative self-image are often identified in language learners who have language anxiety (Kruk, 2018). The degree of foreign-language anxiety may also be affected by the teacher's role and the learning environment. Some teachers forced students to speak in class, which created a lot of stress for foreign-language learners (Arnaiz & Pérez-Luzardo, 2014). Aydin (2008) suggested that the manner of correcting students' mistakes could provoke foreign-language anxiety. In addition, the relationship between teacher and student has an effect on students' foreign-

language anxiety (Hewitt & Stephenson, 2012). Teachers who are not willing to build rapport with students and adopt appropriate ways of teaching contribute to language learners' anxiety (Marwan, 2007).

E. K. Horwitz et al. (1986) observed that people who are suffering from foreign-language anxiety expressed similar symptoms to those who have any other specific anxiety. They experience apprehension, worry, and even dread. Moreover, they have difficulties in concentration, become forgetful, sweat, and have palpitations. It is not surprising that foreign-language anxiety hinders success at learning a foreign language (Horwitz, 1986; Marwan, 2016). Most importantly, it affects foreign-language achievement. One study found a negative correlation between foreign-language anxiety and foreign language achievement (Horwitz, 2001). Y. Zheng and Cheng (2018) reported that students with low anxiety levels perform better than students with high anxiety levels. This shows that anxiety may inhibit the ability to learn a foreign language, further affecting performance and achievement (Naser Oteir & Nijr Al-Otaibi, 2019).

According to E. K. Horwitz et al. (1986), three factors affect foreign-language performance: fear of negative evaluation, communication apprehension, and test anxiety. Fear of negative evaluation refers to the feeling of "apprehension about others' evaluations, avoidance of evaluative situations, and expectation that others would evaluate one negatively" (E. K. Horwitz et al., 1986). Language learners believe that not only their teachers are evaluating their performance, but also their peers. They may be afraid of leaving unfavorable impressions and facing disapproval from other students (Aydin, 2008). Communication apprehension "is a type of shyness characterized by fear of or anxiety about communicating with people". Students may have difficulties in understanding others and being misunderstood when they are speaking in a

foreign language. Test anxiety refers to “a type of performance anxiety stemming from a fear of failure” (E. K. Horwitz et al., 1986). Tests are commonly used in foreign-language subject classes, creating significant anxiety for language learners. Some students who suffer from foreign-language anxiety are not satisfied when they do not perform as well as they wish; they may have unrealistic demands on themselves. Other researchers have proposed that perfectionism and feelings of inadequacy in the foreign language were some of the reasons for suffering foreign-language anxiety (Morgan & Katz, 2021).

Even for those who have a higher foreign-language proficiency level, the role of foreign-language anxiety should not be ignored. The correlation between academic performance and foreign language proficiency level remains stable across different anxiety levels (Xian Zhang, 2019). Indeed, it is obvious that having a high level of foreign-language anxiety could generate a negative attitude and discourage students from continuing their studies (Dewaele, 2007). Most importantly, language anxiety affects motivation to learn a foreign language (Liu & Huang 2011). Onwuegbuzie, Bailey, and Daley (1999) found that students who have high levels of foreign-language anxiety are more likely to drop out from class than students who have low levels of anxiety. They often skipped class and failed to hand in homework on time (E. K. Horwitz et al., 1986). In addition, many researchers found that younger students had higher foreign-language anxiety (Morgan & Katz, 2021). As a result, it is important to help younger students to alleviate their foreign-language anxiety as early as possible in order to facilitate their foreign-language learning process.

2.3 Current situation of NCS students in Hong Kong

Many ethnic minorities reside in Hong Kong. Most originate from Indonesia, the Philippines, India, and Pakistan. Although English is the international language, Chinese is the medium of communication in Hong Kong. Unfortunately, many people in these ethnic minorities do not understand Chinese. Ethnic minorities in Hong Kong not only face challenges of cultural differences, but also language difficulties. When ethnic-minority children attend school, they have a difficult time communicating with local students and teachers. When the students go home, their parents cannot provide any language support since they themselves mostly know no Chinese at all. NCS students and their parents frequently reported difficulties in communicating with the Chinese Language subject teachers, understanding the content of curriculum documents, assisting children in revising Chinese dictations and examinations, etc. (Oxfam, Loh, & Hung, 2020). According to Oxfam (2019), less than 20% of Indian and Nepalese and less than 40% of Pakistanis in Hong Kong can read or write Chinese. NCS students do not only need support learning the Chinese language, but also an inclusive school environment that encourages communications between NCS and native Chinese schoolmates. Lacking a wider context where Chinese is used makes it more difficult to master the language, since students are only at school or within Chinese subject classrooms for a short time. In addition, when NCS students grow to adulthood, incompetence in the Chinese language will result in limited job opportunities.

Qualitative studies showed that NCS students were anxious in speaking Chinese and they wished to escape from situations that required them to speak Chinese (Gao, Lai, & Halse, 2018). Another study found that reading and writing are the most challenging skills in learning Chinese (Shum, Tai, & Shi, 2018). Long-term exposure to this anxiety-inducing environment can cause potential emotional and motivational problems, which may further hinder their future growth,

development, and educational opportunities in the Chinese community. Most importantly, NCS students reported fears that their low Chinese proficiency level would limit their educational and career development (Gao et al., 2018). Unfortunately, research investigating foreign-language anxiety experience from this population is sparse, and therefore very few formal interventions have been provided to reduce their anxiety. Programs and policies that targeted NCS students were mainly about how to train teachers to teach NCS students effectively or how to provide more academic support to NCS students. Very little focus was placed on how to alleviate students' anxiety, which also affects language performance. Recently, a researcher used drama to help with NCS students' Chinese writing, hoping to reduce their anxiety throughout the writing process (Woo, 2020). Acting in small groups was used to help students organize their thoughts before writing. Students were required to communicate with their NCS group members and eventually use their body and voice to act out the idea. After the intervention, NCS students' foreign-language anxiety was reduced. Researchers asserted that this was because students worked in groups and could discuss any problems they encountered. This created a relaxing environment for them to learn. More research using psychosocial interventions should be conducted in order to alleviate NCS students foreign-language anxiety in Hong Kong.

2.4 Interventions for foreign-language anxiety

One study asked foreign-language learners about their perceived ability to cope with anxiety-inducing situations. Students were presented with a five-point Likert scale ranging from "very poor" to "very good", and generally rated their ability as "fair" (the middle option) or below (Arnaiz & Pérez-Luzardo, 2014). Kondo and Ying-Ling (2004) investigated the strategies students used for coping with language anxiety. Five strategy types were identified: preparation, relaxation, positive thinking, peer-seeking, and resignation. In general, students tried to use

cognitive, affective, and behavioral coping strategies, as well as resignation, to deal with their anxiety. Even those with low levels of language anxiety used these coping strategies to reduce the little anxiety they had. Gender differences are also found when using coping strategies. Women tend to use peer-seeking and positive thinking skills, while men are more inclined to use relaxation (Kao, Chen, & Craigie, 2017). In addition, language learners choose different coping strategies in different situations. For example, Abdurahman and Rizqi (2020) found that preparation strategies were often used before presenting in foreign-language class, while strategies such as relaxation and positive thinking were usually used during the presentation. Most importantly, highly anxious students tended to use resignation as a coping strategy, which was not ideal (Abdurahman & Rizqi, 2020).

Researchers made attempts to help foreign-language learners reduce their language anxiety. Some of them do this by focusing on enhancing foreign-language learners' language skills and therefore increasing their confidence. Liao and Wang (2018) provided English comprehensive strategies to students for 15 weeks. The instructor coached students on various comprehensive strategies, for example, how to identify main ideas, make inferences about things not stated in the passage, identify the purpose of the piece of writing, etc. The results showed that anxiety levels could be reduced by providing comprehension strategies. Another interesting study used contracts of speaking in foreign-language classes, where students needed to sign a contract to agree the times that they would speak up in foreign-language classes (Jin, Zhang, & MacIntyre, 2020). Diaries were also used to record students' thoughts about implementing the contract and the changes it brought to the students. The results showed that the contract group had more anxiety reduction than the control group. The diary seems to be a powerful tool: the participants reported that it helped to reflect on their linguistic and non-linguistic gains during

the intervention. The authors also suggested language learners could strengthen their positive experiences associate with language learning which further led to positive self-recognition and even reduced anxiety level.

Other researchers tried to adjust the teaching and learning style and the environment in the hope of helping learners reduce their language anxiety. One study asked teachers to apply strategies that may have a positive effect on the sources of foreign-language anxiety (Alrabai, 2015). The strategies included, but were not limited to, reducing learners' fear of negative evaluation, properly addressing learner's anxiety-provoking beliefs and misconceptions, and increasing students' self-confidence. The results showed that these strategies were able to help learners decrease anxiety and increase self-confidence. Ismail (2016) designed a 10-week engagement program that aimed to help students to reduce foreign-language anxiety through the use of a variety of learning activities, e.g., drawing, writing on the board, educational videos, etc. It was hoped that this would help retain students' attention so that they were more engaged in the learning process. Significant within-group and between-group differences were identified; students in the engagement program had lower foreign-language anxiety compared to the control group. The authors argued that this was due to the comparatively relaxed environment provided where students could interact freely through the use of activities. In addition, a group of researchers in Turkey suggested the use of creative drama to reduce students' anxiety (Sağlamel & Kayaoğlu, 2013). Creative drama gives students opportunities for social interaction, and the researchers believe that this is necessary for learning' that this is necessary for the most effective learning. Students are able to express their ideas through the use of their body instead of words. The research involved many role plays, allowing students to take on other identities and therefore avoid threats to their own identity throughout the learning process. Results were similar

across different levels of language proficiency: there was a significant decrease in language anxiety for both the pre-intermediate and intermediate groups.

Finally, some researchers provided interventions directly to learners to help them cope with their foreign-language anxiety. Kralova, Skorvagova, Tirpakova, and Markechova (2017) provided a 12-week psychosocial training program for foreign-language learners to reduce their pronunciation anxiety. Psychosocial training is a type of active social learning which helps learners to cope with stressful situations by developing social abilities such as empathy, assertiveness, communication, and so on. This study showed that participants in the psycho-social training group had significantly lower anxiety than the participants in the control group. The results also showed that students who were less anxious displayed better performance. A mediation analysis done by Fallah (2017) investigated the relationship between mindfulness and foreign-language anxiety and concluded that higher levels of mindfulness were associated with lower foreign-language anxiety. Charoensukmongkol (2019) reported similar results.

2.5 Limitations of existing interventions for foreign-language anxiety

Based on the above literature, existing interventions on foreign-language anxiety are sparse, and limitations can be identified. First, most of the research on foreign-language anxiety has been conducted in other countries. As a result, it may not provide culturally relevant evidence for the current situation in Hong Kong. Specifically, interventions which might be useful in other countries may not apply to NCS students in Hong Kong. Second, the majority of interventions provided to language learners focus on improving language skills. However, it is equally critical to equip language learners with skills to cope with their foreign-language anxiety.

Only one study can be identified which designed based on mindfulness and examined its effect on foreign-language anxiety (Morgan & Katz, 2021).

2.6 The system of qigong

Qigong is derived from the culture and philosophical concepts of Traditional Chinese Medicine (TCM). Historical records of qigong date from 2000 years ago; an ancient text called "The Yellow Emperor's Canon of Medicine" provides the earliest evidence of the existence of qigong. The concept of maintaining good health and having a long life is crucial in TCM (Deadman, 2014). A wide variety of practices are adopted to achieve this, for example, daoyin (leading and guiding), neigong (internal skill), tuna (exhalation and inhalation), etc. In ancient times, a type of dance was created to prevent muscle atrophy (X. Chen et al., 2019). Through this dance, the flow of qi and blood is promoted. In the 1800s, doctors advocated that prevention was preferable to treatment and should be promoted by practicing qigong. From 1958 to 1963, during the Great Leap Forward and Cultural Revolution, qigong could only be practiced under supervision in rehabilitation centers and hospitals (Yeung, Chan, Cheung, & Zou, 2018). After the Cultural Revolution, the Chinese government encouraged the general public to practice qigong. The evidence of using qigong to promote health can be traced back to 1974, when a silk scroll known as the 'Daoyintu' was found in the Mawangdui Tombs. It depicts figures performing a variety of stretching and bending exercises. The pictures involved four forms of exercise, including breathing exercises, limb exercises, exercise with equipment, and therapeutic exercises. It aims to guide "qi" to flow through the body by incorporating breathing practice into physical movement. In the middle of the twentieth century, the term "qigong" was developed, and people began to use qigong for illness prevention. Around 200 million Chinese people were practicing qigong by that time (Yeung et al., 2018).

"Qi" refers to the vital energy which flows inside the human body, while "gong" refers to training and practice. If qi is flowing smoothly in the body, it indicates good health, while blockage may be the result of illness (Ng & Tsang, 2009). The flow of qi can be improved and enhanced by practicing qigong. Qigong is a broad term referring to a wide variety of ancient Chinese traditional practices, ranging from meditative sitting and standing or quiet breathing to more powerful exercises such as "hard" qigong (Deadman, 2014). In general, qigong can be categorized into two types: static qigong and dynamic qigong (Jiménez-Martín & Liu, 2018). While static qigong involves meditation techniques, dynamic qigong involves bodily movements. It is important to note that both types of qigong involve controlled breathing, concentration, and relaxation. Compared to static qigong, dynamic qigong offers more benefits in a healthcare setting. People who are suffering from emotional distress may find dynamic qigong more beneficial, since the state of static qigong cannot be easily achieved.

2.7 Health qigong

Qigong has many different forms; some forms were developed for health enhancement while some were designed as martial arts. Health qigong is a dynamic form of qigong that aims to promote good health. It is a form of self-training, mind-body exercise which emphasizes health nourishment and prevention of disease (Ng & Tsang, 2009). In addition, it is a type of slow, coherent, and comparatively low-intensity exercise (XiaoLei. Liu, Chen, & Wang, 2016). The three elements of practicing health qigong are adjusting one's body, breath, and heart (F. Zhang, 2007). Adjustment to the body refers to adjusting the body posture and movement. Adjustment to the breath means the use of breathing techniques and the regulation of breathing. Adjustment to the heart refers to adjusting the mind in order to obtain peace of mind. The goal is to bring one's body and mind in harmony. The practice of health qigong requires the individual

to integrate and harmonize their mind, posture, and movement. By contrast, medical qigong is used by TCM doctors to emit qi to heal patients.

A variety of health qigong forms have been developed by different Chinese teachers and training schools. Some popular forms of health qigong are Eight-Section Brocades (Baduanjin), Guolin qigong, Muscle-Tendon Change Classic (Yi Jin Jing), Chan Mi spine exercise, Five Animals Play (Wu Qin Xi), and Six Healing Sounds (Liu Zi Jue) (Lloyd, Tsang, & Deane, 2009; Yeung et al., 2018). In 2000, the Chinese Health Qigong Association defined health qigong as a traditional national sport that combines physical activity, breathing, and psychological adjustment (F. Zhang, 2007). In 2001, the Health QiGong Management Center of China's General Administration of Sport was established, and four forms of qigong, including Yi Jin Jing, Wu Qin Xi, Liu Zi Jue, and Ba Duan Jin, were created and promoted (X. Chen et al., 2019). A few years later, in 2007, more forms of health qigong were created to provide people with a wider range of options for daily practice. Health qigong is now being promoted as a prevention strategy for illness (J. Zhang & Qiu, 2020). Recently, the Health QiGong Management produced a list of eleven health qigong types recognized by the association, to prevent fraudsters from obtaining people's money by taking advantage of their superstitions to persuade them to engage in other types and, in doing so, potentially harming their health (Health QiGong Management Centre of China's General Administration of Sport, 2020). This further strengthens the management of qigong to ensure healthy development and also to protect the physical and mental health of the general public. Qigong has gained popularity worldwide, and people of all ages practice it (Yeung et al., 2018).

Baduanjin has a very long history and is the most widely practiced form of health qigong (X.-q. Zhou, Zeng, Yang, & Wang, 2007). Practice of Baduanjin as a health and fitness exercise

dates back to the Song Dynasty, demonstrating that it has over 800 years of history. The historical evidence of practicing Baduanjin came from the Emperor's Head Secretary; at that time he practiced some exercises such as stretching his hands and expanding his body to imitate animals. During the Ming and Qing dynasties, Baduanjin was widely spread and people believed that practicing Baduanjin can lead to living a long life (X. Li & Yang, 2019). Regarding the physical aspects of Baduanjin, it is a safe aerobic exercise consistent with the theories of kinetics and physiology (Xiao & Zhuang, 2016). In addition to musculoskeletal stretching, deep breathing and mental concentration are incorporated, leading to mind-body integration (J. J. Ye et al., 2020). Baduanjin emphasizes the unification of physical movements and the mind; it has a clear positive impact on fitness (X.-q. Zhou et al., 2007). In 2001, the Chinese Health Qigong Association organized and edited Baduanjin guidelines in the hopes that it could be better adapted for the society of the time. At the same time, Baduanjin has been developed into an exercise specifically for promoting health. In TCM, it is believed that the eight movements of Baduanjin can regulate one's internal organs and meridians, helping to prevent disease and increase longevity. Compared to other forms of health qigong, it is easy to learn, since it involves only eight simple movements (Zou et al., 2017). Importantly, it has both sitting and standing forms so that the difficulty levels can be adjusted based on physical fitness. A systematic review provided evidence that Baduanjin presented numerous health benefits. It has been widely applied in populations suffering from different health conditions, including Parkinson's disease, chronic neck pain, and psychological illness (Zou, Pan, et al., 2018). It is also effective in reducing depression and anxiety symptoms (Rong et al., 2021). Improvements to quality of life, sleep quality, physical fitness (balance, muscular strength, and flexibility), blood pressure, and heart rate have also been observed after Baduanjin intervention (Zou et al., 2017). Although no

research has been conducted on children, research on adults and the elderly shows that Baduanjin is a low-cost and easily operated intervention with no side effects (Rong et al., 2021).

2.8 Qigong as a mind-body intervention

Mindful exercise refers to a specific type of exercise that emphasizes self-awareness and intrapersonal mind-body alignment (Lloyd et al., 2009). Unlike physical exercise, it usually involves low to moderate muscular exercise. Most importantly, it emphasizes connecting the body and mind. Yoga and qigong are two common types of mindful exercise. Both exercises include meditation, breathing exercises, and body movement, which has been shown to be beneficial to health (Tsang, Fung, Chan, Lee, & Chan, 2006; C. C. Wang, Li, Choudhury, & Gaylord, 2019). Studies have demonstrated that among US adults there is an increasing trend of practicing these mindful exercises (C. C. Wang et al., 2019). People believe that mindful exercise is a holistic healing approach for general health and chronic diseases. The effect of qigong on reducing stress and anxiety has been investigated by various researchers (Tsang et al., 2006; C.-W. Wang et al., 2014). A systematic review conducted by C.-W. Wang et al. (2014) shows that qigong exercise can reduce anxiety and stress among healthy subjects up to 3 months after practice. On the other hand, a meta-analysis showed that patients practicing qigong experienced beneficial effects on depressive symptoms but not anxiety symptoms when compared to patients undergoing waitlist control or usual care (C.-W. Wang et al., 2013). It is believed that by practicing qigong, emotions can be adjusted, and thus the flow of qi can be smoothened, finally returning to its normal state (X. Chen et al., 2019). The same study suggests that qigong can improve both physiological and psychological health, and that these two are interdependent.

2.9 Systematic Reviews on qigong studies

2.9.1 Mindful and non-mindful exercise in reducing anxiety

There is evidence that both mindful and non-mindful exercise can be useful in reducing anxiety symptoms. Therefore, a systematic review was completed to compare the effectiveness between mindful and non-mindful exercise on treating anxiety among non-clinical populations.

2.9.1.1 Introduction

Anxiety refers to a psychological state that is characterized by apprehensive expectation or fear (American Psychiatric Association, 2013). It usually arises when facing stressful events (Gong, Dong, Tang, Huang, & Lu, 2020). Although it is a normal response, it may lead to the development of anxiety disorders if the feeling of being anxious becomes overwhelming. In fact, anxiety disorder is one of the most common psychiatric conditions (Stonerock, Hoffman, Smith, & Blumenthal, 2015). This review focuses on the treatment of anxiety, not anxiety disorder.

Currently, the most common treatment for anxiety disorders is psychopharmacology (Cramer et al., 2018). However, this treatment is often associated with side effects and other problems, including metabolic abnormalities, dependency, withdrawal, etc. (Bandelow et al., 2015). Other common forms of treatment include psychotherapy and cognitive behavioral therapy. Both types of treatment are time-consuming and manpower-intensive, and also require intervention from qualified health professionals, such as clinical psychologists and occupational therapists, that many clients cannot afford. Moreover, one study has shown that cognitive-behavioral therapy is most beneficial when conducted individually (Hedman et al., 2013), which adds to its high cost.

Physical exercise, which is already well known to be beneficial to physical health, has recently been used to alleviate anxiety in non-clinical populations. Shirifard, Avanesyan, Honari, and Abadi (2012) found that compared to the control group, the anxiety level of participants who joined the physical exercise program decreased significantly. Another study also suggested that physical exercise may serve as an effective treatment for anxiety disorders (Barbour, Edenfield, & Blumenthal, 2007). A review showed that physical exercise might be helpful for both clinical or non-clinical populations experiencing anxiety (Stonerock et al., 2015).

In recent years, a growing number of research studies have been focusing on the effect of a special type of exercise—mindful exercise—on anxiety. As previously mentioned, mindful exercise refers to physical exercise with mental emphasis at the same time (J. Li et al., 2018). It usually involves low to moderate physical movement, with a simultaneous mental focus on breathing and meditation (Tsang, Chan, & Cheung, 2008). Yoga, Tai Chi, and qigong are popular mindful exercises. A recent systematic review suggested that yoga might be effective as a safe intervention for non-clinical populations with anxiety problems (Cramer et al., 2018). A review on the effect of qigong on anxiety yielded similar results. Yin and Dishman (2014) found that qigong had favorable effects on reducing anxiety symptoms.

Based on the above literature review, both mindful and non-mindful (or physical) exercises are likely to be useful in alleviating anxiety. However, it remains uncertain whether the available evidence provides sufficient justification for regular therapeutic application. It remains unknown which of these interventions (mindful versus non-mindful) is superior to the other in alleviating anxiety symptoms in non-clinical and/or clinical conditions.

The aim of this review is therefore to compare the relative effectiveness of these two exercise interventions, namely, mindful and non-mindful exercises, on reducing or treating anxiety as a psychological state in non-clinical populations. Existing reviews have compared the different effects of mindful and non-mindful interventions on depression (Tsang et al., 2008), and schizophrenia (J. Li et al., 2018). Tsang et al. (2008) did not find any difference between mindful and non-mindful exercises in reducing depressive symptoms. On the other hand, Li et al. (2018) found that mindful intervention is more effective than non-mindful intervention in reducing psychiatric symptoms. However, the number of studies included in the review was limited. To date, no systematic reviews or meta-analyses have ever been conducted to compare the effects of mindful and non-mindful exercise on treating anxiety. Since the prevalence of symptoms of anxiety in the general public has risen (World Health Organization, 2017), it is important to evaluate whether these two non-pharmacological interventions are effective and identify which of them offers more benefit to people suffering from anxiety.

2.9.1.2 Methods

Our review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Search strategy

Studies were identified through systematic search on relevant electronic databases, including PubMed, Embase, Academic Search Premier, and PsycInfo, from inception to Nov 2019, using the following search terms: (anxiety) AND (yoga OR “tai chi” OR “tai ji” OR qigong OR “qi gong” OR “mindful exercise” OR “mind body exercise”) AND (aerobic OR “physical exercise” OR “conventional exercise” OR walk* OR jog* OR run* OR cycl* OR swim* OR anaerobic OR

danc* OR stretch* OR "non mindful") AND (randomized controlled trial). No time limit was set. Relevant systematic reviews and reference lists of selected studies were screened to identify additional studies.

Inclusion and exclusion criteria

Publications that fulfilled the following criteria were included: (1) involving a randomized controlled trial (RCT); (2) published as a journal article; (3) including a mindful exercise and a non-mindful exercise intervention; (4) including an anxiety measurement as the outcome; (5) including participants who had an identified type of anxiety, or healthy adults with elevated levels of anxiety at the commencement of the RCT measured by a validated clinician-based or self-report anxiety symptom questionnaire but WITHOUT a formal diagnosis of an anxiety disorder; and (F) published in Chinese or English. Studies that combined mindful or non-mindful interventions with other types of intervention, or studies whose participants were diagnosed with multiple psychological disorders, were excluded.

Study selection

Two independent reviewers with a bachelor's degree in psychology screened all abstracts and titles under the supervision of the authors. Studies considered eligible by at least one reviewer were included for the next tier of screening. Subsequently, the full texts of the included papers were downloaded and evaluated by the two reviewers according to the inclusion and exclusion criteria. Disagreement was solved by discussion and reconciliation, and the final decision was mutually agreed after mediation with the author.

Data extraction

One reviewer extracted the data from each of the selected articles while the other cross-checked the information. Information on the study's authors and year, sample size, sample characteristics, type, frequency and duration of intervention, and anxiety-related outcomes were extracted.

Data synthesis

Since different studies used different assessment tools to measure anxiety, the standardized mean difference was used instead of mean differences to calculate the pooled effect size. Standardized mean differences and their associated 95% confidence intervals were calculated using Review Manager 5.3. Heterogeneity was assessed for each meta-analysis by looking at the I^2 value. Funnel plots and Egger's regression were examined to detect publication bias using Comprehensive Meta Analysis version 3. A significant result in Egger's regression ($p < 0.05$) indicated that publication bias may have existed. Studies that did not provide enough information to calculate effect size were described using qualitative methods. On top of the meta-analysis on comparing mindful and non-mindful interventions, additional meta-analysis will be conducted on different types of mindful interventions, provided that two or more studies have used the same mindful intervention.

Quality assessment of studies

Each included study was analyzed for risk of bias using the Cochrane Collaboration's criteria (Higgins & Green, 2011). Two reviewers conducted the analysis separately, and the results were then compared. Disagreement was solved by discussion.

2.9.1.3 Results

Search results

A total of 1,453 articles were retrieved from the electronic databases. Reference lists of included studies and related systematic reviews were screened, and an additional 18 studies were identified. After removing duplicates, 1,284 titles and abstracts were screened. Further screening was conducted for 147 articles by reading the full texts. The main reasons for exclusion were the absence of mindful or non-mindful intervention, the absence of anxiety measures, and the use of research methodologies other than RCT. Finally, 24 studies fulfilled the inclusion criteria and were included in our systematic review. Unfortunately, for 10 studies, the data needed for meta-analysis were not available. As a result, 14 studies were included in the meta-analysis. The search results are summarized in the PRISMA flow diagram (Fig.1).

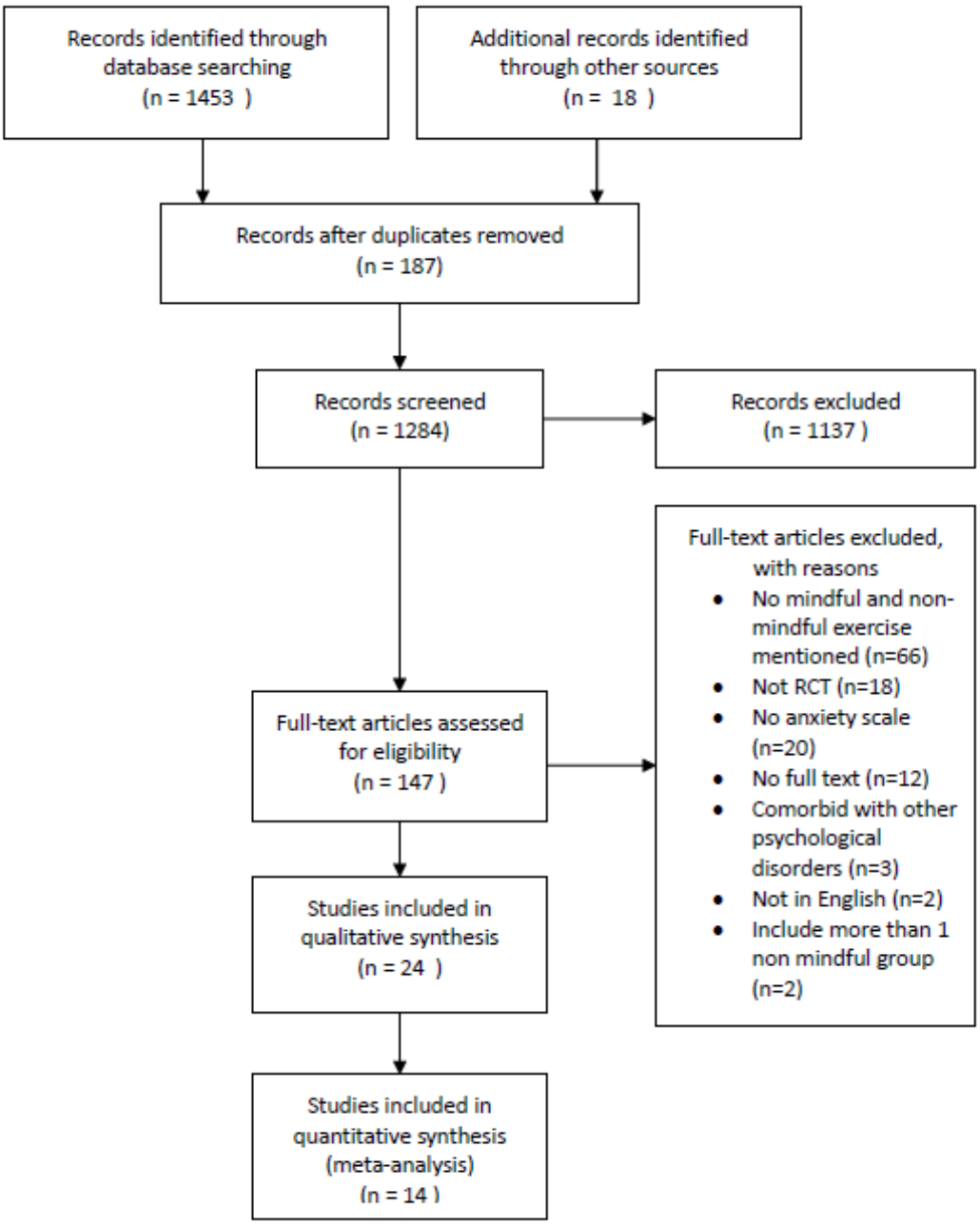

*Figure 2***.** Flow diagram of study selection.

Quality assessments

The risk of bias of the included studies is summarized in Figure 3. Due to the nature of the study, all trials were rated as high risk in performance bias, since blinding participants was difficult. Three studies showed a low risk of bias in all other categories (Fransen, Nairn, Winstanley, Lam, & Edmonds, 2007; P. Liu et al., 2017; Oken et al., 2004). The remaining studies showed a high risk of bias, because the randomization process, blinding procedure, and reasons for attrition were not reported in sufficient detail. Demographic data of some trials did not specify whether the participants had experiences in practicing mindful or non-mindful exercises, which may also create bias.

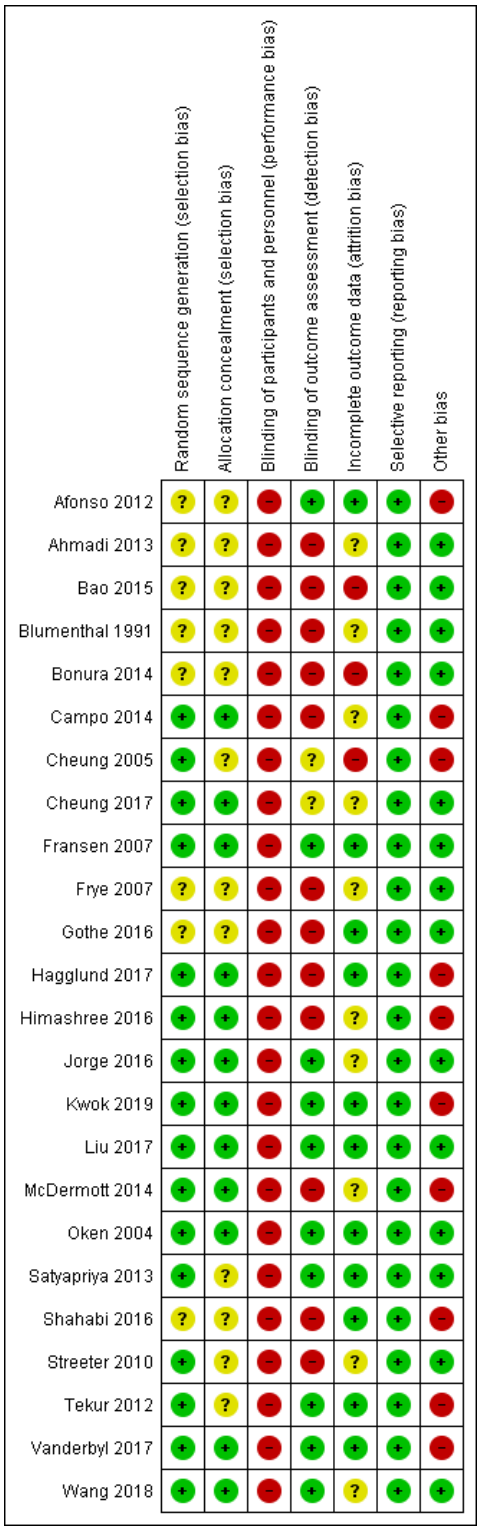

*Figure 3***.** Summary of risk of bias.

Characteristics of Included Studies and Participants

The year of publication of the included studies was between 1991 to 2019. Eleven studies were conducted in the USA (Blumenthal et al., 1991; Bonura & Tenenbaum, 2014; Campo et al., 2014; C. Cheung et al., 2017; Frye, Scheinthal, Kemarskaya, & Pruchno, 2007; Gothe, Keswani, & McAuley, 2016; McDermott et al., 2014; Oken et al., 2004; Shahabi, Naliboff, & Shapiro, 2016; Streeter et al., 2010; C. Wang et al., 2018), three studies in India (Himashree, Mohan, & Singh, 2016; Satyapriya, Nagarathna, Padmalatha, & Nagendra, 2013; Tekur, Nagarathna, Chametcha, Hankey, & Nagendra, 2012), three studies in Hong Kong (B. M. Cheung et al., 2005; Kwok et al., 2019; P. Liu et al., 2017), two studies in Brazil (Afonso et al., 2012; Jorge et al., 2016), one study in Sweden (Hagglund, Hagerman, Dencker, & Stromberg, 2017), one study in Iran (Ahmadi, Arastoo, Nikbakht, Zahednejad, & Rajabpour, 2013), one study in China (Bao & Jin, 2015), one study in Australia (Fransen et al., 2007), and one study in Canada (Vanderbyl et al., 2017).

The sample size ranged from 21 to 200. Participants' age ranged from 13 to over 90 years old. Ten studies involved healthy participants (Bao & Jin, 2015; Blumenthal et al., 1991; Bonura & Tenenbaum, 2014; Frye et al., 2007; Gothe et al., 2016; Himashree et al., 2016; Jorge et al., 2016; McDermott et al., 2014; Satyapriya et al., 2013; Streeter et al., 2010). The remainder of the studies involved clinical populations, including patients with cancer (Campo et al., 2014; P. Liu et al., 2017; Vanderbyl et al., 2017), chronic pain (Shahabi et al., 2016; Tekur et al., 2012), fibromyalgia (C. Wang et al., 2018), heart failure (Hagglund et al., 2017), multiple sclerosis (Ahmadi et al., 2013; Oken et al., 2004), hypertension (B. M. Cheung et al., 2005), insomnia (Afonso et al., 2012), knee osteoarthritis (C. Cheung et al., 2017; Fransen et al., 2007), and Parkinson's disease (Kwok et al., 2019).

For anxiety outcome measurements, various scales were used in the included studies. Nine studies used the State-Trait Anxiety Inventory (Blumenthal et al., 1991; Bonura & Tenenbaum, 2014; Frye et al., 2007; Gothe et al., 2016; Jorge et al., 2016; Oken et al., 2004; Shahabi et al., 2016; Streeter et al., 2010; Tekur et al., 2012), eight studies used the Hospital Anxiety and Depression Scale (C. Cheung et al., 2017; Hagglund et al., 2017; Kwok et al., 2019; P. Liu et al., 2017; McDermott et al., 2014; Satyapriya et al., 2013; Vanderbyl et al., 2017; C. Wang et al., 2018), two studies used the Beck Anxiety Inventory (Afonso et al., 2012; B. M. Cheung et al., 2005), one study used the Hamilton Anxiety Rating Scale (Himashree et al., 2016), one study used the Global Severity Index (Campo et al., 2014), and one study used the Piers-Harris Children's Self-Concept Scale (Bao & Jin, 2015).

All of the above information is summarized in Table 1.

Intervention Characteristics

All included studies used either yoga or qigong as mindful intervention (Table 1). Sixteen studies used yoga as the intervention (Afonso et al., 2012; Ahmadi et al., 2013; Blumenthal et al., 1991; Bonura & Tenenbaum, 2014; C. Cheung et al., 2017; Gothe et al., 2016; Hagglund et al., 2017; Himashree et al., 2016; Jorge et al., 2016; Kwok et al., 2019; McDermott et al., 2014; Oken et al., 2004; Satyapriya et al., 2013; Shahabi et al., 2016; Streeter et al., 2010; Tekur et al., 2012), while eight studies used qigong. Among the studies that used qigong, five studies adopted Tai Chi (Bao & Jin, 2015; Campo et al., 2014; Fransen et al., 2007; Frye et al., 2007; C. Wang et al., 2018) and three studies adopted Guolin qigong (B. M. Cheung et al., 2005; Kwok et al., 2019; P. Liu et al., 2017; Vanderbyl et al., 2017). Common non-mindful exercises used in the included studies were walking, aerobic exercise, and stretching. The duration of intervention ranged from 7 days to 24 weeks. The intensity of intervention varied across different studies,

from practicing once a week (Bonura & Tenenbaum, 2014; C. Cheung et al., 2017; Kwok et al., 2019; Oken et al., 2004), twice per week (Afonso et al., 2012; Campo et al., 2014; B. M. Cheung et al., 2005; Fransen et al., 2007; Hagglund et al., 2017; Jorge et al., 2016; P. Liu et al., 2017; Shahabi et al., 2016; Vanderbyl et al., 2017; C. Wang et al., 2018), three times a week (Ahmadi et al., 2013; Blumenthal et al., 1991; Gothe et al., 2016; McDermott et al., 2014; Satyapriya et al., 2013; Streeter et al., 2010), five times a week (Bao & Jin, 2015; Frye et al., 2007) to daily practice (Himashree et al., 2016; Tekur et al., 2012). In general, most of the studies required participants to practice twice or three times per week for 60 minutes.

Table 1

Summary of the Included Studies

Study	Age and Gender	Sample Size	Health Status	Type of Mindful Exercise	Type of Non-Mindful Exercise	Duration	Outcomes
Afonso et al., (2012) [32]	Age: 50–65 years Gender: Female	29	Postmenopausal with Insomnia	Yoga	Stretching	four months 60 min, twice per week	BAI
Ahmadi et al., (2013) [35]	Age: 22–54 years Gender: 0M, 21F	21	Multiple sclerosis	Yoga	Treadmill training	eight weeks 60 min, three times per week	BAI
Bao et al., (2015) [36]	Age: 13–16 years Gender: 75M, 85F	160	Healthy	Tai chi	Gymnastics	one year 60 min, five times a week	PHCSCS
Blumenthal et al., (1991) [19]	Age: 60–83 years Gender: not specify	67	Healthy	Yoga	Aerobic	four months 60 min, three times per week	STAI
Bonura et al., (2014) [24]	Age: 65–92 years Gender: 32M, 74F	106	Healthy	Chair yoga	Chair exercise	six weeks 45 min, once per week	STAI
Campo et al., (2014) [25]	Age: 58–93 years Gender: 29M, 0F	29	Senior prostate cancer survivors	Qigong	Stretching	12 weeks 60 min, twice per week	GSI
Cheung et al., (2005) [31]	Age: 18–75 years Gender: 37M, 51F	88	Hypertension	Qigong	Conventional exercise	four weeks 120 min, twice per week	BAI
Cheung et al., (2017) [18]	Age: ≥ 60 years Gender: Female	83	Knee osteoarthritis	Yoga	Aerobic/strengthening exercises	eight weeks 45 min, once per week	HADS

Table 1 (Continued)

Summary of the Included Studies

Study	Age and Gender	Sample Size	Health Status	Type of Mindful Exercise	Type of Non-Mindful Exercise	Duration	Outcomes
Fransen et al., (2007) [14]	Age: 59–85 years Gender: 33M, 78F	111	Osteoarthritis	Tai chi	Hydrotherapy	12 weeks 60 min, twice per week	DASS21
Frye et al., (2007) [23]	Age: ≥ 50 years Gender: not specify	61	Healthy	Tai chi	Low impact exercise	12 weeks, 60 min, five times per week	STAI
Gothe et al., (2016) [21]	Age: 55–79 years Gender: 26M, 92F	118	Healthy	Yoga	Stretching and strengthening	eight weeks 60 min, three times per week	STAI
Hägglund et al., (2017) [34]	Age: 18–80 years Gender: 26M, 14F	40	Heart failure	Yoga	Hydrotherapy	12 weeks 60 min, twice per week	HADS
Himashree et al., (2016) [29]	Age: 20–30 years Gender: 200M, 0F	200	Healthy	Yoga	Physical exercise (jogging, squats, sit-ups, etc.)	60 days 1 h, daily	Hamilton's Anxiety Scale
Jorge et al., (2016) [33]	Age: 45–65 years Gender: not specified	69	Healthy	Yoga	Physical exercise	12 weeks 75 min, twice per week	STAI
Kwok et al., (2019) [30]	Age: not specified Gender: 65M, 73F	138	Parkinson's Disease	Yoga	Stretching and resistance exercise	eight weeks Yoga: 90 min, once per week Stretching and resistance exercise: 60 min, once per week	HADS
Liu et al., (2017) [15]	Age: 21–80 years Gender: 0M, 158F	158	Breast Cancer	Qigong	Physical stretching	24 weeks 60 min, twice per week	HADS

Table 1 (Continued)

Summary of the Included Studies

Study	Age and Gender	Sample Size	Health Status	Type of Mindful Exercise	Type of Non-Mindful Exercise	Duration	Outcomes
McDermott et al., (2014) [20]	Age: 30–65 years Gender: 16M, 25F	41	Healthy (individuals with a first-degree relative with T2DM)	Yoga	Walking	eight weeks Yoga: At least three times per week, 75 min Walking: six days per week, 30 min plus breaks for rest	HADS
Oken et al., (2004) [16]	Age: not specified Gender: 4M, 33F	37	Multiple sclerosis	Yoga	Aerobic exercise	six months 90 min, once per week	STAI
Satyapriya et al., (2013) [27]	Age: 20–35 years Gender: 0M, 96F	96	Pregnant	Yoga	Standard antenatal practices	one month 120 min, three times per week	HADS STAI
Shahabi et al., (2016) [17]	Age: 18–65 years Gender: 3M, 24F	27	Chronic abdominal pain or discomfort and associated bowel habit changes	Yoga	Walking	16 sessions 60 min, biweekly	STAI
Streeter et al., (2010) [22]	Age: 18–45 years Gender: 12M, 22F	34	Healthy	Yoga	Walking	12 weeks 60 min, three times per week	STAI
Tekur et al., (2012) [28]	Age: 18–60 years Gender: 44M, 36F	80	Chronic low back pain	Yoga	Physical exercise	seven days whole day, everyday	STAI
Vanderbyl et al. (2017) [37]	Age: ≥ 18 years Gender: 14M, 10F	24	Advanced NSCLC or GI cancer	Qigong	Standard endurance and strength training	six weeks 45 min, twice per week	HADS
Wang et al., (2018) [26]	Age: ≥ 21 years Gender: 3M, 108F	111	Fibromyalgia	Tai chi	Aerobic exercise	24 weeks 60 min, twice per week	HADS

Summary of findings

Compared with baseline, five studies showed a significant decrease in anxiety in the mindful exercise group at post-assessment (Afonso et al., 2012; Himashree et al., 2016; Satyapriya et al., 2013; Streeter et al., 2010; Tekur et al., 2012). In addition, P. Liu et al. (2017) found a significant reduction in anxiety at follow-up assessment, which was conducted 24 weeks after the intervention, compared to baseline. Two studies found a significant drop in anxiety in the non-mindful exercise group at post-assessment (Fransen et al., 2007; Shahabi et al., 2016). On the other hand, Satyapriya et al. (2013) found a significant increase in anxiety for the non-mindful exercise group at post-assessment.

Five studies reported that both mindful and non-mindful exercise groups showed a significant decrease in anxiety at post-assessment (Ahmadi et al., 2013; Frye et al., 2007; Gothe et al., 2016; Hagglund et al., 2017; McDermott et al., 2014). On the other hand, during post-assessment, eight studies showed significantly lower anxiety levels in the mindful exercise group compared to the non-mindful exercise group (Ahmadi et al., 2013; Bao & Jin, 2015; Campo et al., 2014; C. Cheung et al., 2017; Kwok et al., 2019; Satyapriya et al., 2013; Streeter et al., 2010; Tekur et al., 2012). Finally, three studies found a significant interaction effect which showed lower anxiety levels in the mindful exercise group at post-assessment (Bonura & Tenenbaum, 2014; Kwok et al., 2019; Tekur et al., 2012). Furthermore, Bonura and Tenenbaum (2014) found that this significant interaction effect lasted for one month after the intervention

Effectiveness of intervention (meta-analysis)

Ten studies did not provide sufficient data to calculate the standardized mean differences. As a result, fourteen studies were eligible for inclusion in the meta-analysis. Of these, ten studies used yoga as mindful exercise (Afonso et al., 2012; Ahmadi et al., 2013; C. Cheung et al., 2017; Gothe et al., 2016; Hagglund et al., 2017; Himashree et al., 2016; Kwok et al., 2019; Satyapriya et al., 2013; Shahabi et al., 2016; Tekur et al., 2012), while four studies used qigong as mindful exercise (Bao & Jin, 2015; Fransen et al., 2007; Frye et al., 2007; Vanderbyl et al., 2017). Overall, there was no significant difference between practicing mindful and non-mindful exercise when it came to their effects on anxiety levels (SMD = -0.23, [95% CI - 0.58 to 0.11], $p = 0.18$, $I^2 = 86\%$; see Fig.3). Further meta-analyses were conducted to break this down into yoga and qigong, comparing the differences between yoga and non-mindful exercise as well as qigong and non-mindful exercise. When comparing yoga with non-mindful exercise, a significant difference was found, indicating that yoga was more effective than non-mindful exercise in reducing anxiety (SMD = -0.45, [95% CI - 0.81 to -0.09], $p = 0.01$, $I^2 = 82\%$; see Fig.4). On the other hand, when comparing qigong with non-mindful exercise, no significant difference was found (SMD = -0.04 [95% CI -0.43 to 0.35], $p = 0.85$, $I^2 = 62\%$; see Fig.5). Egger's regression tests were conducted, and no evidence of publication bias or asymmetry in the funnel plot was found in any of the meta-analyses conducted.

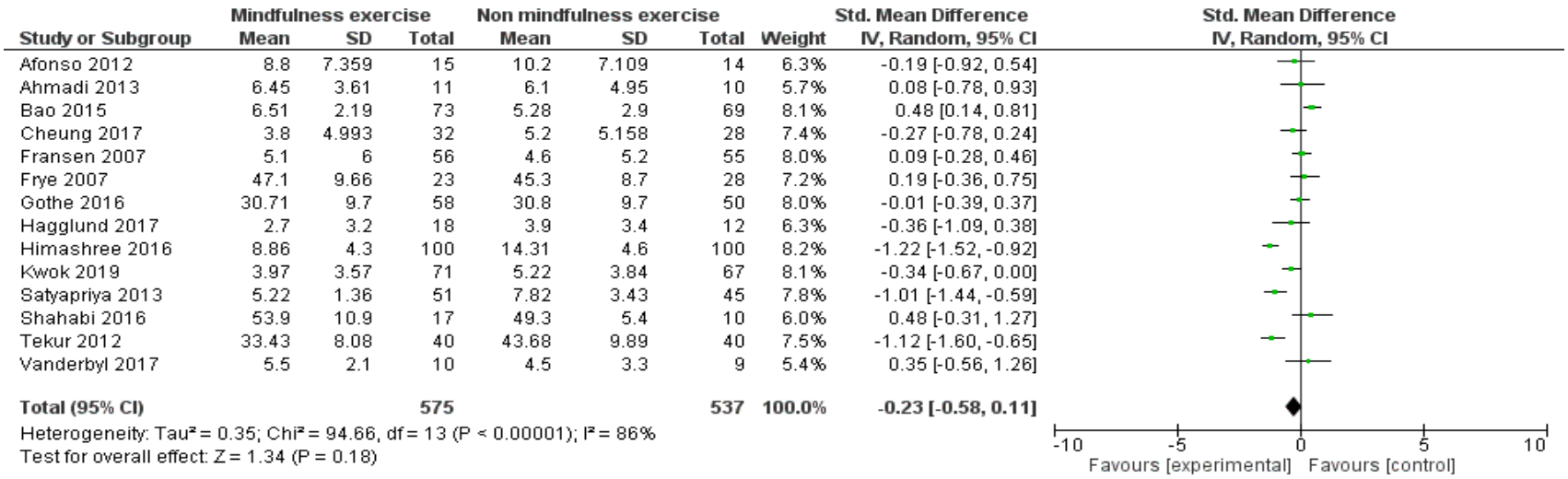

Figure 4. Effect of mindful exercise on anxiety symptoms in comparison to non mindful exercise.

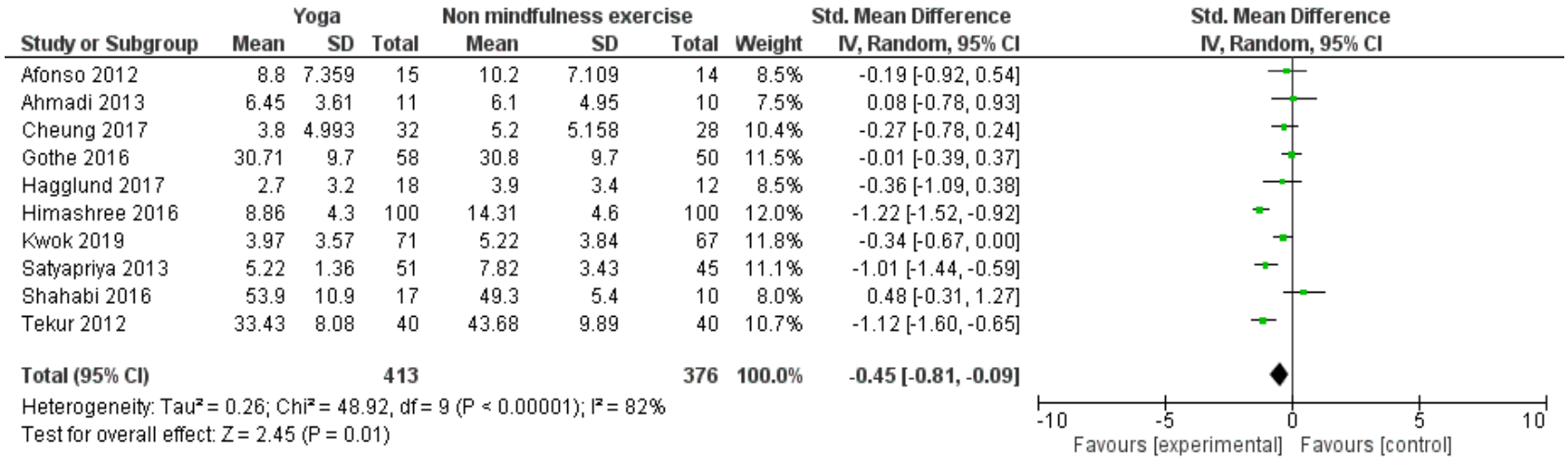

Figure 5. Effect of yoga on anxiety symptoms in comparison to non-mindful exercise.

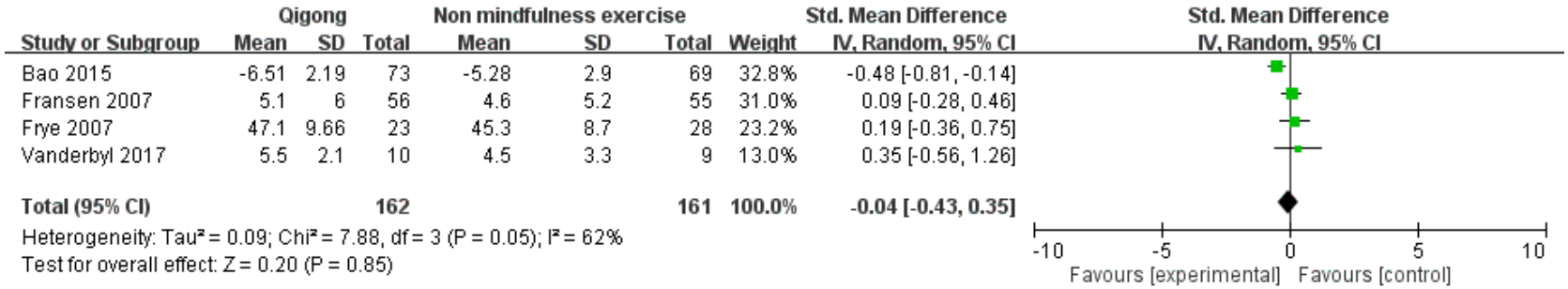

Figure 6. Effect of qigong on anxiety symptoms in comparison to non-mindful exercise.

2.9.1.4 Discussion

To our knowledge, this is the first meta-analytical study comparing the effect of mindful and non-mindful exercise on anxiety in a non-clinical population. This study aimed to compare the effects of mindful and non-mindful exercise on anxiety. 24 studies were included in the qualitative synthesis and 14 studies were included in the meta-analysis. Heterogeneity was observed, since the type of participants, duration of intervention, and assessment tools for anxiety were different across studies. While some of the included studies observed that both mindful and non-mindful interventions had a significant effect on the reduction of anxiety, eight studies found a significantly larger reduction in anxiety from mindful intervention compared to non-mindful intervention. Three studies indicated a significant interaction effect for the mindful exercise group at post-assessment. Although the results of the meta-analysis showed that overall there were no differences between the effects of mindful and non-mindful interventions on anxiety, significant results were found when qigong and yoga were analyzed separately. When comparing yoga with non-mindful intervention, a medium and significant effect was found: participants who practiced yoga demonstrated lower anxiety levels after intervention than those who used non-mindful intervention. By contrast, when comparing qigong and non-mindful intervention, no significant effect was identified. It is important to note that only four studies were included in the meta-analysis of qigong and non-mindful exercise. This may not provide enough evidence for us to draw any valid conclusions. Nonetheless, it is possible that even though yoga and qigong are both mindful exercises, they do not produce the same effect on anxiety levels.

One study suggests that a possible reason that yoga is more effective in reducing anxiety than non-mindful exercise is that it has incorporated the regulation of breathing as well as relaxation exercises in the practice (C. Cheung et al., 2017). This is the uniqueness of mindful exercise compared with non-mindful exercise: mindful exercise focuses on both the mind and the body (P. Liu et al., 2017). Himashree et al. (2016) suggested that yoga may result in a decrease in sympathetic discharge and better oxygen saturation. They suggested that these could be the potential reasons for the improvement of overall mental fitness and health. Another possible mechanism is the reduction of HPA activity, which reduces sympathetic arousal and creates stability in the autonomic system (Satyapriya et al., 2013). However, this cannot explain why qigong is not as effective as yoga, because it also involves regulation of breathing and relaxation in its practice.

One possible mechanism explained by Bonura and Tenenbaum (2014) is that yoga helps reduce anxiety through an additional pathway, which involves the improvement of self-control. The assessment of self-control used by Rosenbaum (1980) measured an individual's tendencies to apply self-control methods as a solution to behavioral problems. This group of researchers found an increase in self-control in the yoga group, and their regression result suggested that changes in self-control may be predictive of changes in psychological health. Another study investigated the mechanisms of yoga in reducing symptoms of post-traumatic stress disorder, and found that yoga is useful in reducing expressive suppression. This may be due to the emphasis that yoga places on developing a non-judgmental attitude toward thoughts and experiences. In addition, yoga helps people reduce their efforts in coping with distressing emotions (Dick, Niles, Street, DiMartino, & Mitchell, 2014). By contrast, no studies have been done to provide

evidence of whether qigong can enhance self-control or decrease expressive suppression. Moreover, the type of qigong selected may not be the one that would have the greatest effect on the chosen population of the study. Bao and Jin (2015) suggested that the type of qigong they used may be too complicated for adolescents. Therefore, the participants may only focus on memorizing the posture, hindering the beneficial effects of qigong. Another study used Tai Chi as an intervention for patients with knee osteoarthritis (Fransen et al., 2007). Since practicing Tai Chi requires frequent bending of the knees, the participants may have experienced knee pain throughout the practice. Another possible reason is that among the four studies which were included in the meta-analysis, three studies were conducted in western countries and the qualification level of the instructor was not mentioned. This may substantially affect the findings of the studies, as the effectiveness of qigong tuition in these studies is questionable. Also, since qigong was originally developed in China, it may not be as effective as yoga when it is practiced by foreigners due to the factor of cultural compatibility. Furthermore, a greater level of popularity was observed in yoga (Cramer et al., 2016). In the United States, the lifetime prevalence of yoga was 13.2%, while the lifetime prevalence of qigong was only 3.1% (Lauche, Wayne, Dobos, & Cramer, 2016). Although yoga is originated in India, it is more well-known and may taken on cultural components from the countries where it is practiced. This shows that culture compatibility may play an important role in determining whether one type of mindful exercise is more effective than the other in a particular context. However, the mechanism by which cultural factors may lead to this difference remains unknown. Further studies are needed to explore this aspect more deeply.

Limitations and future directions

Several limitations can be identified for this review. First, only a small number of studies were included in the meta-analysis of qigong and non-mindful exercise. The results of this review should therefore be interpreted with caution. More RCTs involving larger samples should be conducted to compare the relative effects of qigong, yoga, and non-mindful exercise on anxiety. The results might have been different if more RCTs had been available for comparison. Furthermore, including Chinese database may be helpful in increasing the number of included studies. However, the quality of studies should be reviewed before inclusion. Second, the included studies investigated a diverse range of population types, and the intensity of interventions varied widely. This may mean that there is not sufficient evidence to recommend which populations could benefit most or which intensities could be most therapeutic to reduce anxiety. The age and diagnosis of the participants should be considered carefully by future researchers before deciding which mindful interventions to apply. Although all of the included studies were RCTs, almost half of the included studies suffered from selection bias, detection bias, or attrition bias. Future studies related to this line of research should try to minimize these biases in their study designs. In addition, more research studies of high quality are needed, especially in clinical samples where anxiety is a primary complaint and is clinically diagnosed. Finally, since this review has presented evidence that yoga could be more beneficial in reducing anxiety than non-mindful exercise, future research could begin to investigate the physiological and psychological mechanisms which explain why yoga is superior to non-mindful exercise in reducing anxiety.

2.9.1.5 Conclusion

To conclude, the results of the meta-analysis which compared the effectiveness of yoga and non-mindful exercise show that yoga is more beneficial in alleviating anxiety symptoms than non-mindful exercise. However, this review did not identify evidence to suggest that qigong is more advantageous than non-mindful exercise in treating anxiety. More studies are required in order to determine the reasons for this. This review provides sufficient evidence to suggest that yoga may be used as a regular intervention in primary healthcare and clinical settings to achieve a reduction in patients' anxiety symptoms. Further studies should explore the underlying physiological and psychological mechanisms which underpin its clinical effectiveness so that it can become a mainstream rather than adjunct intervention for people with anxiety.

Based on the review above, studies which use qigong as an intervention in reducing anxiety is sparse. However, much evidence has been shown that qigong is effective in reducing depressive symptoms. While the treatment for both depression and anxiety are often similar, qigong might be helpful in reducing anxiety symptoms. As a result, it might be helpful to review the mechanism of qigong on depression to gain insights on qigong's effect on anxiety.

2.9.2 Mechanisms of qigong

A systematic review was done to study the underlying mechanism of qigong. After constructing a shortlist from the available sources, it was observed that most of the identified papers investigated the effect of qigong on depressive symptoms.

2.9.2.1 Introduction

Depression is a common and serious mental health disorder that is estimated to affect 350 million people worldwide (World Health Organization, 2012). The most common type of depression is major depressive disorder (MDD), characterized by depressed mood, loss of interest or pleasure, and altered cognition, and it is expected to become the second leading contributor to overall disease burden by 2030 (Mathers & Loncar, 2006). The large number of people suffering from depression has caught researchers' attention. So that effective treatments for depression can be identified, there is an urgent need to gain an understanding of the pathophysiological changes in patients with depression. Changes in the endocrine and immune system in patients with depression are a major focus of current research.

The limbic system in the human brain is responsible for emotion regulation. Depressive symptoms are likely to be related to dysfunction in the brain networks that link the limbic system and cortical regions (Leuchter, Cook, Hunter, Cai, & Horvath, 2012). In particular, the limbic system is responsible for controlling the function of the hypothalamic-pituitary-adrenal (HPA) axis. In stressful situations, the HPA axis will be activated. Once the HPA axis is hyperactive, an increased amount of glucocorticoid will be released into the body, which is thought to be an etiological factor of depression (Stahl, 2000). This constitutes a pathophysiological explanation for the increased level of cortisol often observed in patients with depression. In addition, desensitization of the glucocorticoid receptor (GR) may play a role in the pathology of depression. GR is extensively distributed throughout the hippocampus and is responsible for the feedback mechanism that regulates the HPA axis (Anacker, Zunszain, Carvalho, & Pariante, 2011).

When GR in the hippocampus detects an increased level of cortisol, the hippocampus regulates the hypothalamus to decrease corticotrophin-releasing hormone (CRH) and thus reduce the level of cortisol via a negative feedback loop. However, patients with depression may have impaired GR and may therefore be unable to control this process (Kim, Na, Myint, & Leonard, 2016).

Considering that the HPA axis is linked to immune response, abnormal activities in the immune system are found to be concurrent with depression (Leonard, 2001). Overactivation of the innate immune system has been observed in individuals with depression (Dowlati et al., 2010). Notably, there is an association between pro-inflammatory cytokine alterations and depression (Kim & Maes, 2003). Several studies have reported that glucocorticoids will increase anti-inflammatory cytokine levels and decrease pro-inflammatory cytokine levels (Tian, Hou, Li, & Yuan, 2014). Pro-inflammatory cytokines can produce many neurological changes that are related to the pathology of depression, including decreased neurogenesis, regional brain abnormalities, changes in the monoamine system, and neurodegeneration (Zunszain, Hepgul, & Pariante, 2013). Based on the above literature, current research suggests that both the endocrine and immune systems may play a role in depression.

Currently, therapeutic administration of antidepressant medication is the most common treatment for depression. Antidepressants have anti-inflammatory properties affecting the levels of pro-inflammatory cytokines. Serotonin re-uptake inhibitors (SSRI), the common type of antidepressant, mainly function by raising the levels of serotonin and reducing cortisol secretion in the brain (H. Tsang et al., 2013). In addition, SSRIs can increase the concentration of anti-inflammatory cytokines in the serum of depressed

patients (Henje Blom et al., 2012). Although taking SSRIs can be effective in reducing depressive symptoms, many side effects may occur in depressed patients following drug treatment (Tsang & Fung, 2008). Side effects of currently available drug treatment include headaches, sedation, sleep disturbance, alteration of cardiovascular function, and bone loss (H. Tsang et al., 2013). After long term use of antidepressants, patients reported severe withdrawal symptoms which make them difficult to discontinue the use of drugs(Cartwright, Gibson, Read, Cowan, & Dehar, 2016). As a result, researchers are seeking better options for treating depression.

Recently, a growing number of studies are investigating the effect of qigong on depression (Yin & Dishman, 2014). Qigong is an ancient Chinese healing art whose history spans 7000 years (Koh, 1982). According to TCM theory, it is a mind-body discipline that not only focuses on the health-related benefits of physical fitness but is integrated with mindfulness-based practices as well as somatic experiencing to improve mental health (Vergeer et al., 2017). The basic components of qigong involve concentration, relaxation, meditation, breathing regulation, body posture, and movement (Tsang, Cheung, & Lak, 2002). Qigong is often performed in association with abdominal breathing and some mindfulness elements. By combining movement and concentration, individuals experience the enhanced flow of qi, which is considered the vital life-force energy within the body (Vergeer et al., 2017). In TCM theories, qigong is a generic term to refer to a wide range of mind-body practices intended to mobilize the flow of qi inside the human body. Smooth flow of qi along meridian channels in the body is considered a requirement of good health (W.-y. Y. Chow, 2011). Due to the long history of qigong, many different types and forms are now in place. The most popular varieties include

Wuqinxi, Baduanjin, Yi Jin Jing, Liu Zi Jue, and Ma Wang Dui Dao Yin Shu (Guo, Shi, Yu, & Qiu, 2016). In China, approximately 5% of the population of 1.3 billion practice qigong to improve their health and prevent diseases (Xiong, Wang, Li, & Zhang, 2015). Moreover, qigong has become more and more popular in foreign countries. In recent years, people from western countries have also started to practice qigong. According to (Lauche et al., 2016), 7.38 million US adults practice Tai Chi or qigong on a daily basis.

Practicing qigong can be very beneficial to our physical and mental health (J. Ye, Cheung, & Tsang, 2019). A recent systematic review shows that qigong practice can improve quality of life, sleep quality, balance, handgrip strength, trunk flexibility, blood pressure, and heart rate (Zou et al., 2017). Another review focuses on the psychological benefits of qigong and suggests that it can reduce stress and anxiety in healthy adults (C.-W. Wang et al., 2014). Due to its many physical and mental health benefits, qigong is well-placed to assist in improving the health of a wide range of people.

It is noteworthy that qigong is not only practiced by healthy people, but also by patients in various clinical settings. Healthcare professionals have been applying it as an alternative treatment among patients with diverse clinical conditions (P. Klein, Schneider, & Rhoads, 2016; Ng & Tsang, 2009; Xiong et al., 2015). Recently, a systematic review found that qigong was effective in reducing depressive symptoms (X. Liu et al., 2015). Most importantly, it was found that qigong exercise was similarly effective to SSRIs (Stahl, 2000) at reducing depressive symptoms (Tsang et al., 2006). If qigong is confirmed to be an evidence-based adjunct intervention, it is likely that dosages of medication, and therefore its side effects, could be reduced in many patients.

Although more and more evidence reinforces the usefulness of qigong in treating depression, its underlying mechanism remains a mystery. Some researchers have therefore begun to investigate the mechanism of the anti-depressive effects of qigong. (Tsang & Fung, 2008) performed a literature review and proposed possible psychological and neurobiological mechanisms that may explain the effects. Tsang and Fung suggested that qigong can reduce signals of stress from the limbic system and thus lower the level of HPA activity. Although there is only sparse research investigating the psychological mechanism of qigong on depression, Tsang and Fung suggested that self-efficacy is an important psychological mechanism that may regulate depressive symptoms when developed through the use of qigong.

Unfortunately, the majority of the studies in this area only focus on one aspect of the mechanism. Most reviews did not provide a full picture of the effects qigong may have on our physical and mental health. For example, M. S. Lee, Kang, Lim, and Lee (2004) investigated the effect of qigong on the neuroendocrine system, (H. Tsang et al., 2013) investigated the psychological mechanism of qigong practice, and R. Li et al. (2014) investigated the effect of qigong on the physiological system. A surge in the practice of qigong in recent years has created an increased need to understand the underlying biological mechanisms that lead to improved physical and mental health. The objective of the present systematic review and meta-analysis is to identify possible neurophysiological and psychological mechanisms of the anti-depressive effects of qigong. To our knowledge, this is the first study that has used a meta-analytic approach to address the above issue.

2.9.2.2 Methods

The review procedure follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009).

Data source

Studies were sought from multiple databases, including *Psycinfo, PubMed, Embase, Science Direct,* and *Academic Search Premier*, from inception to Dec 2018. For all of these databases, the same set of search terms was used. Since a large number of search terms were used in this review, the search terms and strategies used are presented in Appendix 1. Reference lists of relevant studies were then screened.

Study selection

The titles and abstracts of all results were exported to EndNote X7 for removal of duplicates and further screening of eligibility. To assess the eligibility of each study, a set of inclusion and exclusion criteria was established. Studies were included if: (1) the independent variable was qigong; (2) the dependent variable involved any type of neurophysiological or psychological indicators and a measurement of depression; (3) they were randomized controlled trials or quasi-experimental studies; (4) they were published in English; and (5) they were full-length articles in peer-reviewed journals. Exclusion criteria included studies that (1) were qualitative; (2) only described the research protocols; (3) used external qigong as an independent variable; (4) had no assessment of depression; (5) used a sample characterized by depression with comorbid psychiatric conditions (6) did not investigate any underlying biological mechanism; and (6) were written in languages other than English. All of the studies were screened by two

independent reviewers. Disagreement was resolved through discussion until a compromise was reached.

Data extraction

The following data were extracted from the studies: (1) sample size; (2) study population; (3) types and duration of intervention; (4) control group information; (5) types of outcomes; and (6) study results according to PRISMA guidelines. This process was performed separately by two independent reviewers and then compared to ensure the accuracy of the information.

Quality assessment

The risk-of-bias tool developed by Cochrane Collaboration was used to assess all the included studies. Six categories of bias, including selection bias, performance bias, detection bias, attrition bias, reporting bias, and other bias which did not fit into any of the above categories, were assessed. Two independent reviewers rated each item of bias for all the included studies. Their results were compared, and disagreement was resolved through discussion until a consensus was reached.

Data synthesis and meta-analysis

Studies which included a comparison group were meta-analyzed. However, to do this, a minimum of three studies with the same outcome was required. Since different depression scales were used in different studies, the standardized mean difference (SMD) was adopted for the meta-analysis of the effect of qigong on depression. For other outcomes, mean differences were used. Publication bias was tested using Egger's regression. If the *p*-value was less than 0.1 in the two-tailed test, the outcome was not included in the meta-analysis. If the *p*-value was larger than 0.1, a meta-analysis was

conducted. Review Manager 5.3, developed by the Cochrane Collaboration (2014), was used to analyze the results of studies included in the meta-analysis. Heterogeneity was tested and I^2 was reported. A random-effect model was used for heterogeneity ($p < 0.05$), while a fixed-effects model was used when heterogeneity was not significant ($p > 0.05$) (L. Zhou et al., 2019).

2.9.2.3 Results

Search results

Based on our proposed keywords, a total of 1,029 articles were identified from the databases. After the initial screening of the titles and abstracts, both reviewers identified 90 articles that were potentially suitable to be included in this review. During full-text screening, we found 57 studies without any measurement of depression, eight studies without mention of any mechanism, six studies that adopted qualitative methods, three studies that were protocols, two studies not in English, one study that did not use qigong as the intervention, and one study that used external qigong as the intervention. Hence, these studies were excluded. After assessing the full text of the remaining articles, it was found that 9 studies were eligible according to our selection criteria listed earlier (Figure 7).

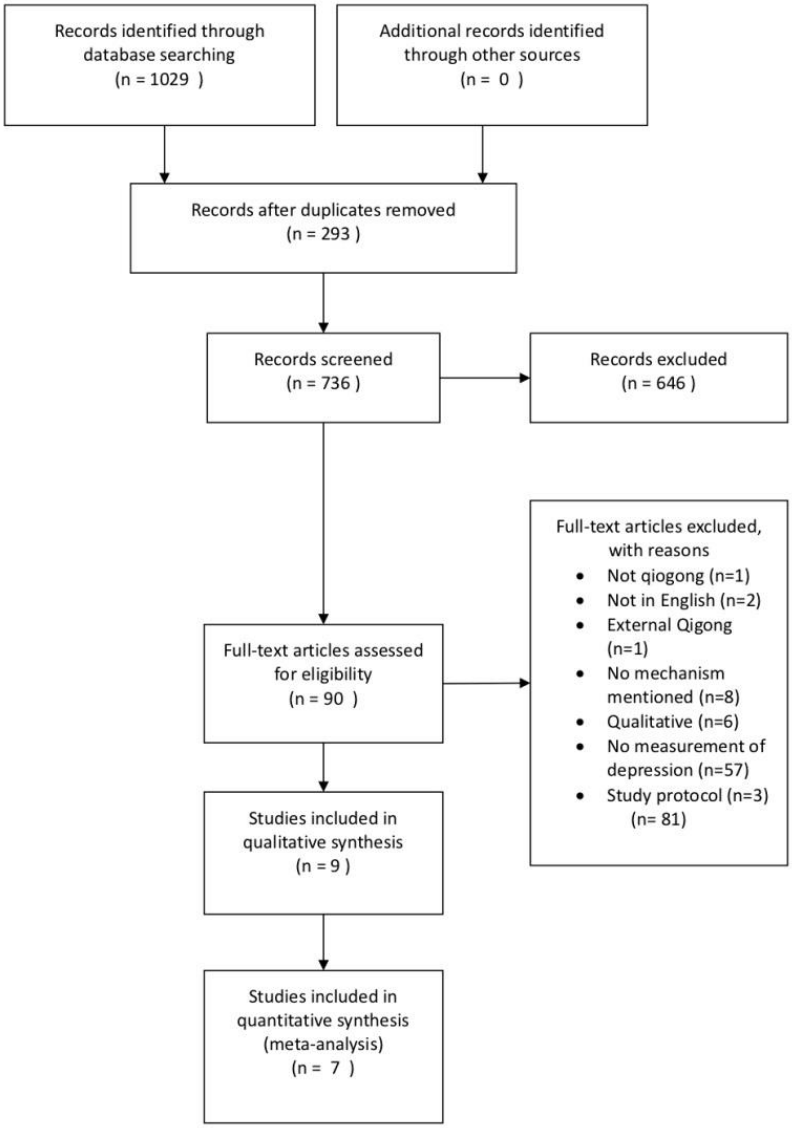

Figure 7. PRISMA flow diagram.

Description of the included studies

Among the included studies, the sample size varied from 24 to 116 participants. Participants were adults, ranging from 18 to 84 years of age. Regarding the target

population, five studies used healthy subjects, two studies used patients with depression, one study used patients with breast cancer, and one used adults with hypertension. Only one study used patients with major depressive disorder as subjects, and they were already taking escitalopram. The types of qigong intervention varied across the included studies. Eight Section Brocades (or Baduanjin) was used in two studies, whereas the remaining seven studies used seven different interventions: Yi Jin Ten-Section Brocades, Tai Chi, Chan Ming Gong, self-healing qigong, Guolin New Qigong, Guolin Qigong, and Laughing Qigong. For the control group, four studies used waitlist control, two studies used a newspaper reading program, one study used a health education program, one used conventional exercise, and one used treatment as usual.

Effect of qigong on depression

Among the nine included studies, depression was found to have improved in five studies, while no change was observed in the remaining four studies. Two studies were excluded from the meta-analysis due to insufficient information on the scores of depression. For the remaining studies, meta-analysis was performed to detect the effect of qigong on depression, and a small to medium significant effect was found (SMD = -0.27, $p < 0.05$, $I^2 = 27\%$; see Fig.2). Self-reported scales including the Geriatric Depression Scale, Center for Epidemiologic Studies Depression Scale, Depression Anxiety and Stress Scales, Hamilton Depression Rating Score, and Zung Self-Rating Depression Scale were used in the included studies.

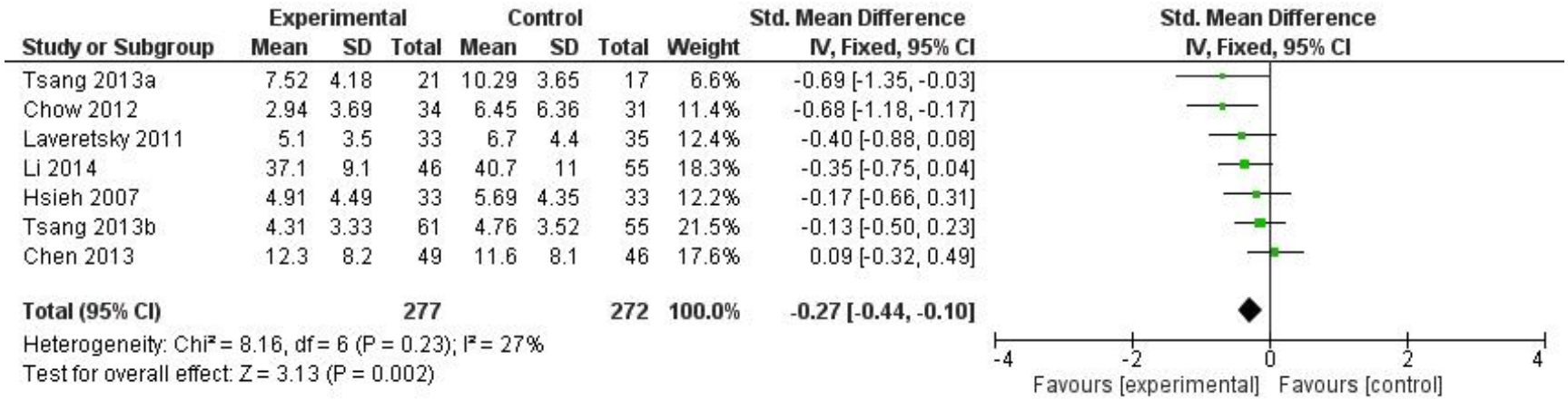

Figure 8. Forest plot of depression.

Neuroendocrine: The Hypothalamic–Pituitary–Adrenal (HPA) axis

The HPA axis and the cortisol level were investigated in six studies. For the cortisol analysis, five studies collected salivary samples and one study collected urine samples. Three studies found significantly lower cortisol levels for the experimental group than the control group during post-assessment (Chan et al., 2013; Y. W. Y. Chow, Dorcas, & Siu, 2012; Hsieh, Chang, Tsai, & Wu, 2015). In addition, two of the studies showed a significant reduction in depression in the qigong group compared to baseline (Chan et al., 2013; Hsieh et al., 2015), while Y. W. Y. Chow et al. (2012) showed a decrease in depression which was statistically insignificant ($p = 0.053$). Further, for the experimental group, Chow et al. showed significantly lower cortisol levels during follow-up assessment ($p < 0.001$).

On the other hand, three studies found no significant differences in cortisol between groups across all assessment time points (Z. Chen et al., 2013; B. M. Cheung et al., 2005; H. Tsang et al., 2013). However, while one study also found no change in depression, two studies found that there was a significant decrease in depression from midpoint to post-assessment. Meta-analysis was performed on the cortisol levels and no significant effect was found ($SMD = -0.12$, $p = 0.59$, $I^2 = 64\%$).

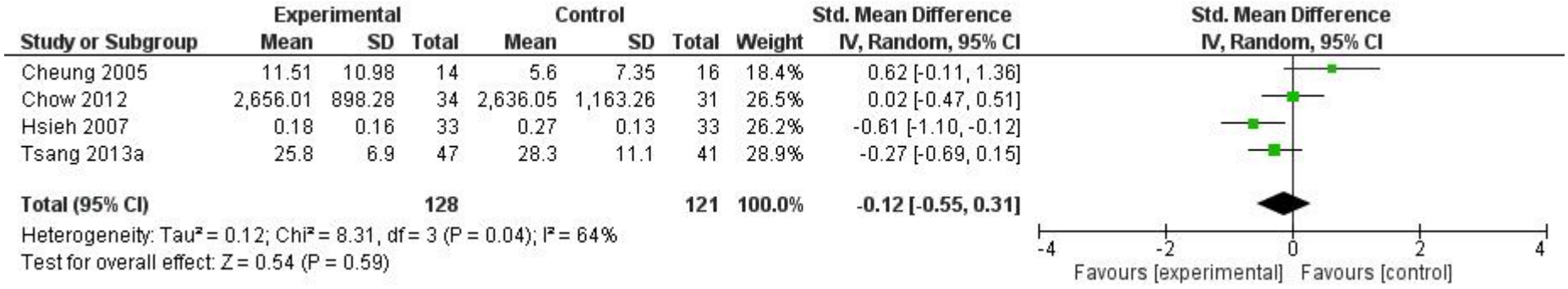

Figure 8. Forest plot of cortisol.

Neuroendocrine: Renin–Angiotensin System (RAS)

Aldosterone and renin levels were evaluated in one study (B. M. Cheung et al., 2005). B. M. Cheung et al. (2005) showed no significant difference in aldosterone between the two groups. However, renin was reported to have decreased significantly for both the experimental and control groups. For the symptoms of depression, no significant difference between the two groups was observed.

Neurotransmitters: Serotonin

Serotonin levels were investigated in one study (H. Tsang et al., 2013). While H. Tsang et al. (2013) found a significant decrease in depression at post-assessment, they found no significant difference in serotonin compared to baseline, and no group by time interaction effect was observed. Table 2 summarizes the results of the neuroendocrine outcomes of the included studies.

Table 2

Summary of the Neuroendocrine Mechanism of Qigong

Author (Year)	Study design	Participants	Sample Size	Intervention	Control	Depression scales	Outcome measures	Results
Chan et al., (2013)	RCT	University students	EG:18/CG:16	Self-Healing Qigong (10week; twice per week; 60 mins)	Waitlist control	DASS-21	1. Salivary cortisol	1. Significant reduction in salivary cortisol from week 1 to week 10 in the qigong group while no statistically change in the control group
Chen et al., (2013)	RCT	Breast cancer patients	EG:49/CG:46	Guolin New Qigong(5-6 weeks;5 times per week;40mins)	Waitlist control	CES-D	1. Salivary cortisol	1. No significant differences between groups for cortisol circadian slope and cortisol awakening responses

Table 2 (Continued)

Summary of the Neuroendocrine Mechanism of Qigong

Author (Year)	Study design	Participants	Sample Size	Intervention	Control	Depression scales	Outcome measures	Results
Cheung et al., (2005)	RCT	Adult with essential hypertension	EG:47/CG:41	Guolin Qigong (16 weeks; twice per week in the first 4 weeks, then was held monthly;120 mins)	Conventional exercise	BDI	1. Urine cortisol 2. Aldosterone 3. Renin	1. No significant difference in cortisol and aldosterone 2. Renin decreased significantly in both groups
Chow et al., (2012)	RCT	Healthy adults	EG:34/CG:31	Chan Mi Gong (8 weeks under instructor's supervision and 4 weeks practice at home; once a week; 90 mins)	Waitlist control	DASS-21	1. Salivary cortisol	1. In week 8 & 12, qigong group had lower cortisol levels than control group

Table 2 (Continued)

Summary of the Neuroendocrine Mechanism of Qigong

Author (Year)	Study design	Participants	Sample Size	Intervention	Control	Depression scales	Outcome measures	Results
Hsieh et al. (2015)	Quasi Experimental	Elder	EG:32/CG:30	Laughing Qigong (4 weeks; twice per week; 50-60mins)	Treatment as usual	GDS	1. Salivary cortisol	1. Experimental group showed lower cortisol level compare to the control. However, no significant changes in cortisol levels for participants in the experimental group while there was a significant increase in cortisol levels

Table 2 (Continued)

Summary of the Neuroendocrine Mechanism of Qigong

Author (Year)	Study design	Participants	Sample Size	Intervention	Control	Depression scales	Outcome measures	Results
Tsang et al., (2013b)	RCT	Depressed elders with chronic illness	Saliva EG:13/CG:11 Blood EG:14/CG:16	Eight-Section Brocades (12 weeks; 3 times per week; 45 mins)	Newspaper reading and discussion program	GDS	1. Salivary cortisol 2. Blood serotonin	1. Across-time change in cortisol was not significant between groups 2. For the blood serotonin level, the group × time interaction effect was not significant

EG, experimental group; CG, control group; GDS, Geriatric Depression Scale; DASS-21, Depression Anxiety, Stress Scales; CES-D, Center for Epidemiologic Studies Depression Scale; BDI, Beck Depression Inventory.

Autonomic nervous system (ANS)

Blood pressure was evaluated in four studies. One study found that both systolic and diastolic blood pressure were significantly lower in the experimental group compared to the control group after qigong intervention (Y. W. Y. Chow et al., 2012). Two studies found no significant differences between groups or time (R. Li et al., 2014; Tsang, Lee, Au, Wong, & Lai, 2013). All four of the studies that evaluated blood pressure showed no significant difference between or within groups for depression.

Among the two studies which did show significant differences in blood pressure, both showed no significant differences in depression (B. M. Cheung et al., 2005; Y. W. Y. Chow et al., 2012). Two studies showed no significant difference in either blood pressure or depression across time (R. Li et al., 2014; H. W. H. Tsang et al., 2013). Meta-analysis was performed on the studies relating to blood pressure and showed a large and significant effect of qigong interventions on reducing diastolic blood pressure (SMD = -1.64, $p < 0.05$, I^2 = 31%; see Fig.4). However, the effect of qigong on systolic blood pressure was not statistically significant (SMD = -0.06, p = 0.78, I^2 = 75%).

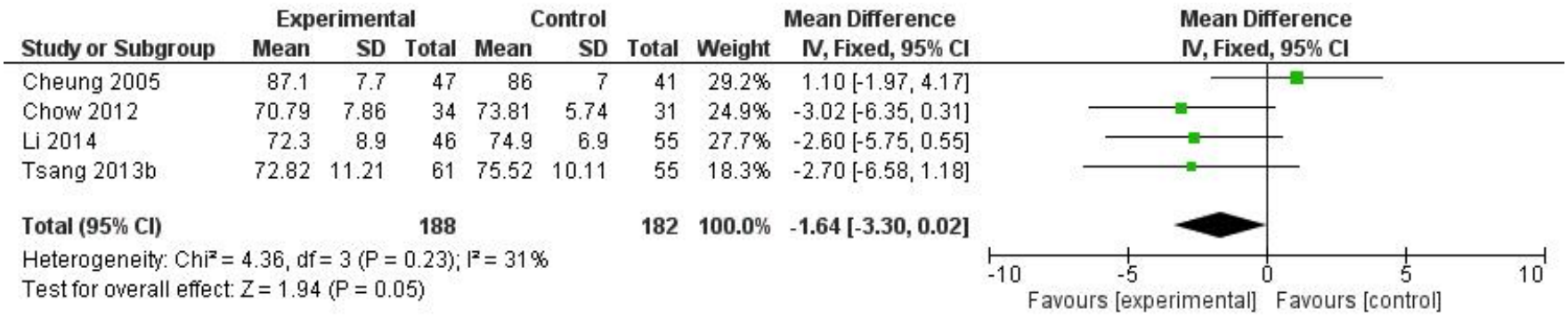

Figure 9. Forest plot of diastolic blood pressure.

Heart rate was assessed in three studies, and heart-rate variability was assessed in one study. For heart rate, one out of the three studies found significantly lower heart rates at post-assessment (Payne, Fiering, Leiter, Zava, & Crane-Godreau, 2017) and one study found a significant group by time interaction effect (H. W. H. Tsang et al., 2013). The remaining study found no significant effect on heart rate (Y. W. Y. Chow et al., 2012). All of these three studies found no significant differences in depression between groups and times. This meant that one study (Y. W. Y. Chow et al., 2012) showed no significant change in either heart rate or depression. The study that assessed heart-rate variability found no significant changes (R. Li et al., 2014). Moreover, the same study showed no significant difference in depression between groups. There were enough studies to perform a meta-analysis on heart rate. Unfortunately, after Egger's regression test, studies that involved heart rate showed publication bias ($p < 0.1$). As a result, meta-analysis was not performed for this outcome.

Immune system

C-reactive protein (CRP) was evaluated in two studies (Lavretsky et al., 2011; Payne et al., 2017), and Immunoglobin A (IgA) was evaluated in one study (Chan et al., 2013). For CRP, Lavretsky et al. (2011) found a significant between-group difference, while Payne et al. (2017) found a significant difference over time. Lavretsky et al. (2011) also showed significant between-group differences in CRP and depression.

Immunoglobulin A was evaluated in one study (Chan et al., 2013). Chan et al. (2013) showed that the qigong group had a significant increase in IgA at both midpoint assessment ($p = 0.018$) and post-assessment ($p = 0.018$) compared to pre-assessment.

While the control group showed an increase in IgA level, this increase was not significant. The research also observed a significant reduction in depression in the qigong group compared to baseline. This study showed that qigong provoked a significant increase in a mucosal immune marker.

Metabolic system

Cholesterol and triglycerides were evaluated in two studies. One study found a significant decrease in cholesterol but not in triglycerides at post-assessment. In addition, no significant effect was reported for depression (B. M. Cheung et al., 2005). Another study, R. Li et al. (2014), found no significant difference for either cholesterol and triglycerides or depression.

One study looked at blood lipid levels (R. Li et al., 2014) and found no significant change at post-assessment. This study also found no significant difference in depression between groups. Lipoproteins (LDL & HDL) were investigated in two studies. Both studies found no significant difference between groups over time (B. M. Cheung et al., 2005; R. Li et al., 2014). However, Cheung et al. found a significant difference for HDL at post-assessment compared to baseline. Both studies reported no significant difference for depression. Table 3 summarizes the results for the physiological outcomes of the included studies.

Table 3

Summary of the Physiological Mechanism of Qigong

Author (Year)	Study Design	Participants	Sample Size	Intervention	Control	Depression scales	Outcome measures	Results
Chan et al., (2013)	RCT	University students	EG:18/CG:16	Self-Healing Qigong (10week; twice per week; 60 mins)	Waitlist control	DASS-21	1. Immunoglobin A	1. Qigong group showed a significant increase in secretion of salivary IgA at post-assessment and follow-up assessment
Chow et al. (2012)	RCT	Healthy adults	EG:34/CG:31	Chan Mi Gong (8 weeks under instructor's supervision and 4 weeks practice at home; once a week; 90 mins)	Waitlist control	DASS-21	1. Blood pressure 2. Heart rate	1. Qigong group had significantly lower systolic blood pressure and diastolic blood pressure than the control group 2. No group difference on heart rate

Table 3 (Continued)

Summary of the Physiological Mechanism of Qigong

Author (Year)	Study Design	Participants	Sample Size	Intervention	Control	Depression scales	Outcome measures	Results
Cheung et al. (2005)	RCT	Adult with essential hypertension	EG:47/CG:41	Guolin Qigong (16 weeks; twice per week in the first 4 weeks, then was held monthly;120 mins)	Conventional exercise	DASS-21	1. Blood pressure 2. Heart rate 3. Total cholesterol 4. Triglycerides 5. LDL 6. HDL	1. Both systolic and diastolic blood pressure decreased significantly in both groups at post assessment 2. Heart rate was significantly lower for both groups at post assessment compare to baseline 3. Total cholesterol was decreased significantly in both groups at post assessment 4. No significant difference was found in Tiglycerides, LDL and HDL

Table 3 (Continued)

Summary of the Physiological Mechanism of Qigong

Author (Year)	Study Design	Participants	Sample Size	Intervention	Control	Depression scales	Outcome measures	Results
Laveretsky et al., (2011)	RCT	Elder with major depressive disorder	EG:33/CG:35	Tai chi (10 weeks; once per week; 120mins)	Health education program	HDRS	1. C-reactive protein (CRP)	1. Experimental group had significant decreased in CRP compare to control
Li et al., (2014)	RCT	Healthy adults	EG:46/CG:55	Baduanjin (16 weeks; 3 times per week; 30-60 mins)	Waitlist control	SDS	1. Blood pressure 2. Heart rate variability (HRV) 3. Rate pressure product 4. Total cholesterol (TC) 5. Triglyceride (TG) 6. Low-density lipoprotein (LDL) 7. High-density lipoprotein (HDL)	1. No significant change was found in blood pressure, HRV, vital capacity and blood lipid index

Table 3 (Continued)

Summary of the Physiological Mechanism of Qigong

Author (Year)	Study Design	Participants	Sample Size	Intervention	Control	Depression scales	Outcome measures	Results
Tsang et al. (2013a)	RCT	Elders	EG:61/CG:55	Yi Jin Ten-Section Brocades (12 weeks; twice per week; 60 mins)	Newspaper reading	GDS	1. Hear rate 2. Blood pressure 3. Forced vital capacity 4. Forced expiratory volume	1. Significant group × time interaction effect on resting heart rate 2. For blood pressure, forced vital capacity and forced expiratory volume, no significant difference was observed

Psychological outcomes

Self-concept and self-efficacy were assessed in one study. (H. Tsang et al., 2013) studied the change in self-concept before and after the intervention and found significant group x time effects of some categories under self-concept. The experimental group experienced lower self-concept in their leisure life during midpoint assessment. During the post-assessment, the experimental group showed enhancement of self-concept of physical well-being. For self-efficacy, Tsang found that the experimental group had significantly higher levels of self-efficacy at midpoint assessment than the control group ($p < 0.025$). A significant difference was also found in the post-assessment period ($p < 0.05$). At the same time, this study showed a significant decrease in depression for the experimental group at midpoint and post-assessment. Further analysis showed that depression was significantly negatively correlated with self-efficacy. Linear regression showed that the change in self-efficacy was able to explain the change in reported depression symptoms. Table 4 summarizes the results for the psychological outcomes of the included studies.

Table 4

Summary of the Psychological Mechanism of Qigong

Author (Year)	Study Design	Participants	Sample Size	Intervention	Control	Depression scales	Outcome measures	Results
Tsang et al. (2013b)	RCT	Depressed elders with chronic illness	EC:20/CG:17	Eight-Section Brocades (12 weeks; 3 times per week; 45 mins)	Newspaper reading and discussion program	GDS	1. Self-efficacy 2. Self-concept	1. Significant group × time interaction effects on self-efficacy and some categories under self-concept

Risk of bias of the included studies

Risk-of-bias assessment tools based on Cochrane standards were used by two reviewers to evaluate the quality of the included studies. All of the included studies had a high risk of performance bias (Figure 10). Participants were able to identify which groups they belonged to, and this may have affected the results of the studies. In addition, over half of the included studies were rated as having unknown or high risks in the categories of allocation concealment and incomplete outcome data.

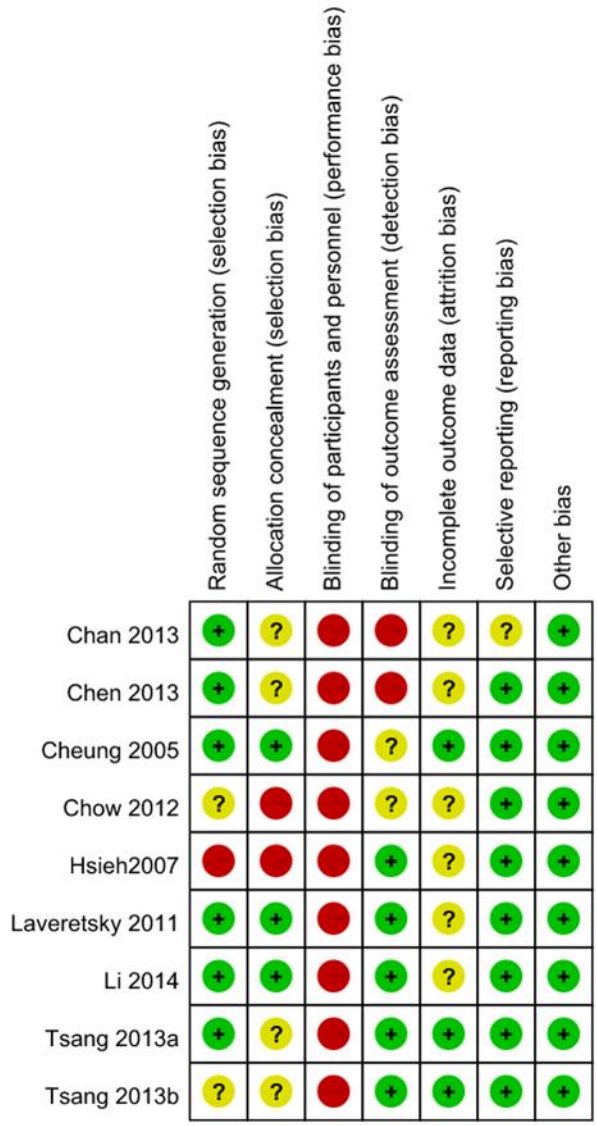

Figure 10. Summary of risk of bias.

2.9.2.4 Discussion

In this review, participants in the included studies were mostly characterized by mild depressive mood. As shown in the meta-analysis, qigong is effective in reducing the symptoms of depression, based on the meta-analytical results of seven studies under intensive review. Although the number of weeks of practicing qigong and the duration of sessions were quite different in the included studies, participants generally showed improvement when they practiced qigong twice a week or more. This is, to date, the most evidenced-based conclusion on the anti-depressive effects of qigong. At the same time, this review has further advanced our understanding of the therapeutic application of qigong by looking into the causes and mechanisms that may explain this effect of qigong, based on existing studies. To summarize, the most valid neurophysiological mechanism is that qigong reduces depression by regulating the autonomic nervous system, specifically by up-regulating the parasympathetic nervous system. Although our conclusions around the autonomic nervous system are based only on blood pressure, which is one of its main indicators (Erdogan et al., 2011), a significant effect was identified, as illustrated in Figure 11. On the other hand, the effect of qigong on the HPA axis remains unclear. While meta-analysis shows no significant effect, there is evidence that qigong can reduce saliva cortisol level (Ponzio et al., 2015), and depression is related to the hyperactivity of the HPA axis (Lamers et al., 2013). This meta-analysis cannot provide evidence to confirm the HPA theory, perhaps due to the small number of available studies.

Several outcomes did not meet the criteria to be included in the meta-analysis. However, these outcomes may also be indicators of the possible neurophysiological or

psychological pathways that can explain how qigong leads to the alleviation of depression. Meta-analysis could not be performed on outcomes relating to the immune system due to the limited number of available studies, and therefore the immune system theory could not be supported. Even for some of the outcomes that were eligible for meta-analysis, only a few studies had investigated the particular outcome. As a result, there are pathways requiring further investigation; these are proposed and summarized by dotted lines in Figure 11. One possible mechanism is that qigong may be able to boost the immune system and thus reduce the level of C-reactive protein (CRP), which, again, will lead to a decrease in depression. This is consistent with previous studies showing CRP to be linked to depression (Au, Smith, Gariépy, & Schmitz, 2014) and demonstrating a significant reduction in CRP after qigong intervention (Oh et al., 2012). Last but not least, qigong is essentially a mind-body exercise, and it may help to increase psychological wellbeing by helping individuals develop positive thinking patterns. This may lead to an increase in self-concept and self-efficacy and a decrease in perceived stress. The result of this will be a decrease in depression.

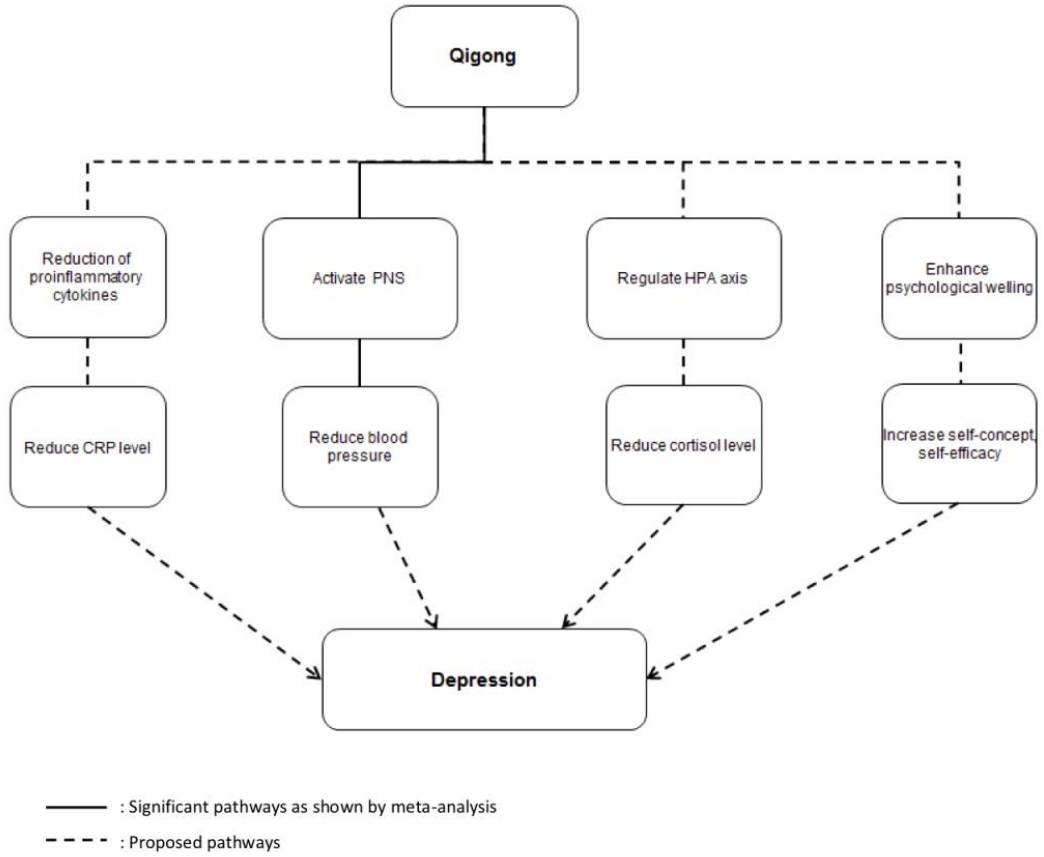

Figure 11. Summary of possible anti-depressive mechanisms of qigong.

There are several limitations to this meta-analytical a limited number of RCTs were included. RCTs provide the highest level of evidence, which is necessary for evidence-based practice. If more RCTs were available, the evidence on the underlying mechanisms of qigong on depression would be more solid and valid. Second, studies included in this review used different populations with depressive mood. As a result, it is difficult to conclude if the mechanism is related to depression other confounding factors. Furthermore, studies in this line of research used different types of outcome measures, which made meta-analysis difficult. In addition, the types of qigong used varied across studies. This makes it difficult for researchers to make recommendations on the type of qigong that would be the most beneficial for people with depression. Finally, no study examined the neurological mechanism of qigong on depression. Therefore, the way that our brain perceives and reacts to qigong and the changes that occur in the brain remain unknown. Regarding the quality of the existing RCTs, there is much room for improvement. Blinding of participants and personnel may be difficult due to the nature of the intervention. However, other categories, such as allocation concealment and incomplete outcome data, could be improved by providing more details of the process of the research.

Looking ahead, more research efforts should be directed towards exploring the anti-depressive mechanism of qigong. Future studies can be structured as RCTs with higher design quality to explore the pathways that have been proposed in this review but not confirmed. There is a need to investigate the effectiveness of different types of qigong and its mechanisms. In addition, future studies can make use of more advanced technologies to look at the neurological mechanism of qigong. For example, changes in

brainwaves may be studied by electroencephalogram (EEG) and event-related potential (ERP), and the corresponding brain areas that are activated by qigong practice may be studied by fMRI. If researchers can put together a more complete picture of the anti-depressive mechanism of qigong, we may have more evidence to inform clinicians about effective practice in different clinical settings. This would be especially valuable because qigong is a low-cost treatment where it is very easy to get patients engaged. Moreover, it does not create any of the side effects caused by current medication (Zou, Yeung, et al., 2018). Most importantly, if qigong, unlike antidepressants (Licht et al., 2009), can help individuals reduce depression without increasing the risk for hypertension, it could be used as a safe alternative and/or adjunctive treatment for depression. In any case, based on the results of this study, qigong can be promoted as a preventive intervention so that members of the public can practice it and, in doing so, reduce their risk of clinical depression and other chronic diseases such as hypertension.

2.9.2.5 Conclusion

This meta-analytical review has further unraveled the biological underpinnings of the effects of qigong on those with depressive symptoms by providing evidence that establishes its effects on reducing depression through activating the parasympathetic nervous system. Other possible pathways are also proposed but need to be evaluated further in future research. Finally, more research is needed to provide solid evidence for the anti-depressive effects of qigong so that clinicians will be able to utilize qigong practice as a treatment in clinical settings.

2.10 Possible Mechanisms on anxiety

Although depression and anxiety have many commonalities, some unique anxiety-related mechanisms of qigong practice can be suggested. One possible mechanism of qigong is that it enhances cognitive processing and improves affect regulation. Specifically, by focusing on the breath and body sensation, practicing mindfulness exercise may increase one's interoceptive awareness. Interoceptive awareness refers to the ability to perceive internal physiological sensations of the body (Neukirch, Reid, & Shires, 2018). It has been argued that this can help to suppress aversive thoughts and impulses. This autonomic process helps restore homeostasis and generate adaptive insights (Yeung et al., 2018). For example, those who practice qigong learn to perceive stressful conditions in a positive way, which leads to lowered stress sensitization (van Dam, 2020). One study found a significant improvement in interoceptive awareness after mindfulness practice (Mehling et al., 2018).

Researchers also propose neurophysiological mechanisms. It is well-known that both the amygdala and the hippocampus are involved in processing emotion. They interact with each other and translate emotion into different outcomes (Yang & Wang, 2017). Dysfunction of the amygdala and hippocampus has been observed in stress-induced neuropsychiatric disorders, including anxiety (Xin Zhang et al., 2018). Specifically, an increase in the volume of the amygdala and a reduction in the volume of the hippocampus is observed when experiencing moderate to severe stress (Yeung et al., 2018). The amygdala is responsible for the emotions of anxiety, and deactivation of the amygdala was observed after a mindfulness-based stress-reduction program (Penelope

Klein, Picard, Baumgarden, & Schneider, 2017). Research has found that the gray-matter density in the hippocampus is enhanced after mindfulness training (Yeung et al., 2018).

Another physiological response of stress that occurs alongside the amygdala's response is the hyperactivity of the HPA axis. When people are exposed to stressful situations, significant activation of the HPA axis and synthesis of stress hormones are observed (Xin Zhang et al., 2018). Prolonged exposure to stress leads to hyperactivation of the HPA axis and a high level of glucocorticoids, which can result in structural and functional disruption in the amygdala. At the same time, the amygdala can strengthen the HPA activity through direct projections to the paraventricular nucleus of the hypothalamus (PVN), which controls the HPA axis. An excited amygdala triggers the hypothalamus to activate the pituitary gland, which secretes the adrenocorticotropic hormone. This then stimulates the adrenal cortex to produce cortisol. The release of cortisol is followed by various responses, including increased blood pressure and blood sugar levels, the conversion of fatty acids into energy, and suppression of the immune system. Simultaneously, stress activates the sympathetic nervous system to stimulate the adrenal medulla. This produces catecholamine hormones such as adrenaline (epinephrine) or noradrenaline (norepinephrine).

Practicing mindfulness exercise may result in a lasting reduction in the intensity of these stress responses. It has frequently been argued that qigong is effective in regulating the HPA axis. A study found that stress-related endogenous chemicals such as norepinephrine and cortisol are reduced after practicing qigong (Griffith et al., 2008). Practicing qigong could alter the autonomic nervous system (ANS) and the endocrine system, which has the effect of stabilizing mood and restoring homeostasis (C.-W. Wang

et al., 2014). Evidence has also been provided by research on meditation, which is an important element in practicing mind-body exercise (mindful exercise). One study provides evidence that mindfulness meditation might alter the HPA axis by activating the parasympathetic nervous system and counter-activating the sympathetic nervous system. This helps to reduce stress responses and consequently decreases stress-associated mood symptoms (Yeung et al., 2018). Moreover, regular meditation can result in lower stress levels, increased well-being, and even lowered blood pressure and resting heart rate.

The polyvagal theory proposed that autonomic regulation and respiratory sinus arrhythmia (RSA), which is indicated by heart-rate variability in the high-frequency spectrum (HF-HRV), are linked to anxiety disorders (Pittig, Arch, Lam, & Craske, 2013; Porges, 2007). Healthy people can adapt to environmental demands and react accordingly. This helps to maintain emotional stability. However, people with anxiety disorders often show difficulties in inhibiting anxious responses in non-threatening situations. It is generally considered that HF-HRV is one of the major outputs of the parasympathetic nervous system, and as a result, it may serve as an important implication of the adaptability and regulatory ability of an individual. It has been suggested that a decreased HF-HRV is associated with less flexibility in responding to the environment. A study found that all anxiety-disorder patients showed significantly lower HRV than healthy adults (Pittig et al., 2013). A meta-analysis supported this finding and found a small to moderate effect size (Chalmers, Quintana, Abbott, & Kemp, 2014). On the other hand, research on qigong found a significant improvement in heart-rate variability, including higher values of SDNN, low frequency, high frequency, and total power, for the qigong group compared to the control group (M.-Y. Chang, 2015). Another study suggested that

the time-domain parameters, particularly the standard deviation of the normal-to-normal intervals (SDNN) and root mean square of successive differences (RMSSD) have a higher association with psychological outcomes than the frequency-domain parameters (Chuang, Kao, Lee, & Chang, 2018). The change of heart-rate variability after practicing qigong provides evidence that qigong may help to regulate the autonomic nervous system through adjusting the parasympathetic nervous system and simultaneously stabilizing the sympathetic nervous system.

2.11 Rationale of the Study

The results from the two systematic reviews on qigong provide compelling evidence that qigong is effective in improving psychological health. Due to the increasing popularity of mindful exercise for the past decade, there is an increase in the number of research studies evaluating its impact on health outcomes when used as an intervention. Nevertheless, yoga remains more commonly practiced than qigong by the general public. Even though qigong is a type of mindful exercise originating in China, existing research efforts on qigong have mainly been performed in western countries. More importantly, the quality of these research studies might not be up to standards, necessitating further research with more stringent attention to suitable protocols. Looking at another area, qigong was found to help regulate emotion by activating the parasympathetic nervous system, mostly via the reduction of blood pressure. Although recent studies have investigated the effect of qigong on the HPA axis, the results are still inconclusive.

Since an increasing number of ethnic minorities are choosing to live in Hong Kong, the problem of language anxiety needs to be addressed, as it affects many aspects

of their lives, especially for ethnic-minority students. At schools, many effort has been made on increasing their Chinese competencies, hoping it can reduce students' language anxiety. However, not much support has been provided on the coping skills of the negative emotions arise during the language learning process. As there are evidence that mindful exercise is helpful in coping with negative emotions, practicing mindful exercise may help to alleviate language anxiety which is a specific type of anxiety. Hopefully, this will lead to better academic performance, which is critical for future career development. This study uses qigong as an intervention, since the research is conducted in Hong Kong and aims to examines an issue that is heavily rooted in Chinese culture. Most importantly, its efficacy on children needs to be investigated so that an additional option of intervention can be explored by healthcare professionals. There are several reasons that Baduanjin was selected as the form of qigong to be used in this study. Based on the above literature, several limitations of existing research on Baduanjin are identified. First, although Baduanjin has been applied to various populations, no study could be identified in using Baduanjin intervention among children. Baduanjin is mostly provided as an intervention for adults. Since Baduanjin is easy to learn and practice, it is likely to apply to a child population as well. Second, current research on the effectiveness of Baduanjin on alleviating anxiety symptoms is inconclusive. While some of the studies found a significant reduction in anxiety after qigong intervention, others could not identify any differences between the groups. Furthermore, reviews and meta-analyses provide inconsistent results. It should also be noted that no research has been done using Baduanjin as an intervention to reduce foreign-language anxiety, which is a problem faced by the students of ethnic minorities in Hong Kong. Last, the mechanisms of qigong

remain unclear and are still waiting to be unraveled. More research should be conducted to examine the mechanisms of qigong so that stronger evidence can be provided for clinical practice.

2.12 Hypotheses

Hypothesis 1 *(Referring to Objective 2)*

1a. Compared to the baseline, participants' saliva cortisol level will decrease significantly after the qigong intervention. In addition, participants in the intervention group will have a lower cortisol level compared to the control group.

1b. Compared to the baseline, participants' heart-rate variability will increase significantly after the qigong intervention. In addition, participants in the intervention group will display an increase in heart-rate variability compared to the control group

1c. Compared to the baseline, participants' blood pressure and heart rate will decrease significantly after the qigong intervention. In addition, participants in the intervention group will have lower blood pressure and heart rate compared to the control group.

Hypothesis 2 *(Referring to Objective 3)*

2a. After the qigong intervention, participants' levels of foreign-language anxiety will drop. In addition, participants in the intervention group will experience lower foreign-language anxiety than the participants in the control group.

2b. After the qigong intervention, participants' Chinese academic achievement will improve. In addition, participants in the intervention group will have greater improvement of foreign language achievement than participants in the control group.

Chapter 3: Methodology

3.1 Research Design

This study was a randomized controlled trial comparing foreign-language anxiety levels of a 10-week qigong group with those of a control group. The independent variable was the qigong intervention. The mediating variables were the neuroendocrine and physiological responses after doing qigong. The primary outcome variable was foreign-language anxiety and the secondary outcome variable was the Chinese academic achievement of NCS students. This study was approved by the Human Subjects Ethics Committee from The Hong Kong Polytechnic University (application number HSEARS20180122001).

3.2 Setting and Participants

G*Power 3.1 was used to calculate the required sample size for this study (Faul, Erdfelder, Lang, & Buchner, 2007). In order to detect a medium effect ($f = 0.25$) for repeated measures ANOVA, at $\alpha = 0.05$ and power = 0.80, the suggested number of participants was 44. Assuming a 20% dropout rate, a total number of 55 participants needed to be recruited. Convenience sampling was used to identify participants. NCS students who showed interest in this study were invited. Potential participants were identified using the inclusion and exclusion criteria. For the inclusion criteria, NCS students who were studying in primary four to primary six were eligible to participate in this study. In addition, they should not have participated in similar programs previously or currently. For the exclusion criteria, NCS students who had special educational needs or physical disabilities were not to be included.

3.3 Intervention

Based on the literature review on using similar intervention (e.g. yoga) on students, the results of the systematic review conducted and the feasibility of the implementation, a 10-week Baduanjin qigong intervention was adopted in this study. A total of 10 sessions were offered to the participants with 45 minutes per session per week. Baduanjin was selected as a type of qigong that is easy to learn and memorize. It is a mind-body exercise with low to moderate intensity. In this study, Baduanjin qigong consists of eight slow and relaxing movements, in addition to one starting and one ending pose. To complete a full set of Baduanjin qigong, approximately 15–20 minutes were needed. The exercise involved movements that stretched participants' spine and limbs as well as strengthening their muscles. The eight movements of Baduanjin and descriptions of each movement are as follows:

(1) Prop Up the Sky with Both Hands to Regulate the Triple Warmer (兩手托天理三焦)

Separate the feet and set them at shoulder distance apart. Bring both hands out in front of the abdomen, with palms facing upward, keeping the left and right hand a distance of one fist apart from each other. Interlace the fingers and slowly move the palms upward to chest-height. Here, rotate the palms inward by 180 degrees and continue to raise the palms to the sky. After straightening both hands to the sky, pause for a moment, then separate the hands, letting each one open out to the side, and lower them slowly.

(2) Draw a Bow on Both Sides like Shooting a Vulture (左右開弓似射鵰)

Broaden the stance so that the feet are further than shoulder-width apart. Cross the hands over the chest, then extend the arms as if drawing back a bowstring, imagining that there is an arrow pointing outward. Turn your gaze toward the direction of the arrow. Stay in this position for a moment, then return the gaze to the front. Now change sides, performing the same motions but with the opposite arms.

(3) Raise Single Arm to Regulate Spleen and Stomach (調理脾胃須單舉)

Return the feet to a position where they are shoulder-width apart. Place both hands in a loose cupping posture in front of the abdomen. Next, separate the left hand and right hand so that the left hand pushes up towards the sky while right hand descends and pushes down towards the ground. Stay in this position for a moment, then change sides.

(4) Look Back to Treat Five Strains and Seven Impairments (五勞七傷往後瞧)

Open both hands out to the side, and while doing so, turn the head and neck to one side. Note that the torso must stay centered and facing forward while the head and gaze are turned towards the back. Stay in this position for a moment, then turn the head and neck back to face forward. Repeat on the opposite side.

(5) Sway Head and Buttocks to Expel Heart-Fire (搖頭擺尾去心火)

Broaden the stance so that the feet are further than shoulder-width apart. Let both hands rest lightly on the thigh for balance. Then, using the upper body, make a circular movement from right to left. When the body reaches the left side, the right leg will be straight and the left leg will be bent. Return to a neutral position, then change sides. The

degree of circular movement can be adjusted depending on the individual's ability and flexibility.

(6) Pull Toes with Both Hands to Reinforce Kidney and Waist (兩手攀足固腎腰)

Reach both hands to the sky, then slowly lower them, making contact with the body and applying pressure to massage the back, the waist, and the back of the thigh. Continue down to the feet. When the hands touch the feet, look forward and straighten both hands to the front. Slowly draw the body upwards and stand up straight. Throughout this process, keep the legs straight. It does not matter if the feet cannot be touched. Try to reach down as far as possible.

(7) Clench Fists and Look with Eyes Wide Open to Build Up Strength and Stamina (攢拳怒目增氣力)

Make both hands into fists and place them on either side of the waist. Slowly extend one fist outward into a punch, ensuring that the gaze follows the fist constantly. Stay in this position for a moment, then return the fist to the side of the waist and change sides.

(8) Rise and Fall on Tiptoes to Dispel All Diseases (背後七顛百病消)

Place the feet close together. Rise onto tiptoes, lifting the heels. Hold this position for a moment, then let the heels drop slowly to the ground.

When participants practiced Baduanjin in this study, both the mind and body were adjusted to reach a soothing state. Breathing, physical postures, relaxation, and

meditation were also practiced during the intervention. Two Baduanjin teachers were responsible for leading the intervention. The intervention was delivered in a group format, and there were 12 participants per class. All qigong instructors had backgrounds in psychology and had experience in leading group activities. They were trained by a certified Traditional Chinese Medicine (TCM) practitioner, who was an expert in health qigong recognized by the General Administration of Sport in China, and they were required to pass a certification examination before delivering health qigong intervention. Throughout the practice, the qigong instructors used positive words and phrases such as "you are doing a great job", "great posture" and "well done" to encourage the participants. Along with advice on technique, this helped participants to practice the qigong protocol accurately, with good postures and movements, while maintaining a relaxed state of mind and rhythmic breathing. A training protocol was provided for qigong instructors in order to reduce discrepancies between instructors. The protocol is presented in Appendix 1.

In this study, Baduanjin was used as the main component of the intervention. Additionally, during the first 5 minutes of the intervention, participants practiced diaphragmatic breathing, which forms the foundation of all qigong techniques. Practicing this element at the beginning helped participants to integrate it correctly into the subsequent Baduanjin practice. Second, the participants completed some simple stretching exercises to warm up their musculoskeletal systems. Third, participants performed qigong for 30 minutes. Finally, the last 5 minutes were used for resting and for the practice of visualization techniques, both of which worked to support the mindfulness element of qigong. In the first 3 sessions, the participants learned 2-3 movements during each session. This meant that by the 4th session, the participants should have learned all

the Baduanjin movements and were able to perform the full set. After this time, two to three cycles of B were performed in each session, with guided practice on mindfulness and rhythmic breathing at the beginning of the session, and short breaks between successive cycles. A simple fidelity checklist was regularly used to assess the performance of each instructor. It included items on the overall style of performing each posture and the technical precision of each posture.

Control

Participants who were allocated to the control group continued their usual routine at school (G. Zheng et al., 2019).

3.4 Assessments

Demographics

Data were collected on participants' age, ethnicity, years of studying Chinese, first language, and their own perceived ability level in the Chinese language. All of the above were self-reported. A set of assessment forms is attached in Appendix 2.

Primary Outcome Measure – Foreign Language Classroom Anxiety Scale (FLCAS)

A 33-item self-reported scale was used to measure the anxiety level of students when they were learning a foreign language. This scale consisted of three subscales: communication apprehension, test anxiety, and fear of negative evaluation. Participants provided their answers on a five-point Likert scale ranging from 'strongly disagree' (1) to 'strongly agree' (5). Higher scores indicate a higher level of anxiety. The scale generated

possible total scores ranging from 33 to 165. Scores between 33 and 98 indicated a low level of anxiety, and scores of 99 or above indicated a moderate or high level of anxiety (Bouddage & Elfatihi, 2018). The Chinese version of FLCAS has been validated with a high internal consistency of 0.908 (Kong, 2017).

Mediating variables

Saliva cortisol level

The passive drool method was used to collect saliva samples. One study suggested that this method provides more stable readings of saliva compared with other methods, as it collects loose saliva which has been produced by different areas of the mouth (Dimolareva et al., 2018). Saliva collection aids were distributed to participants to ensure smooth collection. Saliva was collected twice, once in the morning immediately after the children arrived at school, and once in the afternoon between 2 pm and 4 pm. To ensure that the samples were collected at the times that the researchers intended, the collection times were scheduled within school hours. Each sample contained 0.5ml of saliva. Samples were then transported to the Basic Science Research in the Rehabilitation Laboratory at the Department of Rehabilitation Sciences of The Hong Kong Polytechnic University, and stored in a freezer at a temperature of -80°C until all samples were ready for analysis. The enzyme-linked immunosorbent assay (ELISA) was used to analyze the cortisol level. Salivary cortisol analyses were performed in duplicate through a high-sensitivity salivary cortisol enzyme immunoassay (Salimetrics LLC, USA). A high cortisol level indicated a high level of anxiety, and vice versa.

Blood pressure and heart rate

An automatic blood-pressure meter was used to measure participants' blood pressure and heart rate. Measurements were taken from the left arm while the participant was in a sitting position. Both systolic blood pressure and diastolic blood pressure were recorded.

Heart-rate variability

A CheckMyHeart handheld HRV device produced by DailyCare BioMedical Inc., Taiwan was used to record the heart-rate variability of the participants (S.-R. Chen, Tseng, Kuo, & Chang, 2016; Chuang et al., 2018). It is a portable device used to record electrocardiogram (ECG) signals. Before conducting the measurements, participants were asked to sit in a relaxed position. One sensor was placed on the radial area of the left forearm, while the other was placed on the right forearm. Participants were asked to remain still to ensure that the recordings were of high quality. Each recording took 5 minutes. A total of 6 recordings could be stored in the device. After the recordings were taken, the data was transferred to the computer program which came with the device. At this stage, data analysis could be performed. This study used the SDNN and RMSSD of the time-domain analysis as the parameters of HRV. SDNN refers to the standard deviation of the normal-to-normal (NN) intervals. The SDNN reflected the overall HRV

activity index within the time domain. It revealed the overall intensity of the autonomic nervous activity of the participants. RMSSD, the square root of the mean squared differences of successive NN intervals, was an indicator used to estimate the short-term components of HRV. It reflected the beat-to-beat variance in heart rate, which is mainly controlled by the autonomic nervous system. Higher levels of anxiety were associated with lower SDNN and lower RMSDD.

Secondary outcome variable

Chinese academic scores

Test and examination scores that directly reflected performances in reading, writing, listening, and speaking abilities in the Chinese language were obtained from the school.

3.5 Procedure

Since the participants of this study were children, information sheets and consent forms were distributed to their parents. After the signed consent forms had been returned, participants interested in the study were screened using the inclusion and exclusion

criteria mentioned in Section 3.2. Eligible participants were each assigned a subject code prior to randomization. Participants were then randomly assigned to either the qigong group or the control group using the random-number generator in SPSS. To prevent bias, this process was performed by a researcher who was not involved in this study. Simple randomization was used so that every school had an intervention and a control group.

For the intervention group, a 10-week qigong program was implemented. All participants were asked to fill in questionnaires at baseline, at the end of the 10-week program, and 1 month after the program. Compensation was given to participants to reward them for participating in this project. Researchers who conducted the assessments were blinded to the group allocation (Figure 12).

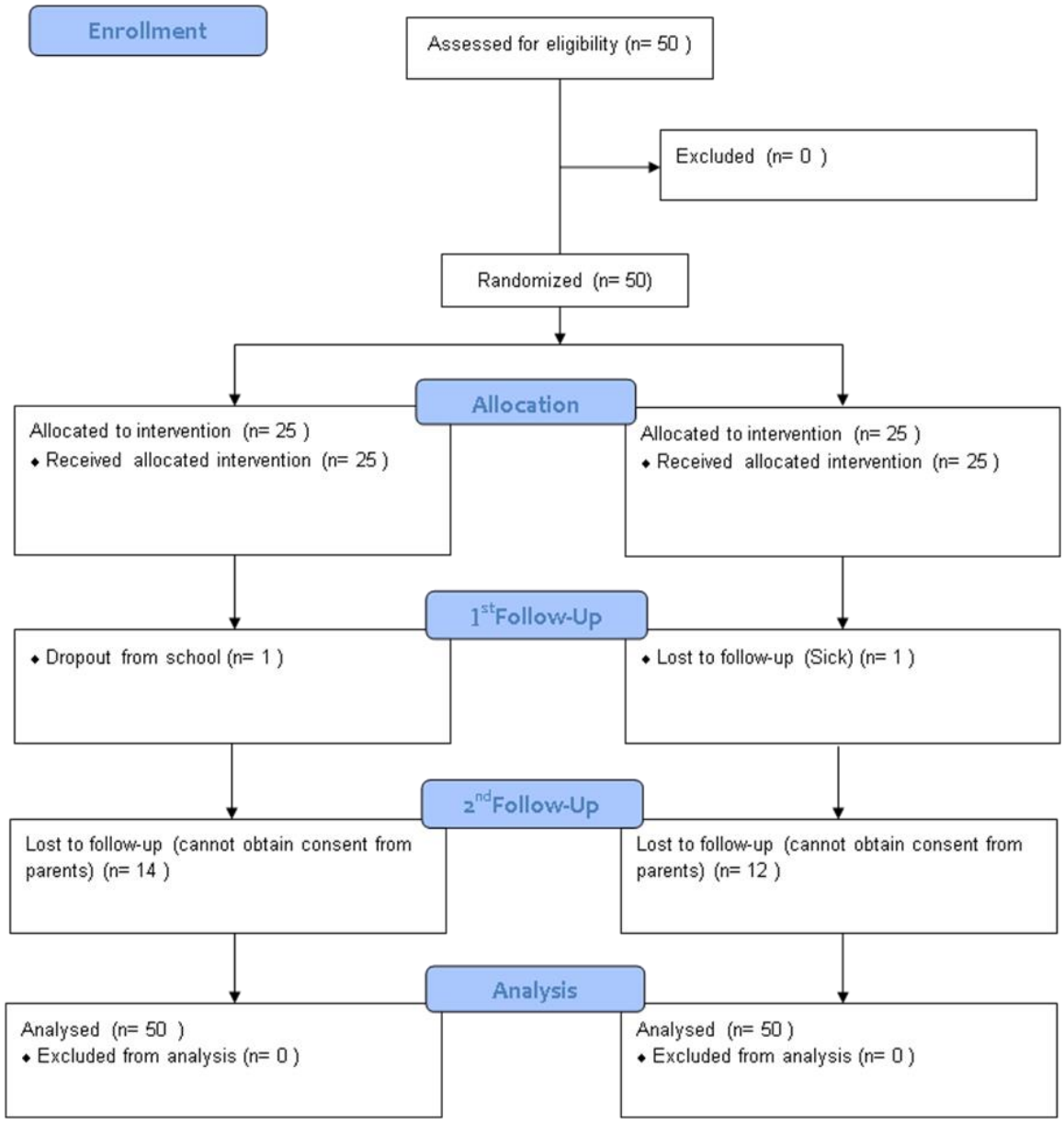

Figure 12. Subject recruitment and group allocation

3.6 Data Analysis

All data were analyzed using the SPSS software (version 26). Descriptive statistics were used to report means and frequencies for each of the measurements assessed. There was a deliberate intention to approach the analysis with the last observation carried forward method so that all participants who enrolled and were randomized were included in the analysis even if they subsequently dropped out of the program. Baseline calculations were performed separately for the intervention group and the control group to investigate if there were any baseline differences between the groups. An independent sample t-test was used for this purpose. P-values of < 0.05 were assumed to indicate statistical significance throughout the analysis.

For Hypothesis 1, an independent sample one-tailed t-test was used to detect whether there were significant differences between the intervention and control group for each neurological measure. A two-way repeated-measures ANOVA was used to evaluate the effect of the qigong intervention on each neurological measure at each of the three specified time points. A post-hoc pairwise comparison was used to detect differences between any two time-points for each group.

For Hypothesis 2, an independent sample t-test was used to detect whether there were significant differences in foreign-language anxiety and academic achievement between the two groups. A two-way repeated-measures ANOVA was used to observe the effect of the qigong intervention on foreign-language anxiety and academic achievement at each of the three specified time points. A post-hoc pairwise comparison was used to detect differences between any two time-points for each group.

For both Hypotheses 1 and 2, if baseline differences were detected in the outcome variables, then a two-way repeated-measures ANCOVA was used instead. All of the outcome measures which displayed differences between the two groups were used as covariates.

Since paired t-tests for the intervention and the control group were conducted simultaneously on the data relating to Chinese academic performance, cortisol levels, and heart-rate variability, the Bonferroni correction of *p*-values (0.05/2 = 0.025) was used to indicate the threshold for statistical significance.

3.7 Data-handling and record-keeping

All assessment forms containing participants' personal information were locked in secure cabinets. Meanwhile, electronic data were stored in a secured USB drive with restricted access. Only the principal investigator and the co-investigators had access to the data.

Chapter 4: Results

A total of 50 students from primary 4 to primary 6 participated in the study. The mean age was 10 years. Ethnicity of the participants included Indian, Indonesian, Nepalese, Pakistani. 9 of the participants indicated themselves as mixed and 5 of them indicated that they belonged to other ethnicities. 25 were randomized into the qigong intervention and 25 were randomized into the control group. One student dropped out from the primary school and was unable to continue to participate in this research. His data was imputed using the last observation carried forward approach. A 92% attendance rate was achieved for the qigong intervention group.

4.1 Between-group baseline comparisons

Table 5 summarizes group differences on demographics and baseline outcome measures. There was no significant difference between the qigong group and the control group on the age years of learning Chinese, gender, grade, father's education, and mother's education. However, a significant difference on ethnicity was identified, which was considered as a covariate in the following assessments. Independent t-test results on the outcome measures shows that there were no significant between group differences for all outcome measures.

Table 5

Demographics, Outcome Measures at Baseline

			Group			
		Sample	**Qigong (*n*=25)**	**Control (*n*=25)**	**t-test**	**Signif.**
		n	**Mean (SD)**	**Mean (SD)**	**(df=48)**	**(2-tailed)**
Age		50	10.44 (0.96)	10.04 (1.04)	1.55	0.13
Years of learning Chinese		50	5.63 (2.52)	6.20 (2.14)	-0.86	0.39
			n	***n***	**Pearson chi-square**	**Signif.**
Gender	Female	21	11	10	0.08	0.77
	Male	29	14	15		
Grade	4	15	7	8	0.13	0.94
	5	17	9	8		
	6	18	9	9		
Ethnicity	Indian	2	0	2	13.22	0.02
	Indonesian	2	1	1		
	Nepalese	3	2	1		
	Pakistani	29	11	18		
	Mixed	9	9	0		
	Others	5	2	3		
			Mean (SD)	**Mean (SD)**	**t-test**	**Signif.**
		50	**(*n*=25)**	**(*n*=25)**		**(2-tailed)**
Foreign language classroom anxiety scale		50	92.16 (14.41)	93.72 (16.67)	-0.35	0.73
Chinese academic result		49	41.00 (22.63)	50.24 (25.41)	-1.34	0.19
Blood pressure-Systolic		50	105.12 (11.72)	107.64 (10.13)	-0.81	0.42
Blood pressure-Diastolic		50	71.20 (12.40)	72.64 (11.95)	-0.42	0.68
Heart rate		50	84.92 (12.05)	82.80 (12.56)	0.61	0.55
Cortisol (AM)		50	0.42 (0.45)	0.43 (0.34)	-1.10	0.28
Cortisol (PM)		50	0.41 (0.55)	0.41 (0.47)	-0.13	0.90
Heart rate variability-SDNN		47	54.24	63.60	-0.98	0.34

		(16.20)	(42.93)		
Heart rate variability-RMSSD	47	47.78 (17.79)	40.45 (18.50)	1.33	0.19

4.2 Between-group post-intervention comparisons

Unfortunately, due to the outbreak of COVID-19, all schools were closed after the post-assessment of this project. Follow-up assessments were collected 6 months after post-assessments which was originally planned to be collected after 1 month of post-assessment.

Primary outcome measures

There was no statistically significant main effect of time [$F(1, 48) = 1.16$, $p = 0.30$] and group [$F(1, 48) = 0.54$, $p = 0.47$] for foreign language anxiety. Also, no interaction effect was found on foreign language anxiety [$F(1, 48) = 0.82$, $p = .40$].

Mediating outcome measures

There was no statistically significant main effect of time [$F(1, 48) = 0.18$, $p = 0.81$], group [$F(1, 48) = 1.18$, $p = 0.28$], and interaction effect [$F(1, 48) = 0.33$, $p = .72$] for systolic blood pressure. Also, no statistically significant main effect of time [$F(1, 48) = 0.52$, $p = 0.60$], group [$F(1, 48) = 0.01$, $p = 0.91$], and interaction effect [$F(1, 48) = 0.31$, $p = .74$] for diastolic blood pressure. In addition, no statistically significant main effect of time [$F(1, 48) = 0.06$, $p = 0.91$], group [$F(1, 48) = 0.12$, $p = 0.73$], and interaction effect [$F(1, 48) = 0.31$, $p = .69$] for heart rate.

Independent sample t-test was used to examine between group differences for salivary cortisol level and heart rate variability since they were collected twice only due to the outbreak of COVID-19. There was no statistically significant improvement on salivary cortisol in the morning $t(48) = 1.11$, $p = .27$. , however a trend of lower cortisol level in the afternoon $t(48) = -1.92$, $p = .06$ for the qigong intervention group was observed compare to the control group. In addition, no statistically significant differences of SDNN $t(46) = 0.14$, $p = 0.89$. and RMSSD $t(46) = 082$, $p = 0.41$. could be identified between qigong and control group.

Secondary outcome measures

There were no between group differences at post-assessment, $t(47) = -1.13$, $p = .26$.

Table 6

Comparisons of Post-assessment between Qigong Group and Control Group

	Mean (SD)			
Outcome measures	Qigong	Control	t-test	*p*
Chinese academic results	43.42 (21.89)	50.68 (23.04)	-1.13	0.26
Cortisol-AM	0.39 (0.05)	0.37 (0.06)	1.11	0.27
Cortisol-PM	0.38 (0.06)	0.41 (0.05)	-1.92	0.06
HRV-SDNN	52.11 (19.10)	51.35 (18.81)	0.14	0.89
HRV-RMSSD	42.69 (20.64)	40.33 (19.54)	0.41	0.69

Table 7

Comparison of Outcome Measures between Qigong and Control Group at Baseline, Post and Follow-up Assessments

	Mean (SD)			Effect					
				Group		Time		Group x time	
	Qigong	Control	*p*	*F*	*p*	*F*	*p*	*F*	*p*
Foreign language classroom anxiety scale									
Pre-assessment	92.16 (14.41)	93.72 (16.67)	0.73						
Post-assessment	92.80 (17.54)	96.72 (27.67)	0.55	0.54	0.47	1.16	0.30	0.82	0.40
Follow-up	93.20 (16.61)	100.08 (26.06)	0.27						
Blood pressure-Systolic									
Pre-assessment	106.92 (15.63)	107.64 (10.13)	0.85						
Post-assessment	103.32 (14.72)	106.88 (8.91)	0.31	1.18	0.28	0.18	0.81	0.33	0.72
Follow-up	106.52 (14.22)	110.60 (11.54)	0.27						
Blood pressure-Diastolic									
Pre-assessment	71.20 (12.40)	72.64 (11.95)	0.68						
Post-assessment	71.84 (12.93)	71.56 (10.25)	0.93	0.00	0.96	0.54	0.57	0.38	0.66
Follow-up	72.76 (12.54)	71.52 (9.95)	0.70						
Heart rate									
Pre-assessment	84.92 (12.05)	82.80 (12.56)	0.55						
Post-assessment	85.04 (15.96)	84.40 (11.94)	0.87	0.12	0.73	0.06	0.91	0.31	0.69
Follow-up	81.36 (14.84)	82.76 (14.52)	0.74						

4.3 Within group comparisons of pre, post measures

Due to the effect of the pandemic, participants' Chinese academic result, cortisol level, and heart rate variability were only collected for 2 time points. Thus, within group comparison using paired t test was conducted. A significant within group differences was identified for both groups in the morning cortisol level. For the afternoon cortisol level, significant within group difference was also identified for the qigong intervention group $t(24) = 2.77$, $p = .01$., while no significant differences was found in the control group. There were no significant differences in the pretest and posttest scores for the Chinese academic results for both groups. Two outcome indicators of heart rate variability, SDNN and RMSSD showed no significant within group differences.

Table 8

Within Group Pre-post Comparisons

	Paired differences					
			95% CI of the difference			
	Mean	SD	Lower	Upper	t	Sig.
Chinese academic result						
Qigong	-2.42	9.46	-6.41	1.58	-1.25	0.22
Control	-0.44	8.65	-4.01	3.13	-0.25	0.80
Cortisol (AM)						
Qigong	0.27	0.61	0.00	0.05	2.24	0.03
Control	0.58	0.54	0.35	0.80	5.37	0.00
Cortisol (PM)						
Qigong	0.29	0.52	0.01	0.05	2.77	0.01
Control	0.00	0.01	-0.00	.0.01	1.00	0.33
HRV-SDNN						
Qigong	2.16	19.74	-6.18	10.50	0.54	0.60
Control	12.24	40.55	-5.29	29.78	1.45	0.16
HRV-RMSSD						
Qigong	5.41	25.22	-5.24	16.06	1.05	0.30
Control	0.42	21.50	-8.88	9.72	0.94	0.93

Chapter 5: Discussion and Implications

5.1 Discussion

This study aims to investigate the effectiveness of qigong in reducing foreign-language anxiety among NCS students. In addition, it seeks to investigate the mechanisms of qigong in reducing foreign-language anxiety. To provide better support to NCS students in Hong Kong, the development of a stress-management approach for reducing foreign-language anxiety is necessary. The benefits of qigong in improving mental health and reducing anxiety have been supported by prior research. Further research is needed to investigate the effect of qigong on different populations and different types of anxiety, especially in school settings, where empirical evidence is scarce. To our knowledge, this is the first study that has applied qigong in an educational context to reduce foreign-language anxiety. This has also been the first study to use Baduanjin on a population consisting of children.

5.1.1 The effect of qigong on foreign-language anxiety

The results of the study suggest that qigong did not produce direct beneficial effects on foreign-language anxiety. In addition, participants' Chinese academic results did not improve after practicing Baduanjin, the chosen form of qigong. However, a deeper analysis suggests that this does not rule out the possibility that qigong has other positive outcomes in terms of managing foreign-language anxiety.

As mentioned in the earlier chapters, no previous research has ever attempted the use of qigong to reduce foreign-language anxiety. Nevertheless, a recent study used mindfulness meditation, which involves body scans, awareness of senses, working with

thoughts, etc., to help university students reduce foreign-language anxiety (Morgan & Katz, 2021). In alignment with our study, this research showed that practicing meditation was not effective at reducing foreign-language anxiety. It did, however, report an observed increase in mindfulness. Significantly, this study demonstrated that qigong changes learners' perspectives towards foreign-language anxiety. The participants became more aware of their emotional responses, particularly when experiencing anxiety or stress in a foreign-language learning environment. In addition, some participants acquired skills in meditation and became more mindful in general. However, they reported that they did not apply those skills in foreign-language learning, explaining why the levels of foreign-language anxiety were not reduced. A possible reason that these skills were not applied to foreign-language learning is that participants did not have enough time to learn how to apply their new skills to challenging life situations, particularly given the short-term nature of the training: in the study, 5-minute mindfulness meditation was practiced three times a week for 13 weeks. A short session duration and short intervention program may not provide sufficient time for participants to develop a habit of employing mindfulness and being relaxed in stressful circumstances. A longer period is required for participants to incorporate this habit into their daily lives and successfully apply it in stressful situations. The same problem was present in our study. The intervention in this study was also short-term: it lasted for only 10 weeks. A non-significant effect on foreign-language anxiety was observed, aligning with the results of Morgan and Katz's study. However, previous research has shown that long-term meditation practitioners who have practiced for three years or above can recover from stress quickly (Gamaiunova, Brandt, Bondolfi, & Kliegel, 2019). A similar mechanism is

expected to occur in qigong practitioners, as both qigong and meditation involve mindfulness elements. This provides further evidence that our non-significant short-term effect does not rule out the possibility that a longer period of practice among the participants of this study may cause a significant reduction in their foreign-language anxiety. Of course, further empirical evidence has yet to be collected.

In addition, it should be noted that in this study, the participants' level of foreign-language anxiety ranged from mild to moderate. Individuals with these lower anxiety levels may benefit less from qigong compared with those who have a high level of foreign-language anxiety. The research conducted by Morgan and Katz (2021) showed that participants who have a high level of foreign-language anxiety at baseline tend to exhibit a more remarkable decrease in anxiety after practicing mindful meditation than those who start with a low level of foreign-language anxiety. This may explain why the effect of qigong on reducing foreign-language anxiety was not significant in our study. In our study, participants' foreign-language anxiety total scores ranged from 70 to 133. Only 13 out of 50 participants had a score over 99, which indicated a moderate to high level of foreign-language anxiety. Previous research suggests that foreign-language anxiety is a powerful predictor of foreign-language achievement (Tuncer & Doğan, 2015). As a result, it is reasonable that this study did not find improvement in foreign-language academic achievement, since foreign-language anxiety level was not reduced.

Another study, conducted by Fallah (2017), suggested that mindfulness is negatively correlated with foreign-language anxiety through a mediator variable. They argued that mindfulness can lead to better emotion regulation, which may facilitate a reduction in the level of foreign-language anxiety. If foreign-language learners become

more skilled at mindfulness, they may develop better concentration and become more focused when learning a foreign language. Additionally, they may not be as preoccupied with their mistakes as they were previously, which may lead to a decrease in test anxiety and communication apprehension. Employing mindfulness can help learners calm their thoughts when they encounter foreign-language anxiety. Although this study made use of an intervention containing mindfulness elements, it remains unknown whether the participants acquired substantial mindfulness skills after the intervention. Individual differences may play an important role in this context, for example differences in the degree of trait mindfulness. The degree to which mindfulness skills are retained in the long term after completing a qigong intervention program may also contribute to its effect on foreign-language anxiety. However, conclusions cannot be drawn from the available evidence, since this study involves participants who are much younger than the participants in the previous research mentioned above, meaning that it is difficult to make comparisons.

Although no study has yet been conducted on the use of mindfulness interventions to reduce foreign-language anxiety in children, some studies have been conducted to examine the effectiveness of mindfulness-based interventions on more general forms of anxiety in children and adolescents. A meta-analytical study showed that mindfulness-based interventions had no significant effect on anxiety in children and adolescents (Ruiz-Íñiguez, Santed Germán, Burgos-Julián, Díaz-Silveira, & Carralero Montero, 2020). This may be due to the heterogeneity of the mindfulness-based interventions used in different studies. The authors of the meta-analysis identified five different types of mindfulness-based intervention used in the studies they were reviewing. Furthermore,

many of the studies involved an active control group, making it difficult to assess the relative benefits of the mindfulness-based intervention applied to the experimental group. For example, Liehr and Diaz (2010) used a control group who were receiving a treatment based on health education, and observed a decrease in anxiety level in both the mindfulness-based intervention group and the control group. Although between-group differences cannot be identified, it can still be concluded that mindfulness-based intervention is effective in reducing anxiety. The meta-analysis also identified mindfulness-based cognitive therapy, mindfulness-based stress reduction, and mindfulness meditation as popular mindfulness interventions that are frequently adopted by researchers. However, there is currently a lack of evidence on the effect of mindfulness exercises such as qigong, yoga, and Tai Chi in relation to children. Even though the results of this study appear to align with the result of the meta-analysis, it is too early to conclude whether mindful exercise is effective in children, since this is the only study evaluating the effect of qigong on anxiety in a child population.

In summary, this study cannot provide evidence that qigong helps reduce foreign-language anxiety. Whether foreign-language learners can learn to apply mindfulness skills in situations where they experience foreign-language anxiety needs to be explored further. Future studies should consider adding mindfulness as an outcome measure. Although mindfulness practice has been shown to reduce anxiety, this study did not investigate whether participants' mindfulness increased after qigong intervention. In addition, further randomized controlled trials should be conducted to examine the effect of different types of mindfulness practice (such as meditation, yoga, qigong, etc.) on foreign-language anxiety in children. If mindfulness practice can help children to cope

more effectively with foreign-language anxiety, it may consequently improve their foreign-language achievement. Finally, future studies should also investigate the effect of qigong on participants with a moderate to high level of foreign-language anxiety compared with those who suffer from a mild level of anxiety.

5.1.2 Endocrine and physiological outcome measures and their relationship with qigong

This study reported a marginally significant between-group difference in cortisol level, a biomarker of stress, where participants in the qigong group displayed a lower cortisol level than those in the control group. A study by Yoo et al. (2016) examined the cortisol levels of elementary school students and reported similar results. Cortisol levels were measured in the afternoon after mind subtraction meditation, and lower levels were recorded compared with the control group. Within-group comparisons showed that the afternoon cortisol level had reduced significantly from the morning level for the qigong group but not for the control group. This result is in line with previous research on adults, where the cortisol level was reduced after qigong intervention compared to baseline but there was no significant difference in the control group (Chan et al., 2013; Marshall, McClanahan, Warren, Rogers, & Ballmann, 2020). During stressful situations, the hypothalamus becomes more active and secretes the adrenocorticotropic hormone (ACTH), which further stimulates the adrenal cortex to produce cortisol. At the same time, the sympathetic nervous system is activated, which prepares the body for a fight-or-flight response. The fact that practicing qigong reduces cortisol levels provides some evidence that it can activate the parasympathetic nervous system and therefore lead to a more relaxed state in the body. This reaction mechanism is also supported by an article published by X. Chen et al. (2019). This result provides further evidence to support one

of the pathways proposed by So, Cai, Yau, and Tsang (2019), who suggest that qigong can regulate the HPA axis and decrease cortisol levels. Tsang and Fung (2008) proposed a similar neuroendocrine pathway to explain the mechanism of qigong, and further suggested that qigong could regulate the hypothalamus through the amygdala. This hypothesis has recently been supported by neuroimaging studies that demonstrate that intervention with mindfulness elements, for example mindful breathing, leads to decreased activation of the amygdala (Doll et al., 2016; Froeliger, Garland, Modlin, & McClernon, 2012). The findings of our study provide additional evidence that this HPA pathway can be used to explain the mechanism of qigong's effects on anxiety regulation.

Blood pressure, heart rate, and heart-rate variability are indicators of the body's stress response. Our study used these parameters to understand the effect of qigong on our physiological responses. Unfortunately, no significant differences were measured in blood pressure, heart rate, and heart-rate variability after practicing qigong. Regarding blood pressure and heart rate, previous studies have provided mixed evidence. Y. W. Y. Chow et al. (2012) observed significantly lower systolic and diastolic blood pressure after a 12-week qigong intervention but found no significant differences in heart rate. Another study identified a significant decrease in heart rate but not in blood pressure after qigong intervention (Skoglund & Jansson, 2006). Existing evidence suggests that to produce a reduction in heart rate and blood pressure, longer-term practice of qigong is required. The review conducted by Zou et al. (2017) suggested that practicing qigong 3 times per week for a minimum of 12 weeks may produce beneficial effects on blood pressure and heart rate. The session duration and program length of the qigong intervention in this study may therefore have been insufficient to result in such physiological changes in the

participants. The review suggested that Baduanjin is likely to affect both systolic and diastolic blood pressure for populations of young adults, mixed-age adults, and older adults. Since no previous study has investigated the use of Baduanjin for young children, the results of our study can act as a reference for future researchers.

Regarding heart-rate variability, a previous study with a sample size similar to that of this study did not observe a difference in heart-rate variability after qigong intervention (Yi et al., 2021). Our study's results were consistent with this finding. Currently, the relationship between qigong and heart-rate variability is inconclusive. While some studies have adopted time-domain analysis to examine the effect of qigong on heart-rate variability, some have adopted frequency-domain analysis. There is still disagreement concerning which of these approaches is more suitable for measuring the relationship between heart-rate variability measurement and anxiety. A study by M.-Y. Chang (2015) which provides evidence that qigong practice improves heart-rate variability involved a more intensive qigong training program consisting of three sessions per week. Another study that found significant differences in heart-rate variability involved experienced qigong practitioners as participants (Goldbeck et al., 2021). The lower heart-rate variability observed in these qigong practitioners provided evidence that they achieved calmness, which further indicated a decrease in parasympathetic modulation and an activation of the autonomic nervous system. This may imply that regular practice of qigong improves the regulation of emotion, including the emotions which contribute to depression and anxiety. Our study may have been too short for the participants in this study to experience the benefits of physiological changes; they only practiced qigong for 10 weeks.

To summarize, this study provides evidence that qigong affects the HPA axis. It is proposed that qigong can improve participants' relaxation skills and regulation of emotion. When participants encounter a stressful event, their experience of practicing qigong may help prevent hyper-activation of the HPA axis. Although qigong may be able to regulate the HPA axis, an idea supported by the observation of lower cortisol levels after qigong intervention, this study does not provide evidence that qigong can regulate the physiological responses of stress. Previous research using qigong as an intervention has yielded similar findings, where it has been shown that qigong can alter cortisol levels but not physiological responses such as blood pressure and heart rate (C. Chang, Tsai, & Hsieh, 2013). This suggests that short-term qigong training can activate changes to the HPA axis but not to the autonomic nervous system. Further research is required in order to understand the physiological mechanism that causes this. Since the neuroendocrine and autonomic nervous systems are closely related, it is important to identify why qigong only affects cortisol levels and not blood pressure or heart rate. Specifically, if qigong can activate the parasympathetic nervous system, then blood pressure and heart rate should decrease, as would be expected if the body is trained to adopt a more relaxed state. Another possible explanation is simply that the baseline blood pressure and heart rate of this group of participants already fall within a normal range. Therefore, practicing qigong may indeed activate the parasympathetic nervous system and help participants to stabilize their physiological responses; it is possible that a significant effect would only be observed in participants who exhibited elevated blood pressure and heart rate at baseline.

A final interesting finding is that although a reduction was observed in cortisol levels, no significant improvements were noted on the self-reported anxiety scales. One

possible explanation is that people's subjective perceptions may be different from their actual physical reactions (Ellis & Simons, 2005). In this study, participants may have believed that they were still anxious when learning a foreign language after the intervention even though they were objectively in a much more relaxed state, as shown by the decrease in cortisol levels. Moreover, participants' subjective feelings of anxiety may need a longer time to adjust compared to their physical responses, especially given that the target population of this study is children who may be less emotionally mature.

5.2 Implications of the study

5.2.1 Research

Many studies have been conducted to investigate the effectiveness of qigong at reducing anxiety symptoms. The present study specifically focuses on foreign-language anxiety among students. Most existing research focuses on improving foreign-language achievement by providing more support on language skills; there is limited research that attempts to alleviate foreign-language anxiety. There is only one other study that evaluates the effect of mindfulness intervention on foreign-language anxiety (Morgan & Katz, 2021). Our study is the first attempt to test the effectiveness of qigong at reducing foreign-language anxiety in children. Although the result is inconclusive, this study has provided a novel research direction for researchers. The lack of evidence in this area of research means that conclusions on the effect of mindfulness exercise on foreign-language anxiety cannot be drawn, and further studies should be conducted. Since foreign-language anxiety is common during the process of language learning (Wardhani, 2019), it is critical to identify effective interventions to manage this anxiety and improve foreign language performance. This is especially important for ethnic minorities in Hong

Kong, as their proficiency in the Chinese language will affect their future career opportunities. This may be equally important to those who are living in a country where they do not speak the native language. While a large body of research evidence supports the use of mindfulness intervention in reducing anxiety symptoms in general, it will be beneficial to investigate its effect on reducing foreign-language anxiety.

A systematic review on the application of qigong for youths suggested that currently there is insufficient evidence to show that qigong is beneficial to their psychological well-being (Riskowski & Almeheyawi, 2019). This study provides one more piece of evidence that qigong can potentially benefit young people's mental health. However, more research is needed to investigate the effect of qigong on younger populations.

In addition, this study adds to existing evidence that practicing qigong can prevent hyper-activation of the HPA axis. This is demonstrated by the reduced cortisol levels of participants in the qigong group. Previous research investigating the effect of qigong on the HPA axis was mostly conducted on adults or the elderly. This study expands the existing literature by using children as the study population. It has provided evidence that qigong can reduce cortisol levels in children and may therefore relieve stress and anxiety. This research contributes evidence supporting the proposed neuroendocrine pathway of qigong suggested by previous researchers. Although this study cannot provide evidence that qigong has a positive effect on stress-related physiological responses, the results are consistent with some existing research. This may inspire further research to investigate this phenomenon and understand why qigong reduces cortisol level but does not improve blood pressure, heart rate, or heart-rate variability. New mechanism pathways may be

proposed, and researchers can test these to gain a fuller understanding of the mechanisms of qigong.

5.2.2 Rehabilitation Professionals and Clinical/Educational Practice

This study has several clinical implications. First, Baduanjin is safe for children to practice. No adverse event was reported by any participants in this study. All participants from the qigong group were able to perform a full cycle of Baduanjin, which indicates that children can learn Baduanjin successfully. They were able to memorize all the movements and perform the poses accurately. Since there have been no previous studies on the use of Baduanjin for children, this finding is important for clinicians because it provides an additional option for intervention.

Second, this study reveals that qigong has a beneficial effect on children's mental health. Children who practiced qigong had lower cortisol levels compared to the control group. Clinicians may therefore consider using qigong as an intervention for children who display anxiety symptoms. In addition, children face considerable stress at primary school for several reasons, including the expectation to build relationships and the frequency of assignments and tests. Health professionals can initiate more school-based qigong programs to relieve students' stress and anxiety. This may raise students' interest in practicing qigong, which will encourage them to build up a habit of practicing regularly and will potentially lead to long-term mental-health benefits.

Last but not least, the beneficial effects of qigong on children's mental health may lead to improved academic performance, which is an important indicator of success within the school setting. Reduction of stress levels has been previously shown to have a

positive effect on general academic performance (Lampe & Müller-Hilke, 2021). In addition, emotion plays an important role in cognitive processes. Experiencing high levels of stress may affect children's attention and memory, hindering their ability to maintain their academic performance (Vorontsova-Wenger, Ghisletta, Ababkov, & Barisnikov, 2021). Practicing mindfulness exercise is one way to reduce stress levels and also increase resilience to stress (Sarkissian, Trent, Huchting, & Singh Khalsa, 2018). As demonstrated by this study, qigong can help children to reduce their stress levels, and it is therefore very likely that it can help to maintain or even boost their academic performance.

5.3 Limitations of the study

Firstly, due to the COVID-19 pandemic, the follow-up assessment that was originally scheduled for 4 weeks after the intervention could not be conducted until 6 months after the intervention. This follow-up assessment was purposely scheduled after a short period so that the short-term effects could be identified. Unfortunately, this could not be completed because all schools were closed during this period. Future studies should conduct a follow-up assessment 1 month after the assessment to identify whether there are any effects before proceeding to longer follow-up periods. Although the follow-up assessment was eventually conducted after 6 months, many participants were unavailable as data could only be collected from 50% of the participants because some schools were closed. As a result, the data for the follow-up period provided limited information and did not necessarily reflect the effectiveness of the intervention. Furthermore, the data that was collected may not represent changes due to the intervention. For example, students attended online Chinese classes for some or all of the

period in question, which may have created less foreign language anxiety than classes conducted in person.

Secondly, the sample size was small, and all the participants were from the same primary school. Therefore, these results may not be generalizable to other NCS students in Hong Kong. Integrated education is currently promoted in Hong Kong, meaning that both NCS students and local students study at the same school. However, the proportion of ethnic minorities in each school is different, ranging from very few NCS students to 90% NCS students. In the school in this study, around 80% of the students were NCS, and the foreign language environment at this school might be different from the environment in schools with few NCS students. In schools with a high proportion of NCS students, Chinese lessons are likely to be tailored to foreign language learners. Students' foreign language anxiety levels may therefore also differ. In addition, NCS students in schools with a lower proportion of NCS students may suffer from higher anxiety levels as they are surrounded by local Chinese students who speak Chinese fluently, so they may react differently to qigong interventions. Future studies could conduct qigong interventions across multiple schools to investigate whether there is any difference in its effects between schools. Also, as mentioned in the systematic review, there may be differences between mindful and non-mindful interventions for addressing anxiety. By increasing the number of participants, three groups, including a qigong group, a non-mindful exercise group, and a control group, can be compared. In addition, due to the small sample size, path analysis or structural equation modeling could not be conducted in order to validate the theoretical model of this study. Therefore, future studies can include larger sample sizes so as to provide evidence for the proposed model.

Thirdly, the length and intensity of the intervention may not be sufficient to produce a significant effect. This study adopted a 10-week qigong intervention, with sessions being held once per week. As there may already be many other activities for children to attend, meeting once per week is common for school-based qigong classes, but this may not be sufficient for reducing children's foreign language anxiety since NCS students attend Chinese classes once per day and face the anxiety-provoking stimuli frequently. Unfortunately, it may be difficult to extend the duration of the qigong intervention far beyond 10 weeks in practice since semesters usually only last 3 to 4 months and have breaks within them. An intervention that lasts beyond one semester may result in a high drop-out rate. Additionally, it is better if qigong training occurs every week without being interrupted by mid-term breaks. As a result, a 10-week duration may still be suitable, but the frequency of sessions should be increased to twice per week to investigate if this yields any difference in results.

Fourthly, the demographic data obtained in this study are limited. Data on some of the major factors related to foreign language anxiety could not be collected and could not be controlled for in the data analysis. For example, Bijon et al. (2020) found that socioeconomic status and parental education were factors that affected foreign language anxiety in undergraduate students. Since the parents of the ethnic minority students in this study were very conservative and hard to reach, it was not possible to collect this information for this study. Future studies should make an effort to reach the parents and obtain this information in order to conduct a more comprehensive analysis. In addition, qualitative interviews can be conducted at the beginning of the study in order to obtain more information on the participants' backgrounds. In addition to the participants' basic

demographic information, students' current coping strategies for dealing with foreign language anxiety can be collected. This may contribute to developing the content for this type of intervention.

Lastly, this study only reviewed the outcomes relating to the neuroendocrine system and insufficient evidence to offer a comprehensive understanding of the effects of practicing qigong as a mindfulness exercise. Researchers have observed changes in brain structures and functions, particularly in the hippocampus, after participants practiced mindfulness exercises such as yoga (van Aalst, Ceccarini, Demyttenaere, Sunaert, & Van Laere, 2020). Since the hippocampus is involved in the neuroendocrine regulation of stress hormones, it is possible that this is one of the pathways through which qigong reduces stress. Although this study demonstrated that qigong can reduce cortisol levels, it did not use neuroimaging techniques to examine changes to the hippocampus. As a result, it is not possible to draw conclusions on the relationship between brain function and the neuroendocrine system and physiological outcomes observed.

Chapter 6: Conclusion

Ethnic minorities have been migrating to Hong Kong since the 19th century. Most of them can be described as working-class and perform low-paid jobs. Nowadays, ethnic-minority parents aspire for their children to receive higher education so that they can obtain better jobs. Unfortunately, ethnic minorities still face many challenges, particularly in learning the Chinese language. Experiencing foreign-language anxiety can have a detrimental effect on Chinese academic achievement. Currently, there is limited research on using mindfulness interventions to reduce students' foreign-language anxiety. Since qigong is one of the proven ways to reduce anxiety in adults, it is likely that it can be beneficial to children as well.

The results of this study partially support the first hypothesis, which is that qigong can reduce cortisol levels in children. Unfortunately, significant changes were not observed in other physiological outcomes. Even so, the results suggest that qigong may reduce stress and anxiety in children. Schools may wish to implement a school-based qigong program to help students relieve stress. This may also benefit students' academic performance. Furthermore, clinicians may wish to use qigong as an intervention to reduce stress in children. On the other hand, the results of this study do not support our second hypothesis. Neither foreign-language anxiety level nor foreign-language academic performance showed significant changes after the qigong intervention. Although this study has not successfully demonstrated that qigong is effective in reducing foreign-language anxiety, it provides some motivation for future studies in the field of foreign-language anxiety to further investigate qigong as a possible intervention.

Qigong is growing in popularity worldwide, and the findings of this study may apply to children not only in Hong Kong but across the globe. Practicing qigong can reduce stress, which may improve overall well-being, and promoting qigong practice would allow these benefits to be experienced by children worldwide.

Appendix A: Ethics Approval from The Hong Kong Polytechnic University

From: rohsesc@_____ <rohsesc@_____>
Sent: Monday, January 22, 2018 2:06:05 PM
To: Tsang, Hector [RS]
Cc: Man, David [RS]; Chung, Vangie [RS]; LO, Alexandra [RS]; Man, Gloria [RS]; Mok, Dennis [RS]
Subject: Application Result (HSEARS20180122001)

Dear Tsang Wing Hong Hector

Please note that the following application for human ethics approval has been approved:

Project Title: The scientific basis of qigong as mind-body intervention to reduce foreign language anxiety
Application Number: HSEARS20180122001 (Click here to view the application)
Principal Investigator: Tsang Wing Hong Hector
Department: Department of Rehabilitation Sciences
Approver / Delegate: Man Wai Kwong

Human Subjects Ethics Application Review System
(It is a system-generated message. Please do not reply to it)

c.c. Approver / Delegates

THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學
Opening Minds • Shaping the Future • 啟迪思維 • 成就未來

Appendix B: Research Project Information Sheet and Consent Form (English)

The Hong Kong Polytechnic University Department of Rehabilitation Sciences

Research Project Information Sheet

Project title: The scientific basis of qigong as mind-body intervention to reduce foreign language anxiety

Principal Investigator: Professor Hector Tsang, Professor and Head, Department of Rehabilitation Sciences,

The Hong Kong Polytechnic University

Other Investigator: Ms Wendy So, PhD Student, Department of Rehabilitation Sciences,

The Hong Kong Polytechnic University

Project information:

This study aims to evaluate the effectiveness of qigong in reducing foreign language anxiety among Non-Chinese Speaking (NCS) children and gain a deeper understanding of the neuroscience mechanism of qigong on reducing foreign language anxiety. You will be randomly assigned to a 12-weeks qigong group or waitlist control group using a random number generator. The qigong class will be held once a week and each class will last for 45 minutes.

Data Collection:

Your involvement includes providing relevant personal information through interviews and filling in questionnaires during pre, post and follow-up assessments. Follow up assessments will be conducted 4 weeks after the intervention. Neurophysiological data including blood pressure, skin conductance, saliva samples and electrical activity of the brain will also be collected at the three time points. The saliva samples will be destroyed once the data processing is completed or participants withdraw from the study. You have the rights to reject any sample collections.

Benefits:

Participants will be able to receive free qigong classes. Also, the result of the research may contribute to our knowledge of foreign language anxiety. Furthermore, to show our

appreciation for participant's effort, he/she will receive a gift upon completion of the study. Individual report and certificate will be also given to the participants after the results are released.

Risks:

There is no anticipated risk. The assessment and intervention will be conducted by qualified professionals and should not result in any undue discomfort.

Confidentiality:

All information related to you will remain confidential, and will be identifiable by codes known only to the researcher. All the data are used to serve research and educational purpose only.

Contact Person:

For any questions/concerns about the study, please contact the project's principal investigator:

Professor Hector Tsang

Department of Rehabilitation Sciences

The Hong Kong Polytechnic University

Hung Hom, Kowloon

Hong Kong

Tel: 27666750

Email: hector.tsang@_____

Thank you for your interest in participating in this study.

The Hong Kong Polytechnic University Department of Rehabilitation Sciences

Research Project Informed Consent Form

Project title: The scientific basis of qigong as mind-body intervention to reduce foreign language anxiety

Principal Investigator: Professor Hector Tsang, Department of Rehabilitation Sciences,

The Hong Kong Polytechnic University

Consent:

I, _____, have been explained the details of this study. The child, _____ voluntarily consent to participate in this study. I understand that he/she can withdraw from this study at any time without giving reasons, and his/her withdrawal will not lead to any punishment or prejudice against me. I am aware of any potential risk in joining this study. I also understand that the child personal information will not be disclosed to people who are not related to this study and his/her name or photograph will not appear on any publications resulted from this study.

I can contact the chief investigator, Prof Hector Tsang for any questions about this study. If I have complaints related to the investigator(s), I can contact Ms Vangie Chung, Secretary of the Departmental Research Committee, at 2766 4329. I know I will be given a signed copy of this consent form.

To be completed by the parent/guardian

I have read and understood the information sheet and give permission for the child (name above) to be included in the study.

Signature (parent/guardian):_____

Relationship to child:_____

Date: _____

*Please put a √ in the appropriate □.

Appendix C: Research Project Information Sheet and Consent Form (Chinese)

科研同意書香港理工大學康復治療科學系

科研題目: 氣功對減少外語焦慮的科學依據

導師: 曾永康, 教授及系主任, 康復治療科學系, 香港理工大學

科研人員: 蘇穎欣, 博士研究生, 康復治療科學系, 香港理工大學

研究內容:

本研究旨在評估氣功能否有效地減少非華語學生的外語焦慮及進一步了解它的神經科學機制。你將被隨機分配到一個為期十二週的氣功組或候補名單對照組。氣功班將每週舉行一次，每次四十五分鐘。

數據收集:

您的參與包括在前測、後測及後續評估時，通過面談及問卷提供相關個人資料。後續評估將在最後一節課堂後的第 4 週進行。神經生理學數據包括血壓，皮膚電導反應，唾液樣本及腦電波亦將在三個時間點收集。一旦完成數據處理或參加者選擇退出研究時，唾液樣本將被銷毀。參加者有權拒絕任何樣本收集。

得益:

參加者將可以免費參加氣功班。此外，研究的結果有助於我們增加對外語焦慮的認識。此外，為了答謝參與者的努力，他/她將在完成研究後獲得超市禮券。數據分析後，將會提供個人報告及證書給參加者。

風險:

這項研究沒有任何預期風險。評估及課堂將由合格的專業人員執行，不應導致任何不適。

保密:

所有與參加者有關的信息都將會保密，並且使用只有研究人員知道的代碼。所有數據僅用於研究和教育目的。

聯繫人:
有關這個研究項目的任何問題或疑慮，請聯繫項目首席研究員：

曾永康教授

康復治療科學系

香港理工大學

紅磡, 九龍

電話: 27666750

電郵: hector.tsang@

感謝您對參與本研究的興趣。

香港理工大學康復治療科學系

科研同意書

科研題目: 氣功對減少外語焦慮的科學依據

導師: 曾永康, 教授及系主任, 康復治療科學系, 香港理工大學

科研人員: 蘇穎欣, 博士研究生, 康復治療科學系, 香港理工大學

同意書:

本人, _____, 已瞭解此次研究的具體情況。本人, _____願意參加此次研究, 本人有權在任何時候、無任何原因放棄參與此次研究, 而此舉不會導致我受到任何懲罰或不公平對待。本人明白參加此研究課題的潛在危險性以及本人的資料將不會洩露給與此研究無關的人員，我的名字或相片不會出現在任何出版物上。

本人可以用電話 2766 6750 來聯繫此次研究課題負責人，曾永康教授。若本人對此研究人員有任何投訴，可以聯繫鍾小姐（部門科研委員會秘書），電話：2766 4329。本人亦明白，參與此研究課題需要本人簽署一份同意書。

由家長或監護人填寫

本人已仔細閱讀同意書並允許上術子女參與這項研究。

簽名（家長或監護人）：_____ 日期：

_____

關係:_____

*請在適當位置填上✓.

Appendix D: Assessment Form

請在適當方格內填上「✓」號。
Please tick ✓ in the correct boxes.

1 上中文課時，我沒信心講中文。
During Chinese lessons, I am not confident to speak Chinese.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

2 上中文課時，我怕錯。
During Chinese lessons, I am afraid to be wrong.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

3 老師上中文課快叫到我時，我會震。
I tremble when I am about to be called by the teacher during Chinese class.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

4 當我聽不懂中文老師在說些什麼時，我會感到害怕。
I would feel afraid if I do not understand my Chinese teacher.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

5 如果每天要上 3 節中文課，我也不怕。
I would not be afraid even if there are 3 Chinese lessons per day.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

6 上中文課時，我會想著其他的事，無法專心上課。
I would be thinking of something else and cannot concentrate during Chinese lessons.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

7 我一直認為其他同學的中文比我好。
I have been thinking my classmates are better than me in Chinese.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

8 中文測驗/考試時，我通常感到輕鬆自在。

I usually feel relaxed and easy during Chinese tests and exams.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

9 上中文課時，如果沒有準備而要我講中文，我會驚慌。
If I am asked to speak Chinese without preparation during Chinese lessons, I would be very anxious.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

10 我擔心中文不及格。
I am worried about failing Chinese.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

11 我不明白為什麼有些人討厭上中文課。
I don't understand why some people get so upset over Chinese lessons.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

12 上中文課時，我會緊張得忘記我所知道的東西。
During Chinese lessons, I get so nervous that I will forget everything I know.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

13 要我在中文課主動回答問題，我會感到不自在。
It embarrasses me to volunteer answers in Chinese lessons.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

14 我和香港人講中文會很緊張。
I get very nervous when speaking Chinese with Hong Kong people.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

15 當我不了解中文老師所說我的錯處時，我會感到煩惱。
I would be bothered when I do not understand my mistake pointed out by my Chinese teacher.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

16 即使我準備好中文課，我仍很緊張。
Although I am well-prepared, I am still nervous for Chinese lessons.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

17 我常常不想上中文課。
Very often, I do not want to have Chinese lessons.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

18 我對講中文有信心。
I am confident in speaking Chinese.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

19 我害怕中文老師會糾正我每個錯誤。
I am afraid that my Chinese teacher would correct every one of my mistake.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

20 老師上中文課快叫到我時，我覺得心跳加速。
I feel my heart beating faster when I am about to be called by the teacher during Chinese class.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

21 我愈多讀中文，我愈感到困惑。
The more I study for Chinese, the more confused I get.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

22 我能輕鬆地準備中文課。
I can get prepared for Chinese lessons easily.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

23 我總覺得其他同學的中文都講得比我好。
I always feel my classmates speak Chinese better than I do.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

24 在同學面前講中文，我覺得非常不自在。
I feel uncomfortable when speaking Chinese in front of my classmates.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

25 中文課進度太快，我會擔心落後。
I am worried to lag behind the speedy progress of Chinese lessons.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

26 我上中文課比上其他科目還要緊張不安。
I am particularly nervous and uncomfortable in Chinese lessons than other subjects.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

27 當我上中文課講中文時，我會感到緊張和困惑。
I feel nervous and puzzled when I am speaking Chinese during Chinese lessons.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

28 下一堂是中文課時，我覺得有信心並感輕鬆。
I feel confident and easy when the next lesson is Chinese class.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

29 當我聽不懂中文老師的全部說話，我會緊張。
I feel nervous when I am unable to understand the Chinese teacher completely.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

30 學中文必須學那麼多規則，我感到困難。
I feel difficult when there are too many rules in learning Chinese.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

31 我害怕講中文時，其他同學會笑我。
I am afraid that other classmates would tease me while I am speaking Chinese.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

32 在說中文的本地同學旁邊，我覺得輕鬆自在。
I feel comfortable when I am next to Chinese-speaking students.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

33 當中文老師問到那些我沒有準備好的問題時，我會感到緊張。
I would feel nervous when the Chinese teacher asks questions that I have not yet prepared.

非常同意	同意	沒有意見	不同意	非常不同意
Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
□	□	□	□	□

背景資料
Background Information

1 性別
Gender

□ 男 Male	□ 女 Female

2 生日
Birthday

_____ (Day 日) _____ (Month 月) _____ (Year 年) / _____ (Age 歲)

3 種族
Ethnicity

□ 華人 Chinese	□ 菲律賓人 Filipino	□ 印度人 Indian	□ 印尼人 Indonesian
□ 尼泊爾人 Nepalese	□ 巴基斯坦人 Pakistani	□ 混血兒 Mixed	□ 其他 Others _____

4 出生地點
Birth Place

□ 香港 Hong Kong	□ 菲律賓 The Philippines	□ 印度 India	□ 印尼 Indonesia
□ 尼泊爾 Nepal	□ 巴基斯坦 Pakistan	□ 其他 Others _____	

5 母語
First Language / Mother Language

□ 廣東話 Cantonese	□ 他加祿語 Tagalog	□ 印地語 Hindi	□ 印尼語 Indonesian
□ 尼泊爾語 Nepali	□ 烏爾都語 Urdu	□ 英語 English	□ 其他 Others _____

6 你在做這份問卷時，是讀中文版還是英文版的？(可選多於一個)
Did you read Chinese or/and English when doing this questionnaire? (can choose more than one)

中文 Chinese	英文 English
□	□

7 你明白這份問卷的所有問題嗎？
Did you understand all questions in this questionnaire?

完全明白 Yes	明白大部份問題 Understand most questions	不明白大部份問題 Do not understand most questions	完全不明白 Not at all

□ □ □ □

8 你學中文多久了？
How long have you been learning Chinese?

_____年

9 你在以下情況會用什麼語言嗎？(可選多過一項)
What language do you use in the following situations? (You can select more than one option.)

	母語 First Language	廣東話 Cantonese	英文 English	其他，請註明 Others, Please state
與父親談話 Talking with father	□	□	□	_____
與母親談話 Talking with mother	□	□	□	_____
與兄弟姊妹談話 Talking with brothers/ sisters	□	□	□	_____
與朋友談話 Talking with friends	□	□	□	_____
與同學談話 Talking with classmates	□	□	□	_____
與中文老師談話 Talking with Chinese teacher	□	□	□	_____
與其他老師談話 Talking with other teachers	□	□	□	_____
與陌生人談話（例：售貨員） Talking with strangers (e.g. Shop keepers)	□	□	□	_____

10 你覺得自己的中文**聆聽**能力如何？
How would you rate yourself in **listening Chinese**?

很好 Very Good	好 Good	普通 Fair	基本 Beginner
□	□	□	□

11 你覺得自己的中文**說話**能力如何？
How would you rate yourself in **speaking Chinese**?

很好 Very Good	好 Good	普通 Fair	基本 Beginner
□	□	□	□

12 你覺得自己的中文**閱讀**能力如何？
How would you rate yourself in **reading Chinese**?

很好 Very Good	好 Good	普通 Fair	基本 Beginner
□	□	□	□

13 你覺得自己的中文**寫作**能力如何？
How would you rate yourself in **writing Chinese**?

很好 Very Good	好 Good	普通 Fair	基本 Beginner
□	□	□	□

Appendix E: Qigong Protocol (Standing Version)

序言

各位你地好!我地係理工大學既研究人員，今日黎係教大家一個叫做 “八段錦”既健身氣功既。我地將會係十個星期過黎同大家做運動，每星一堂，每次 45 分鐘。雖然八段錦都係一種運動，但係大家唔需要勉強自己，盡量跟住做就可以。如果有咩唔舒服或者問題，可以隨時舉手話俾我知，我會過黎幫你。

Week 1

預備式

1.雙腳併攏站立，兩手自然放在身體兩側，目視前方。自然呼吸。

2.左腳向左邁步與肩同寬，兩臂內旋向兩側擺起，與髖同高，掌心向後。自然呼吸。

3.兩膝關節稍屈，膝關節不超越腳尖，兩腳平行站立；兩臂外旋，向前抱在肚前，掌心向內，指尖相對約 10cm，目視前方。自然呼吸。

功法作用：寧靜心神、調整呼吸、端正身形，做好練功前的準備。

第一式 雙手托天理三焦

哩招主要係通過伸拉改善肩頸病。咁依家會做兩次示範，然後大家跟住做啦。

1.兩臂下落，兩掌係肚前交叉，手心向上，目視前方；動作開始時配合呼氣。

2.兩腿緩慢伸直，同時兩掌提起到胸前，隨後兩臂向內旋轉向上托起，掌心向上，抬頭目視兩掌，兩手盡量伸直後目視前方，動作稍停。動作開始時配合吸氣。

3.兩腿膝關節微屈，兩臂下落，兩掌相交於肚前，掌心向上，目視前方。動作開始時配合呼氣。

第一式兩掌一上一下為一次，共做六次。

功法作用：通過兩手上舉，緩慢用力，保持伸拉，可以使身體通暢、氣血調和；通過拉伸身體組織，可以提高關節的靈活性，對治療肩部疾病、頸椎病具有良好的作用。

第二式 左右開弓似射雕

哩招可以增加手力，同時都可以改善駝背同埋肩膊問題。咁依家會做兩次示範，然後大家跟住做啦。

1.重心右移，左腳向左邁步站立，膝關節緩慢伸直，兩掌向上交叉於胸前，左掌在外，目視前方。自然呼吸。

2.右掌屈指向右拉至膊頭前，左掌成八字掌向左推出 (展現兩手手形)，與膊頭同高，同時兩腿緩慢半蹲成馬步，動作稍停，目視左前方。動作開始時配合吸氣。

3.重心右移，兩手放鬆，右手向右劃個大圓圈，與肩同高，重心繼續右移，左腳回收成並步站立，動作開始時配合呼氣。同時兩掌托於肚前，掌心向上，目視前方。自然呼吸。

右式動作與左式相同，只是左右相反，一左一右為一次，共做三次。

最後一次做完時，右腳回收成開步站立，雙腿微屈，同時兩掌下落捧於肚前，目視前方。

功法作用：能夠發展下肢肌肉力量，提高平衡和協調能力，增加前臂和手部肌肉的力量，有利於矯正駝背、肩內收等不良姿勢。

Qigong tutorial Schedule

Week 2

預備式（動作步驟同上）

第一式 雙手托天理三焦（動作步驟同上）

第二式 左右開弓似射雕（動作步驟同上）

第三式 調理脾胃須單舉

哩招主要對脾胃有良好作用。咁依家會做兩次示範，然後大家跟住做啦。

1.雙手抱於肚前，掌心向上，兩腿緩慢伸直，左掌向上提起，提到頭頂左上方，右掌緩慢下按至右髖旁，指尖向前，動作稍停。動作開始時配合吸氣。

2.兩腿緩慢微屈，左掌下落至肚前，右臂外旋，右掌向上捧於肚前，目視前方。動作開始時配合呼氣。

右式動作與左式相同，只是左右相反，一左一右為一次，共做三次。

最後一次做完時，兩腿微屈，右掌下按於右髖旁，指尖向前，目視前方。

第四式 五勞七傷往後瞧

哩招主要對肩、頸、背同埋眼睛有良好作用。咁依家會做兩次示範，然後大家跟住做啦。

1.兩腿緩慢伸直，同時兩臂伸直，指尖向下，目視前方。自然呼吸。

2.兩臂外旋，掌心向外，頭向左後轉，動作稍停，目視左斜後方。動作開始時配合吸氣。

3.兩腿緩慢微屈，同時兩臂內旋按於髖旁，指尖向前，目視前方。動作開始時配合呼氣。

右式動作與左式相同，只是左右相反，一左一右為一次，共做三次。

最後一次做完時，兩腿委屈，同時兩掌捧於肚前，目視前方。

Qigong tutorial Schedule

Week 3

預備式（動作步驟同上）

第一式 雙手托天理三焦（動作步驟同上）

第二式 左右開弓似射雕（動作步驟同上）

第三式 調理脾胃須單舉（動作步驟同上）

第四式 五勞七傷往後瞧（動作步驟同上）

第五式 搖頭擺尾去心火

哩招主要對腰、脊椎有好處。咁依家會做兩次示範，然後大家跟住做啦。

1.重心左移，右腳向右邁步站立，同時兩掌上托至頭上方，指尖相對，目視前方。動作開始時配合吸氣。

2.兩腿微屈半蹲成馬步，同時兩臂下落，兩掌浮於膝關節上方。動作開始時配合呼氣。

3.重心右移，上體向右傾斜，俯身，目視右腳面。自然呼吸。

4.重心左移，同時上體由右向左旋轉，目視右腳跟。自然呼吸。

5.重心右移成馬步，同時頭向後搖擺，上體立起，目視前方。自然呼吸。

右式動作與左式相同，只是左右相反，一左一右為一次，共做三次。

最後一次做完時，重心左移，右腳回收成開步站立，兩臂上舉，兩掌心相對，雙腿微屈，同時兩掌下按至肚前，指尖相對，目視前方。

第六式 兩手攀足固腎腰

哩招可以刺激到脊柱督胍等等穴位，從而達到固腎壯腰。咁依家會做兩次示範，然後大家跟住做啦。

1.兩腿緩慢伸直站立，同時兩臂向前、向上舉起，目視前方。動作開始時配合吸氣。

2.兩臂彎曲，兩掌下按於胸前，掌心向下，指尖相對。

3.兩臂外旋，兩掌心向上，兩掌順腋下後插至背部。動作開始時配合呼氣。

4.兩掌心向內沿脊柱方向向下按摩到臀部，隨之上身緩慢彎曲，兩手沿退後向下按摩至腳面，抬頭目視前下方，動作稍停。自然呼吸。

5.兩掌沿地面舉起至頭頂。動作開始時配合吸氣。

該式一上一下為一次，共做六次。最後一次做完時，兩腿委屈，同時兩掌向前下按至肚前，掌心向下，指尖向前，目視前方。

Qigong tutorial Schedule

Week 4

預備式（動作步驟同上）

第一式 雙手托天理三焦（動作步驟同上）

第二式 左右開弓似射雕（動作步驟同上）

第三式 調理脾胃須單舉（動作步驟同上）

第四式 五勞七傷往後瞧（動作步驟同上）

第五式 搖頭擺尾去心火（動作步驟同上）

第六式 兩手攀足固腎腰（動作步驟同上）

第七式 攥拳怒目增氣力

哩招可以增加手腳肌肉力量，肌肉更加結實。咁依家會做兩次示範，然後大家跟住做啦。

1.重心右移，左腳向左邁步，兩腿半蹲成馬步，同時，兩掌握拳在腰兩側，目視前方。自然呼吸。

2.左拳向前沖出，與肩同高，目視左拳。自然呼吸。

3.左臂內旋，左拳變掌，虎口向下，目視左掌。自然呼吸。

4.左臂外旋，肘關節微屈，同時左掌向左纏繞，等到掌心向上後握住，大拇指在內，目視左拳。自然呼吸。

5.左拳屈肘回收至腰側，目視前方。自然呼吸。

右式動作與左式相同，只是左右相反，一左一右為一次，共做三次。

最後一次做完時，重心右移，左腳回收成並步站立，兩圈變掌，垂於身體兩側，目視前方。

功法作用：使全身肌肉結實有力、氣力增加。

第八式 背後七顛百病消

哩招可以刺激脊柱間既經脈，令全身既氣血通暢。咁依家會做兩次示範，然後大家跟住做啦。

1.兩腳跟提起，頭上頂，動作稍停，目視前方。動作開始時配合吸氣。

2.兩腳跟下落，清震地面。動作開始時配合呼氣。

該式一起一落為一次，共做七次。

功法作用：顛足可以刺激脊柱督脈，可使全身臟腑經絡氣血通暢，提高人體平衡能力，解除肌肉的緊張。

收式

1.兩臂內旋向兩側擺起與髖同高，掌心向後，目視前方。自然呼吸。

2.兩臂屈肘相交於肚部，男性左手在裏，女性右手在裏。

3.兩臂垂於身體兩側。自然呼吸。

功法作用：使氣息歸原，放鬆肢體。

Qigong tutorial Schedule

Week 5-10

預備式（動作步驟同上）

第一式 雙手托天理三焦（動作步驟同上）

第二式 左右開弓似射雕（動作步驟同上）

第三式 調理脾胃須單舉（動作步驟同上）

第四式 五勞七傷往後瞧（動作步驟同上）

第五式 搖頭擺尾去心火（動作步驟同上）

第六式 兩手攀足固腎腰（動作步驟同上）

第七式 攥拳怒目增氣力（動作步驟同上）

第八式 背後七顛百病消（動作步驟同上）

收式（動作步驟同上）

Appendix F: Quality Assessment

健身氣功·八段錦 － 操練考試評分

姓 名_____ 日 期 年 月 日

整體健身氣功風格的表現 （佔總分16%）				
	2	1	0	點評
1.意念既能放鬆，又能專一集中 不緊張，把精神專注於調整身體內在各部位				
2.呼吸與動作協調，節奏要相符 順應自然規律，“莫忘莫助”，通過外在的動作來導引				
3.動作“鬆”“緊”相隨，有節奏的相間 “鬆”指動作放鬆，“緊”指於維持姿勢稍稍用力及停留				
4.注重軀幹及脊柱的姿勢與活動 脊柱的中正的調正，及屈、伸、旋、轉的運動				
5.啟動遠端末梢關節的活動 尤其是前臂、手腕及指關節				

每勢動作的準確程度 （佔總分34%）						
	4	3	2	1	0	點評
第一勢：兩手托天理三焦						
第二勢：左右開弓似射雕						
第三勢：調埋脾胃須單舉						
第四勢：五勞七傷往後瞧						
第五勢：搖頭擺尾去心火						

6.配合預備勢及收勢 注重預備勢及收勢，與功法融合一起				
7.速度及節奏 動作保持平均速度，與演示音樂和諧一致				
8.因應體能，靈活調節運動量 調節動作幅度及節奏，做到最少的不適症狀*，最大之參予				

* 例如：重心不穩、氣短、頭暈、抖動、心慌等

第六勢：兩手攀足固腎腰						
第七勢：攢拳怒目增氣力						
第八勢：背後七顛百病消						

Bonus + 2

評分標準：

整體健身氣功風格的表現 （佔總分16%）
2 - 能完全表現 1 - 部份表現 0 - 未能表現

每勢動作的準確程度 （佔總分34%）
4 - 動作熟練、暢順、連貫，掌握動作的全部要點 3 - 基本動作熟練、暢順、連貫，掌握動作的部份要 2 - 掌握基本要求（動作的起點、路線、終點和轉接，以及定式的身型、手型、步型等） 1 - 完成動作，但動作有錯誤 0 - 未能完成動作，因遺忘造成動作停頓、漏做動作

總分：_____ 評審員：_____

健身氣功·八段錦每勢動作要點及容易犯錯之處：

招 式	動作要點：	容 易 犯 錯 之 處

兩手托天理三焦	兩掌上托要舒胸展體，略有停頓，保持伸拉 兩掌下落要鬆腰沉髖，沉肩墜肘，鬆腕舒指，上體中正	兩掌上托時，抬頭不夠 繼續上舉時，鬆懈斷勁
左右開弓似射雕	八字掌側撐需沉肩墜肘，屈腕，豎指，掌心涵空 側拉之手五指要拼攏屈緊，肩臂放平	端肩，弓腰 八字腳
調埋脾胃須單舉	力在掌根，上撐下按 舒胸展體，拔長腰背	掌指方向不正，肘關節沒有曲度 上體不夠舒展
五勞七傷往後瞧	頭向上頂，肩向下沉，轉頭不轉體 旋臂，兩肩後張	上體後仰 轉頭旋臂不充分或轉頭速度太快
搖頭擺尾去心火	馬步下蹲要收髖斂臀，上體中正 搖轉時頸部與尾閭對拉伸長，速度應柔和緩慢，動作圓活連貫	搖頭時頸部僵直，或前傾過大，使整個上身隨之擺動 尾閭搖動不圓，活幅度太小。
兩手攀足固腎腰	反穿摩運要適當用力，至足背時鬆腰沉肩，兩膝挺直 向上起身時要以臂帶身	兩手向下摩運時，低頭，膝關節彎曲 向上起身時起，身在前，舉臂在後

攢拳怒目增氣力	沖拳時要擰腰順肩，力達拳面，怒目瞪眼，注視冲出之拳 拳回收時要旋腕，五指用力抓握	冲拳時上體前俯，端肩，掀肘 拳回收時，旋腕不明顯，抓握無力
背後七顛百病消	上提時腳趾要抓地，提肛收腹，百會穴上頂，略有停頓 腳跟下落時，咬牙，輕震地面	腳跟上提時，端肩 身體重心不穩

整體表現點評：_____

_____

References

Abdurahman, N. H., & Rizqi, M. A. (2020). Indonesian Students' Strategies to Cope with Foreign Language Anxiety. *TEFLIN journal, 31*(1), 1-18. doi:10.15639/teflinjournal.v31I1/1-18

Afonso, R. F., Hachul, H., Kozasa, E. H., Oliveira Dde, S., Goto, V., Rodrigues, D., . . . Leite, J. R. (2012). Yoga decreases insomnia in postmenopausal women: a randomized clinical trial. *Menopause, 19*(2), 186-193. doi:10.1097/gme.0b013e318228225f

Ahmadi, A., Arastoo, A. A., Nikbakht, M., Zahednejad, S., & Rajabpour, M. (2013). Comparison of the effect of 8 weeks aerobic and yoga training on ambulatory function, fatigue and mood status in MS patients. *Iranian Red Crescent Medical Journal, 15*(6), 449-454. doi:10.5812/ircmj.3597

Alrabai, F. (2015). The influence of teachers' anxiety-reducing strategies on learners' foreign language anxiety. *Innovation in language learning and teaching, 9*(2), 163-190. doi:10.1080/17501229.2014.890203

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders.* (5th ed.). Washington, DC.

Anacker, C., Zunszain, P. A., Carvalho, L. A., & Pariante, C. M. (2011). The glucocorticoid receptor: Pivot of depression and of antidepressant treatment? *Psychoneuroendocrinology, 36*(3), 415-425. doi:10.1016/j.psyneuen.2010.03.007

Arnaiz, P., & Pérez-Luzardo, J. (2014). Anxiety in Spanish EFL University Lessons: Causes, Responsibility Attribution and Coping. *Studia Anglica Posnaniensia, 49*(1), 57-76. doi:10.2478/stap-2014-0003

Au, B., Smith, K. J., Gariépy, G., & Schmitz, N. (2014). C-reactive protein, depressive symptoms, and risk of diabetes: Results from the English Longitudinal Study of Ageing (ELSA). *Journal of Psychosomatic Research, 77*(3), 180-186. doi:10.1016/j.jpsychores.2014.07.012

Aydin, S. (2008). An Investigation on the Language Anxiety and Fear of Negative Evaluation among Turkish EFL Learners. 421.

Bandelow, B., Reitt, M., Röver, C., Michaelis, S., Görlich, Y., & Wedekind, D. (2015). Efficacy of treatments for anxiety disorders: a meta-analysis. *International Clinical Psychopharmacology, 30*(4), 183-192. doi:10.1097/YIC.0000000000000078

Bao, X., & Jin, K. (2015). The beneficial effect of Tai Chi on self-concept in adolescents. *International Journal of Psychology, 50*(2), 101-105. doi:10.1002/ijop.12066

Barbour, A. K., Edenfield, M. T., & Blumenthal, A. J. (2007). Exercise as a Treatment for Depression and Other Psychiatric Disorders: A REVIEW. *Journal of Cardiopulmonary Rehabilitation and Prevention, 27*(6), 359-367. doi:10.1097/01.HCR.0000300262.69645.95

Baroi, Sultwana, Z., Sultana, R., Muhammad, N., & K. Saha, A. (2020). Factors Influencing Foreign Language Speaking Anxiety among Undergraduate Students. *Journal of Psychosocial Research*, *15*(2), 639–649. https://doi.org/10.32381/JPR.2020.15.02.25

Blumenthal, J. A., Emery, C. F., Madden, D. J., Schniebolk, S., Walsh-Riddle, M., George, L. K., . . . Coleman, R. E. (1991). Long-term effects of exercise on psychological functioning in older men and women. *J Gerontol, 46*(6), P352-361.

Bonura, K. B., & Tenenbaum, G. (2014). Effects of yoga on psychological health in older adults. *J Phys Act Health, 11*(7), 1334-1341. doi:10.1123/jpah.2012-0365

Bouddage, S., & Elfatihi, M. (2018). *Foreign Language Speaking Anxiety among 2nd Year Baccalaureate Students in Morocco*.

Campo, R. A., Agarwal, N., LaStayo, P. C., O'Connor, K., Pappas, L., Boucher, K. M., . . . Kinney, A. Y. (2014). Levels of fatigue and distress in senior prostate cancer survivors

enrolled in a 12-week randomized controlled trial of Qigong. *J Cancer Surviv, 8*(1), 60-69. doi:10.1007/s11764-013-0315-5

Cartwright, C., Gibson, K., Read, J., Cowan, O., & Dehar, T. (2016). Long-term antidepressant use: patient perspectives of benefits and adverse effects. *Patient preference and adherence, 10*, 1401-1407. doi:10.2147/PPA.S110632

Census and Statistics Department. (2011). *2011 Population Census Thematic report: Ethnic minorities.* Retrieved from Hong Kong

Chalmers, J. A., Quintana, D. S., Abbott, M. J. A., & Kemp, A. H. (2014). Anxiety disorders are associated with reduced heart rate variability: A meta-analysis. *Front Psychiatry, 5*, 80-80. doi:10.3389/fpsyt.2014.00080

Chan, E. S., Koh, D., Teo, Y. C., Hj Tamin, R., Lim, A., & Fredericks, S. (2013). Biochemical and psychometric evaluation of Self-Healing Qigong as a stress reduction tool among first year nursing and midwifery students. *Complement Ther Clin Pract, 19*(4), 179-183. doi:10.1016/j.ctcp.2013.08.001

Chang, C., Tsai, G., & Hsieh, C.-J. (2013). Psychological, immunological and physiological effects of a Laughing Qigong Program (LQP) on adolescents. *Complement Ther Med, 21*(6), 660-668. doi:10.1016/j.ctim.2013.09.004

Chang, M.-Y. (2015). Qigong Effects on Heart Rate Variability and Peripheral Vasomotor Responses. *West J Nurs Res, 37*(11), 1383-1403. doi:10.1177/0193945914535669

Charoensukmongkol, P. (2019). The role of mindfulness in reducing English language anxiety among Thai college students. *International journal of bilingual education and bilingualism, 22*(4), 414-427. doi:10.1080/13670050.2016.1264359

Chen, S.-R., Tseng, C.-L., Kuo, S.-Y., & Chang, Y.-K. (2016). Effects of a Physical Activity Intervention on Autonomic and Executive Functions in Obese Young Adolescents: A

Randomized Controlled Trial. *Health Psychol, 35*(10), 1120-1125. doi:10.1037/hea0000390

Chen, X., Cui, J., Li, R., Norton, R., Park, J., Kong, J., & Yeung, A. (2019). Dao Yin (a.k.a. Qigong): Origin, Development, Potential Mechanisms, and Clinical Applications. *EVID-BASED COMPL ALT, 2019*, 1-11. doi:10.1155/2019/3705120

Chen, Z., Meng, Z., Milbury, K., Bei, W., Zhang, Y., Thornton, B., . . . Cohen, L. (2013). Qigong improves quality of life in women undergoing radiotherapy for breast cancer: results of a randomized controlled trial. *Cancer, 119*(9), 1690-1698. doi:10.1002/cncr.27904

Cheung, B. M., Lo, J. L., Fong, D. Y., Chan, M. Y., Wong, S. H., Wong, V. C., . . . Karlberg, J. P. (2005). Randomised controlled trial of qigong in the treatment of mild essential hypertension. *J Hum Hypertens, 19*(9), 697-704. doi:10.1038/sj.jhh.1001884

Cheung, C., Wyman, J. F., Bronas, U., McCarthy, T., Rudser, K., & Mathiason, M. A. (2017). Managing knee osteoarthritis with yoga or aerobic/strengthening exercise programs in older adults: a pilot randomized controlled trial. *Rheumatol Int, 37*(3), 389-398. doi:10.1007/s00296-016-3620-2

Chow, W.-y. Y. (2011). *The effects of qigong on reducing stress, anxiety and enhancing body-mind wellbeing.* Dept. of Applied Social Sciences, The Hong Kong Polytechnic University, Hong Kong.

Chow, Y., & Tsang, H. (2007). Biopsychosocial effects of qigong as a mindful exercise for people with anxiety disorders : a speculative review. *13*(8), 831-840.

Chow, Y. W. Y., Dorcas, A., & Siu, A. M. H. (2012). The Effects of Qigong on Reducing Stress and Anxiety and Enhancing Body–Mind Well-being. *Mindfulness, 3*(1), 51-59. doi:10.1007/s12671-011-0080-3

Chuang, H.-W., Kao, C.-W., Lee, M.-D., & Chang, Y.-C. (2018). Effectiveness of story-centred care intervention program in older persons living in long-term care facilities: A

randomized, longitudinal study. *PLoS One, 13*(3), e0194178-e0194178. doi:10.1371/journal.pone.0194178

Cipriani, A., Furukawa, T., Salanti, G., Geddes, J., Higgins, J., Churchill, R., . . . Barbui, C. (2009). Comparative efficacy and acceptability of 12 new-generation antidepressants: a multiple-treatments meta-analysis. *The Lancet, 373*(9665), 746-758.

Cramer, H., Lauche, R., Anheyer, D., Pilkington, K., Manincor, M., Dobos, G., & Ward, L. (2018). Yoga for anxiety: A systematic review and meta-analysis of randomized controlled trials. In (Vol. 35, pp. 830-843).

Cramer, H., Ward, L., Steel, A., Lauche, R., Dobos, G., & Zhang, Y. (2016). Prevalence, Patterns, and Predictors of Yoga Use: Results of a U.S. Nationally Representative Survey. *American Journal of Preventive Medicine, 50*(2), 230-235. doi:https://doi.org/10.1016/j.amepre.2015.07.037

Deadman, P. (2014). A brief history of qigong. *The Journal of Chinese medicine*(105), 5-17.

Dewaele, J.-M. (2007). The effect of multilingualism, sociobiographical, and situational factors on communicative anxiety and foreign language anxiety of mature language learners. *INT J BILINGUAL, 11*(4), 391-409. doi:10.1177/13670069070110040301

Dimolareva, M., Gee, N. R., Pfeffer, K., Maréchal, L., Pennington, K., & Meints, K. (2018). Measuring cortisol in the classroom with school-aged children—a systematic review and recommendations. *Int J Environ Res Public Health, 15*(5), 1025. doi:10.3390/ijerph15051025

Doll, A., Hölzel, B. K., Mulej Bratec, S., Boucard, C. C., Xie, X., Wohlschläger, A. M., & Sorg, C. (2016). Mindful attention to breath regulates emotions via increased amygdala–prefrontal cortex connectivity. *NeuroImage, 134*, 305-313. doi:https://doi.org/10.1016/j.neuroimage.2016.03.041

Dowlati, Y., Herrmann, N., Swardfager, W., Liu, H., Sham, L., Reim, E. K., & Lanctôt, K. L. (2010). A Meta-Analysis of Cytokines in Major Depression. *Biological Psychiatry, 67*(5), 446-457. doi:10.1016/j.biopsych.2009.09.033

Ellis, R. J., & Simons, R. F. (2005). THE IMPACT OF MUSIC ON SUBJECTIVE AND PHYSIOLOGICAL INDICES OF EMOTION WHILE VIEWING FILMS. *Psychomusicology, 19*(1), 15-40. doi:10.1037/h0094042

Erdogan, D., Gonul, E., Icli, A., Yucel, H., Arslan, A., Akcay, S., & Ozaydin, M. (2011). Effects of normal blood pressure, prehypertension, and hypertension on autonomic nervous system function. *Int J Cardiol, 151*(1), 50-53. doi:10.1016/j.ijcard.2010.04.079

Fallah, N. (2017). Mindfulness, coping self-efficacy and foreign language anxiety: a mediation analysis. *Educational psychology (Dorchester-on-Thames), 37*(6), 745-756. doi:10.1080/01443410.2016.1149549

Fransen, M., Nairn, L., Winstanley, J., Lam, P., & Edmonds, J. (2007). Physical activity for osteoarthritis management: a randomized controlled clinical trial evaluating hydrotherapy or Tai Chi classes. *Arthritis Rheum, 57*(3), 407-414. doi:10.1002/art.22621

Froeliger, B. E., Garland, E. L., Modlin, L. A., & McClernon, F. J. (2012). Neurocognitive correlates of the effects of yoga meditation practice on emotion and cognition: a pilot study. *Frontiers in integrative neuroscience, 6*, 48-48. doi:10.3389/fnint.2012.00048

Frye, B., Scheinthal, S., Kemarskaya, T., & Pruchno, R. (2007). Tai chi and low impact exercise: Effects on the physical functioning and psychological well-being of older people. *Journal of Applied Gerontology, 26*(5), 433-453. doi:10.1177/0733464807306915

Gamaiunova, L., Brandt, P.-Y., Bondolfi, G., & Kliegel, M. (2019). Exploration of psychological mechanisms of the reduced stress response in long-term meditation practitioners. *Psychoneuroendocrinology, 104*, 143-151. doi:10.1016/j.psyneuen.2019.02.026

Gao, F., Lai, C., & Halse, C. (2018). Belonging beyond the deficit label: the experiences of 'non-Chinese speaking' minority students in Hong Kong. *Journal of multilingual and multicultural development, 40*(3), 186-197. doi:10.1080/01434632.2018.1497042

Goldbeck, F., Xie, Y. L., Hautzinger, M., Fallgatter, A. J., Sudeck, G., & Ehlis, A.-C. (2021). Relaxation or Regulation: The Acute Effect of Mind-Body Exercise on Heart Rate Variability and Subjective State in Experienced Qi Gong Practitioners. *Evidence-based complementary and alternative medicine, 2021*, 1-14. doi:10.1155/2021/6673190

Gong, M., Dong, H., Tang, Y., Huang, W., & Lu, F. (2020). Effects of Aromatherapy on Anxiety: A Meta-analysis of Randomized Controlled Trials. *Journal of Affective Disorders*. doi:https://doi.org/10.1016/j.jad.2020.05.118

Gothe, N. P., Keswani, R. K., & McAuley, E. (2016). Yoga practice improves executive function by attenuating stress levels. *Biol Psychol, 121*(Pt A), 109-116. doi:10.1016/j.biopsycho.2016.10.010

Griffith, J. M., Hasley, J. P., Liu, H., Severn, D. G., Conner, L. H., & Adler, L. E. (2008). Qigong stress reduction in hospital staff. *J ALTERN COMPLEM MED, 14*(8), 939-945. doi:10.1089/acm.2007.0814

Guo, Y., Shi, H., Yu, D., & Qiu, P. (2016). Health benefits of traditional Chinese sports and physical activity for older adults: A systematic review of evidence. *Journal of Sport and Health Science, 5*(3), 270-280. doi:https://doi.org/10.1016/j.jshs.2016.07.002

Hagglund, E., Hagerman, I., Dencker, K., & Stromberg, A. (2017). Effects of yoga versus hydrotherapy training on health-related quality of life and exercise capacity in patients with heart failure: A randomized controlled study. *Eur J Cardiovasc Nurs, 16*(5), 381-389. doi:10.1177/1474515117690297

Han, L. (2014). Foreign Language Speaking Anxiety: A Study of Chinese Language Learners. *Journal of the National Council of Less Commonly Taught Languages, 15*, 99-117.

Health QiGong Management Centre of China's General Administration of Sport. (2020). 体育总局气功中心关于健身气功推广功法目录的公告. Retrieved from http://www.sport.gov.cn/qgzx/n5402/c957402/content.html

Hedman, E., Mörtberg, E., Hesser, H., Clark, D. M., Lekander, M., Andersson, E., & Ljótsson, B. (2013). Mediators in psychological treatment of social anxiety disorder: Individual cognitive therapy compared to cognitive behavioral group therapy. *Behaviour Research and Therapy, 51*(10), 696-705. doi:10.1016/j.brat.2013.07.006

Henje Blom, E., Lekander, M., Ingvar, M., Åsberg, M., Mobarrez, F., & Serlachius, E. (2012). Pro-inflammatory cytokines are elevated in adolescent females with emotional disorders not treated with SSRIs. *Journal of Affective Disorders, 136*(3), 716-723. doi:http://dx.doi.org/10.1016/j.jad.2011.10.002

Hewitt, E., & Stephenson, J. (2012). Foreign Language Anxiety and Oral Exam Performance: A Replication of Phillips's MLJ Study. *MOD LANG J, 96*(2), 170-189. doi:10.1111/j.1540-4781.2011.01174.x

Higgins, J. P. T., & Green, S. (2011). *Cochrane handbook for systematic reviews of interventions*: The Cochrane Collaboration, Chichester.

Himashree, G., Mohan, L., & Singh, Y. (2016). Yoga Practice Improves Physiological and Biochemical Status at High Altitudes: A Prospective Case-control Study. *Altern Ther Health Med, 22*(5), 53-59.

Hong Kong Unison. (2015). *探討香港非華語學生於本地就讀專上教育機會的研究報告*. Retrieved from Hong Kong:

Horwitz, E. K., Horwitz, M. B., & Cope, J. (1986). Foreign Language Classroom Anxiety. *The Modern Language Journal, 70*(2), 125-132. doi:https://doi.org/10.1111/j.1540-4781.1986.tb05256.x

Horwitz, E. K., Tallon, M., & Cope, J. (2010). Foreign Language classroom anxiety. In *Anxiety in school: The causes, consequences, and solutions for academic anxietites* (pp. 95-115). New York: Peter Lang Publishing.

Hsieh, C. J., Chang, C., Tsai, G., & Wu, H. F. (2015). Empirical study of the influence of a Laughing Qigong Program on long-term care residents. *Geriatrics & Gerontology International, 15*(2), 165-173. doi:http://dx.doi.org/10.1111/ggi.12244

Ismail, N. M. (2016). The Effectiveness of an Engaging Program to Reduce Saudi Female University EFL Students' Foreign Language Anxiety and to Enhance Their Motivation to Learn English at Taif University. *International journal of psychological studies, 8*(1), 92. doi:10.5539/ijps.v8n1p92

Jahnke, R., Larkey, L., Rogers, C., Etnier, J., & Lin, F. (2010). A Comprehensive Review of Health Benefits of Qigong and Tai Chi. *American Journal of Health Promotion, 24*(6), e1-e25. doi:10.4278/ajhp.081013-LIT-248

Jiménez-Martín, P. J., & Liu, H. (2018). Exploring the health advantages and disadvantages of static and dynamic postures of Qigong and its use as a Traditional and Complementary Medicine. *EUR J INTEGR MED, 24*, 61-64. doi:10.1016/j.eujim.2018.11.001

Jin, Y., Zhang, L. J., & MacIntyre, P. D. (2020). Contracting Students for the Reduction of Foreign Language Classroom Anxiety: An Approach Nurturing Positive Mindsets and Behaviors. *Frontiers in psychology, 11*, 1471-1471. doi:10.3389/fpsyg.2020.01471

Jorge, M. P., Santaella, D. F., Pontes, I. M., Shiramizu, V. K., Nascimento, E. B., Cabral, A., . . . Ribeiro, A. M. (2016). Hatha Yoga practice decreases menopause symptoms and improves quality of life: A randomized controlled trial. *Complement Ther Med, 26*, 128-135. doi:10.1016/j.ctim.2016.03.014

Jung, M. J., Shin, B.-C., Kim, Y.-S., Shin, Y.-I., & Lee, M. S. (2006). IS THERE ANY DIFFERENCE IN THE EFFECTS OF QI THERAPY (EXTERNAL QIGONG) WITH AND WITHOUT TOUCHING? A PILOT STUDY. *International Journal of*

Neuroscience, 2006, Vol.116(9), p.1055-1064, 116(9), 1055-1064. doi:10.1080/00207450600575474

Kao, P.-C., Chen, K. T.-C., & Craigie, P. (2017). Gender Differences in Strategies for Coping with Foreign Language Learning Anxiety. *Social behavior and personality, 45*(2), 205-210. doi:10.2224/sbp.5771

Kao, P.-C., & Craigie, P. (2013). Coping strategies of Taiwanese University students as predictors of English language learning anxiety. *Social Behavior and Personality: an international journal, 41*(3), 411.

Khodadady, E., & Khajavy, G. H. (2013). Exploring the Role of Anxiety and Motivation in Foreign Language Achievement: a Structural Equation Modeling Approach. *Porta Linguarum: revista internacional de didáctica de las lenguas extranjeras*(20), 269-286.

Kim, Y.-K., & Maes, M. (2003). The role of the cytokine network in psychological stress. *Acta Neuropsychiatrica, 15*(3), 148-155. doi:10.1034/j.1601-5215.2003.00026.x

Kim, Y.-K., Na, K.-S., Myint, A.-M., & Leonard, B. E. (2016). The role of pro-inflammatory cytokines in neuroinflammation, neurogenesis and the neuroendocrine system in major depression. *Progress in Neuropsychopharmacology & Biological Psychiatry, 64*, 277-284. doi:10.1016/j.pnpbp.2015.06.008

Klein, P., Picard, G., Baumgarden, J., & Schneider, R. (2017). Meditative Movement, Energetic, and Physical Analyses of Three Qigong Exercises: Unification of Eastern and Western Mechanistic Exercise Theory. *Medicines (Basel), 4*(4), 69. doi:10.3390/medicines4040069

Klein, P., Schneider, R., & Rhoads, C. (2016). Qigong in cancer care: a systematic review and construct analysis of effective Qigong therapy. *Supportive Care in Cancer, 24*(7), 3209-3222. doi:10.1007/s00520-016-3201-7

Koh, T. C. (1982). Qigong--Chinese breathing exercise. *The American journal of Chinese medicine, 10*(1-4), 86.

Komaroff, A. L. (2012). Ask the doctor: Side effects of anxiety medications. *Harvard Health Letter*. http://www.health.harvard.edu/mind-and-mood/side-effects-of-anxiety-medications

Kondo, D. S., & Ying-Ling, Y. (2004). Strategies for Coping with Language Anxiety: The Case of Students of English in Japan. *ELT journal, 58*(3), 258-265. doi:10.1093/elt/58.3.258

Kong, N., K. (2017). *The Effect of Social Skills Training on Oral Proficiency and Foreign Language Anxiety in Chinese Language.* (Master of Philosophy), The University of Hong Kong, Hong Kong.

Kralova, Z., Skorvagova, E., Tirpakova, A., & Markechova, D. (2017). Reducing student teachers' foreign language pronunciation anxiety through psycho-social training. *System (Linköping), 65*, 49-60. doi:10.1016/j.system.2017.01.001

Kruk, M. (2018). Changes in foreign language anxiety: A classroom perspective. *International journal of applied linguistics, 28*(1), 31-57. doi:10.1111/ijal.12182

Kuo, T.-C., Ho, F.-M., & Lin, C.-W. (2003). Physiological Changes Associated with Neiyang Qigong. *Journal of Health Science, 49*(4), 278.

Kwok, J. Y. Y., Kwan, J. C. Y., Auyeung, M., Mok, V. C. T., Lau, C. K. Y., Choi, K. C., & Chan, H. Y. L. (2019). Effects of Mindfulness Yoga vs Stretching and Resistance Training Exercises on Anxiety and Depression for People With Parkinson Disease: A Randomized Clinical Trial. *JAMA Neurol, 76*(7), 755-763. doi:10.1001/jamaneurol.2019.0534

Lamers, F., Vogelzangs, N., Merikangas, K. R., de Jonge, P., Beekman, A. T. F., & Penninx, B. W. J. H. (2013). Evidence for a differential role of HPA-axis function, inflammation and metabolic syndrome in melancholic versus atypical depression. *Molecular Psychiatry, 18*(6), 692-699. doi:10.1038/mp.2012.144

Lampe, L. C., & Müller-Hilke, B. (2021). Mindfulness-based intervention helps preclinical medical students to contain stress, maintain mindfulness and improve academic success. *BMC Med Educ, 21*(1), 145-145. doi:10.1186/s12909-021-02578-y

Lauche, R., Wayne, P. M., Dobos, G., & Cramer, H. (2016). Prevalence, Patterns, and Predictors of T'ai Chi and Qigong Use in the United States: Results of a Nationally Representative Survey. *The Journal of Alternative and Complementary Medicine, 22*(4), 336-342. doi:10.1089/acm.2015.0356

Lavretsky, H., Alstein, L. L., Olmstead, R. E., Ercoli, L. M., Riparetti-Brown, M., St. Cyr, N., & Irwin, M. R. (2011). Complementary Use of Tai Chi Chih Augments Escitalopram Treatment of Geriatric Depression: A Randomized Controlled Trial. *The American Journal of Geriatric Psychiatry, 19*(10), 839-850. doi:http://dx.doi.org/10.1097/JGP.0b013e31820ee9ef

Lee, M. S., Kang, C.-W., Lim, H.-J., & Lee, M.-S. (2004). Effects of Qi-training on anxiety and plasma concentrations of cortisol, ACTH, and aldosterone: A randomized placebo-controlled pilot study. *Stress and Health: Journal of the International Society for the Investigation of Stress, 20*(5), 243-248. doi:http://dx.doi.org/10.1002/smi.1023

Lee, S. M., Pittler, H. M., Guo, H. R., & Ernst, H. E. (2007). Qigong for hypertension: a systematic review of randomized clinical trials. *Journal of Hypertension, 25*(8), 1525-1532. doi:10.1097/HJH.0b013e328092ee18

Leonard, B. E. (2001). The immune system, depression and the action of antidepressants. *Progress in Neuro-Psychopharmacology and Biological Psychiatry, 25*(4), 767-780. doi:http://dx.doi.org/10.1016/S0278-5846(01)00155-5

Leuchter, A. F., Cook, I. A., Hunter, A. M., Cai, C., & Horvath, S. (2012). Resting-state quantitative electroencephalography reveals increased neurophysiologic connectivity in depression. *PLoS One, 7*(2), e32508. doi:10.1371/journal.pone.0032508

Li, J., Shen, J., Wu, G., Tan, Y., Sun, Y., Keller, E., . . . Wu, J. (2018). Mindful exercise versus non-mindful exercise for schizophrenia: A systematic review and meta-analysis of randomized controlled trials. *Complementary Therapies in Clinical Practice, 32*, 17.

Li, R., Jin, L., Hong, P., He, Z. H., Huang, C. Y., Zhao, J. X., . . . Tian, Y. (2014). The effect of baduanjin on promoting the physical fitness and health of adults. *Evid Based Complement Alternat Med, 2014,* 784059. doi:10.1155/2014/784059

Li, X., & Yang, J. (2019). Analysis on Traditional Chinese Medicine Thoery in “Baduanjin of Health Qigong”. *Wushu Studies, 4*(04), 105-107. doi:10.13293/j.cnki.wskx.007740

Liao, H.-C., & Wang, Y.-H. (2018). Using comprehension strategies for students' self-efficacy, anxiety, and proficiency in reading English as a foreign language. *Social behavior and personality, 46*(3), 447-458. doi:10.2224/sbp.6648

Licht, M. M. C., De Geus, J. C. E., Seldenrijk, P. J. A., Van Hout, G. H., Zitman, W. J. H. F., Van Dyck, W. J. H. R., & Penninx, W. J. H. B. (2009). Depression Is Associated With Decreased Blood Pressure, but Antidepressant Use Increases the Risk for Hypertension. *Hypertension, 53*(4), 631-638. doi:10.1161/HYPERTENSIONAHA.108.126698

Liehr, P., & Diaz, N. (2010). A Pilot Study Examining the Effect of Mindfulness on Depression and Anxiety for Minority Children. *Arch Psychiatr Nurs, 24*(1), 69-71. doi:10.1016/j.apnu.2009.10.001

Liu, M., & Jackson, J. (2008). An Exploration of Chinese EFL Learners' Unwillingness to Communicate and Foreign Language Anxiety. *MOD LANG J, 92*(1), 71-86. doi:10.1111/j.1540-4781.2008.00687.x

Liu, P., You, J., Loo, W., Sun, Y., He, Y., Sit, H., . . . Loo, W. T. Y. (2017). The efficacy of Guolin-Qigong on the body-mind health of Chinese women with breast cancer: a randomized controlled trial. *Quality of Life Research, 26*(9), 2321-2331. doi:10.1007/s11136-017-1576-7

Liu, X., Chen, S., & Wang, Y. (2016). Effects of Health Qigong Exercises on Relieving Symptoms of Parkinson’s Disease. *EVID-BASED COMPL ALT, 2016,* 1-11. doi:10.1155/2016/5935782

Liu, X., Clark, J., Siskind, D., Williams, G. M., Byrne, G., Yang, J. L., & Doi, S. A. (2015). A systematic review and meta-analysis of the effects of Qigong and Tai Chi for depressive symptoms. *Complement Ther Med, 23*(4), 516-534. doi:10.1016/j.ctim.2015.05.001

Lloyd, C., Tsang, H., & Deane, F. (2009). Qigong as a mindful exercise intervention for people living with mental ill health. *International journal of therapy and rehabilitation, 16*(7), 393-398. doi:10.12968/ijtr.2009.16.7.43049

MacIntyre, P. D., & Gardner, R. C. (1989). Anxiety and Second-Language Learning: Toward a Theoretical Clarification*. *Language Learning, 39*(2), 251-275. doi:https://doi.org/10.1111/j.1467-1770.1989.tb00423.x

Marshall, M., McClanahan, M., Warren, S. M., Rogers, R., & Ballmann, C. (2020). A comparison of the acute effects of different forms of yoga on physiological and psychological stress: A pilot study. *Int J Environ Res Public Health, 17*(17), 1-8. doi:10.3390/ijerph17176090

Marwan, A. (2007). Investigating Students' Foreign Language Anxiety. *Malaysian Journal of ELT Research, 3*(1), 37-55.

Mathers, C. D., & Loncar, D. (2006). Projections of Global Mortality and Burden of Disease from 2002 to 2030 (Projections of Global Mortality). *PLoS Medicine, 3*(11), e442. doi:10.1371/journal.pmed.0030442

McDermott, K. A., Rao, M. R., Nagarathna, R., Murphy, E. J., Burke, A., Nagendra, R. H., & Hecht, F. M. (2014). A yoga intervention for type 2 diabetes risk reduction: a pilot randomized controlled trial. *BMC Complement Altern Med, 14*, 212. doi:10.1186/1472-6882-14-212

Mehling, W. E., Chesney, M. A., Metzler, T. J., Goldstein, L. A., Maguen, S., Geronimo, C., . . . Neylan, T. C. (2018). A 12-week integrative exercise program improves self-reported mindfulness and interoceptive awareness in war veterans with posttraumatic stress symptoms. *J CLIN PSYCHOL, 74*(4), 554-565. doi:10.1002/jclp.22549

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of internal medicine, 151*(4), 264.

Morgan, W. J., & Katz, J. (2021). Mindfulness meditation and foreign language classroom anxiety: Findings from a randomized control trial. *Foreign language annals*. doi:10.1111/flan.12525

Naser Oteir, I., & Nijr Al-Otaibi, A. (2019). Foreign Language Anxiety: A Systematic Review. *Arab world English journal, 10*(3), 309-317. doi:10.24093/awej/vol10no3.21

Neukirch, N., Reid, S., & Shires, A. (2018). Yoga for PTSD and the role of interoceptive awareness: A preliminary mixed-methods case series study. *European journal of trauma & dissociation = Revue europâeenne du trauma et de la dissociation, 3*(1), 7-15. doi:10.1016/j.ejtd.2018.10.003

Ng, B. H. P., & Tsang, H. W. H. (2009). Psychophysiological outcomes of health qigong for chronic conditions: A systematic review. *Psychophysiology, 46*(2), 257-269. doi:10.1111/j.1469-8986.2008.00763.x

Oh, B., Butow, P., Mullan, B., Clarke, S., Beale, P., Pavlakis, N., . . . Vardy, J. (2012). Effect of medical Qigong on cognitive function, quality of life, and a biomarker of inflammation in cancer patients: a randomized controlled trial. *Supportive Care in Cancer, 20*(6), 1235-1242. doi:10.1007/s00520-011-1209-6

Oken, B. S., Kishiyama, S., Zajdel, D., Bourdette, D., Carlsen, J., Haas, M., . . . Mass, M. (2004). Randomized controlled trial of yoga and exercise in multiple sclerosis. *Neurology, 62*(11), 2058-2064. doi:10.1212/01.wnl.0000129534.88602.5c

Onwuegbuzie, A., Bailey, P., & Daley, C. E. (1999). Factors associated with foreign language anxiety. *Applied Psycholinguistics, 20*, 217-239.

Oxfam, Loh, K. Y. E., & Hung, O. Y. (2020). *A Study on the Challenges Faced by Mainstream Schools in Educating Ethnic Minorities in Hong Kong*. Retrieved from Hong Kong: https://www.eoc.org.hk/eoc/upload/ResearchReport/researchreport_20200115_e.pdf

Pappamihiel, N. E. (2002). English as a Second Language Students and English Language Anxiety: Issues in the Mainstream Classroom. *Research in the Teaching of English, 36*(3), 327-355.

Payne, P., Fiering, S., Leiter, J. C., Zava, D. T., & Crane-Godreau, M. A. (2017). Effectiveness of a Novel Qigong Meditative Movement Practice for Impaired Health in Flight Attendants Exposed to Second-Hand Cigarette Smoke. *Front Hum Neurosci, 11*, 67. doi:10.3389/fnhum.2017.00067

Pittig, A., Arch, J. J., Lam, C. W. R., & Craske, M. G. (2013). Heart rate and heart rate variability in panic, social anxiety, obsessive–compulsive, and generalized anxiety disorders at baseline and in response to relaxation and hyperventilation. *Int J Psychophysiol, 87*(1), 19-27. doi:10.1016/j.ijpsycho.2012.10.012

Ponzio, E., Sotte, L., D'Errico, M. M., Berti, S., Barbadoro, P., Prospero, E., & Minelli, A. (2015). Qi-gong training reduces basal and stress-elicited cortisol secretion in healthy older adults. *Eur. J. Integr. Med., 7*(3), 194-201. doi:10.1016/j.eujim.2015.01.002

Porges, S. W. (2007). The polyvagal perspective. *Biol Psychol, 74*(2), 116-143. doi:10.1016/j.biopsycho.2006.06.009

Riskowski, J. L., & Almeheyawi, R. (2019). Effects of Tai Chi and Qigong in Children and Adolescents: A Systematic Review of Trials. *Adolescent research review, 4*(1), 73-91. doi:10.1007/s40894-017-0067-y

Rong, J., Li, J., Jing, F., Ren, Y., Xiao, Y., Pan, Q., . . . Jing, F. (2021). Efficacy of Baduanjin exercise for rehabilitation after COVID-19: A protocol for systematic review and meta-analysis. *Medicine (Baltimore), 100*(24), e26366-e26366. doi:10.1097/MD.0000000000026366

Rose, G. (2008). *Language acculturation anxiety in Spanish Speaking Adult immigrants learning English in the United States.* (PhD), University of Texas, USA.

Ruiz-Íñiguez, R., Santed Germán, M. Á., Burgos-Julián, F. A., Díaz-Silveira, C., & Carralero Montero, A. (2020). Effectiveness of mindfulness-based interventions on anxiety for children and adolescents: A systematic review and meta-analysis. *Early Interv Psychiatry, 14*(3), 263-274. doi:10.1111/eip.12849

Sağlamel, H., & Kayaoğlu, M. N. (2013). Creative Drama: A Possible Way to Alleviate Foreign Language Anxiety. *RELC journal, 44*(3), 377-394. doi:10.1177/0033688213500597

Sajedi, R., & Sajedi, R. (2017). EFL Learners' Anxiety and their Language Achievement. *Int J Ment Health Addiction, 15*(5), 1118-1121. doi:10.1007/s11469-016-9685-z

Sarkissian, M., Trent, N. L., Huchting, K., & Singh Khalsa, S. B. (2018). Effects of a Kundalini Yoga Program on Elementary and Middle School Students' Stress, Affect, and Resilience. *Journal of Developmental & Behavioral Pediatrics, 39*(3).

Satyapriya, M., Nagarathna, R., Padmalatha, V., & Nagendra, H. R. (2013). Effect of integrated yoga on anxiety, depression & well being in normal pregnancy. In (Vol. 19, pp. 230-236).

Shahabi, L., Naliboff, B. D., & Shapiro, D. (2016). Self-regulation evaluation of therapeutic yoga and walking for patients with irritable bowel syndrome: a pilot study. *Psychol Health Med, 21*(2), 176-188. doi:10.1080/13548506.2015.1051557

Shirifard, R. K., Avanesyan, H., Honari, H., & Abadi, S. E. G. (2012). Compression of the effect of individual and in group physical exercise on state anxiety in young people. *Indian Journal of Science and Technology, 5*(4), 2627-2632. doi:10.17485/ijst/2012/v5i4/30435

Shum, M. S.-k., Tai, C. P., & Shi, D. (2018). Using 'Reading to Learn' (R2L) pedagogy to teach discussion genre to non-Chinese-speaking students in Hong Kong. *INT J BILING EDUC BI, 21*(2), 237-247. doi:10.1080/13670050.2016.1159653

Skoglund, L., & Jansson, E. (2006). Qigong reduces stress in computer operators. *Complement Ther Clin Pract, 13*(2), 78-84. doi:10.1016/j.ctcp.2006.09.003

So, W. W. Y., Cai, S., Yau, S. Y., & Tsang, H. W. H. (2019). The Neurophysiological and Psychological Mechanisms of Qigong as a Treatment for Depression: A Systematic Review and Meta-Analysis. *Front Psychiatry, 10,* 820-820. doi:10.3389/fpsyt.2019.00820

Spielberger, C. D. (1983). *Manual for the state–trait anxiety inventory*. Palo Alto, CA: Consulting Psychological Press.

Stahl, S. M. (2000). Placebo-controlled comparison of the selective serotonin reuptake inhibitors citalopram and sertraline. *Biological Psychiatry, 48*(9), 894-901. doi:10.1016/S0006-3223(00)00957-4

Stonerock, G., Hoffman, B., Smith, P., & Blumenthal, J. (2015). Exercise as Treatment for Anxiety: Systematic Review and Analysis. *ann. behav. med., 49*(4), 542-556. doi:10.1007/s12160-014-9685-9

Streeter, C. C., Theodore, H. W., Owen, L., Rein, T., Karri, S. K., Yakhkind, A., . . . Jensen, J. E. (2010). Effects of yoga versus walking on mood, anxiety, and brain GABA levels: A randomized controlled MRS study. *Journal of Alternative and Complementary Medicine, 16*(11), 1145-1152. doi:10.1089/acm.2010.0007

Tekur, P., Nagarathna, R., Chametcha, S., Hankey, A., & Nagendra, H. R. (2012). A comprehensive yoga programs improves pain, anxiety and depression in chronic low back pain patients more than exercise: An RCT. *Complementary Therapies in Medicine, 20*(3), 107-118. doi:https://doi.org/10.1016/j.ctim.2011.12.009

Tian, R., Hou, G., Li, D., & Yuan, T. (2014). A Possible Change Process of Inflammatory Cytokines in the Prolonged Chronic Stress and Its Ultimate Implications for Health. In *Sci. World J.* (Vol. 2014).

Tsang, H., Tsang, W., Jones, A., Fung, K., Chan, A., Chan, E., & Au, D. (2013). Psycho-physical and neurophysiological effects of qigong on depressed elders with chronic illness. *17*(3), 336-348.

Tsang, H. W. H., Chan, E. P., & Cheung, W. M. (2008). Effects of mindful and non-mindful exercises on people with depression: A systematic review. *British Journal of Clinical Psychology, 47*(3), 303-322. doi:10.1348/014466508X279260

Tsang, H. W. H., Cheung, L., & Lak, D. (2002). Qigong as a psychosocial intervention for depressed elderly with chronic physical illnesses. *17*(12), 1146-1154.

Tsang, H. W. H., & Fung, K. M. T. (2008). A Review on Neurobiological and Psychological Mechanisms Underlying the Anti-depressive Effect of Qigong Exercise. *J Health Psychol, 13*(7), 857-863. doi:10.1177/1359105308095057

Tsang, H. W. H., Fung, K. M. T., Chan, A. S. M., Lee, G., & Chan, F. (2006). Effect of a qigong exercise programme on elderly with depression. *Int J Geriatr Psychiatry, 21*(9), 890-897. doi:10.1002/gps.1582

Tsang, H. W. H., Lee, J. L., Au, D. W., Wong, K. K., & Lai, K. W. (2013). Developing and testing the effectiveness of a novel health qigong for frail elders in Hong Kong: a preliminary study. *Evid Based Complement Alternat Med, 2013*, 827392. doi:10.1155/2013/827392

Tuncer, M., & Doğan, Y. (2015). Effect of Foreign Language Classroom Anxiety on Turkish University Students' Academic Achievement in Foreign Language Learning. *Journal of education and training studies, 3*(6), 14. doi:10.11114/jets.v3i6.998

van Aalst, J., Ceccarini, J., Demyttenaere, K., Sunaert, S., & Van Laere, K. (2020). What Has Neuroimaging Taught Us on the Neurobiology of Yoga? A Review. *Frontiers in integrative neuroscience, 14*, 34-34. doi:10.3389/fnint.2020.00034

van Dam, K. (2020). Individual Stress Prevention through Qigong. *INT J ENV RES PUB HE, 17*(19), 1. doi:10.3390/ijerph17197342

Vanderbyl, B., Mayer, M., Nash, C., Tran, A., Windholz, T., Swanson, T., . . . Jagoe, R. T. (2017). A comparison of the effects of medical Qigong and standard exercise therapy on

symptoms and quality of life in patients with advanced cancer. *Supportive Care in Cancer, 25*(6), 1749-1758. doi:10.1007/s00520-017-3579-x

Vergeer, I., Bennie, J., Charity, M., Harvey, J., Biddle, S., & Eime, R. (2017). Participation trends in holistic movement practices: a 10-year comparison of yoga/Pilates and tai chi/qigong use among a national sample of 195,926 Australians. *BMC Complementary and Alternative Medicine, 17*(1). doi:10.1186/s12906-017-1800-6

Vorontsova-Wenger, O., Ghisletta, P., Ababkov, V., & Barisnikov, K. (2021). Relationship Between Mindfulness, Psychopathological Symptoms, and Academic Performance in University Students. *Psychol Rep, 124*(2), 459-478. doi:10.1177/0033294119899906

Wang, C.-W., Chan, C. H. Y., Ho, R. T. H., Chan, J. S. M., Ng, S.-M., & Chan, C. L. W. (2014). Managing stress and anxiety through qigong exercise in healthy adults: A systematic review and meta-analysis of randomized controlled trials. *BMC COMPLEM ALTERN M, 14*(1), 8-8. doi:10.1186/1472-6882-14-8

Wang, C.-W., Chan, C. L. W., Ho, R. T. H., Tsang, H. W. H., Chan, C. H. Y., & Ng, S.-M. (2013). The Effect of Qigong on Depressive and Anxiety Symptoms: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *EVID-BASED COMPL ALT, 2013*, 716094-716013. doi:10.1155/2013/716094

Wang, C., Schmid, C. H., Fielding, R. A., Harvey, W. F., Reid, K. F., Price, L. L., . . . McAlindon, T. (2018). Effect of tai chi versus aerobic exercise for fibromyalgia: comparative effectiveness randomized controlled trial. *Bmj, 360*, k851. doi:10.1136/bmj.k851

Wang, C. C., Li, K., Choudhury, A., & Gaylord, S. (2019). Trends in Yoga, Tai Chi, and Qigong Use Among US Adults, 2002-2017. *Am J Public Health, 109*(5), 755-761. doi:10.2105/AJPH.2019.304998

Wardhani, A. (2019). Exploring Fear of Negative Evaluation in Foreign Language Anxiety: Photovoice of Undergraduates in Speaking Class. *JSSH (Jurnal Sains Sosial dan Humaniora), 3*(1), 1-10. doi:10.30595/jssh.v3i1.3843

Woo, J. P.-S. (2020). Motivation and Second Language Learning: How Stanislavski's System Motivates Learning as a Motivational Teaching Practice in Chinese Narrative Writing as a Second Language. *The Journal of Drama and Theatre Education in Asia, 9*, 29-52.

Woodrow, L. (2006). Anxiety and Speaking English as a Second Language. *RELC Journal, 37*(3), 308-328.

World Health Organization. (2012). 350 Million People Suffer From Depression: WHO. In. Williamsville.

World Health Organization. (2017). *Depression and Other Common Mental Disorders:Global Health Estimates*. Switzerland:

Xiao, C. M., & Zhuang, Y. C. (2016). Effect of health Baduanjin Qigong for mild to moderate Parkinson's disease. *GERIATR GERONTOL INT, 16*(8), 911-919. doi:10.1111/ggi.12571

Xiong, X., Wang, P., Li, X., & Zhang, Y. (2015). Qigong for Hypertension: A Systematic Review. *Medicine*. doi:10.1097/MD.0000000000000352

Yang, Y., & Wang, J.-Z. (2017). From structure to behavior in basolateral amygdala-hippocampus circuits. *FRONT NEURAL CIRCUIT, 11*, 86-86. doi:10.3389/fncir.2017.00086

Ye, J., Cheung, W. M., & Tsang, H. W. H. (2019). The Neuroscience of Nonpharmacological Traditional Chinese Therapy (NTCT) for Major Depressive Disorder: A Systematic Review and Meta-Analysis. *Evidence-based complementary and alternative medicine : eCAM, 2019*, 2183403-2183403. doi:10.1155/2019/2183403

Ye, J. J., Simpson, M. W., Liu, Y., Lin, W., Zhong, W. H., Cai, S. H., & Zou, L. Y. (2020). The effects of Baduanjin qigong on postural stability, proprioception, and symptoms of patients with knee osteoarthritis : a randomized controlled trial. *PolyU PIRA, 6*, 1-10. doi:10.3389/fmed.2019.00307

Yeung, A., Chan, J. S. M., Cheung, J. C., & Zou, L. (2018). Qigong and Tai-Chi for Mood Regulation. *Focus (American Psychiatric Publishing), 16*(1), 40-47. doi:10.1176/appi.focus.20170042

Yi, J., Kim, S. G., Khil, T., Shin, M., You, J.-H., Jeon, S., . . . Kim, J. U. (2021). Psycho-Electrophysiological Benefits of Forest Therapies Focused on Qigong and Walking with Elderly Individuals. *Int J Environ Res Public Health, 18*(6), 1-16. doi:10.3390/ijerph18063004

Yin, J., & Dishman, R. K. (2014). The effect of Tai Chi and Qigong practice on depression and anxiety symptoms: A systematic review and meta-regression analysis of randomized controlled trials. *Mental Health and Physical Activity, 7*(3), 135-146. doi:10.1016/j.mhpa.2014.08.001

Yoo, Y. G., Lee, D. J., Lee, I. S., Shin, N., Park, J. Y., Yoon, M. R., & Yu, B. (2016). The Effects of Mind Subtraction Meditation on Depression, Social Anxiety, Aggression, and Salivary Cortisol Levels of Elementary School Children in South Korea. *J Pediatr Nurs, 31*(3), e185-197. doi:10.1016/j.pedn.2015.12.001

Zhang, F. (2007). 健身气功概念探邃. *Journal of Shandong Normal University(Natural Science), 22*(3).

Zhang, J., & Qiu, J. d. (2020). Analysis on Physiological Mechanism of Health-Care Qigong Curing The Future of Disease——Take Wuqinxi as an Example. *Wushu Studies, 5*(9).

Zhang, X. (2019). Foreign Language Anxiety and Foreign Language Performance: A Meta-Analysis. *MOD LANG J, 103*(4), 763-781. doi:10.1111/modl.12590

Zhang, X., Ge, T. T., Yin, G., Cui, R., Zhao, G., & Yang, W. (2018). Stress-induced functional alterations in amygdala: Implications for neuropsychiatric diseases. *FRONT NEUROSCI-SWITZ, 12*(MAY), 367-367. doi:10.3389/fnins.2018.00367

Zhao, A., Guo, Y., & Dynia, J. (2013). Foreign Language Reading Anxiety: Chinese as a Foreign Language in the United States. *Modern Language Journal, 97*(3), 764-778. doi:10.1111/j.1540-4781.2013.12032.x

Zhao, S. (2015, 10 Aug). Majority of Hong Kong's post-secondary education programmes unsuitable for non-Chinese speakers, study finds. *South China Morning Post*.

Zheng, G., Chen, B., Fang, Q., Lin, Q., Tao, J., & Chen, L. (2019). Baduanjin exercise intervention for community adults at risk of ischamic stroke: A randomized controlled trial. *Sci Rep, 9*(1), 1240-1240. doi:10.1038/s41598-018-37544-0

Zheng, Y., & Cheng, L. (2018). How does anxiety influence language performance? From the perspectives of foreign language classroom anxiety and cognitive test anxiety. *Lang Test Asia, 8*(1), 1-19. doi:10.1186/s40468-018-0065-4

Zhou, L., Guo, Z., Xing, G., Peng, H., Cai, M., Chen, H., . . . Mu, Q. (2019). Antidepressant Effects of Repetitive Transcranial Magnetic Stimulation Over Prefrontal Cortex of Parkinson's Disease Patients With Depression: A Meta-Analysis. *Frontiers in Psychiatry, 9*. doi:10.3389/fpsyt.2018.00769

Zhou, X.-q., Zeng, Y.-g., Yang, B.-l., & Wang, A.-l. (2007). Effects of Health Qigong and Baduanjin on theMiddle and Old Aged People' s Blood Lipid. *Journal of Bejing Sport University, 30*(6). doi:DOI :10.19582/j .cnki .11-3785/g8.2007.06.024

Zoberi, K., & Pollard, C. A. (2010). Treating anxiety without SSRIs: are SSRI side effects a problem for your patient with generalized anxiety disorder? Here are some options to consider--and others to avoid.(selective serotonin reuptake inhibitors)(Report). *Journal of Family Practice, 59*(3), 148.

Zou, L., Pan, Z., Yeung, A., Talwar, S., Wang, C., Liu, Y., . . . Thomas, G. A. (2018). A Review Study on the Beneficial Effects of Baduanjin. *J Altern Complement Med, 24*(4), 324-335. doi:10.1089/acm.2017.0241

Zou, L., Sasaki, J. E., Wang, H., Xiao, Z., Fang, Q., & Zhang, M. (2017). A Systematic Review and Meta-Analysis of Baduanjin Qigong for Health Benefits: Randomized Controlled Trials. *Evid Based Complement Alternat Med, 2017,* 4548706-4548717. doi:10.1155/2017/4548706

Zou, L., Yeung, A., Quan, X., Hu, X., Chan, J., Wang, C., . . . Wang, H. (2018). Mindfulness-Based Baduanjin Exercise for Depression and Anxiety in People with Physical or Mental Illnesses: A Systematic Review and Meta-Analysis. *International Journal of Environmental Research and Public Health, 15*(2), 321. doi:10.3390/ijerph15020321

Zunszain, P. A., Hepgul, N., & Pariante, C. M. (2013). Inflammation and depression. *Curr Top Behav Neurosci, 14,* 135-151. doi:10.1007/7854_2012_211