THE EFFECTS OF QIGONG ON REDUCING STRESS, ANXIETY AND ENHANCING BODY-MIND WELLBEING

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The Effects of Qigong on Reducing Stress, Anxiety and Enhancing Body-mind Wellbeing

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ABSTRACT

Background and purpose: Stress-related comorbid illnesses such as depression, anxiety disorders, hypertension, and heart disease are responsible for considerable disability worldwide. Few studies have investigated the therapeutic value of qigong. Using a combination of psychological and physiological approaches, the intent of this study was to investigate whether practicing qigong helps to reduce stress and anxiety, thus enhancing body-mind well-being.

Methods: A randomized controlled clinical trial was conducted using a Repeated Measures design. Thirty-four healthy middle-aged adults participated in an 8-week qigong program. Their outcomes were compared with 31 matched subjects in the waitlist control group and 34 participants from a psychology class. The outcome measures included measures of mood states (DASS-21), quality of life (ChQOL), and physiological measures of stress (salivary cortisol level and blood pressure). GLM was used to analyze the data of the 3 groups collected in the 1st, 4th, 8th, and 12th follow-up weeks.

Results: In week 8, significant main effects were found in cortisol level (F= 5.733, p = 0.02) and blood pressure (F = 4.587, p = 0.036) between the qigong and the waitlist groups. Significant Time x Group interaction effects were found in stress (F = 4.558, p = 0.014), depressiveness (F = 4.375, p = 0.016), the ChQOL scales (F = 3.059, p = 0.011) and cortisol levels (F = 5.108, p = 0.027). In week 12, two groups differed substantially as indicated by the main effects in the DASS-21 scales ($F = 6.377$, $p = 0.014$), the ChQOL scales ($F = 6.042$, $p = 0.017$), cortisol level ($F = 15.908$, $p \leq 0.001$), blood pressure ($F = 6.212$, $p = 0.015$), as well as the interaction effects in the DASS-21 scales ($F = 3.247$, $p = 0.003$), the ChQOL scales ($F = 4.996$, $p \leq 0.001$), cortisol levels ($F = 11.047$, $p \leq 0.001$), and heart rate ($F = 5.566$, $p = 0.002$). Significant differences were also found between the qigong group and the psychology group in all outcome measures ($p \leq 0.05$) except heart rate. In general, the qigong participants enjoyed better quality of life and mood states with lower cortisol levels and blood pressure than the two other groups.

Conclusion: The present findings support the concept that qigong has positive effect on reducing stress, anxiety and enhancing body-mind well-being. In this study, we re-packaged a traditional qigong exercise into a systematic workout structure, and demonstrated its potential effects on mood regulation as illustrated by both psychological and physiological measures.

PUBLICATIONS ARISING FROM THE THESIS

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CHAPTER 1

INTRODUCTION

1.1. Stress Related Illnesses and Limitations of Mainstream Therapies

Research evidence has shown that many health problems, in modern societies, such as depression, anxiety disorders, hypertension, and other stress-related chronic diseases are all stress-related (Baum & Posluszny, 1999; Byrne & Espnes, 2008; Pandya, 1998; Stahl & Hauger, 1994; Tennant, 2000; Tsui, 2008). However, due to concerns about discrimination and loss of face in families (Acuna & Bolis, 2005), persons with mental illness often conceal their problems and do not seek the appropriate help at an early enough stage (Lee, Lee, Chiu, & Kleinman, 2005). Nonetheless, failure to seek prompt treatment might further exacerbate the problems (e.g., suicide) (Census & Statistics Dept., HK; Leung et al., 2009). Medication sometimes leads to side effects (Croog, et al., 1986). It also requires good drug compliance and constant monitoring by physicians to enhance its effectiveness. Consequently, many people now prefer self-help and easy to use body-mind strategies to promote health. It stimulates the involvement of mindful exercise (e.g., qigong or yoga), a kind of low-to-moderate exercise focusing on meditation and breath-centering techniques (Forge, 2005; Popowych, 2007) as a non-pharmacologic, home-based and less stigmatizing intervention to stabilize mood disturbance at an early stage or as a complementary therapy to conventional treatment (Fang & Schinke, 2007; Lee, Lim, & Lee, 2004).

There is growing evidence that physical exercise has positive impact on body-mind well-being. However, public awareness and the level of research attention focused on mindful exercise (e.g., qigong, yoga, etc.) are much less than with many aerobic exercises (Daley, 2002; Scully, Kremer, Meade, Graham, & Dudgeon, 1998). Moreover, people who prefer less vigorous activities might be left out in studies of aerobic exercise. Qigong is a Chinese exercise for *yang sheng* (養生; health preservation) and *bao jian* (保健; health maintenance). It shares the common health concept (i.e., harmony of *yin* and *yang*) of Traditional Chinese Medicine (TCM), which is more appealing in the Chinese culture. However, among the limited qigong studies that have been completed, it is common to assess the potential effects of qigong by either psychological or physiological measuring tools. There is a lack of studies that adopt a comprehensive and holistic approach to the examination of body-mind well-being.

Anxiety and depression are the two most common mental health problems seen in the general medical setting (Ansseau, et al., 2004; Leon, et al., 1995; Olfson, et al., 2000; Ormel, et al., 1994; Spitzer, et al., 1994). More than 30 million Americans have a lifetime history of anxiety at an estimated cost of $42 billion dollars a year (Regier, et al., 1988). The Public Health Survey 2003/04 conducted by the University of Hong Kong indicated that about 2.0% of the Hong Kong population suffered from anxiety disorder. However, attention paid to anxiety is far less than depression in terms of research and public health efforts in terms of detection and treatment (Kroenke, Spitzer, Williams, Monahan, & Lowe, 2007).

1.2. Purpose of the Study

The purpose of this study is to investigate whether practicing qigong helps to reduce stress and anxiety, thus enhancing body-mind well-being by employing both physiological and psychological indicators. More specifically, we aim at evaluating the psychological and physiological effects of a standardized set of qigong exercises, which is based on a traditional school of qigong. Qigong is expected to enhance body-mind well-being through its effects on variables such as blood pressure, heart rate, cortisol level, stress level, anxiety level, and quality of life.

The hypothesis of this study was that after 8 weeks of qigong practice, the psychological and physiological well-being of the intervention subjects who practiced qigong would be better than that of the two control groups (i.e., waitlist and psychology class).

The secondary aim of this study is, by using interviews and our newly designed questionnaires, to gain more information about the individual experience of qigong and especially *qi,* which is rarely discussed in previous qigong studies. The results of this study could be an important addition to the existing literature on effectiveness of qigong, which underscores the promotion of qigong as a strategy for mental health enhancement.

1.3. Literature Review

1.3.1. Prevalence of Stress-related Illnesses: a Global Picture

Stress begins in the brain and affects the mind and the body. Stress and its related comorbid diseases are responsible for a large proportion of disability worldwide. The World Health Organization (WHO) Global Burden of Disease Survey estimated that mental disease, of which a large portion is stress-related disorders, will be the second leading cause of disability by the year 2020 (Madhu, 2009; WHO, 2001b). Acute stress stimulates the regulative reaction of neural, cardiovascular, autonomic, immune, and metabolic systems. However, when the body fails to cope with prolonged stressful conditions, dysfunctional consequences of these systems might be the result.

It is estimated that mood disorders affect approximately 20.9 million American adults, or about 9.5 percent of the U.S. population. Among them, 6.7 percent have a major depressive disorder (Kessler, Chiu, Demler, & Walters, 2005; U.S. Census Bureau, 2005). It is suggested that by 2020, depression may surpass cancer to become the world's second leading cause of disease and disability just behind cardiovascular and cerebrovascular diseases (Desjarlais, Eisenberg, Good, & Kleinman, 1995; Murray & Lopez, 1996; WHO, 2008). There are more than one billion additional people entering the age of risk between 1985 and 2015 (Lee, 1999). In 1998, heart failure cost about $20 billion US dollars, $5 billion of which was associated with depression (Sullivan, Simon, Spertus, & Russo, 2002). Among those patients with heart failure, those with moderate and intense depressive symptoms have a significantly higher death rate than patients with mild depression or those who are not depressed at all (Murberg, Bru, Svebak, Tveteras, & Aarsland, 1999; Vaccarino, Kasl, Abramson, & Krunholz, 2001). WHO (2010) further added that fewer than 25% of those who suffer from depression have access to effective treatments.

Anxiety is another negative emotional state resulting from an individual's perception of threat and perceived inability to predict, control, or gain the preferred results under specific environmental demands or unknown stressful situations (Barlow, 1988). Anxiety is an adaptive process, which involves cognitive, neurobiological, and behavioural components. A person with anxiety symptoms can lie along the continuum from normal anxiety level to pathologic reactions (e.g., generalized anxiety disorder, chronic anxiety, etc.). It is estimated that 18% of American adults had some form of anxiety disorders in the past 12 months (Kessler, Chiu, Demler, & Walters 2005). Moreover, anxiety has affected between 40% and 60% of the individuals who have heart conditions (Denollet & Brutsaert, 1998; De Jong, Moser, An, Chung, 2004; Konstam, Moser, & De Jong, 2005).

1.3.2. Economic Costs of Stress on Society

According to the inverted-U theory, an individual will have an optimal performance under an optimal level of arousal. When we can cope with it, stress sometimes can be helpful as it motivates us to achieve goals. However, too much stress can lead to deterioration in performance and is often linked with anxiety and illness (Weinberg & Gould, 1995). Excessive personal and organizational stresses can lead to negative behavioural consequences such as poor job performance, absenteeism, and tardiness (Banham, 1992; Beehr

& Newman, 1978). Excessive stress is also a major cause of accidents and injuries in the workplace (Murphy, DuBois, & Hurrell, 1986). It is estimated that, in the UK, work-related stress, depression, or anxiety affected 442,000 individuals in 2007/8, with a loss of 13.5 million working days. Figures indicated that around 13.6% of all working people in the UK thought their job was very or extremely stressful (Health & Safety Executive, 2009).

Prolonged periods of sick leave from the workplace have increased rapidly due to stress-induced illnesses such as anxiety, depression, physical fatigue, emotional exhaustion, and burnout. The UK Confederation of British Industry (1996) estimated that 24 million working days are lost because of stress-related problems and it constituted about ₤1.3 billion of economic loss (Rose & Taylor, 1998). The Health and Safety Executive further estimated that in the UK, 80 million working days were lost each year due to absenteeism. Stress is therefore regarded as a major contributor to sickness and absence from work (Banham, 1992). It is stated in Healthy People 2000, a report from the U.S. Department of Health and Human Services (2001), that two-thirds of visits to doctors are for stress-related illnesses and stress contributes to 50% of all illness in United States. About 65 million stress sufferers spend more than US $370 million a year on stress-related medications and treatments (Segail, 2007).

1.3.3. Influence of Stress on Body-mind Well-being and Quality of Life

Though an optimal amount of stress can raise performance, failure to cope with stress can have a negative impact on the body. Psychological stress has been shown to be related to physical illnesses such as hypertension, heart disease, and cancer (Baum & Posluszny, 1999; Byrne & Espnes, 2008; Pandya, 1998; Stahl & Hauger, 1994; Tennant, 2000). Stress is also linked to unhealthy behaviours, such as eating high-fat foods, not exercising, alcoholism, and smoking (Ng & Jeffery, 2003; McEwen, 2008). Psychological consequences, such as neuroticism, tension, depression, irritation, and anxiety have also been cited in previous literature (Beehr, 1976; Beehr, Walsh, & Taber, 1976; Caplan, Cobb, French, Jr. Van Harrison, & Pinneau, 1975; Coburn, 1975; Gemmil, & Heisler, 1972). The onset of anxiety disorders in teenagers is linked to undesirable secondary outcomes, such as teenage pregnancy, marital problems, and poor educational performance, which resulted in substantial social and economic costs to the society (Kessler & Greenberg, 2002).

1.3.4. The Situation in Asia and Mainland China

Tsui (2008) noted that workers in Asian countries are being overloaded and excessively stressed, which may lead to a series of health problems such as: depression, anxiety, physical fatigue, sleeping problems, diet disorders and stress-related chronic diseases (e.g., hypertension, cardiovascular problems, etc.). Other consequences include total mental breakdown and even suicide attempts (WHO, 2007). As indicated by the Japan Health Ministry (2006), 1.2 million over-stressed Japanese workers had treatment for stress-related disorders in 2002. Roughly, 14% of Japanese citizens suffer from depression, a mental illness closely related to stress. However, the social stigma associated with depression has discouraged the over-stressed people to seek proper treatment (Tsui, 2008).

The Chinese Psychiatrist Association (CPA) claimed that due to concerns about discrimination and a lack of qualified therapists in mainland China, 90% of persons with depression did not receive proper treatment (*People's Daily*, 2007). It is estimated that from 2005 to 2015, the costs related to loss of productivity and premature deaths caused by chronic illness (e.g., heart disease) may be as high as $558 billion in mainland China (Narayan, Ali, & Koplan, 2010). In fact, more and more sudden deaths of middle-aged Chinese professionals and executives have been reported recently; 70% of exhausted and over-stressed employees are at risk of dying (Chinese Academy of Social Sciences, 2006). For instance, more than 10 employees of Foxconn's Shenzhen factory committed suicide in the summer of 2010. Lack of social interaction and long working hours are a suspected factor in vulnerability to stress and the poor psychological health of the employees (China Labor Bulletin, 2010). In modern societies and industrialized communities, suicide is often regarded as the psychopathological reaction towards stress. The overall rate of mental disorders in mainland China was estimated to be at a high level of 17.3% (Shi, et al., 2005). One of the most common diagnostic groups was suffering from anxiety disorders (4.3%). The overall prevalence of mental distress was higher in rural than in urban areas. The researchers concluded that mental disorders seriously affect the social and economic development of Zhejiang Province. It is also found that stressed employees on prolonged sick leave were more prone to health compromising behaviour (e.g., excessive alcohol use). Such a low-level of well-being further weakened their intellectual efficacy and increased the possibility of industrial accidents (Chinese Academy of Social Sciences, 2006; Rose & Taylor, 1998).

1.3.5. Negative Social Events and Well-being: a Local Picture

The relationship between major life events and mental and physical diseases was proposed by Holmes and Rahe with their establishment of the social readjusting rating scale (SRRS) in 1967. Significant life changes can trigger a high level of stress that stimulates readjustment, which in turn makes the body more vulnerable to diseases. In fact, major negative social events, such as economic recession, outbreak of infectious diseases, and natural disasters, which always bring considerable loss of jobs and life, can cause a substantial amount of stress within a large population, and a spread of stress related illnesses such as mental illnesses (Brenner, 1973), cardiovascular disease (Jenkins, 1976), hypertension (Sever & Poulter, 1989), peptic ulcer disease (Feldman, Walker, Green, & Weingarden, 1986) and even mortality (Brenner, 1979) in the affected population.

A number of studies have indicated that during the Severe Acute Respiratory Syndrome (SARS) period, there were significant increases in the anxiety and perceived stress levels of the people in Hong Kong (Chiu, Lam, Li, & Chiu, 2003; Chua, et al., 2004; Lee, et al., 2006; Leung, et al., 2003; Wan, et al, 2004; Wong, et al., 2004; Wong, Gao, & Tam, 2007; Yu, Ho, So, & Lo, 2005). Besides the influence of infectious diseases, the financial market of Hong Kong was also confronted by the Asian financial crisis in 1997 and a global financial tsunami in 2008. Researchers have found that the psychological health of the community was being threatened during these periods of economic fluctuation. A local investigation, conducted in 2008, by the Hong Kong Baptist University and the Mental Health Association of Hong Kong found that about 40% of 1899 respondents showed mild to severe symptoms of anxiety (e.g., fear and rapid breathing). This figure was even higher than that of the USA (33.2%). About 23.7% of local respondents experienced mild to severe depressive symptoms (e.g., decreased concentration, lost of motivation, etc.), which was nearly double the figure (11.4%) of US respondents (U.S. Census Bureau, 2005). The data of another study conducted in 2008 by the Hong Kong Young Women's Christian Association indicated that after the international financial turmoil, 15% of 1058 respondents demonstrated severe depressive symptoms, and 40% had anxiety symptoms and sleep problems. Almost 60% of them regarded their stress as being generated from their own uncertainties about the economic future and the rapid rise of the price of goods. About one-third also worried about a loss of income (Central News Agency, 2009).

A mix of long working hours, rising living costs, time pressure, highly competitive work environments, and the lack of adequate rest are all factors that contribute to the emotional distress of Hong Kong's people. "Hong Kong is one of the world's most stressed-out cities where stress can boil over" (Schuman, 2008). It is not surprising that Hong Kong ranked 88th (i.e., among the world's unhappiest places) on the happiness list in the world

(*Hong Kong Magazine*, 2007). The Hong Kong Research Association (2009) added that although 46% of 1085 respondents experienced high stress levels and 12% even had suicidal thoughts, only 16% would seek professional help when they could not find relief from stress.

1.4. Factors Contributing to Stress and Anxiety

1.4.1. Concepts of Psychosocial Stress

"Stressor" is defined as an environmental demand or threat that exceeds a person's ability to meet the challenge (Peter & Siegrist, 1999). The individual will evaluate the stressors and then react to tackle the potential threat or to fulfil the environmental demands. "Coping" refers to a multidimensional process involving behavioural, cognitive, affective, and motivational factors. "Strain" is introduced to define an individual's response to a stressor in manifested psychological and physiological outcomes (Peter & Siegrist, 1999). Psychological manifestations include, but are not limited to anger, anxiety, depression, frustration, hopelessness, and helplessness. Neuro-hormonal immune reactions and the activation of the autonomic nervous system are physiological responses, which are instructed by the brain. The amount of strain a person experiences depends on the significance of the stressor towards the person and the extent and intensity of exposure.

1.4.2. Biological Aspects of Stress and Anxiety

For the most part, the brain determines what is stressful for an individual and then executes mental, behavioural, and biochemical changes to acute and chronic stressors. Stress is due to psychological and physical stressors. Physical stressors may include cold, heat, infection, or haemorrhage; while psychological stressors may include an examination, concerns about weight, and unemployment. Selye's (1979) theory of general adaptation syndrome divided the general response to alarm, as the resistance and exhaustion stage. When we are stressed, the increase in heart rate and the release of stress hormones are amplified bodily reactions that result from the suppression of parasympathetic activity or the activation of sympathetic nervous system (i.e., alarm stage) (Lovallo, 2005). Figure 1 illustrates the response of the HPA axis when facing stress. The primary stress hormone cortisol is a kind of glucocorticoid (i.e., steroid hormones) produced by the adrenal cortex. Increased secretion of cortisol produced by the adrenal cortex is a strongly correlated physiological reaction towards psychological stress (Blackhart, Eckel, & Tice, 2007). The release of other chemical mediators such as catecholamines (i.e., adrenaline and noradrenaline) is also a bodily response to sudden, unexpected stressful events. It helps to increase blood flow to skeletal muscles, heart rate, and energy levels, which equip the body to cope with the stressors (i.e., resistance stage). This innate and involuntary *fight-or-flight* biological response allows the body to “fight” or “escape” from perceived threat for survival, especially in animals.

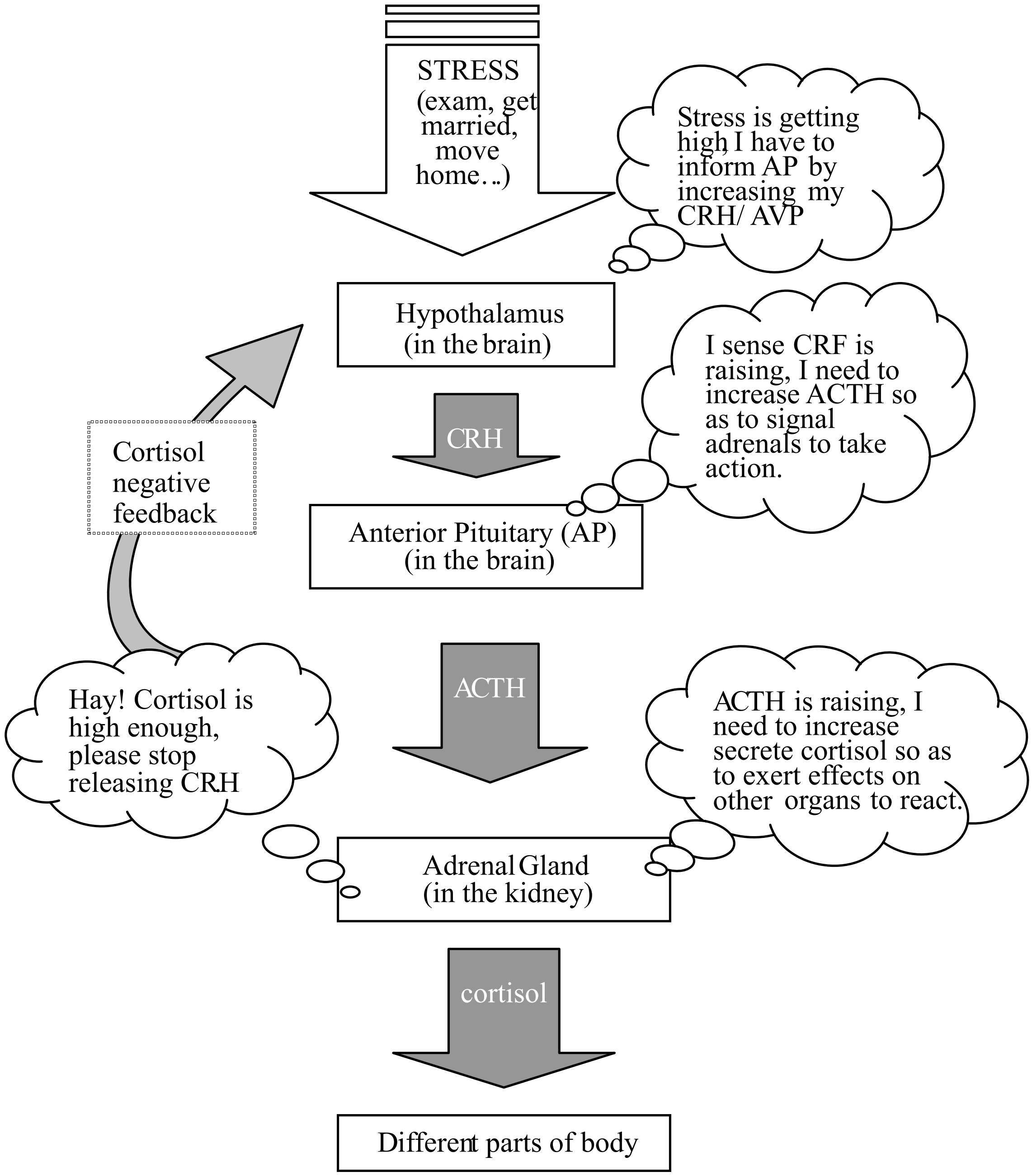

Figure 1: The response of the HPA axis when facing stress.

Note: ACTH: Arenocorticotropin Hormone

AVP: Arginine Vasopressin

CRF: Corticotropin Releasing Factor

CRH: Corticotropin Releasing Hormone

1.4.3. Psychological Aspects of Stress and Anxiety

While the biological model outlines a useful framework for studying the links between stress and anxiety, the *fight-or-flight* response cannot fully explain why some people fail to handle stress properly while others do, even when facing the same stressors (e.g., examination). Different persons will have different stress responses towards the same stressors. The arousal-performance curve shows that eustress is found when one can adjust positively to a small quantity of stress; then performance and motivation can subsequently increase (see Figure 2) (Vaughan, 2007). However, if the perceived ability is far below task difficulty, when the stressors persist, the person will suffer from continuous distress, anxiety, and even panic. Friedman and Roseman (1974) discovered that a person with Type A personality who is time-driven, impatient, incapable of relaxing, and hostile is more susceptible to stress. Consequently, chronic stress makes them more vulnerable to psychosomatic disorders. Anxiety disorders develop from chronic anxiety and could seriously affect the normal functioning of a person. Excessive worry, fear, excessive suspicion, obsessive thoughts, and preoccupation are symptoms of anxiety disorders.

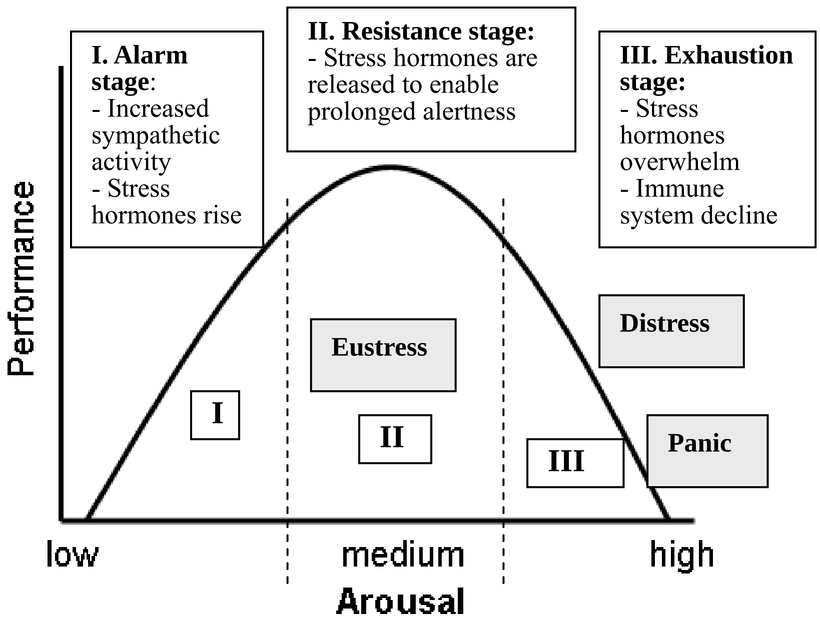

Figure 2: Arousal-performance curve (modified from the model of Vaughan, 2004).

1.4.4. Individual Differences

Cognitive appraisal evaluates and determines what a potent stressor is and whether it threatens the individual. The brain then executes adaptive physiological and behavioural changes towards stressful experiences. However, not everyone reacts in the same way towards potential stressors. Individual differences in childhood experiences and adult life play important roles in determining whether one reacts negatively or adapts positively. Unsatisfactory experiences in school, at work, in family life, and peer relationships can lead an individual to respond in non-desirable stress coping behaviours, such as alcohol abuse and various unsociable behaviours, which can increase the chance of emotional problems. It is found that children who are neglected can develop prolonged emotional problems (Repetti, Taylor, & Seeman, 2002). Differences in genetic makeup also affect the stress response of an individual. Evidence indicates that people with the short form of serotonin transporter (5-HT T) exhibited more depressive symptoms, diagnosable depression, suicidality, maladaptive behaviours (e.g., alcoholism), and were thus more vulnerable to stressful environmental insults (Caspi, et al., 2003).

1.4.5. Cultural Factors – Special Characteristics of Chinese Culture

In addition to biological and psychological factors, Bronfenbrenner's ecological systems theory, stresses that the cultural context of the macrosystem also affects the person, which further explains the high prevalence of stress-related disorders. People from Asian cultures commonly present their psychological problems as somatic discomforts, which include headache, lower back pain, neck pain, coughing, bronchitis, breathing difficulties, stomach pain, and abdominal problems (Brosschot, Gerin, & Thayer, 2006; Rose & Taylor, 1998).

Somatization makes the general practitioners less likely to diagnose anxiety (Kessler, Lloyd, & Lewis, 1999). Less than half of the anxiety cases are identified in the primary care consultations (Goldberg & Huxley, 1992). Mental illness is stigmatized as weakness and "loss of face" in traditional Chinese culture (Ju-K'ang, 1985). It discourages the depressed family member from seeking help and therapy. Insensitivity to anxiety symptoms and somatization of illness makes mood disorders even more difficult to identify at an early stage.

1.4.6. Social Factors – Inadequacy of Primary Health Care

Community resources or the lack thereof (for example, insufficient medical services within the macrosystem), also contribute to the mental problems of an individual. Psychotherapy, such as cognitive behavioural therapy (CBT), and drug therapy are two mainstream treatments of mood disorders. However, some studies showed that CBT is not always effective with patients suffering from anxiety disorders, especially for those who prefer medication (Grevier, 2003). Drug therapy is not always desirable as it carries side-effects (e.g., nausea), which usually bring a reduction in the quality of life (Croog, et al., 1986). It is shown that between 20% and 59% of patients of depression had low drug compliance (Johnson, 1973; WHO, 2010). Haslam and his colleagues (2003) also found that lack of improvement in symptoms and concerns about dependency made sufferers of anxiety and depression prematurely cease medication. They took less than the prescribed amount or stopped taking the medication. These limitations of mainstream treatments therefore stimulate an increasing interest in the use of non-pharmacologic alternative treatments (Fang & Scinke, 2007; Lee, Lim, & Lee, 2004). An important concern is to identify cost-effective strategies that can be implemented for the general public to prevent mood disorders at an early stage.

1.5. Effects of Emotions on Health

1.5.1. Perspective of Western Medical Science

Excessive amounts of stress hormones in the body can weaken the immune system (i.e., exhaustion stage). Over-activation of the sympathetic nervous system is a potent trigger of platelet aggregation, volume contraction, increased coagulation, and recurrent thrombus formation (Grignani, et al., 1991; Hjemdahl, Larrson, & Wallen, 1991; Jern, et al., 1989; Markovitz & Matthew, 1991; Patterson, Krantz, Gottdiner, Hecht, Vargot, & Golostein, 1995), thrombogenesis (Von Kanel, Mills, Fainman, & Dimsdale, 2001), as well as cardiac electric instability, which can mediate cardiac dysrhythmias (Middlekauff & Mark, 1998). Prolonged secretion of cortisol and vasopressin can narrow artery walls by increasing blood platelets. The heart and immune systems are weakened if the consumption of adrenaline by the body persists (Bloomfield, 1998). A chronic increase in heart rate and blood pressure can increase the probability of stroke and heart attacks (McEwen, 2008). Anxiety, depression, hyper-reactivity, anger, reduced performance, social withdrawal, and drug abuse are possible emotional and behavioural consequences. Prolonged stress is also found to be responsible for coronary artery occlusion (Papademtriou, Gottdiner, Kop, Howell, & Krantz, 1996) and acute myocardial infarction (Gelernt & Hochman, 1992). As evidenced by myocardial ischemia (Krantz, Kop, Santiago, & Gottdiner, 1996; Mittleman, et al., 1995) and impaired ventricular function, such as wall-motion abnormalities (Mazzuero, Temporelli, & Tavazzi, 1991; Kuroda, et al., 2000), negative mood also contributes to poor cardiac conditions.

1.5.2. Perspective of Traditional Chinese Medicine (TCM)

As documented in ancient Chinese medical literature *Huangdi Neijing* (黃帝內經), adverse health conditions can be exacerbated by emotional distress. The seven basic emotions (七情): joy (喜), anger (怒), worry (憂), brooding (思), sorrow (悲), fear (恐), and surprise (驚), if not properly controlled, can affect harmony and then impair the functions of the bodily organs. It is stated in *Huangdi Neijing Suwen* (黃帝內經•素問•陰陽應象大論) that anger harms the liver (怒傷肝); joyfulness harms the heart (喜傷心), brooding harms the spleen (思傷脾), melancholy harms the lungs (憂傷肺), and fear harms the kidneys (恐傷腎). One common possible effect of excessive emotions is disturbed sleep, which may further weaken the body and make one more vulnerable to infection. Excessive emotions lead to disorders in circulation of *qi* and blood, thus causing an internal state of imbalance in the body. In order to regulate the emotions, it is suggested in *Neijing* that an individual should keep a peaceful and optimistic mind, which is free of worries and perplexing thoughts. Longevity can be enhanced by adopting a healthy life regimen such as doing exercise, practicing temperance in diet, keeping a regular daily schedule, and pursuing mind-regulation activities. Qigong is an ancient mind-calming exercise in the Chinese culture.

1.5.3. A Holistic Model of Health and Illness

Kaplan's (1993) biopsychosocial model of stress and health, which focuses on the individual level, illustrates complex relationships (see Figure 3) (Kaplan, Sallis, & Patterson, 1993). WHO (2001a) defined health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (p. 1). The biopsychosocial model of health and illness emphasizes that biological, social, and psychological components are intertwining systems of the body and contribute to health in a synergistic manner (Engel, 1980; Lakhan, 2006). Quality of life, psychological states, and feelings should all be considered when assessing the wellness of a person. Such a concept of wellness bears a remarkable resemblance to the holistic perspective employed by alternative therapy, where well-being is optimal physical, emotional, and spiritual health. The limitation of mainstream treatments, social stigma, poor drug compliance, and reluctance to seek professional help, further stimulates the increasing need for non-pharmacologic and alternative therapies (e.g., mindful exercise) for early intervention of mood disorders or as a complementary treatment to conventional methods.

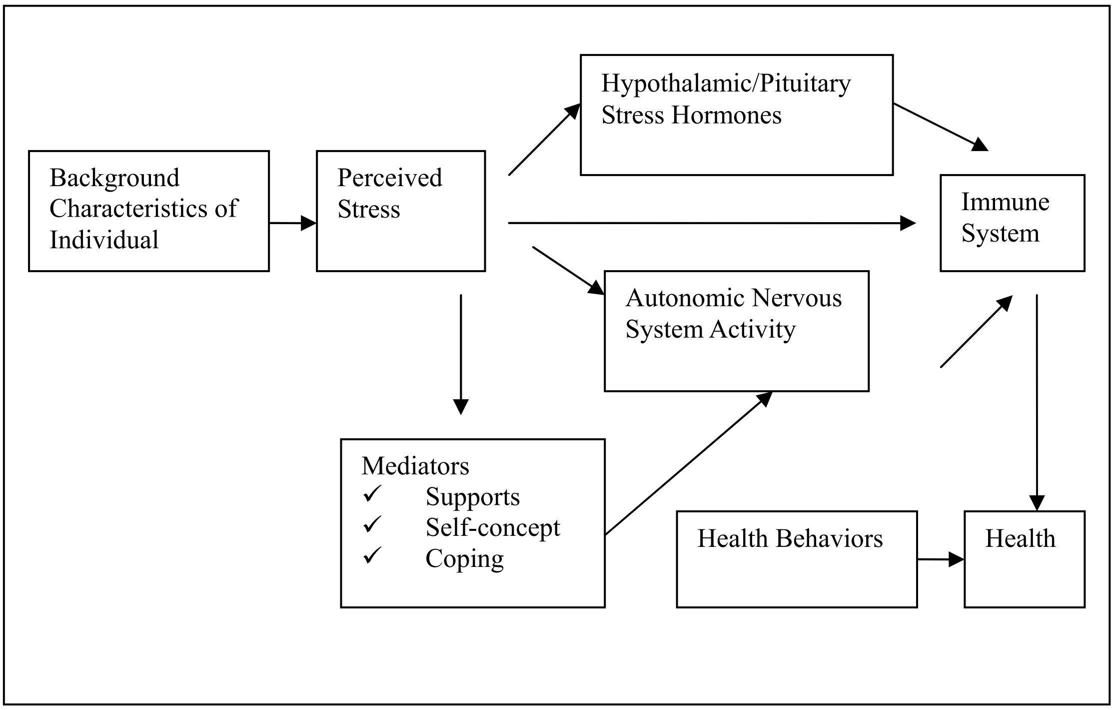

Figure 3: Biopsychosocial model of stress and health (Kaplan, 1993).

A growing body of evidence has shown mindful exercise, such as qigong, yoga, and meditation, to be effective interventions in improving psychological and physical health (Brown & Gerbarg, 2005; Henderson, Hart, Lai, & Hunyor, 1998; Schell, Allolio, & Schonecke, 1994; Schneider, et al., 1995; Sundar, et al., 1984; West, Otte, Geher, Johnson, & Mohr, 2004). Inhibition of the sympathetic nervous system has been shown to strengthen the immune system in several forms of meditation: including mindfulness meditation, qigong, and transcendental meditation (Collins & Dunn, 2005; Davidson, 2003; Lee, Huh, et al., 2003; Takahashi, et al., 2005). As suggested in Kaplan's model, they provide a scientific base of the physiological effect of mindful exercise as an effective mediator to cope with stress. Besides the physiological path, some local research efforts on elderly depression (Tsang, Cheung, Lak, 2002; Tsang, Fung, Chan, Lee, & Chan, 2006; Tsang, Mok, Au Yeung, & Chan, 2003) have demonstrated that qigong as a mindful exercise is a similarly promising alternative therapy for alleviating stress-related mood disorders through improving the psychosocial health of the sufferers.

1.6. A Way Out – Mindful Exercise

1.6.1 What is Mindful Exercise?

Mindful exercise is a category of exercise with a focus on self-awareness and intrapersonal mind-body alignment to be accompanied by low-to-moderate muscular exercise and non-judgmental meditation. It is different from most physical activities, which centre on kinesthetic training. Forge (2005) suggests that mindful exercise should include introspective meditation, proprioceptive awareness of bodily movement, breath-centering techniques, anatomic alignment postures, and contemplation of energy-centric flow. Yoga and qigong are examples of mindful exercise that maintain a belief in the "life energy," such as *prana* or *qi*, focus on inner mental activity and self awareness, synchronize muscular movements with breathing patterns, and pay attention to form and alignment (Forge, 1997). Although mindful exercise mainly focuses on cognitive relaxation, abdominal breathing, self-regulation, and internal awareness, it also shares the repetitive and rhythmical movements of aerobic exercise. Previous findings are in line with suggestions from cardiovascular fitness theory, which holds that aerobic exercise improves cardiac output, oxygen consumption, stroke volume, muscle metabolism, and elasticity of the blood vessels (Fletcher, et al., 1996; Soni & Deanfield, 1997).

1.6.2. Qigong as Mindful Exercise

While it is widely known that regular aerobic exercises are beneficial to health, high intensity exercise might discourage the elderly population (Lan, Chou, Chen, Lai, & Wong, 2004), or those who dislike the running and sweating of regular exercise (Berger & Owen, 1988). Researchers suggested that a moderate exercise regimen can improve heart functions (Durham, 2005), and bring a mood elevation similar to that observed in athletes doing vigorous exercise (Berger & Owe, 1992). Netz and Lidor (2003) compared the effectiveness of mindful versus aerobic exercise modes in mood alternations. Their results indicate that low-intensity, cognitive focus, rhythmic movements may be more effective in immediate mood improvement than high-exertion kinesthetic-based movements. It has been proposed that by maximizing isometric muscle contraction during qigong practice, respiratory efficiency can also be improved (Li, Li, Matsuura, Tsubouchi, & Shimizu, 2001). Moreover, different mindful exercises have their own nature and seem to have different effects on body-mind well-being. The responses given by the subjects in a 4-year qualitative study indicated that yoga, meditation and qigong have some similarities yet each maintain certain unique impacts on the subjects (Schure, Christopher& Christopher, 2008). For instance, while both yoga and meditation helped increasing mental clarity, both yoga and qigong helped increasing energy. Qigong has positive effects in increasing feelings of centeredness, a sense of mind-body- emotion connection and a sense of fluidity which were not mentioned in yoga and meditation. *Chan mi gong* (the qigong style used in this study) demonstrated its specific effects on enhancing memory and learning efficiency (Qu & Xu, 1992).When compared with progressive muscle relaxation (PMR), the effect of PMR was more obvious in somatic domains and qigong was more effective in psychological measures (Hui, Wan, Chan & Yung, 2006). When compared with *Tai chi*, *Tai chi* demonstrated better effects in cardiorespiratory variables due to its higher exercise intensity while qigong enhanced breathing efficiency during exercise due to the diaphragmatic breathing (Lan, Chou, Chen, Lai & Wong, 2004). When compared with medication group, the qigong group had significantly lower anxiety scores & insomnia (Li, Chen & Mo, 2002). Therefore, mindful exercise could be a viable alternative to aerobic exercise in attaining physical fitness and mood elevation (Berger & Owen, 1992) and different mindful exercises might have different impacts on one's wellness. However, qigong did not significantly outperform conventional exercise (e.g. stretching) in anxiety, depression, quality of life (Cheung et al., 2005). Therefore, further investigation is needed to confirm the specific effect of qigong on wellbeing.

1.6.3. Historical Background of Qigong

Mindful exercise originated from two ancient Asian exercises: qigong and yoga. They share the common doctrine of mind, body, and spirit integration (Forge, 2005). A number of different terms have been used to describe this ancient exercise. These include: *xing-qi* (行氣; promoting the circulation of *qi*), *fu-qi* (服氣; intake of *qi*), *dao-yin* (導引; guiding the energy flow), *tui-na* (吐納; exhaling and inhaling), *zuo-chan* (坐禪; sitting in meditation), *yang-sheng* (養生; nourishing the spirit), and *jing-zuo* (靜坐; sitting still). It was not until 1953, when *Liu Gui-zheng* (劉貴珍) published a paper entitled "*Practice on Qigong Therapy*"《氣功療法實踐》, that the term qigong was commonly adopted as the formal name for this type of exercise (Li, 2009).

1.6.4. What is Qigong?

"*Qi*" means vital energy and "*gong*" means discipline. According to *Liu Gui-zheng*, the concept of *qi* includes the air we breathe in, *yuan qi* (元氣; innate vital substance), *jing qi* (經氣; *qi* that flows in the meridians), and the *qi* derived from nature. Besides practice, *Liu Gui-zheng* also regarded "*gong*" as the improved functions of internal organs through qigong practice (Zhang, 2005). Scientists have debated about the existence of *qi* over the last two decades. However, researchers have provided some evidence of *qi* by using physical signal detectors such as the far-infrared detectors, which detected a modified far-infrared radiation from the palm of a qigong practitioner (Chen, 2004). A balanced state of internal *qi* flow is essential for optimal physical and emotional health as well as vitality. If *qi* does not move and behave properly inside the body, the person will get sick. Qigong is a mindful exercise focusing on the balance of *yin* and *yang* (陰陽平衡), as well as enhancing the circulation of *qi* inside the body (Dorcas, 1996). Qigong is mainly composed of five elements: visualization, meditation, relaxation, deep breathing, and target *qi* circulation (Tseng, Lin, & Yeh, 1995). Qigong puts emphasis on the control of the mind-states, posture, and breath. The three main doctrines of qigong include *tiao xin* (調心; mind regulation), *tiao shen* (調身; body regulation), and *tiao xi* (調息; breath regulation). Qigong is a Chinese exercise for *yang sheng* (養生; health preservation) and *bao jian* (保健; health maintenance). It shares the common health concept of harmony of *yin* and *yang* with Traditional Chinese Medicine (TCM), which is more popular in the Chinese culture. It is stated in *Liu's* (1953) "*Practice on Qigong Therapy,*" that "氣功療法，人人可行，不花錢，不費事，可以卻病，可以強身，可以全生，可以延年。" Translated, it means that qigong therapy is not costly; it is easy for everyone to practice. It helps people to prevent illness, preserve health, and enhance longevity.

1.6.5. The Great Dance

Qigong first appeared around five thousand years ago as an ancient art of dance (Liu, 1999). In the time of the *Tangyao* era of Chinese history (2357–2255 BC) (唐堯時期), the dance of *dao yin* (導引) was the mobilization of *qi* through dancing (Yao, 1991; Zhang, 1990). By guiding and connecting the *qi*, it allowed obstructions within the body to be removed. Different forms of breathing and special sounds were also integrated in the practice. This was also called the "Great Dance." This ancient style of qigong incorporated dancing and chanting into Chinese healing rituals for remedy and health preservation purposes (Yao, 1991; Zhang, 2009; Zhang & Ken, 2001). It was not until 1973 that the earliest manuscript of qigong exercises was dug out from an early ancient tomb of the *Han* Dynasty(漢朝) (206 BC–220 AD). An old drawing showed 44 men and women wearing ancient Chinese costumes, doing some bodily movements, breathing exercises, and dance like gestures (Li, 2009).

Regarding the historical development of qigong, it can be divided into four major periods. Before the *Han* dynasty (206 BC), the old Chinese classic "*Yi Jing*" (易經 *Book of Changes*), the Chinese bible of philosophy

(1122 BC), was probably the first Chinese book introducing the concept of *qi* (vital energy). The concepts of *yin* (陰) and *yang* (陽) first appeared in *Yi Jing*. *Yin* is the slow, soft, insubstantial, diffuse, cold, wet, tranquil, and feminine aspects of nature. *Yang*, by contrast, is the hard, fast, solid, dry, focused, hot, aggressive, and masculine characteristics. An internal state of imbalance between *yin* and *yang* energy can lead to illness. *Yi Jing* also documented the integrated concept of *San Jie* (三界 three natural powers): *Tian* (天 Heaven), *Di* (地 Earth), and *Ren* (人 Human). The seniors in that epoch who studied the relationship of these three natural powers seem to be the pioneers in the development of qigong. During the *Zhou* dynasty (周朝) (1122–934 BC), the founder of Taoism, *Lao Zi* (老子), mentioned certain breathing techniques in his testament *Tao De Jing* (道德經; Classic on the Virtue of the Tao). He stressed that the way to obtain health was to concentrate on *qi* and achieve softness. Later, the *Shi Ji* (史記; Historical Record) in *Lu Shi Chun Qi* (呂氏春秋; Lu's Annuls of Spring, Autumn and Warring States Periods) (770–221 BC) also described more complete methods of breath training. It reads as follows:

> "In past times at the beginning of the *Yin Kang* period, during the *Xia* period (夏) (2070–1600 BC), the *yin qi* (陰氣) was obstructed and stagnated. The water pathways (of the earth) were congested and stagnated. The *qi* of humankind became sluggish and gloomy. Peoples' sinews and bones curled with cold and could not extend to their

fullest. Thus, dancing was created to ward off stagnation."

(Zhang & Rose, p. 63)

During this period of early development of qigong, many TCM practitioners became very interested in *qi*, and at that time, qigong became one of the origins of TCM. The deep-rooted concepts of *yin* (陰) and *yang* (陽) harmony, the five elements (i.e., metal, wood, water, fire, and earth) and the meridian systems of *Jing* (經; channel) and *Luo* (絡; collateral) were generated from the basic principles of qigong.

The period from 206 BC–500 AD marked the second stage of qigong development. Since the *Han* dynasty (206 BC–220 AD), Buddhism and its meditation methods were adopted from India and spread over China, which brought qigong practice and meditation into the era filled with religious colour. The religious practitioners cultivated their *qi* to a deeper level, worked with internal functions of the body, and strove to control their bodies, minds, and spirits in order to break away from the cycle of reincarnation.

The third period of development was from 500 AD–1911 AD. During the *Liang* dynasty (梁朝) (502–557 AD), qigong was adopted in the field of martial arts. Many different styles of qigong flourished during this period. For instance, *Taichi Nei Dan* (太極內丹; Internal Elixir) and *Shaolin Wai Dan* (少林外丹; External Elixir) were two famous schools of martial arts qigong at that time. Later in the *Qing* dynasty (清朝) (1644–1911 AD), because of improved international transportation and communication, different styles of qigong practices were also imported from nearby countries such as India and Japan.

After 1911 AD, qigong received more recognition and then underwent rapid development after the set up of the People's Republic of China in 1949. The Chinese government, together with medical practitioners and qigong masters have made contributions to popularize qigong for health preservation and disease prevention. In 2001, the State Sport General Administration of China (國家體育總局) founded the Chinese Health Qigong Association, as an official agent to popularize, spread, and research qigong in cooperation with the Peking Sport University. In 2003, the organization presented four new qigong exercises, all based on the essence of ancient qigong and specifically developed for health purposes: *Yi Jin Jing* (易筋經; tendon-changing classic), *Wu Qin Xi* (五禽氣; frolics of five animals), *Liu Zi Jue* (六字訣; the art of expiration in producing six different sounds), and *Ba Duan Jin* (八段錦; eight-section brocades). The new version of health qigong broke from the old tradition of family-styles and close master-apprentice relationship. Scientific studies were conducted under the paradigm of TCM, modern medicine, psychology, sports science physiology, and biochemistry, which have inspired many local and overseas people to learn this traditional exercise. In China, the first International Health Qigong Demonstration and Exchange was held in 2005. In 2008, the first European Health Qigong Congress was organized in Germany, which signified the increasing recognition in Western communities.

Currently, about 60 million people practice qigong daily in China (Cheung, et al., 2005). Chen, Mackenzie & Hou (2006) further estimated that over 100 million people practice health qigong. According to the Hong Kong Tai Chi Association (2001), there were more than three hundred thousand people enrolled in morning qigong classes. Qigong was ranked 19th among the top 20 most popular sports in Hong Kong. Qigong and walking had the highest frequency of daily participation (Hong Kong Sports Development Board, 2002).

1.6.6. Classification of Qigong

There are different ways to classify qigong; one is to categorize it according to the five key religious or theoretical backgrounds, including Confucianism (儒家), Buddhism (佛家), Taoism (道家), medical, and martial arts (Mackenzie & Rakel, 2006). Each approach has its own aim, discipline, and application. Taoists aim at the preservation of the physical body, high virtue (善), and ultimately for longevity. The Buddhists emphasize the liberation of mind, tranquillity (四大皆空) in meditation, and the obtainment of enlightening wisdom (明心見性). The Confucians focus on attaining high moral character and intelligence (正心修身). The medical school concentrates on prevention and healing of illness through the harmony of *yin* and *yang*, as well as balancing the flow of *qi* inside the individual. Medical practitioners learn how to use the inner *qi* for diagnosis and cure. The martial arts branch trains the practitioners to both protect themselves from physical attacks (by weapons or humans) and to utilize *qi* to produce fatal blows.

If we classify qigong according to the traditions of practice, there are five main *gong fa* (功法 branches): *tui-na* (吐納派), *dao-yin* (導引派), *chan-ding* (禪定派), *cun-xiang* (存想派), and *zhou-tian* (周天派). The *Tui-na* approach focuses on breathing regulation. The *Dao-yin* school gives attention to bodily movements. The *Chan-ding* division stresses the importance of inner silence and tranquillity. The *Cun-xiang* style emphasizes the use of imagery and *yi-nian* (意念; thought). The *Zhou-tian* branch concentrates on the regulation of *qi-xi* (氣息; energy and vitality) and the circulation of *qi* within the body.

1.6.7. Effects of Qigong on Stress and Anxiety Reduction

A considerable percentage of primary care doctor visits are related to stress (Mackenzie & Rakel, 2006). Common conditions include headache, hypertension, asthma, and allergy. Thus, other than drug therapy, an effective stress management exercise might help to reduce stress related health problems and increase the quality of life. Previous qigong studies have documented the relaxation response produced by qigong practice and its effectiveness in reducing stress. He, Le, Xi, & Zhang (1999) used a "stress meter" to measure the skin conductivity of the subjects and found that the degree of relaxation achieved by qigong meditation was significantly deeper than that of non-qigong meditation. Lee and colleagues

(Lee, Ryu, & Chung, 2000) further established that veteran qigong practitioners (with over 13 months training) had significantly lower scores in all the subscales of Symptoms of Stress (SOS) inventory when compared to the controls. A significant negative correlation was found between the length of qigong training and the SOS subscales. Studies that recruited patients as subjects indicated that qigong therapy was useful in treating anxiety and depression in psychiatric settings (Pavek, 1988; Shan, Yan, Sheng, & Hu, 1989; Wang, 1993). It is also reported that qigong exercise could significantly reduce anxiety, adrenocorticotropic hormone (ACTH), cortisol, and aldosterone levels (Lee, Kang, Lim, & Lee, 2004); improves the mood, cellular function of neutrophil and natural killer cells (Lee, Hui, et al., 2001). These clinical reports support the scientific position of qigong as an effective stress management exercise to improve anxiety and symptoms of stress. It is concluded that qigong distinguishes itself from other therapies in terms of its TCM concept and emphasis of *qi* (vital energy) and *yi* (intention power), which manages our mood states both physically and psychologically, and achieves a result that goes beyond the simple reduction of stress (Lehrer, Woolfolk, & Sime, 2007).

1.7. Limitations of Available Qigong Studies and Qigong Protocol

1.7.1. A Critique of Available Qigong Studies

Qigong, despite its mysterious mask of *qi* and unique meridians theory, is suitable for people with different physical strengths; and has been shown to be effective in mood augmentation and stabilization of the sympathetic nervous system (Lee, Lim, & Lee, 2004). However, different styles or schools of qigong may have different effects on body-mind regulation. A comprehensive review of literature (spanning from 1950–2009) on qigong was conducted using databases Medline, PsyINFO, PsyARTICLES, ProQuest, and the Social Sciences Citation Index. The keywords included: *qi*, qigong, *qi*-training, *daoyin,* health, anxiety, stress, cortisol, blood pressure, and heart rate. Although some of them are case series and not randomized control trials, we also searched the Chinese Social Sciences Citation Index and CAJ full-text database to capture the neurological research studies written in Chinese. Therefore, to include as many studies as possible, the selection criteria were rather flexible. Forty relevant studies were found; the details are shown in Appendix 7.

Several observations can be made from the review. Firstly, studies employed different styles of qigong in their studies, and there were few studies on *chan mi gong*. Secondly, few studies used both psychological and physiological measures to examine the health improvement of subjects from a holistic perspective. Thirdly, most studies recruited patients as subjects and the results may not always be applicable to healthy people. Fourthly, there is a lack of studies that measure cortisol levels in saliva. Fifthly, few studies used follow-up measurement and qualitative interviews to gain more in-depth information about the ongoing effects of qigong and the personal experience of *qi*. Finally, yet importantly, the only five available studies of *chan mi gong* were done about 20 years ago in mainland China; up to date information is limited. The limitations of these 40 selected studies are summarized in Table 1 below.

Table 1: A Summary of the Methodological Limitations of 40 Qigong Studies.

Methodology	Details	No. of Studies	Remarks	This study
Independent variable - qigong	qigong schools (e.g., Guolin) other than *chan mi gong*	35 (87.5%)	-	-
	Chan mi gong	5 (12.5%)	- all done in PR China, none in other parts of the world - almost 20 years old, no update	√
Dependent variables - well-being	physiological effects only (e.g., BP)	19 (47.5%)	-	-
	psychological effects only (e.g., stress)	13 (32.5%)	-	-
	physiological and psychological effects	7 (17.5%)	- 2 HK; 1 PR China; 1 US, 3 Korean - 2 used plasma; all no follow-up and qualitative	√
Subjects (local studies)	patients (e.g., hypertension)	4 (10%)	- limited generalizability to generally healthy people	-
	non-patients	1 (2.5%)	- used plasma cortisol; no qualitative; follow-up and control group	√
Means to measure cortisol	salivary cortisol	0 (0%)	-	√
	plasma cortisol	3 (7.5%)	- use of needle might cause anxiety to some subjects	-
Design	supple. w/ qualitative	0 (0%)	-	√
	with follow-up measurement	4 (10 %)	- 1 HK, 2 PR China, 1 Sweden - no qualitative	√
Place of study	other countries	23 (57.5%)	- none studied *chan mi gong*	-
	PR China	12 (30%)	- 5 studied *chan mi gong,* but 20 years ago	-
	Hong Kong	5 (12.5%)	- none studied *chan mi gong*	√

Five (12.5%) among these 40 qigong studies explored *chan mi gong* (禪密功) (Du, Zhang, Li, & Dai, 1992; Hong, et al., 1990; Qu & Xu, 1992; Wang, et al., 1990; Zhang, Fu, & Zhan, 1990) and all were conducted in PR China. The remaining 35 studies focused on other forms of qigong such as *guolin* (郭林) qigong (Cheung, et al., 2005; Jones, 2001), *biyun* (碧雲) qigong (Johansson & Hassmen, 2008; Jouper & Hassmen, 2008), *shuxinpingxuegong* (舒心平血功) (Lee, Lee, Choi, & Chung, 2003), etc. Only seven (17.5%) of the 40 studies focused on emotional health, and at the same time, used both psychological and physiological tools to measure body-mind well-being. Thus, a majority of them focused on either physiological health or psychological health conditions, but not both. They used either physiological indicators (e.g., heart rate) or psychological measurements (e.g., SF-36). Therefore, they might not be able to provide a comprehensive and holistic picture of body-mind well-being as suggested by WHO (2001a). Qigong is a legacy of TCM, which addresses health and illness in the Taoist philosophy and *qi*-centered terminology (Ai, 2003). The holistic view of well-being in qigong lies in the dynamic mind-body-environment interaction rather than specific physiological characteristics.

In an earlier review (Chow & Tsang, 2007), we proposed to view qigong from both psychosocial and physiological perspectives. The psychosocial aspect includes the cognitive behavioural, distraction, and social interaction theories. Cognitive behavioural theory suggests that physical exercise can stimulate positive thoughts and feelings, which counteract negative feelings and anxiety (Fu & Yang, 2005). Social interaction theory proposes that doing exercise with peers can improve interpersonal relationships (Cox, 1994; Cox, 1998). Distraction theory states that physical exercise itself as a task can help divert one's attention temporarily away from worries and pressure (Gosselin & Taylor, 1999; Morgan, 1985). These correspond to the "mind regulating" discipline, which requires a high concentration on breathing, positive thoughts, or the body, while clearing the stray thoughts; and ultimately achieving a state of mindfulness or *ru jing* (入靜; entering tranquillity) (Zeng, 2004).

The physiological domain covers the cardiovascular fitness hypothesis, and two neurophysiological theories, including the amine and endorphin hypotheses. Cardiovascular fitness theory suggests that physical training may enhance the activity of the autonomic nervous system (ANS) (La Rovere, Mortara, Sandrone, & Lombardi, 1992; Narumi, Taku, Tetsuya, & Toshio, 2004). The "breath regulating" principle shares similar emphasis that improvement of heart functioning and the central nervous system can be achieved by practicing long, smooth, and rhythmic diaphragmatic breathing (Zeng, 2003). The "body regulating" doctrine further highlights the importance of qigong postures and movements in serving different healing purposes to achieve mind-body well-being (Zeng, 2004). The amine hypothesis proposes that doing exercise can stimulate the availability of brain neurotransmitters as reflected by the increases of serotonin and dopamine (Fu & Yang, 2005). Though there are limited studies contributing evidence to the endorphin hypothesis, it is reviewed that physical exercises increase endorphin levels, which is associated with positive mood states (La

Fontaine, et al., 1992). Figure 4 provides a graphical illustration of the integrated model.

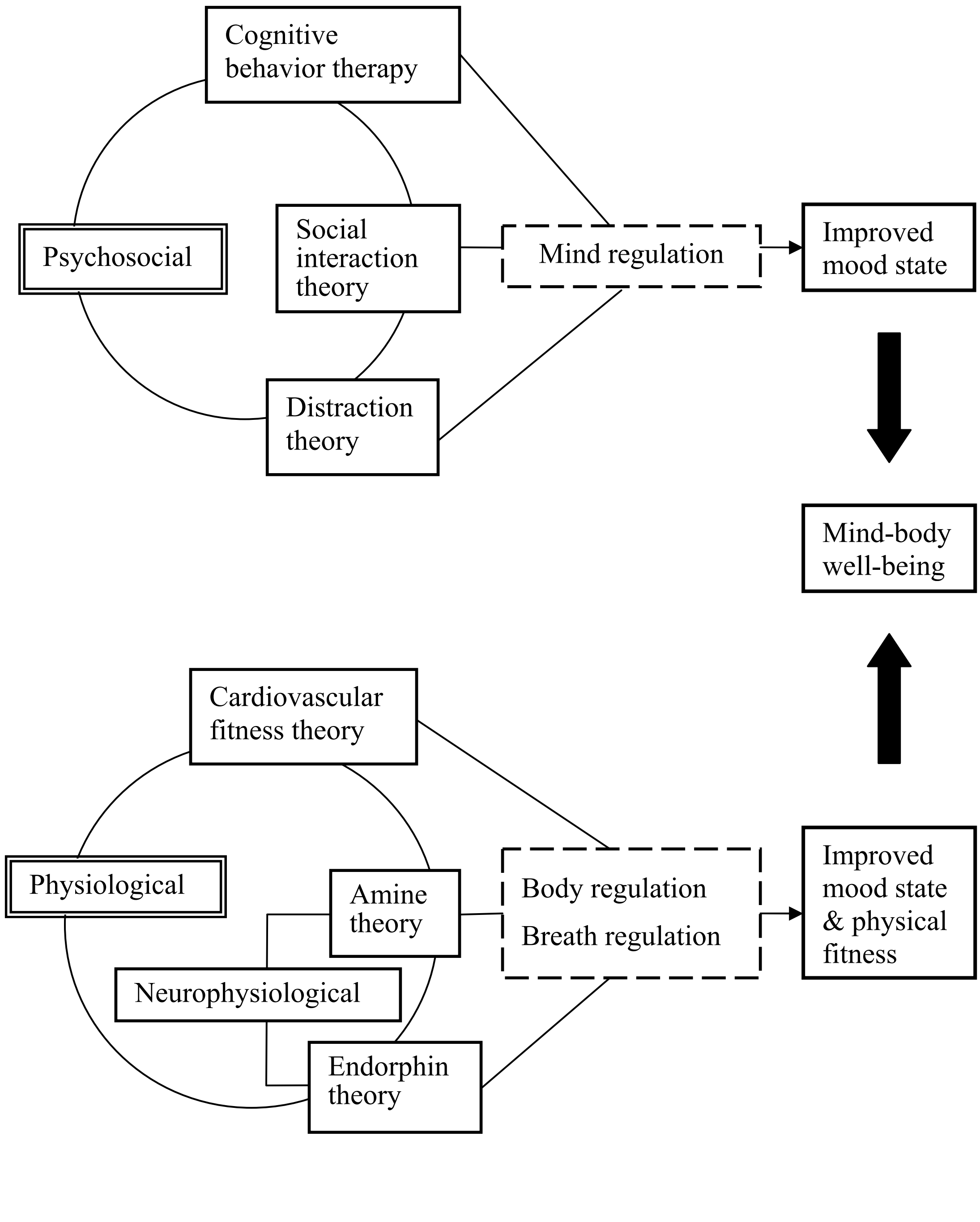

Figure 4: The integrated model (Chow & Tsang, 2007).

Among these 40 qigong studies, there were only five (12.5%) local studies, and only two (5%) of those measured both mental and physical health. Cheung, et al., (2005) found that the blood pressure and anxiety levels of hypertension patients was reduced after practicing *Guolin* qigong for 16 weeks; however, the group difference was not significant when compared with conventional exercise. Hui, Wan, Chan, & Yung (2006) found positive effects of *Lam Ching* (林青) qigong on the body-mind well-being of patients with heart disease. However, there was no follow-up assessment included in these two local studies. The other three local studies, which measured either mental or physical aspects of well-being by quantitative methods, did not include any qualitative information (e.g., the subjective feeling of *qi*). Furthermore, two among these three studies did not take follow-up measurements (Jones, 2001; Tsang, Mok, Au Yeung, & Chan, 2003). Follow-up assessment and qualitative information are not included in the other six overseas studies, which employed both psychological and physiological measures (Hu & Liu, 2008; Lee, et al., 1997; Lee, Kang, Lim, et al., 2004; Lee, Lee, Kim, & Moon, 2003; Lee, Lim, & Lee, 2004; Li, Chen, & Ho, 2002). Thus, the prolonged effect of qigong and subjective experience of *qi* was not yet thoroughly demonstrated.

Only four studies (10%) used follow-up measurements to capture the ongoing effects of qigong. Two of them were longitudinal studies conducted in China, which observed the subjects from six months to two years (Tang, et al., 1995; Sun, Lei, Yan, & He, 1989). One local study used follow-up measurements to investigate the ongoing effects of *ba duan jin* on elderly patients suffering from depression (Tsang, et al., 2006). One Swedish study measured the anxiety and depressive levels of subjects 6-months and 12-months post-training (Stenlund, et al., 2009). However, the qualitative experience of qigong and *qi* was not mentioned. Therefore, since *qi,* the essence of qigong, was not studied and discussed in these 40 studies, a significant piece of the puzzle seems missing in the studies about qigong.

When most local studies used patients as subjects (Cheung, et al., 2005; Hui, Wan, Chan, & Yung, 2006; Tsang, et al., 2003; Tsang, et al., 2006), only one (2.5%) employed health volunteers as subjects, but it had no follow-up assessment and control group for comparison (Jones, 2001). This might limit the generalizability of the positive effects of qigong to the general population.

Blood pressure, heart rate, and cortisol level are indicators, which are used to reflect the physiological level of stress and anxiety in previous studies (Li, et al., 2002; Lee, Lee, & Kim, et al., 2003; Lee, Kang, & Lim, et al., 2004; Cheung, et al., 2005; Hui, et al., 2006). Although cortisol level is a significant indicator of stress level, so far only two Korean (5%) and one local (2.5%) qigong study measured plasma cortisol levels (Jones, 2001; Lee, Lee, Kim, et al., 2003; Lee, Kang, Lim, et al., 2004). Moreover, using a needle in blood sample collection might stimulate stress and anxiety in the subjects, which might additionally affect the results.

In response to the weaknesses stated above, to maximize the scope of beneficial outcomes of qigong in a more holistic manner, we employed both physical and mental health measurements in our study. Quantitative analysis was based on the data collected by using standardized inventories (e.g., DASS-21) and equipment (e.g., blood pressure meter). Qualitative information, such as the subjective experience of *qi,* was collected by logbooks, as well as both short and in-depth interviews. It appears that our study was the fourth in the field to measure cortisol level, and the first to use saliva, which is less invasive than other methods, as a means to detect the cortisol level. In addition to pre, mid, and post measurements, follow-up measurements were included in our design, which could potentially facilitate gathering more evidence on the ongoing effects of qigong. The problem of limited generalizability to the general population led us to recruit healthy adults as our subjects. Two control groups were used for comparison with the intervention group.

1.7.2. Limitations of Traditional Qigong Protocol

A proper fitness workout should include progressive warm-up (e.g., stretching) to satisfy individual conditioning levels, the core practices (from low intensity to high intensity), and a cool-down (e.g., calming, restoration) period (Fu & Yang, 2005). Proper warm-up and cool-down periods are fundamental for a healthy and safe fitness regimen. Warming-up gradually increases the range of motion of our major joints, including ankles, knees, hips, and shoulders. It provides a slow dilation of blood vessels that circulate to the heart and thus reduces the risk of blood pressure spikes. Meanwhile, the cool-down phase gradually decreases body temperature and helps prevent muscle soreness. It allows for an appropriate drop in blood pressure as well.

In ancient Chinese culture, the concept of bodybuilding exercise was not as systematic as it is in modern times. Most traditional qigong styles are rather short and simple and do not have such a step-wise progressive structure. For example, *ba duan jin* is composed of only eight steps, which are more suitable for elderly and weak patients to practice. The warm-up and cool-down demands are minimal and not even included when practicing such non-vigorous and traditional physical activity (Lou, 1993). However, for persons in relatively good physical condition, especially young adults and females, the traditional *gong-fu* (功夫; martial arts) dressing and old-fashioned image of qigong might appear to be less attractive, less trendy, and not meeting the needs for modern beauty and body fitness (Tan & Tian, 2008a, 2008b). One of our goals was to promote qigong exercise to the general public as a regular exercise for body-mind well-being. Therefore, we planned to propose a modern mindful exercise protocol, which integrates the essence of qigong and fitness progressive structure to meet the increasing demand of nonpharmacological modalities in achieving biopsychosocial health for those suffering from stress and anxiety in today's population.

1.8. A New Standardized Qigong Protocol

In this study, the investigator re-packaged a new qigong protocol mainly based on the techniques of a unique style of old qigong, *chan mi gong;* and supplemented with a popular school of health qigong, *ba duan jin* (八段錦). We used the four sets of spine exercises (築基功; *zhu ji gong*)*,* the elementary syllabus of *chan mi gong* as the core exercise, and two simple poses of *ba duan jin* to act as preparatory poses for warming up the body and activating the energy.

1.8.1. *Ba Duan Jin*

Ba duan jin (also named Eight Section Brocade) is a popular and simple qigong system incorporating only eight distinct movements. *Ba duan jin* emerged before the Song dynasty (960–1279 AD), and was gradually refined during the periods of the *Ming* (1368–1644 AD) and *Qing* Dynasties (1644–1911 AD) (Bao, 2001). In order to make it more suitable for promoting health, both the movements and the amount of physical exercise were modified by the State Sport General Administration of China. These modifications were based on the knowledge of modern athletic science and physiology and were thus classified under the category of health qigong. The characteristic movements of *ba duan jin* are gentle, smooth, and coherent. The exercise can be practiced either in standing or in sitting positions. Researchers have found that the practice of *ba duan jin* could reduce anxiety and depression symptoms (Hu & Liu, 2008); increase sleep duration (Manzaneque, et al., 2009), and enhance the effectiveness of the immune system (Manzaneque, et al., 2004).

1.8.2. *Chan Mi Gong*

Chan mi gong is originally rooted in Tibetan Buddhism. Qigong master *Liu Han Wen* (劉漢文) (1921–2004), who people commonly called the grand master of *chan mi gong*, modified the traditional form. Liu came from a Chinese family of practicing Buddhists and medical doctors. He learned various types of meditation and qigong at home as a child. He synthesized his learning into a system of exercises, integrated with some Taoist mind-body cultivation techniques and named it *chan mi gong*. In the 1950s, he first taught *chan mi gong* in a sports clinic of Liaoning Province in China. Since he taught qigong in Beijing in the 1980s, *chan mi gong* has widely spread in China and the rest of the world. In 1994, the first *chan mi gong* society was founded in Germany (Rehle, 2006). *Chan mi gong* consists of six syllabuses. The fundamental syllabus is composed of a series of unique spine techniques. They are the back to forth sways, lateral left to right swings, and clockwise and anticlockwise turns, which are respectively corresponding to the transverse, coronal, and sagittal body axes. These soft and flexible spiral bodily movements are believed to be able to resolve tensions in the body from the inside to the outside and to regulate the internal *yin* and *yang* energy (Liu, 1989).

Though *chan mi gong* is a less well-known qigong style, five studies have demonstrated its promising effects in improving microcirculation (Du, et al., 1992); stabilizing blood pressure (Zhan, Fu, & Zhao, 1990); improving cerebral blood flow (Wang, et al., 1990); enhancing memory and learning efficiency (Qu & Xu, 1992); and, increasing immunogenicity

(Hong, et al., 1990). However, these five Chinese studies were done almost 20 years ago and randomization was not mentioned. They all used only a physiological outcome measurement, and none of them measured stress, anxiety, or benefits on mental health. There is very little knowledge about the potential effects of *chan mi* qigong on psychological health enhancement. The basic training is characterized by gentle movements of the spine, deep relaxation, special standing, hands, and body postures. The four fundamental sets of movements are structured in a step-by-step systematic way where difficulties increase gradually. It is more suitable for new learners to learn yet it maintains a certain level of difficulty and challenge. Unlike *ba duan jin* which consists of only eight discrete poses which are more suitable for the elderly to practice, however healthy young adults might find it not so attractive or not interesting. Since our target subjects were those living in a sedentary life style, the flexible spiral movements might help them to increase body flexibility. The effects of *chan mi gong* on the regulation of mood, in particular stress, anxiety, and quality of life have, to the best of our knowledge, never been investigated before. We propose that the unique spiral movements of *chan mi gong*, which distinguish it from other schools of qigong, might have massaging and stimulating effects on different parts and organs of the body, which is worthy of further investigation.

CHAPTER 2

METHODOLOGY

2.1. Research Design

The objective of this study was to investigate whether a specific qigong exercise has a positive effect on reducing stress and anxiety, and enhancing body-mind well-being by using both psychological and physiological outcome measures. This study had two phases, the pilot study (Phase I), and the main study (Phase II). The main study was further divided into two sub-phases (IIa and IIb) (see Figure 5). The pilot study served a number of purposes including refining the intervention protocol, obtaining feedback on the program, trying out the research procedures, and testing whether there was any effect of qigong on mood states. In the pilot study, all eligible subjects (n = 8) were assigned to the intervention group (i.e., qigong program). Participants of a psychology class were used as a control group for comparison with the intervention group.

A newly standardized qigong protocol was used in the 8-week qigong program. Standardized questionnaires (e.g., DASS-21) were used to collect the data of the psychological states of the subjects, while the physiological condition was measured by electronic blood pressure/heart rate meter and salivary cortisol kit. Data was collected at four measure points (i.e., pre, mid, post, and follow-up). The General Linear Model (Repeated Measures) was used for data analysis. We interviewed the subjects of the qigong group using a newly designed semi-opened questionnaire to collect qualitative information (e.g., *qi*-feeling). An in-depth interview was done with one qigong subject in pilot study and two qigong subjects in main study. Based on the qualitative data obtained from subjects and the suggestions from the departmental research panel, the procedures and qigong protocol were revised before carrying out the main study.

2.2 Sample Size of Main Study & Power Calculation

The sample size was estimated by using PASS analysis where the alpha level was set at 0.05 (2-tailed) and power at 80%. Based on the result of pilot study, the minimum between group differences to detect was set at 1.25 and standard deviation was set at 2.00. The calculated sample for each group was 27. To compensate for the potential 15% dropouts, the sample size was adjusted to be not less than 31 for each group. Finally 68 subjects were recruited for randomization into either qigong group or waitlist control group.

2.3 Randomization & Allocation Concealment

The main study (Phase IIa) was a randomized clinical trial of qigong intervention on improving stress, anxiety, and body-mind well-being. There were more females (n = 22) than males (n = 12) in the main study. As physiological measures (e.g., blood pressure) were known to be related to age and gender, a stratified randomization procedure was used to ensure a similar proportion of females and males and a similar mean age in each group. It further minimized the difference of gender and age between the two groups. The potential subjects were first stratified based on gender and then age. The median age of each gender was used to split the subjects into two halves. Therefore, we had four sub-groups: older female, younger female, older male and younger male. Before implementation of the study, a prior randomization list for each subgroup was drawn on random numbers generated and sorted by the computer. The potential subjects were then randomized into either “t” (treatment) or “c” (control) group within each stratum so that the overall sample was balanced by the strata. A third person who was not involved in the study did this. The result was saved in a computer file with a security password. A week before the first qigong session, he opened the file and assigned the subject to either the treatment or control group accordingly.

In Phase IIb of the main study, a psychology class was used as the second control group for comparison with the qigong group. After the pilot study, the qigong protocol was further revised before using it in the main study. Similar to the pilot study, we also had four sessions of data collection (pre, mid, post, and follow-up).

2.4 Qualitative Information

To collect qualitative information about the programs, we had short interviews with all subjects in the follow-up week. The subjects were requested to elaborate on their qigong experience and use 5-point scales to express their level of satisfaction. Our newly designed semi-opened questionnaire was used in to collect information about *qi*-feelings and the experience of practicing qigong. In order to collect more detailed feedback, two subjects in the main study were selected for in-depth interviews.

2.5 Secondary Analysis

A cross-sectional study found that veteran qigong trainees (two years of practice) had better mood states than the novices (two months of practice) (Lee, Ryu, & Chung, 2000). However, the significance of practice hours was rarely mentioned in relatively short-term qigong training. Cohen (1997) also claimed that *de qi* (得氣; reach the *qi*) is important in healing and treatment. It is suggested that women are more suitable and more easily gain satisfaction when practicing moderate impact exercise, like qigong (Zhai, 2006). Nevertheless, the significance of gender and *de qi* is rarely documented in the available literature. Therefore, among the subjects of the qigong group, we also did a secondary analysis based on four pairs of comparisons: a) between those who could feel *qi* and those who could not, b) between those who practiced more and those who practiced less, c) between men and women, and d) between older subjects and younger subjects. GLM (Repeated Measures) was used for quantitative analysis.

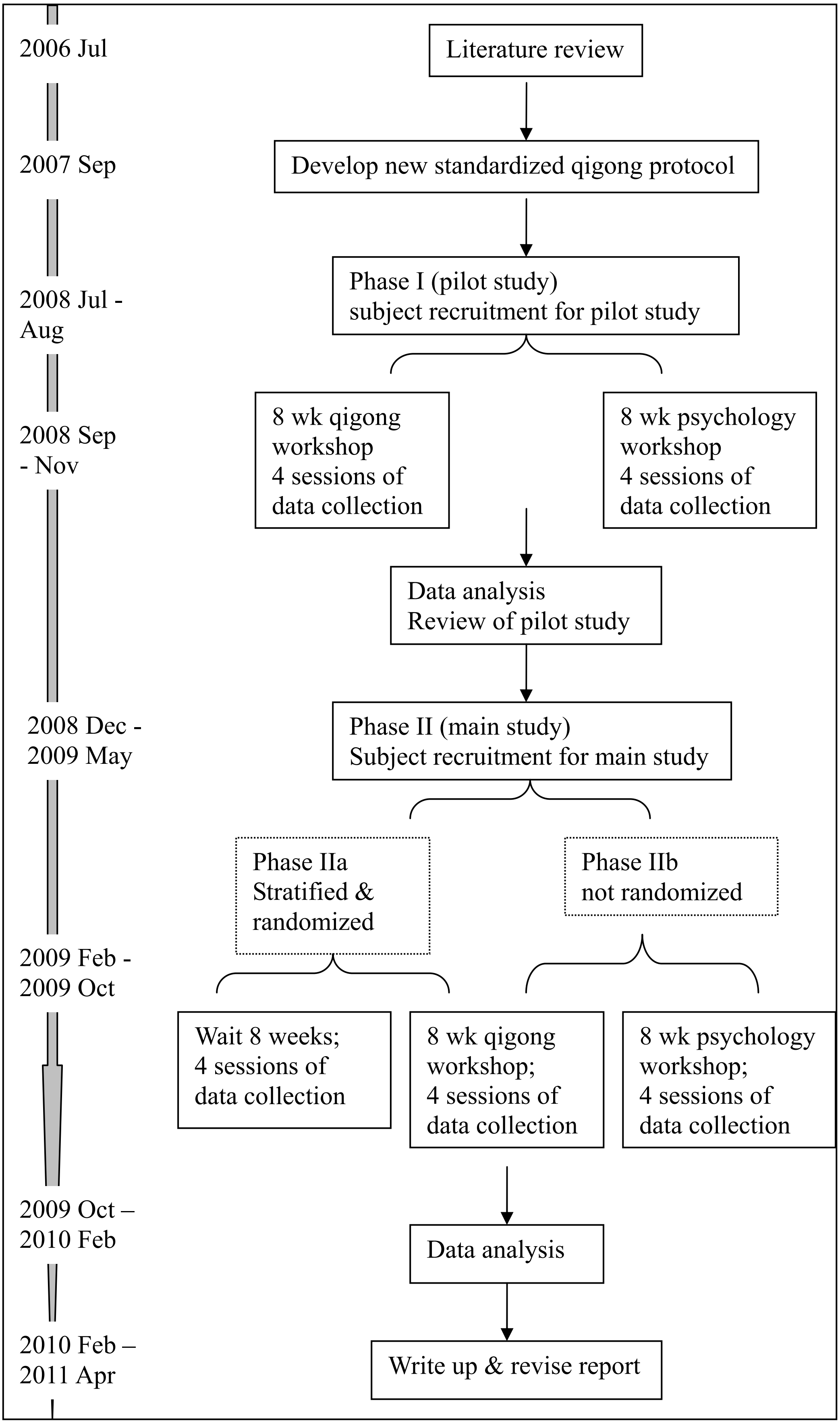

Figure 5: Flow chart of the complete study.

2.6. The Intervention Program: The *Mindfit* Exercise (re-packaged qigong protocol)

A standardized set of qigong exercises, named *Mindfit* Exercise*,* was developed based on the traditional school of qigong, *chan mi gong.* Its elementary syllabus (i.e., *zhu ji gong*), which is composed of four sets of spine techniques formed the core poses of our new qigong protocol. Two simple postures of *ba duan jin* served as preparatory *ti-qi* (提氣) steps and were integrated into the protocol. Some spine and muscle stretching poses were integrated into the exercise to make it into a more comprehensive fitness exercise. The preliminary protocol was presented to a seven-member expert panel, including a qigong master, traditional Chinese medicine practitioner, psychiatrist, psychologist, occupational therapist, and rehabilitation specialist. Each of them has been practicing in his/her own profession for at least 8 years (8 to 24 years). The two qigong masters have taught qigong for over 20 years. The TCM practitioner has practiced qigong for over 10 years and was experienced in qigong therapy. The occupational therapist has studied qigong for several years and he also integrates qigong in his clinical work. The psychiatrist, psychologist and rehabilitation specialist have solid experience in other kinds of mindful exercise or physical exercise for body-mind well-being.

The experts evaluated the protocol according to the therapeutic values (psychological, physiological, and social) and safety for people who practice it (see Appendix 6). The comments were positive and the protocol was refined in light of the advice given by the experts. For example, the panel members commented that there was a need to indicate in the protocol the possible harm/injury and precautions. The precautions were then introduced in the first workshop and the subjects were reminded to stop doing the exercise when they felt unwell (e.g., dizzy). Since there were English-speaking members in the panel, both English and Chinese descriptions were used in the initial manuscript of the protocol. However, the panel suggested we use only one language in the manual. As our subjects were Chinese adults, the descriptions on the manual for home practice and the media of instruction during lessons were all in Chinese (Cantonese). The protocol consisted of seven major parts, each part focused on specific functions (see Table 2). The poses of the core spine exercise are shown in Figure 6.

Table 2: Content of Mindfit Protocol Used in Pilot Study.

Part	Title	Functions
I	Meditation	To settle down the body and the mind, enhance concentration and mind relaxation, increase the feeling of peacefulness
II	Warm-up	To warm-up the muscles, joints; prepare both the body and mind for exercise
III	*Dantian* breathing	Increase concentration, improve breathing rhythm, relieve from stress, clear the mind, prepare the body for intermediate *qi*-exercise
IV	*Qi*-spine exercise I (*zhu ji gong*)	Basic *qi*-exercise to improve digestive and circulatory systems; strengthen muscles and increase flexibility of joints, align spine
V	*Qi*-spine exercise II (*zhu ji gong*)	Intermediate *qi*-exercise to strengthen the spine and increase flexibility, enhance internal *qi* (energy) circulation, improve blood circulation
VI	Cool-down	To cool-down body and mind, resume harmony
VII	Progressive body relaxation	To enhance body and mind relaxation, energy resume

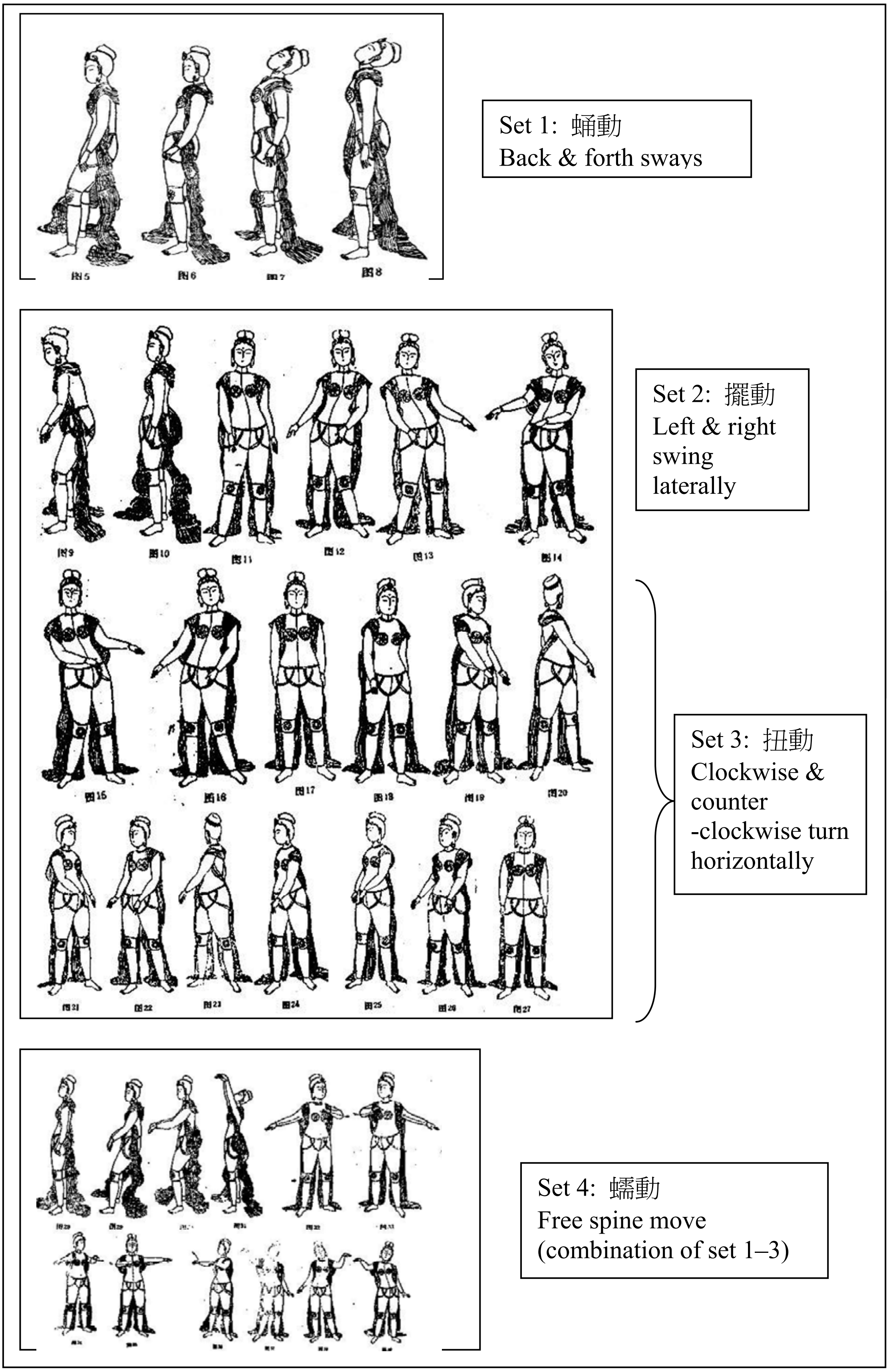

Figure 6: Poses of the four sets of core spine exercises (Liu, 1989).

2.7. Instruments

Since this study aimed to measure both the psychological and physiological effects of qigong on body-mind well-being; we needed different measurement tools for different purposes. A summary of the measuring instruments and their functions are shown in Table 3.

Table 3: Instruments and Purposes.

Instruments	Purpose	Appendix
PAR-Q questionnaire	Screening of suitability and readiness for sports participation	1
Health condition questionnaire	Screening of eligibility for participation in the study and readiness for practicing qigong	2
DASS-21 questionnaire	Measurement of changes in stress/anxiety/depressive level	3
ChQOL questionnaire	Measurement of changes in quality of life	4
Short follow-up questionnaire	Follow-up interview (used in the 4th measurement) collect information about *qi*-feeling and feedback on the whole qigong program	5
Salivary cortisol kit	Measurement of salivary cortisol level	-
Blood pressure and pulse meter thermometer	Measurement of physiological changes; monitor health conditions (BP, HR and body temperature) of the subjects so as to ensure they were suitable to take the tests	-
Protocol evaluation form for expert panel	For the members in the expert panel to evaluate the *Mindfit* exercise protocol.	6

2.7.1. Screening Instruments:

2.3.1.1. Physical Activity Readiness Questionnaire (PAR-Q) (Shephard, Thomas, & Weller, 1991; Thomas Reading, & Shephard, 1992)

PAR-Q is a questionnaire to check the readiness for physical exercise of a subject. Although the risk that qigong will cause a cardiac catastrophe is relatively low, a pre-exercise screening is still a necessary precaution for those who were willing to join the study. The revised PAR-Q has been widely used in pre-exercise screening and is recommended for symptom-free adults with no obvious cardiac risk factors (Thomas, et al., 1992). The potential participant is required to answer seven questions about their physical condition. The participant will be advised to seek the doctor's advice before doing exercise if s/he answers "YES" on any of the questions.

2.7.1.2. Health Condition Questionnaire

A health condition questionnaire (see Appendix 2) was designed to screen potential subjects as to whether they meet the inclusion criteria. In the questionnaire, potential subjects were asked whether they were smokers, were pregnant (women), or taking psychiatric medication. Those applicants who regularly practiced mindful exercises (e.g., qigong, yoga) and other kinds of aerobic exercises (e.g., swimming) were also excluded from our study. Since this study was targeted at healthy adults, those having chronic disease (e.g., hypertension) were not selected either.

2.7.2. Outcome Measures on Psychological Well-being

2.7.2.1. Depression Anxiety Stress Scales (DASS-21) (Lovibond & Lovibond, 1995a, see Appendix 3)

The DASS-21 is a simplified version of the full edition DASS-42. It is a self-report instrument designed to measure the three emotional states of depression, anxiety, and tension/stress. Using a 4-point scale, subjects are asked to rate the extent to which they have experienced each state over the past week. Each of the three DASS-42 subscales (i.e., depression, anxiety, and stress) contains 14 items and the simplified DASS-21 scales contain seven items in each subscale. Subscale scores for depression, anxiety, and stress are calculated by summing the scores for the relevant items. The DASS manual provides a series of cut-off values to classify individuals into severity rating categories as normal, mild, moderate, severe, and extremely severe (Lovibond & Lovibond, 1995b). The three scales of stress, anxiety, and depression were regarded as the operational definitions, which reflected the mood states of the subjects in our study. The DASS-42 subscales had acceptable test-retest reliability: $r = 0.71$ for depression, $r = 0.79$ for anxiety, and $r = 0.81$ for stress. The DASS depression scale had a high correlation with BDI-II ($r = 0.74$) and the DASS anxiety scale had a high correlation with BAI ($r = 0.81$) (Brown, Chorpita, Korotitsch, & Barlow, 1997; Lovibond & Lovibond, 1995a).

Lee, et.al, (2007) used DASS-21 in a clinical setting to measure the impact of SARS on the psychological states of frontline health care workers. A mental health survey of university students employing the Chinese translated version of DASS-21 was conducted in Hong Kong as well (Wong, Cheung, Chan, Ma, & Tang, 2006). The DASS-21 has a number of advantages (e.g., better factor loadings) over the full length DASS-42. It takes only half the time to administer, which is more acceptable for clients with limited concentration, yet it still possesses an adequate level of reliability. Henry and Crawford (2005) used confirmatory factor analysis (CFA) to assess competing models of the factor structure of the DASS-21. It was found that DASS-21 has high structural validity as its RCFI is larger than 0.90 (RCFI = 0.941). The analysis of RMSEA indicated a very good fit (RMSEA = 0.05) as well (Crawford & Henry, 2003). Antony and his colleagues (1998) found that the three subscales of DASS-21 also had a moderate to high correlation with BDI, BAI, and STAI-T. Details are shown in Table 4.

Table 4: Reliability and Validity of DASS-21.

Study	DASS subscale	Internal consistency (Cronbach's alpha)	Convergent validity Correlation with BDI (*r*)	Convergent validity Correlation with BAI (*r*)	Convergent validity Correlation with STAI-T (*r*)
Antony, Bieling, Cox, Enns, & Swinson (1998)	DASS-D	0.94	0.79	0.51	0.71
	DASS-A	0.87	0.62	0.85	0.55
	DASS-S	0.91	0.69	0.70	0.68
Crawford & Henry (2003) Henry & Crawford (2005)	DASS-D	0.88			
	DASS-A	0.82			
	DASS-S	0.90			
	Total scale	0.93			
		High overall alpha > 0.85	Moderate to high	Moderate to high	Moderate to high

Note. BDI: Beck Depression Inventory

BAI: Beck Anxiety Inventory

DASS-D: DASS depression scale

DASS-A: DASS anxiety scale

DASS-S: DASS stress scale

STAI-T: State-Trait Anxiety Inventory

2.7.2.2. Chinese Quality of Life instrument (ChQOL) (Leung, et al., 2005)

The Chinese Quality of Life instrument (ChQOL), is a self-reported health status generic measurement specifically developed as an outcome measure for TCM (see Appendix 4). It was selected for use in this study since its design is based on a traditional concept of health (i.e., harmony of *yin* and *yang*) in TCM, unlike other generic instruments such as the SF-36 (Cheung, et al., 2005; Hui, et al., 2006). The ChQOL is one of the few instruments that were developed on a clear and explicit theory of health in the context of the Chinese culture. The ChQOL consists of 50 items, which are categorized under three domains (physical function, spiritual/vitality, and emotion) and 13 facets (e.g., complexion, anxiety, etc.). The domain and facet structure of the ChQOL is shown in Figure 7 (Zhao, Leung, & Chan, 2007). In TCM literature, *Xing* (形; physical form) refers to the bodily structure of human beings. *Shen* (神; spirit) refers to the general outward manifestations of both the life activities and the mental activities, which include consciousness, *qi xi (*氣息; energy and vitality), and reasoning of the human mind. The physical form of the body is the basis for production of the spirit, while the spirit can regulate the body. They depend on each other for their existence, and the unity of the body and spirit is the essence of one’s survival (Leung, et al., 2005). The 7-emotions (七情) theory of TCM stresses that emotion and body are linked and mutually affected. Emotion disturbances, which are due to stress coming in from outside of the body, affect the corresponding viscera organs and thereby result in illness (Liu, 1998). The items of ChQOL are the manifestation of the equilibrium of *yin*

(陰) and *yang* (陽) of the corresponding facets and domains. In the principle of TCM, one will become vulnerable to illness (both physically and mentally) if the *yin* and *yang* environment is imbalanced inside the body. Qigong shares the principle of *yin* and *yang* harmony (陰陽調和) with TCM tradition.

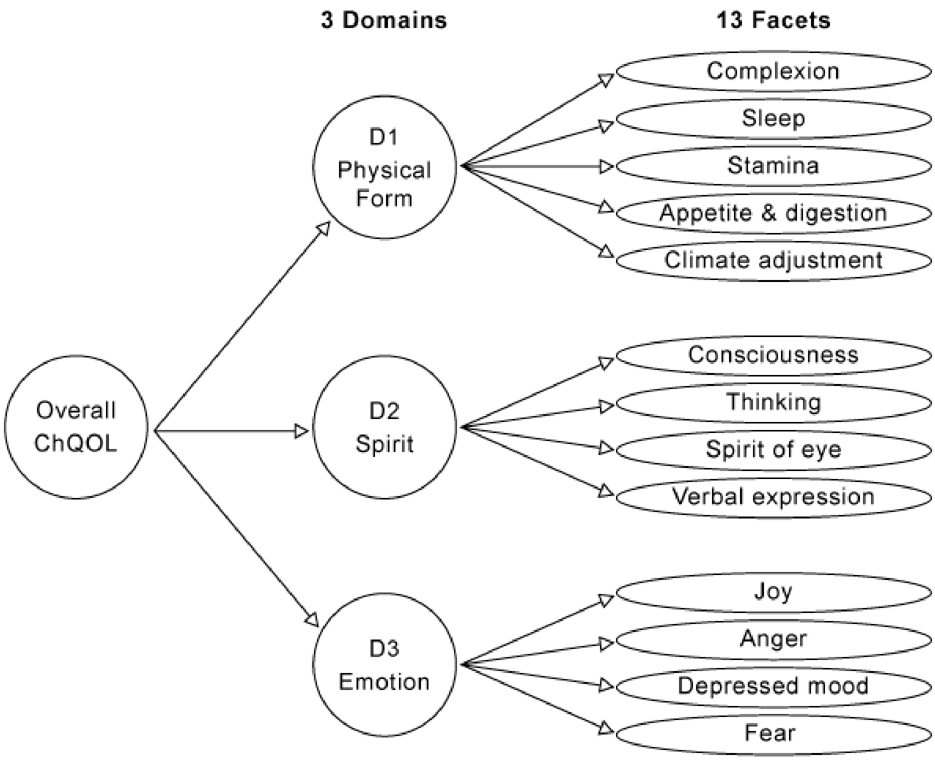

Figure 7: Domain and facet structure of the ChQOL (Zhao, et al., 2007).

First developed and validated in Mainland China, the ChQOL uses a 5-point Likert scale to rate the intensity, frequency, or evaluation of the selected attributes of health status. All facet and domain scores are transformed to a 0 to 100 scale, with a higher score indicating a better health status. Previous studies have revealed that the ChQOL is valid and the psychometric properties are good (Leung, et al., 2005; Zhao, Chan, Leung, Liu, & Fang, 2004; Zhao, Liu, Leung, Chan, & Fang, 2006). The Cronbach's α coefficient of the ChQOL domains are considered adequate to good, with 0.80 for physical, 0.89 for spiritual/vitality, 0.82 for emotion, and 0.80 for overall ChQOL. It also has significant correlations with other health related quality of life instruments, i.e., the WHOQOL-100 and the SF-36 (Leung, et al, 2005; Zhao, et al., 2006). Details are shown in Table 5. Zikmund (2003) stated that the concept of well-being is closely related to the concept of the quality of life. The authors also suggested that ChQOL has good reliability and validity. It can be used to assess quality of life in clinical and scientific research. Therefore, we employed the three domains of ChQOL as the operational definitions, which indicated the well-being condition of the participants in this study.

Table 5: Reliability and Validity of ChQOL.

Study	Internal consistency (Cronbach's alpha)	Test-retest reliability (Intra-class correlation, ICC)	Structural validity (Comparative fitness index, CFI)	Convergent validity with WHOQOL-100 domains (Pearson's r)	Correlation with SF-36 facets (Pearson's r)
Leung, et al., (2005)	facet : 0.71 – 0.90	facet: 0.67-0.84	item-facet fitness: 0.82-1.00	overall health: 0.21 – 0.64	overall health: 0.19-0.55
Zhao, et al., (2006)					
Zhao, Leung & Chan (2007)	domain: 0.80 – 0.89	domain: 0.83-0.90	item-facet domain fitness 0.87-0.96		
	good all alpha > 0.7	good overall ICC >0.7	good overall CFI > 0.9	mild convergence	moderate correlation

2.7.3. Outcome Measures on Physiological Well-being

2.7.3.1. Salivary Cortisol Level, Blood Pressure, and Heart Rate

Cortisol is a reliable physiological indicator of one's stress level. Saliva collection is a precise non-invasive sampling procedure for cortisol measurements in situations where blood sampling is not favourable (Aardal & Holm, 1995). Salivary cortisol concentrations correspond closely to serum cortisol for determination of physiologic stress (Riad-Fahmy, Read, Walker, & Griffiths, 1982). The correlation between saliva and serum was highly significant, $r = 0.89$, $p < 0.0001$ (Salimetric, 2003). Salivary cortisol was assayed using ELISA kit (Cortisol Correlate-EIA kit, Assay Designs, Inc., USA). The same kit was used in a previous study for assessing the effect of psychological stress on salivary cortisol (Takai, et al., 2004). Blood pressure and heartbeat were monitored by a blood pressure recorder as well. The salivary cortisol levels, systolic and diastolic blood pressure, and heart rates were regarded as operational indicators of physiological well-being of the subjects in our study.

CHAPTER 3

THE EXPERIMENT

3.1. Pilot Study

The pilot study (Phase I) attempted to collect feedback for refining the intervention protocol, to try out the research procedures, and conduct an estimation of the effect size of qigong on mood states. Similar to the main study, four repeated measures of outcomes were conducted.

3.1.1. Data Collection Procedures

3.1.1.1. Subject Recruitment

Interested participants were recruited by advertisements posted on the notice boards in the campus of the Hong Kong Polytechnic University (PolyU) and through email networks from July to August 2008. Leaflets were distributed to the public in a health exhibition as well. Subjects of the control group were recruited from a psychology class organized by a local community centre during the same period. Both qigong and psychology classes were administered from September to November 2008. This study was approved by the Research Committee of PolyU. Volunteer participants were scheduled for a meeting with the investigator a week prior to the start of the qigong group and psychology class to explain the study and collect their written consent. In order to determine whether they were eligible to join the study, each potential participant had to complete the PAR-Q, health condition questionnaire, and a preliminary DASS-21 test.

Subjects were recruited to participate in the study if they met the following inclusion criteria: (1) age 18 years or older; (2) non-smoker; (3) physically healthy (e.g., not taking medication for chronic disease); (4) physically suitable for doing medium intensity exercise as assessed by PAR-Q*;* demonstrated at least a mild degree of mood disturbance as defined by the range of scores according to the DASS manual in one or more domain of DASS (i.e., stress, anxiety, or depression) in the preliminary screening test. The exclusion criteria were: (1) have used psychiatric drugs during the last six months; (2) pregnant; (3) have chronic illness and need regular medication (e.g., heart problem); (4) have learned any kind of mindful exercise (e.g., yoga, qigong) and have been practicing it regularly in the past two years; and (5) regularly participate in other kind of aerobic exercises (e.g., swimming). Sixteen subjects were recruited for the pilot study. As an incentive, subjects who completed all classes and the assessments of each subject would receive a health report indicating their changes in heart rate, blood pressure, and cortisol level collected in different assessment days.

3.1.1.2. Data Collection of Psychological and Physiological Outcome Measures

Data collection of psychological outcome measures was conducted at four points during the experiment: pre (1st week), mid (4th week), post (8th week) of qigong training, and follow-up (2 weeks after the eight qigong lessons, i.e., the 10th week). The subjects completed the DASS-21 and

ChQOL questionnaires, blood pressure, heart rate, and cortisol measurements in each checkpoint. However, due to limited resources and work force availability, only three groups of physiological measures were obtained at the 1st, 4th, and 8th week.

On the day of the first qigong and psychology class, the subjects were required to rest for 15–20 minutes before data for their blood pressure and pulse rate were taken. After that, they were given ChQOL questionnaires to complete. Then, salivary samples were collected as well. Since the subjects had provided scores of DASS-21 in the orientation session (a week before the first qigong/psychology lesson), DASS-21 was not given again in this first checkpoint (week 1). Together with the data of DASS-21 collected during the orientation meeting, this first lot of data was treated as the baseline for further comparisons with the outcomes collected in the 4th and 8th weeks. Two weeks after lesson eight (i.e., 10th week), in addition to DASS-21, CHQOL, and physiological measurements, subjects were requested to report their subjective experience of both physical and psychological changes through responding to open-ended questions in a self-report questionnaire. They were asked to report on their experience with *qi* and subjective health changes after practicing the qigong protocol, as well as making comments about the qigong protocol. One subject, who could stay longer after class, was selected for an in-depth interview in order to gain personal experience information regarding qigong.

3.1.1.3. Collection of Salivary Samples

The cortisol level is very low at night and rises to a peak after awakening in the early morning; then it decreases over the next few hours. In order to control as much as possible for the time of day, appointments were made between 9:00 and 10:00 a.m. on each assessment day. According to the manufacturer's instructions, certain substances can cause interference in immunoassays. To ensure the reliability of measures, the subjects received instructions to: 1) avoid alcohol for 24 hours before sample collection; 2) finish a light breakfast at least 90 minutes before sample collection; 3) avoid dairy products during breakfast; foods with high sugar, acidity, or high caffeine content were also to be avoided. At least 1 ml of saliva for each sample was collected in the sterile tube. Evidence of blood contamination was determined by visual inspection and such samples were annotated when trace of blood was found.

After collection, the labelled salivary samples were immediately stored in a collection box filled with blue ice. Then, as the standard procedure in studies involving the measure of saliva cortisol, the samples were frozen and kept in a deep freezer at -80° C before further analysis (Sanchez-Martin, et al., 2001). Standards, controls, and samples were assayed in triplicate. After thawing at room temperature, the saliva sample was diluted 10 times with assay buffer. The samples were shaken for incubation at 250 rpm for about two hours at room temperature. We followed the ELISA kit instructions on handling and storing the reagents and performed the immunoassays. As described in previous studies, the concentration of cortisol in saliva was determined by a time-resolved fluorescence immunoassay, (Hellhammer, Buchtal, Gutberlet, & Kirschbaum, 1997; Takai, et al., 2004). The results were obtained by counting on a spectrometer

(Bio-Rad Ultramark Reader). The sensitivity of the assay for saliva samples was 56.72 pg/ml.

3.1.2. Intervention

The treatment (qigong) group learnt and practiced the *Mindfit* exercise weekly, for a total of eight lessons from September to November 2008. Educational lessons (once a week) about psychology and well-being were given to the control group (see Figure 8). Each session lasted for around 90 minutes. The subjects in the qigong group learned and practiced the qigong protocol under the supervision of the investigator, who has practiced qigong for 20 years. The psychology lectures for the control group were delivered by the same investigator. The data of blood pressure, heart rate, questionnaires, and salivary samples were collected by research assistants. Lecture notes and a soft-copy PowerPoint file were produced to both detail the protocol and be available to the subjects for home practice. The subjects were required to practice the exercise 20 to 30 minutes a day. In order to monitor their compliance with this requirement, they were instructed to record the practice time and their experience in practicing the exercise (e.g., difficult to follow, relaxed, sweating, etc.) on the logbooks that were provided.

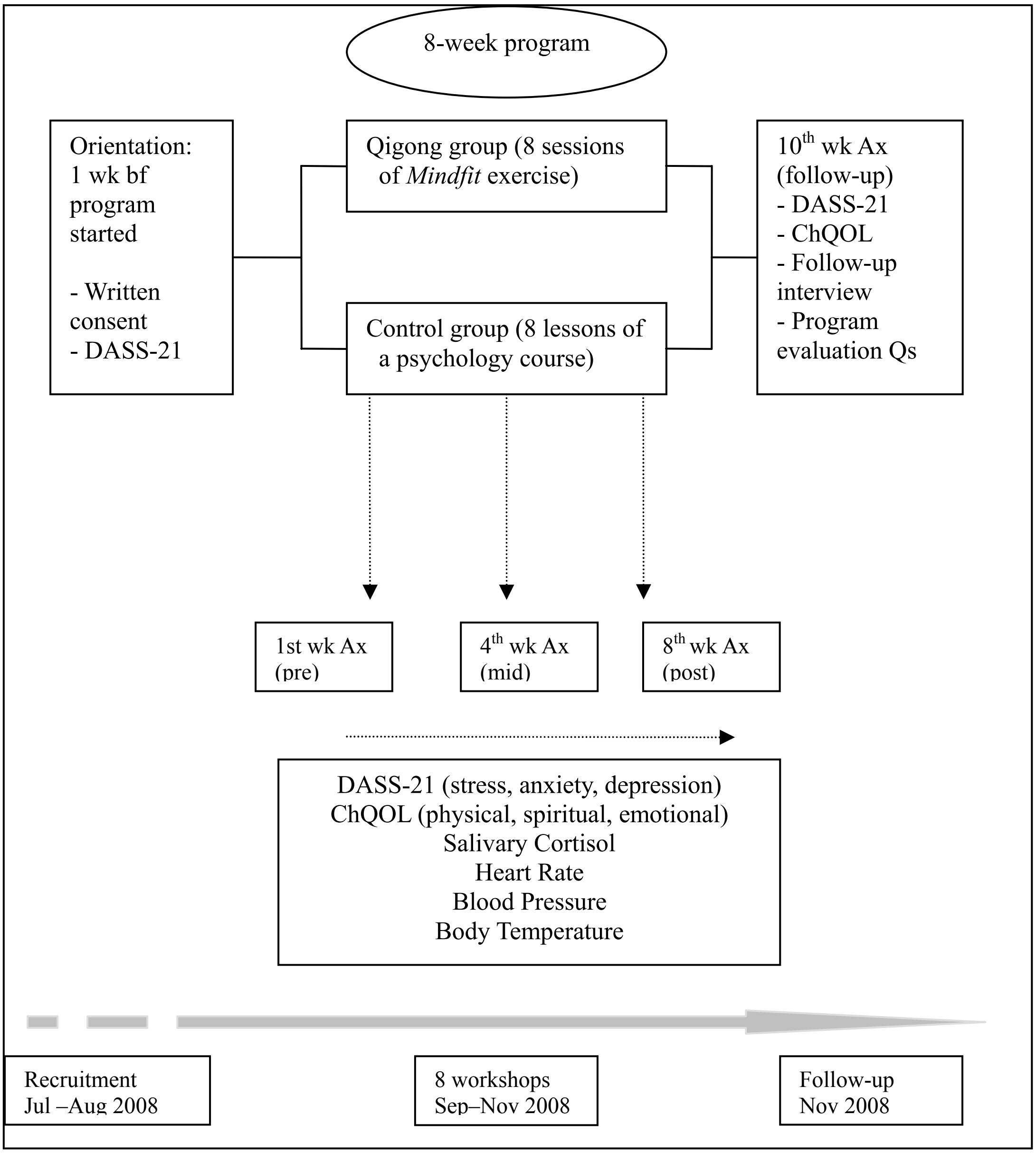

Figure 8: Flow chart of assessment and intervention in pilot study.

3.1.3. Ethical Issues and Safety measures:

All participants volunteered to participate in the study and provided written informed consent before entry. All the information collected was treated as confidential and only used for research purposes.

In each qigong session, the subjects in the intervention group were asked whether they had any uncomfortable feelings such as chest pain and dizziness during and/or after the practice. They were told to stop practicing whenever they had symptoms or feelings of discomfort. Collected data of blood pressure and pulse rate were analyzed for any indications of potential health hazards.

3.1.4. Aims and Hypotheses

The aim of the pilot study was to investigate whether practicing qigong helps to reduce stress and anxiety, as well as improving the quality of life. We employed a Repeated Measures design to detect group differences in four measure time-points throughout the study period. We hypothesized that:

Within-group Difference

1) After joining the 8-week qigong class, the participants would have significant improvement in **psychological well-being** outcomes (i.e., lowered DASS-21 and higher CHQOL) when compared with the baseline.
2) After joining the 8-week qigong class, the participants would have significant improvement in **physiological well-being** outcomes (i.e., lowered BP, HR, and cortisol) when compared with the baseline.

Between-group Difference (Treatment Effect)

3) After joining the 8-week qigong class, the **psychological** well-being (i.e., lowered DASS-21 and higher CHQOL) of participants in the

intervention group (i.e., the qigong group) would be significantly different from that of the subjects in the control group (i.e., the psychology group).

4) After joining the 8-week qigong class, the **physiological** well-being (i.e., lowered BP, HR, and cortisol) of participants in the intervention group (i.e., the qigong group) would be significantly different from that of the subjects in the control group (i.e., the psychology group).

3.1.5. Statistical Analysis

The statistical software SPSS16 was used to analyze the data collected. The independent variable is the group, which the participants joined, i.e., the intervention (qigong) and waitlist control group. To test for within-group effect (i.e., hypothesis 1 and 2), the data of three main assessment points (pre, mid, and post) and follow-up measurement were analyzed by GLM (Repeated Measures) for each group. This analysis aimed to examine whether there was any improvement in overall body-mind well-being as indicated by the dependent variables: mood states (DASS-21—stress, anxiety, and depression scores), quality of life (ChQOL—physical, spiritual, and emotional scores), physiological conditions (cortisol level, blood pressure, and pulse rate) throughout the study period. In order to investigate whether there was any group difference in all the dependent variables over time, GLM (Repeated Measures) was also used to analyse the data. In order to statistically equate the baseline, the respective pre-test scores of each dependent variable were treated as covariate.

The strength of the effect size (eta squared, η^2) was interpreted by employing the generally accepted guidelines given by Cohen (1988). Cohen's guidelines stated that, for eta squared (η^2), 0.01 indicates a small effect (Cohen's d = 0.2), 0.06 indicates moderate effect (Cohen's d = 0.5), and 0.14 to infinity indicates a large effect (Cohen's d = 0.8) (Cohen, 1988; Kinnear & Gray, 2008; Pallant, 2005). Similar criteria have been used in social science studies focusing on emotional disturbance (Curtin, 2007) and anxiety disorder (Kittler, Menard, & Phillips, 2007).

3.1.6. Results of Pilot Study (Phase I)

3.1.6.1. Subjects

Eight Chinese subjects, four males and four females, aged 43 to 60 years (M = 49.00, SD = 7.1) satisfied the inclusion criteria and participated in the intervention group. For comparisons, eight eligible subjects (seven females and one male), aged 33 to 43 years (M = 36.63, SD = 4.06) who joined a psychology class were treated as a control group. The qigong group was significantly older than the control group (t = 4.27, p = 0.001). Evidence showed that demographic variables (e.g., age) had only very modest influences on DASS scores (Crawford & Henry, 2003). Jho (2001) found no significant statistical correlation between age and quality of life. It is also found that salivary cortisol levels do not change significantly with age (Ahn, Lee, Choi, Kwon, & Chun, 2007). However, it was additionally noted that there were group differences in physiological differences (e.g. blood pressure) and thus the baseline measure of each dependent variable was entered as a covariate to equate the uneven baselines between the two groups.

3.1.6.2. Compliance

For the qigong group, all eight subjects (100%) attended all eight sessions over the research period. Out of the eight subjects in the control group, seven (87.5%) attended eight workshops of the psychology class; only one subject missed one session due to an out-of-town business trip. There was no significant difference between the number of training classes attended in the two groups (t = 1.075, p = 0.302). The qigong participants reported an average of 22.7 minutes of home practice per day, which was regarded as satisfactory. Seven of them (87.5%) practiced over 20 minutes a day. The subjects in the control group also finished the home assignments (e.g., reading articles). All sixteen subjects (100%) completed the questionnaires of DASS and ChQOL in pre-, mid-, and post-assessment points. For cortisol measures compliance, we collected 48 samples from all 16 subjects. Each subject provided salivary samples at pre, mid, and post-assessments. For the 4th assessment, five subjects in the qigong group (62.5%) and four subjects in the control group attended the short interview by completing the semi-opened questionnaires and the follow-up assessments (DASS-21 and ChQOL only). Therefore, nine sets of scores were collected and inputted when analysing the ongoing effect of qigong. Due to limited resources, no physiological measurement was done in the 4th checkpoint. One qigong subject, who could stay for about 45 minutes after the class, was invited for an in-depth interview to gain more details.

3.1.6.3. Baseline Difference

The differences of each DV and age between the two groups were calculated by using a *t*-test (see Table 6). The results showed that the two groups were significantly different on age, systolic and diastolic blood pressure; other comparisons were not significant. A summary of treatment effects between the two groups is shown in Table 7 below. A summary of changes in 10 outcome measures of the eight subjects in the qigong group over the first three tests is shown in Table 8. There were only five subjects who provided data of psychological outcome measures in the 4th measurement, a separate summary of these five subjects over all four assessments is shown in Table 9. For the control group, a summary of changes in 10 outcome measures of the eight subjects over the first three assessments is shown in Table 10. There were only four subjects who provided data of psychological outcome measures in the 4th measurement, a separate summary of these four subjects over all four measurements is shown in Table 11.

Table 6: Comparisons of Pre-test Scores of Qigong Group (Treatment) and Psychology Group (Control).

Outcome measures	*M(SD)* Treatment Qigong group (n = 8)	Control Psychology group (n = 8)	*t*	*p*
Age	49.00 (7.11)	36.63 (4.07)	4.27	0.001*
DASS-S pre-test	17.50 (6.48)	11.50 (6.21)	1.89	0.08
DASS-A pre-test	10.25 (6.45)	7.25 (4.27)	1.10	0.294
DASS-D pre-test	9.25 (6.76)	4.75 (4.89)	1.53	0.149
ChQOL-P pre-test	51.51 (9.78)	58.60 (13.00)	-1.23	0.24
ChQOL-S pre-test	55.91 (17.61)	60.34 (16.78)	-0.52	0.615
ChQOL-E pre-test	61.97 (15.95)	68.11 (11.11)	-0.90	0.388
ChQOL-OA pre-test	56.47 (12.34)	62.35 (10.51)	-1.03	0.322
Cortisol pre-test	2392.37 (1269.31)	2283.16 (874.55)	0.20	0.844
Sys BP pre-test	116.38 (13.33)	102.38 (12.64)	2.16	0.049*
Dia BP pre-test	79.13 (8.68)	65.50 (6.28)	3.60	0.003*
HR pre-test	64.88 (7.32)	68.13 (5.36)	-1.01	0.33

* $p \leq 0.05$

Note: DASS-S: DASS stress subscale
DASS-A: DASS anxiety subscale
DASS-D: DASS depression subscale
ChQOL-P: ChQOL physical domain
ChQOL-S: ChQOL spiritual/vitality domain
ChQOL-E: ChQOL emotional domain
ChQOL-OA: ChQOL overall scale
Cortisol: salivary cortisol
Sys BP: systolic blood pressure
Dia BP: diastolic blood pressure
HR: heart rate

Table 7: Comparison of Treatment Effects between Qigong Group (Treatment) and Psychology Group (Control) over Re-assessments.

Outcome measures	Time 1 to Time 3 Pre to post (wk 1 to wk 8)					Time 1 to Time 4 Pre to follow-up (wk 1 to wk 10)				
	Main effect[a,b] *F*	*p*	η^2 (Effect size[#])	Interaction effect *F*	*p*	Main effect[a,c] *F*	*p*	η^2 (Effect size[#])	Interaction effect *F*	*p*
DASS-S	7.746	0.016*	0.373 (L)	0.346	0.566	6.875	0.039*	0.534 (L)	3.886	0.085
DASS-A	0.315	0.584	-	2.072	0.174	3.313	0.119	-	1.489	0.269
DASS-D	0.441	0.518	-	0.264	0.616	0.385	0.558	-	1.817	0.215
ChQOL-P	2.523	0.136	-	5.440	0.036*	0.739	0.423	-	0.592	0.553
ChQOL-S	1.163	0.300	-	7.939	0.015*	1.873	0.220	-	6.673	0.019*
ChQOL-E	1.398	0.258	-	3.394	0.088	3.733	0.102	-	3.762	0.062
ChQOL-OA	2.278	0.155	-	13.386	0.003*	4.695	0.073	-	3.472	0.080
Cortisol	0.122	0.732	-	4.178	0.062	-	-	-	-	-
Sys BP	2.547	0.135	-	0.004	0.950	-	-	-	-	-
Dia BP	5.909	0.030*	0.312 (L)	0.375	0.551	-	-	-	-	-
Heart rate	0.108	0.748	-	0.023	0.881	-	-	-	-	-

* $p \leq 0.05$ # S = small effect ($\eta^2 \leq 0.01$), M = moderate effect ($\eta^2 \leq 0.06$), L = large effect ($\eta^2 \geq 0.14$)

a: Pre-test (Time 1) values of two groups were treated as covariate b: Treatment n = 8, Control n = 8 c: Treatment n = 5, Control n = 4

Table 8: Changes in Outcome Measures of Qigong Group (n = 8) over Re-assessments (Time 1-3).

Outcome measures	*M (SD)*			*F*	*p*
	Time 1 (wk 1) Pre	Time 2 (wk 4) Mid	Time 3 (wk 8) Post		
Psychological					
DASS-S	17.50 (6.48)	12.75 (7.48)	10.5 (6.91)	6.51	0.010*
DASS-A	10.25 (6.45)	7.75 (7.29)	5.50 (4.99)	7.62	0.006*
DASS-D	9.25 (6.76)	6.00 (5.55)	4.00 (4.00)	7.79	0.020*
ChQOL-P	51.51 (9.77)	54.79 (12.98)	66.93 (13.75)	12.27	0.002*
ChQOL-S	55.91 (17.61)	58.00 (14.90)	70.78 (14.68)	6.19	0.020*
ChQOL-E	61.97 (15.95)	68.24 (11.88)	75.83 (9.44)	7.12	0.018*
ChQOL-OA	56.47 (12.34)	60.34 (9.01)	71.18 (10.51)	12.56	0.005*
Physiological					
Cortisol level	2392.37 (1269.31)	2674.85 (1546.32)	1477.31 (974.95)	5.52	0.018*
Sys BP	116.38 (13.33)	112.12 (19.01)	102.63 (13.95)	4.52	0.039*
Dia BP	79.13 (8.68)	75.50 (11.80)	68.88 (10.56)	4.85	0.030*
Heart rate	64.88 (7.32)	69.25 (7.85)	71.63 (9.86)	3.56	0.096

* $p \leq 0.05$

Table 9: Changes in Outcome Measures of Qigong Group (n = 5) over Re-assessments (Time 1–4).

Outcome measures	*M (SD)*				*F*	*p*
	Time 1 (wk 1) Pre	Time 2 (wk 4) Mid	Time 3 (wk 8) Post	Time 4 (wk 10) follow-up		
DASS-S	18.80 (8.07)	14.80 (9.01)	10.00 (7.07)	6.40 (4.56)	9.89	0.010*
DASS-A	12.00 (7.87)	10.00 (8.37)	8.00 (4.69)	4.40 (3.85)	4.55	0.060
DASS-D	10.00 (8.00)	6.80 (6.57)	5.60 (4.34)	3.20 (2.68)	3.19	0.131
ChQOL-P	48.92 (9.06)	50.42 (15.14)	66.83 (17.74)	67.33 (13.16)	7.84	0.030*
ChQOL-S	48.42 (15.01)	49.75 (8.99)	64.25 (14.23)	64.96 (13.55)	4.23	0.075
ChQOL-E	65.81 (12.47)	72.48 (12.89)	77.46 (11.96)	85.29 (5.58)	6.70	0.028*
ChQOL-OA	54.38 (10.84)	57.55 (10.17)	69.51 (13.46)	72.53 (8.92)	10.32	0.007*

* $p \leq 0.05$

Table 10: Changes in Outcome Measures of Psychology Group (n = 8) over Re-assessments (Time 1–3).

Outcome measures	*M (SD)*			*F*	*p*
	Time 1 (wk 1) Pre	Time 2 (wk 4) Mid	Time 3 (wk 8) Post		
Psychological					
DASS-S	11.50 (6.21)	13.50 (4.75)	12.00 (8.35)	0.63	0.494
DASS-A	7.25 (4.27)	4.75 (3.85)	5.50 (2.56)	3.12	0.076
DASS-D	4.75 (4.89)	3.50 (4.38)	2.00 (3.55)	3.68	0.055
ChQOL-P	58.60 (13.00)	60.37 (14.48)	60.21 (14.79)	0.17	0.828
ChQOL-S	60.34 (16.78)	60.50 (17.66)	59.82 (23.65)	0.01	0.984
ChQOL-E	68.11 (11.11)	70.39 (15.04)	71.90 (18.74)	1.17	0.331
ChQOL-OA	62.35 (10.51)	63.75 (13.27)	63.98 (17.57)	0.184	0.821
Physiological					
Cortisol level	2283.16 (874.88)	2278.53 (523.23)	1983.38 (782.80)	0.98	0.379
Sys BP	102.38 (12.64)	108.25 (14.12)	105.12 (9.95)	1.48	0.265
Dia BP	65.50 (6.28)	73.88 (8.69)	70.75 (7.57)	7.71	0.011 *
Heart rate	68.13 (5.36)	74.13 (13.56)	74.75 (8.10)	1.98	0.188

* $p \leq 0.05$

Table 11: Changes in Outcome Measures of Psychology Group (n = 4) over Re-assessments (Time 1–4).

Outcome measures	*M (SD)*				*F*	*p*
	Time 1 (wk 1) Pre	Time 2 (wk 4) Mid	Time 3 (wk 8) Post	Time 4 (wk 10) Follow-up		
DASS-S	12.50 (7.72)	14.00 (4.32)	15.50 (10.63)	17.00 (14.65)	0.58	0.514
DASS-A	8.00 (5.42)	6.00 (5.42)	6.50 (3.42)	7.00 (4.76)	0.34	0.632
DASS-D	8.00 (4.90)	5.50 (5.51)	3.50 (4.73)	6.00 (4.90)	3.00	0.147
ChQOL-P	59.59 (16.20)	61.25 (20.03)	65.83 (16.27)	72.19 (17.18)	1.85	0.242
ChQOL-S	71.20 (10.96)	62.81 (19.39)	64.90 (31.84)	61.36 (32.44)	0.57	0.541
ChQOL-E	62.40 (12.56)	62.79 (18.38)	65.94 (25.25)	60.13 (24.01)	0.42	0.665
ChQOL-OA	64.40 (11.66)	62.28 (17.55)	65.56 (24.11)	64.56 (24.42)	0.14	0.810

* $p \leq 0.05$

3.1.6.4. Changes in Psychological Well-being (DASS-21, ChQOL) between Two Groups

The univariate model of the General Linear Model (Repeated Measures) was used to compare differences in outcome measures between the two groups. The baseline measure of each dependent variable was used as a covariate to equate the baseline. Thus, the differences between groups were estimated with the differences in pre-test scores removed.

In the between group analysis, a significant main effect was found in DASS-S ($p = 0.016$). Significant Time x Group interaction effects were found during post assessment (week 8) in ChQOL-P ($p = 0.036$), ChQOL-S ($p = 0.015$), and ChQOL-OA ($p = 0.003$). In the follow-up assessment (week 10), a significant main effect was found in DASS-S ($p = 0.039$) and a significant Time x Group interaction effect was found in ChQOL-S ($p = 0.019$) (see Table 7).

For within group analysis, in post assessment, the eight qigong subjects showed significant improvements in all outcome measures of psychological well-being when compared with the baseline values. No significant improvement was shown by the control group over the first 8 weeks. In the follow-up assessment, the five qigong subjects also demonstrated significant improvements in DASS-S ($p = 0.01$), ChQOL-P ($p = 0.03$), ChQOL-OA ($p = 0.028$), and ChQOL-OA ($p = 0.007$). No significant improvement was found in the control group.

3.1.6.4.1. Stress (DASS-S):

The *t*-test results indicated no significant difference between the two pre-test scores of DASS-S. After about two months of the qigong program, a significant main effect was found ($F = 7.746$, $p = 0.016$) when the qigong group showed a greater improvement than the control group. As per Cohen's (1988) criteria, the effect level was large as the η^2 of DASS-S was 0.373. For within-group comparisons, in the qigong group, the DASS-S score decreased to 12.75 ($SD = 7.48$) in week 4; and further reduced to 10.5 ($SD = 6.91$) in week 8. Such an improvement in stress over the training period was significant ($F = 6.51$, $p = 0.01$). In the control group, the DASS-S score increased to 13.5 ($SD = 4.75$) in week 4, and then reduced to 12.00 ($SD = 8.35$) in week 8. Although there was an improvement from week 1 to week 8, such a within group difference was not significant (see Figure 9).

When the data of the follow-up measurement was included in the analysis of treatment effect, we observed a significant main effect between the two groups ($F = 6.875$, $p = 0.039$). The qigong group experienced a decline in the stress score while the control group experienced an increased trend in stress level over the 10-week period. Here, the η^2 of DASS-S increased to 0.534, which was at a large effect level as well. The Time x Group interaction effect was not significant in week 8 or 12 (see Figure 10).

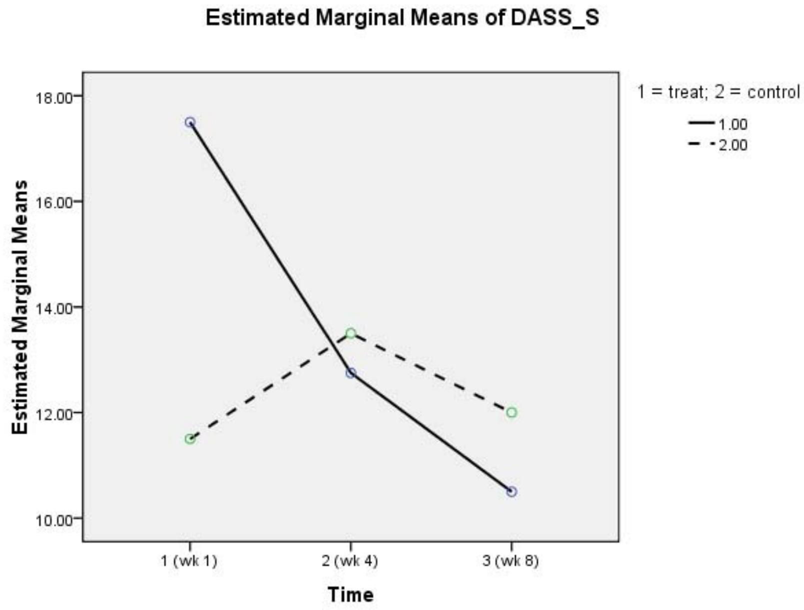

Figure 9: Changes in DASS-S score of qigong group (n = 8) and control group (n = 8) over three assessments.

Note: Pre-test (Time 1) values of two groups were treated as covariate.

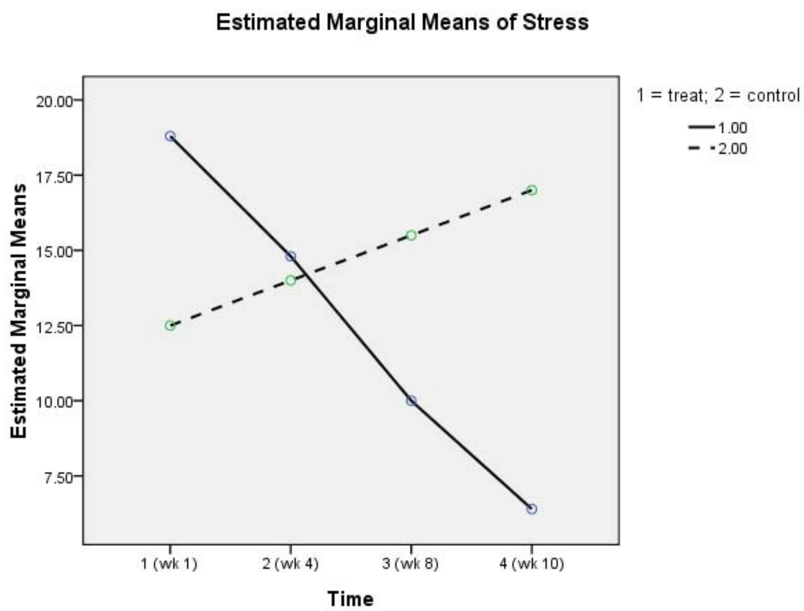

Figure 10: Changes in DASS-S score of qigong group (n = 5) and control group (n = 4) over four assessments.

Note. Pre-test (Time 1) values of two groups were treated as covariate.

3.1.6.4.2. Anxiety (DASS-A):

There was no significant difference between the two pre-test anxiety scores of the two groups. In weeks 8 and 10, no significant difference was found in the group comparisons. For within group comparisons, in the qigong group, the mean value decreased to 7.75 (*SD* = 7.29) in week 4 and further reduced to 5.50 (*SD* = 4.99) in week 8. Such an improvement in anxiety throughout the eight weeks was significant ($F = 7.62$, $p = 0.006$). In the control group, however, anxiety values in the 4th and 8th week (*M* = 4.75, *SD* = 3.85 and *M* = 5.50, *SD* = 2.56 respectively) were not significantly different from the baseline (see Figure 11).

A continuous decline in anxiety level was found among the five subjects of the qigong group in week 10; however, it was not significant. Similar to the situation in stress level, the control group (four subjects) showed a non-significant variation in anxiety scores (see Figure 12).

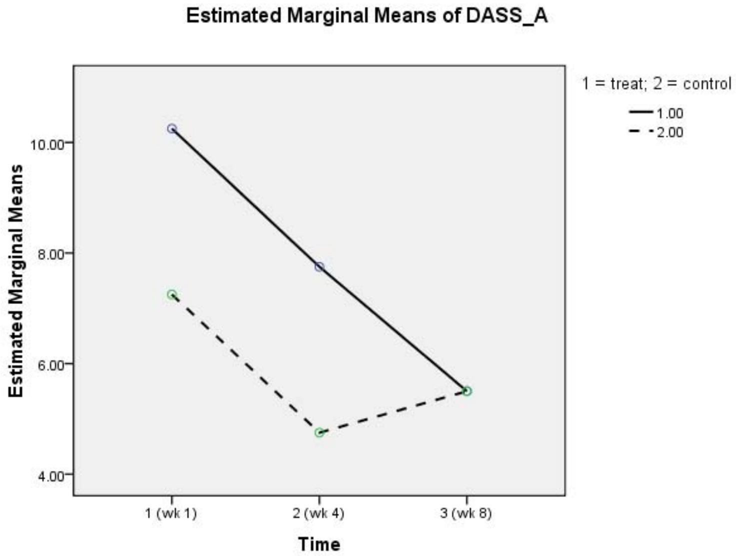

Figure 11: Changes in DASS-A score of qigong group (n = 8) and control group (n = 8) over three assessments.

Note: Pre-test (Time 1) values of two groups were treated as covariate.

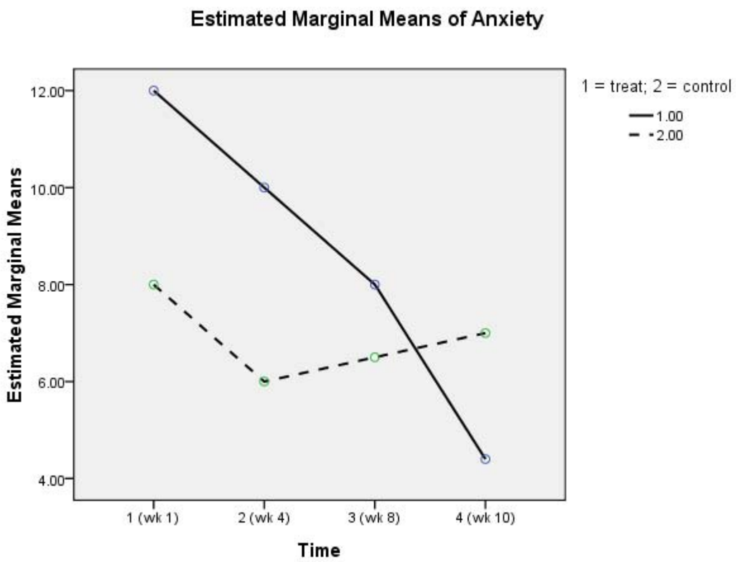

Figure 12: Changes in DASS-A score of qigong group (n = 5) and control group (n = 4) over four assessments.

Note: Pre-test (Time 1) values of two groups were treated as covariate.

3.1.6.4.3. Depression (DASS-D)

The results of the *t*-test showed no significant difference between the two scores of the two groups at baseline. In weeks 8 and 10, no significant difference was found in the between group comparisons. For within group comparisons, the depression level significantly reduced to 6.00 (SD = 5.55) in the middle of the qigong class and ultimately reached 4.00 (SD = 4.00) when the program finished (F = 7.79, p = 0.02). For the subjects in the control group, their depression values also decreased in week 4 and week 8 (M = 3.5, SD = 4.38 and M = 2.00, SD = 3.55 respectively), but did not reach a significant level (see Figure 13).

Although the depression level of the intervention group also decreased in the 10th week, it was not significantly different from the baseline value. No significant change was found in the control group either (see Figure 14).

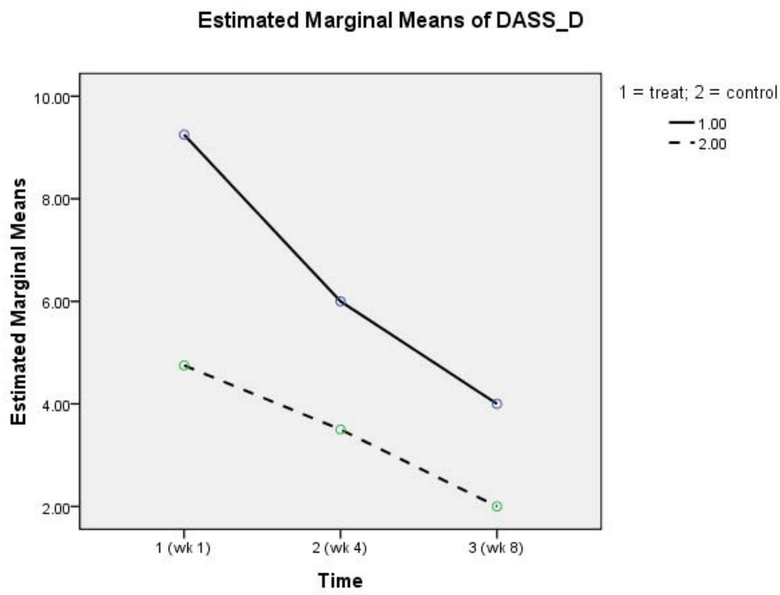

Figure 13: Changes in DASS-D score of qigong group (n = 8) and control group (n = 8) over three assessments.

Note: Pre-test (Time 1) values of two groups were treated as covariate.

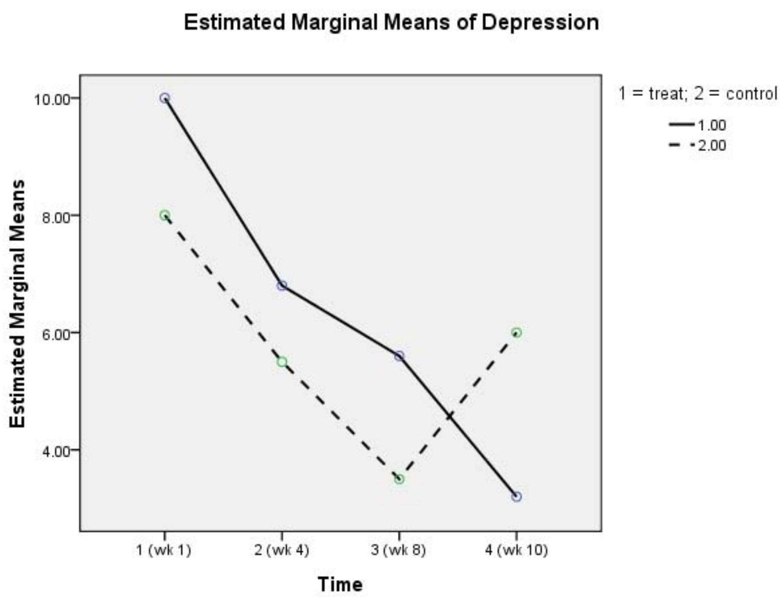

Figure 14: Changes in DASS-D score of qigong group (n = 5) and control group (n = 4) over four assessments.

Note: Pre-test (Time 1) values of two groups were treated as covariate.

3.1.6.4.4. Quality of Life – Physical Domain (ChQOL-P)

As shown by *t*-test, the difference between these two pre-test values was not significant. In week 8, the main effect was not significant. A significant Time x Group interaction effect was found ($F = 5.44$, $p = 0.036$) indicating that the changes in physical functioning across the three check points were dependent on the type of groups (Ho, 2006). For within-group comparison, in the qigong group, there was a significant improvement in physical functioning with an increase to 54.79 ($SD = 12.98$ in the middle of, and 66.93 ($SD = 13.75$) at the end of the program ($F = 12.27$, $p = 0.002$). In the control group, the value also changed to 60.36 ($SD = 14.48$) in week 4 and 60.21 ($SD = 14.79$) in week 8; however, such an improvement was not significant (see Figure 15).

The improvement in physical functioning among the five subjects who practiced the qigong exercise continued after the program had finished ($F = 7.84$, $p = 0.03$). No significant change was found in the mild improvement within the four subjects of the control group. The between group difference was not significant in week 10 (see Figure 16).

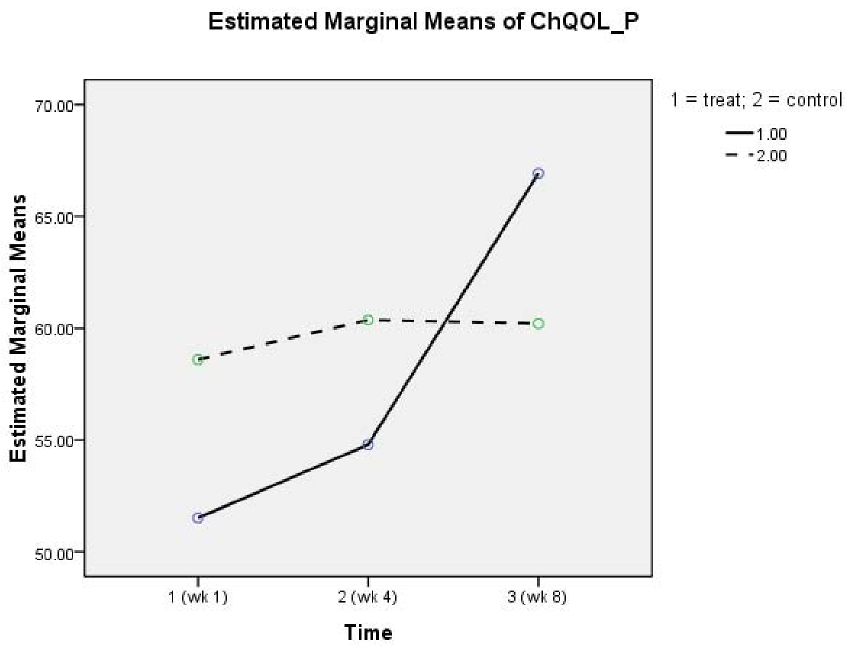

Figure 15: Changes in ChQOL-P score of qigong group (n = 8) and control group (n = 8) over three assessments.

Note: Pre-test (Time 1) values of two groups were treated as covariate.

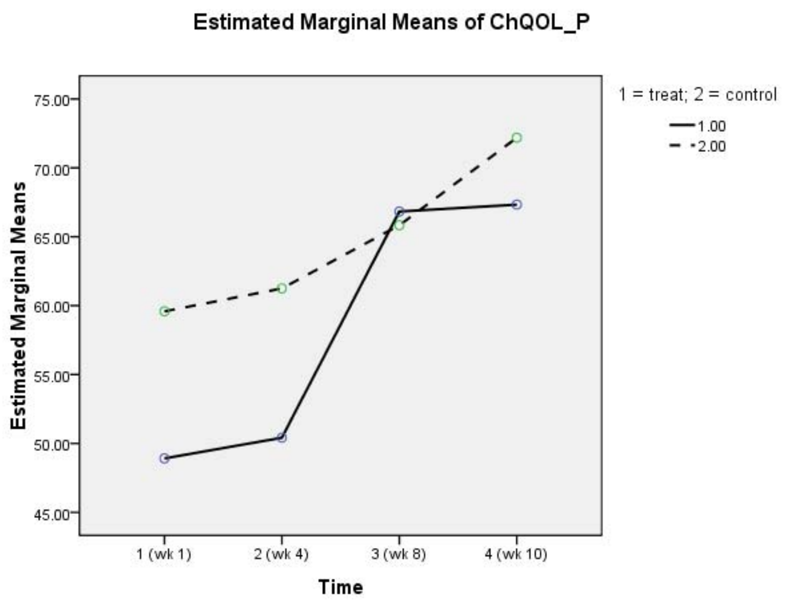

Figure 16: Changes in ChQOl-P score of qigong group (n = 5) and control group (n = 4) over four assessments.

Note: Pre-test (Time 1) values of two groups were treated as covariate.

3.1.6.4.5. Quality of Life – Spiritual and Vitality Domain (ChQOL-S)

Regarding the aspect of spiritual and vitality domain, no significant difference was found between the pre-test score of the control group and that of the qigong group. No significant main effect was found throughout the 10 weeks. A significant Time x Group interaction effect was found in week 8 ($F = 7.939$, $p = 0.015$). For within group changes, the values of the qigong group increased in week 4 and week 8 ($M = 58.00$, $SD = 14.90$ and $M = 70.78$, $SD = 14.68$ respectively) along a significant trend ($F = 6.19$, $p = 0.02$). No significant within group change was shown in the data given by the control group (see Figure 17).

In week 10, a significant Time x Group interaction effect was found ($F = 6.673$, $p = 0.019$). The qigong group showed continuous improvement in vitality from week 8 to 10, while the control group showed further deterioration during this period (see Figure 18).

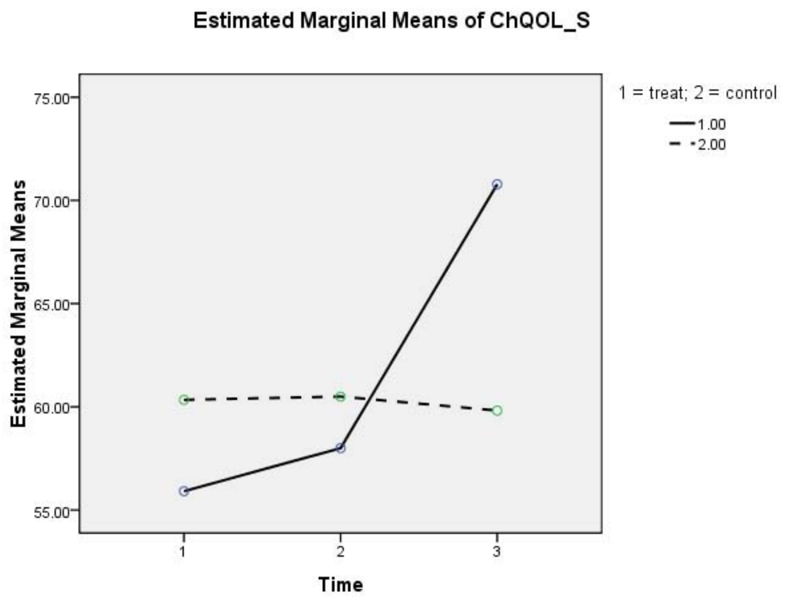

Figure 17: Changes in ChQOL-S score of qigong group (n = 8) and control group (n = 8) over three assessments.

Note: Pre-test (Time 1) values of two groups were treated as covariate.

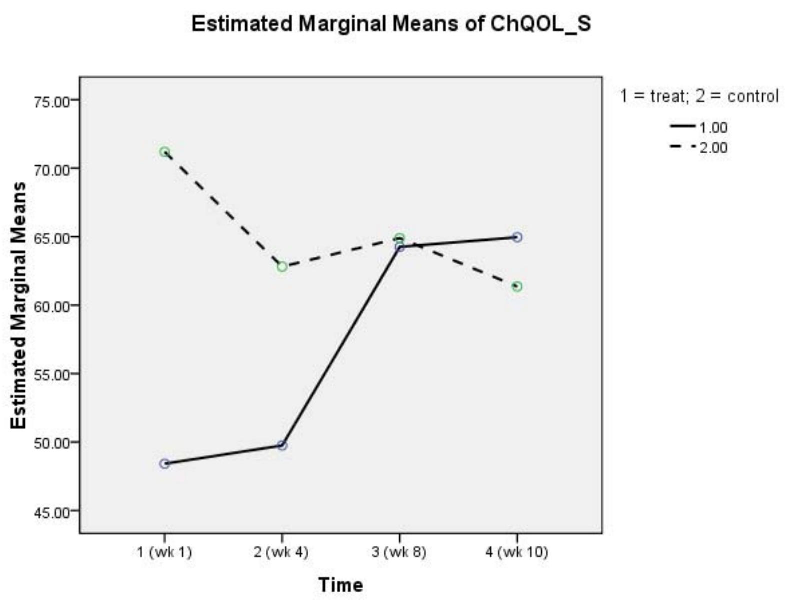

Figure 18: Changes in ChQOl-S score of qigong group (n = 5) and control group (n = 4) over four assessments.

Note: Pre-test (Time 1) values of two groups were treated as covariate.

3.1.6.4.6. Quality of Life – Emotional Domain (ChQOL-E)

The *t*-test results showed that, at the beginning, two groups were not significantly different in ChQOL-E. For between group comparisons, the two groups did not substantially differ throughout the 10 weeks. For within group comparisons, the condition of the qigong group significantly improved after week 4 (M = 68.24, SD = 11.88) and finally reached 75.83 (SD = 9.44) in the last qigong class (F = 7.12, p = 0.018). The mean values of the control group also increased a bit throughout the 8 weeks, but did not reach a significant level (see Figure 19).

The improvement in emotional domain among the five subjects who practiced the qigong exercise persisted in week 10 (F = 6.7, p = 0.028). No significant change was found in the mild improvement within the four subjects of the control group (see Figure 20).

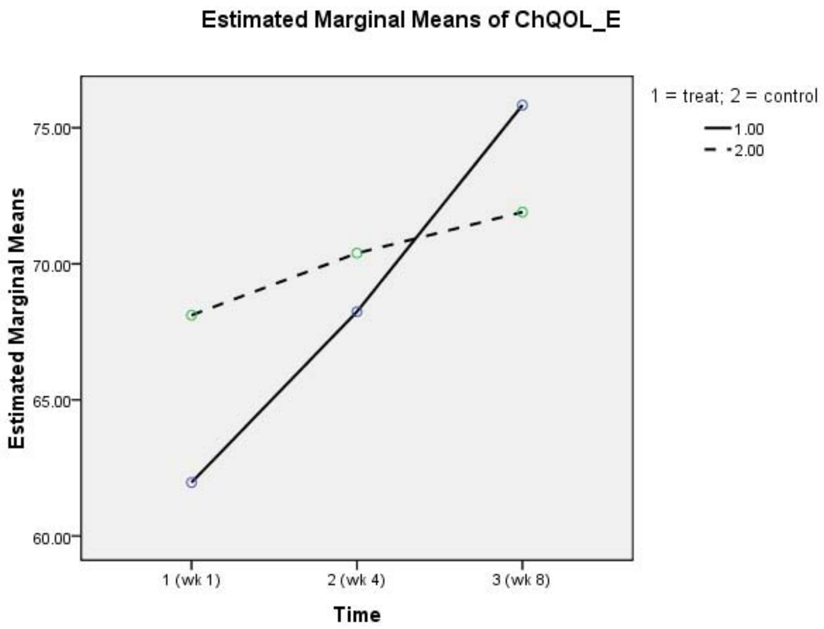

Figure 19: Changes in ChQOL-E score of qigong group (n = 8) and control group (n = 8) over three assessments.

Note: Pre-test (Time 1) values of two groups were treated as covariate.

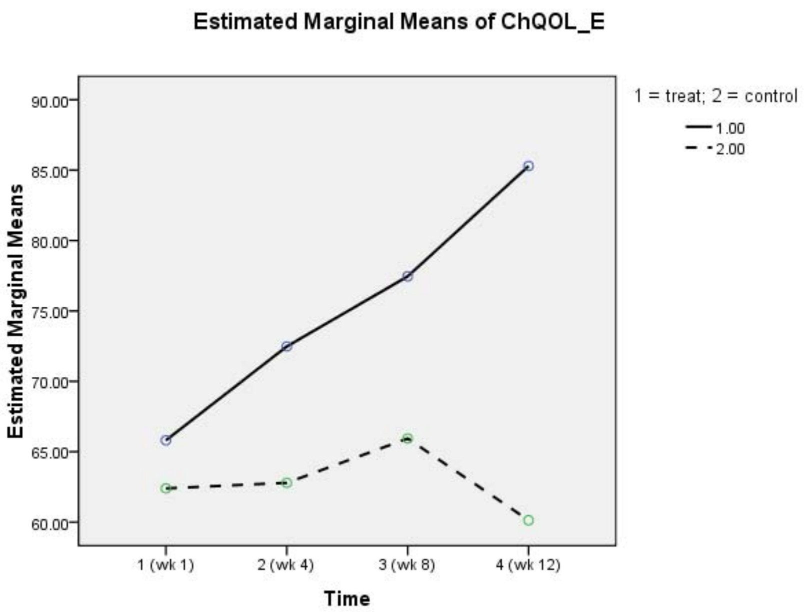

Figure 20: Changes in the ChQOl-E score of the qigong group (n = 5) and the control group (n = 4) over four assessments.

Note: Pre-test (Time 1) values of two groups were treated as covariate.

3.1.6.4.7. Quality of Life – Overall Domain (ChQOL-OA)

The *t*-test results showed that two groups were not significantly different in ChQOL-OA at baselines. The main effects were not significant in week 8 and week 10. In week 8, a significant Time x Group interaction effect was found (F = 13.386, p =0.003). The results of the within group analysis showed that the condition of the qigong group significantly improved after week 4 (M = 60.34, SD = 9.01) and finally reached 71.18 (SD = 10.51) in the last qigong class (F = 12.56, p = 0.005). The mean values of the control group did not change much throughout the 8 weeks (see Figure 21).

The improvement in overall domain among the five subjects who practiced the qigong exercise maintained in week 10 (F =10.32, p = 0.007). No significant change was found in the mild improvement within the four subjects of the control group (see Figure 22).

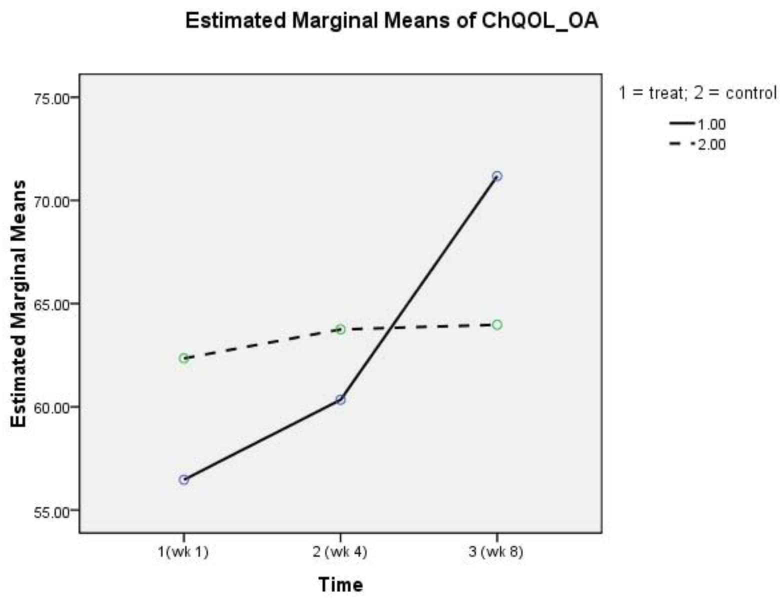

Figure 21: Changes in the ChQOL-OA score of the qigong group (n = 8) and the control group (n = 8) over three assessments.

Note: Pre-test (Time 1) values of two groups were treated as covariate.

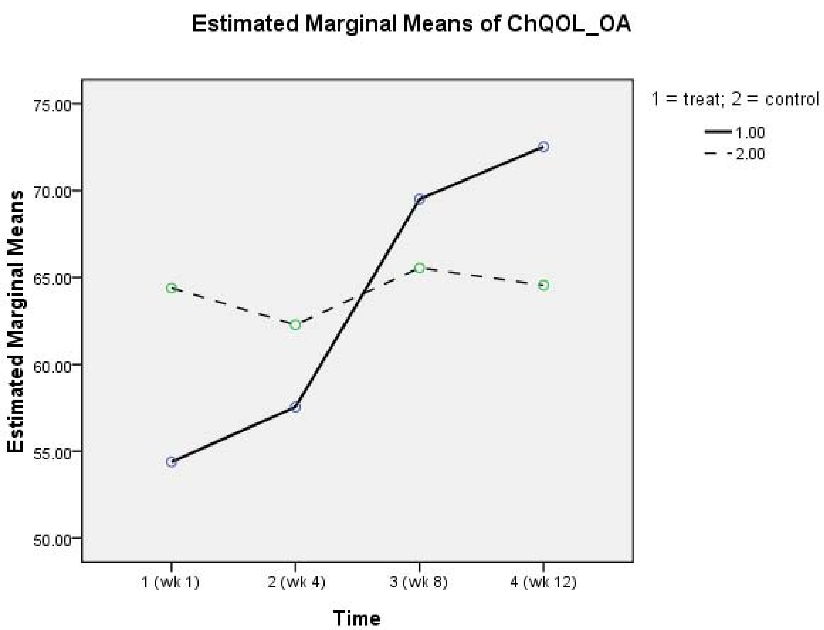

Figure 22: Changes in the ChQOl-OA score of the qigong group (n = 5) and the control group (n = 4) over four assessments.

Note: Pre-test (Time 1) values of two groups were treated as covariate.

3.1.6.5. Changes in Physiological Well-being (Cortisol, Blood Pressure, and Heart Rate) between Two Groups

A univariate model was also employed in this analysis, and the baselines were entered as covariates to enable comparisons of outcomes in each dependent variable (i.e., salivary cortisol, SysBP, DiaBP, and heart rate). Thus, the differences between groups were estimated with the differences in pre-test scores removed.

Over the first 8 weeks, no significant difference was found between the two groups in all the measurements of physiological outcome measures of wellness except DiaBP ($p = 0.03$). For within group comparisons, the qigong group showed significant improvements in cortisol level ($p = 0.018$), SysBP ($p = 0.039$), and DiaBP ($p = 0.03$), but not heart rate. Except for a significant increase in DiaBP ($p = 0.011$) when compared with the baseline value, no significant improvement was shown by the control group. In the follow-up session, we did not collect the physiological data, so no further analysis was done here.

3.1.6.5.1. Salivary Cortisol

As shown by *t*-test results, the difference between the baseline values of the two groups was also not significant. No significant group differences were found in the between group analysis. For within group analysis, in the qigong group, their saliva cortisol level increased to 2674.8 pg/ml (*SD* = 1546.3) in week 4 and then decreased to 1477.3 pg/ml (*SD* = 974.95), such changes were significant (F = 5.52, p = 0.018). In the control group, the baseline was 2283.1 pg/ml (*SD* = 874.88) and gradually declined to 2278.5 pg/ml (*SD* = 523.23) (4^{th} week) and 1983.3 pg/ml (*SD* = 782.80) (8^{th} week), however, it was not significant (see Figure 23).

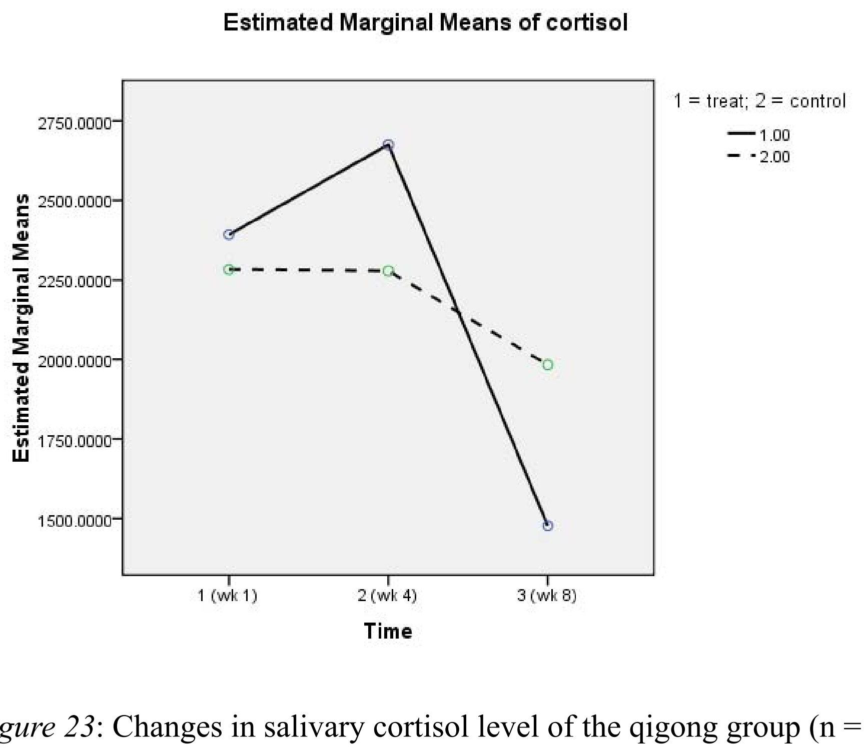

Figure 23: Changes in salivary cortisol level of the qigong group (n = 8) and the control group (n = 8) over three assessments.

Note: Pre-test (Time 1) values of two groups were treated as covariate.

3.1.6.5.2. Systolic Blood Pressure (SysBP)

The baseline value of the qigong group was significantly higher than that of the control group (p =0.049). The results of GLM showed no significant group difference in SysBP. For within group changes, in the qigong group, systolic blood pressure declined to 112.17 mm/Hg (SD = 19.01) at the 4th week and 102.63 mm/Hg (SD = 13.95) at the 8th week. Such an improvement over the 8 weeks was significant (F = 4.52, p = 0.039). In the control group, their systolic blood pressure increased to 108.25 mm/Hg (SD = 14.12) in week 4 and then dropped to 105.12 mm/Hg (SD = 9.84) at the end of the psychology class. However, the changes over these 8 weeks were insignificant (see Figure 24).

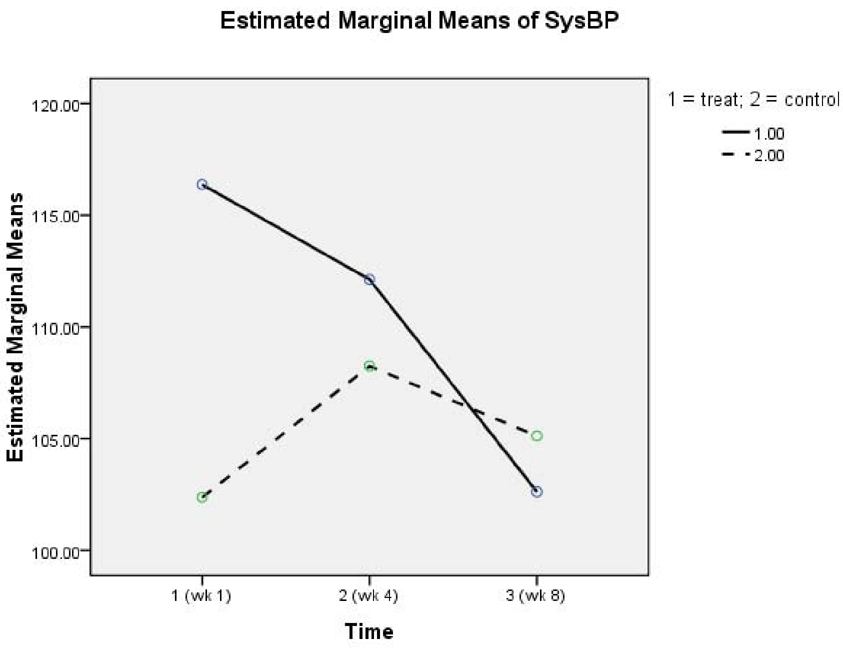

Figure 24: Changes in systolic blood pressure of the qigong group (n = 8) and the control group (n = 8) over three assessments.

Note. Pre-test (Time 1) values of two groups were treated as covariate.

3.1.6.5.3. Diastolic Blood Pressure (DiaBP)

Similar to the situation of systolic BP, the baseline diastolic BP value of the exercise group was significantly higher than that of the control group (t = 3.60, p = 0.003). A significant main effect was found between the two groups in week 8 after pre-test values were covariated (F = 5.909, p = 0.03). The effect level was large ($\eta^2 = 0.312$). The interaction effect was not significant. For within group analysis, in the qigong group, their diastolic blood pressure significantly (F = 4.85, p =0.03) declined in week 4 (M = 75.50 mm/Hg, SD = 11.80) and week 8 (68.88 mm/Hg, SD = 10.56). There was a significant fluctuation that occurred in the control group when the value increased from 65.50 mm/Hg (SD = 6.28) before the psychology class began to 73.88 mm/Hg (SD = 8.69) in the middle assessment and then decreased to 70.75 mm/Hg (SD = 7.57) after 8 weeks (F = 7.71, p = 0.011) (see Figure 25).

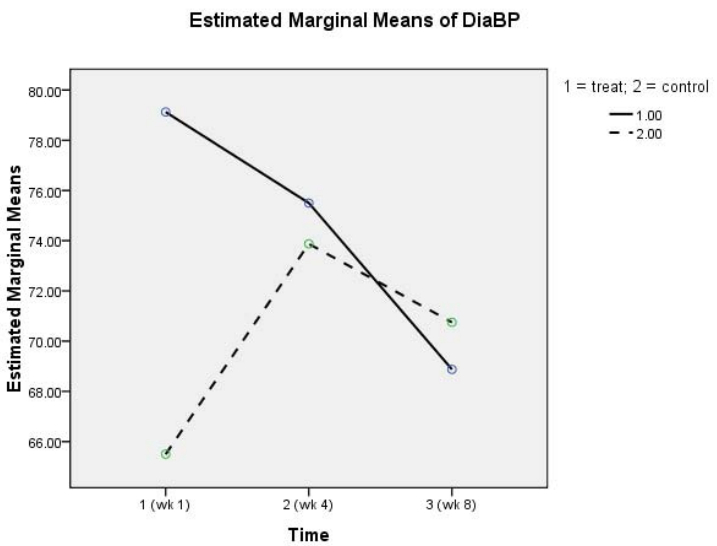

Figure 25: Changes in diastolic blood pressure level of qigong group (n = 8) and control group (n = 8) over three assessments.

Note. Pre-test (Time 1) values of two groups were treated as covariate.

3.1.6.5.4. Heart Rate (HR)

The two baseline values were not found to be significantly different. In the qigong group, no significant changes in heart rate occurred over the study period, but it increased from 64.88 beats/min (*SD* = 7.32) before training to 69.25 bpm (*SD* = 7.85) in week 4 and 71.63 bpm (*SD* = 9.86) in week 8. Although the heart rate increased slightly from the baseline value 68.13 bpm (*SD* = 5.36) to 74.13 bpm (*SD* = 13.57) (4th week) and 74.75 bpm (*SD* = 8.10) (8th week), the change in the control group was insignificant. No significant group difference was found in the between group comparisons (see Figure 26).

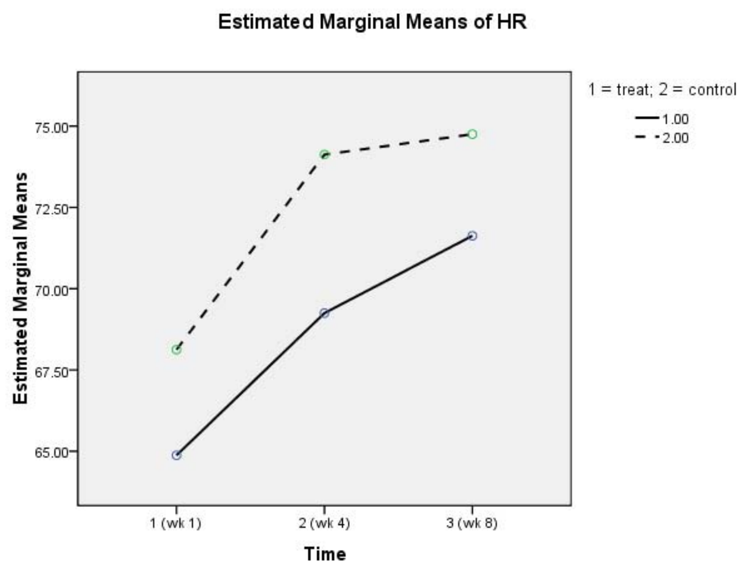

Figure 26: Changes in heart rate of the qigong group (n = 8) and the control group (n = 8) over three assessments

Note. Pre-test (Time 1) values of two groups were treated as covariate.

3.1.7. Qualitative Analysis

In the follow-up session, in the questionnaires, we requested the participants to evaluate their subjective experience on both physical and psychological changes. The subjects also elaborated their changes and feelings in the open-ended questions. A summary of their comments are shown in Table 12. All eight subjects (100%) regarded the qigong protocol as helpful in reducing stress, being relaxed, and increasing positive thoughts. The feelings of anxiety and depression decreased in at least six subjects (75%) over the study period. For instance, a subject said, “I feel emotional release and less nervous.” Another participant stated, “My positive thoughts increased, I feel much happier than before.”

Physically, all of them (100%) noticed that they developed more strength in the body, became more flexible in bodily movements and joints, and were able to relax muscles. One subject with back pain said, “My back pain has improved, the joints and muscles become more flexible.” A majority of them (87.5%) reported they were more attentive and sociable after 8 weeks of qigong practice. More than two-thirds of them (75%) also said that they felt more energetic and younger after the qigong program. At least six participants (75%) had improvements in quality of sleep and vitality. One subject mentioned, “The quality of sleep improved and better attentiveness, not feeling tired so easily.” However, lack of time to practice at home was a common problem found in the qigong group, like what one subject stated, “Increased work load makes practicing at home more difficult.” Noisy home environment also discouraged them to do home practice. As one subject explained, “It is not that easy to practice at home because home environment is rather noisy.” Sometimes they also had difficulties in managing the techniques in the protocol.

Table 12: Summary statistics on psychological and physical benefits perceived by the qigong group (n = 8).

After 8 weeks of training, how do you feel about your physical and psychological states?

Evaluation Criteria	Strongly agree n (%)	Agree n (%)	Disagree n (%)	Strongly disagree n (%)	No opinion n (%)	Mean scores * (*SD*)
情緒得到舒緩 Emotional relief	4 (50)	4 (50)	-	-	-	4.50 (0.53)
專注力得到提高 More attentive	6 (75)	1 (12.5)	1 (12.5)	-	-	4.50 (1.07)
生活壓力得到舒緩 Released Stress	3 (37.5)	5 (62.5)	-	-	-	4.38 (0.52)
焦慮感減少 Decreased anxiety	2 (25)	4 (50)	-	-	2 (25)	4.00 (0.76)
抑鬱的心境得到緩解 Reduced depressiveness	2 (25)	4 (50)	-	-	2 (25)	4.00 (0.76)
肌肉和關節都能放鬆 Improved relaxation in joints and muscles	4 (50)	4 (50)	-	-	-	4.50 (0.53)
肌肉和關節較以往靈活 Improved flexibility in joints and muscles	3 (37.5)	5 (62.5)	-	-	-	4.38 (0.52)
精神和心境都能放鬆 Relaxed spiritual and mood states	4 (50)	4 (50)	-	-	-	4.50 (0.53)
感覺充滿活力、不易疲倦 Feelings of being energetic and less tired	2 (25)	4 (50)	1 (12.5)	-	1 (12.5)	3.88 (0.99)
感覺輕鬆、年輕了 Feel younger	2 (25)	4 (50)	1 (12.5)	-	1 (12.5)	3.88 (0.99)
小組練習有助擴闊社交生活 Small group practice helps sociability	-	7 (87.5)	-	-	1 (12.5)	4.38 (0.74)
睡眠質素得到改善 (e.g., 較易入睡、一覺瞓天光) Improved quality of sleep (e.g., fall asleep easily)	4 (50)	3 (37.5)	-	-	1 (12.5)	4.38 (0.74)

**Note*. Judgement was made on a 5-point scale (1 = Strongly disagree; 2 = Disagree; 3 = No opinion; 4 = Agree, and 5 = Strongly agree).

3.1.7.1. Summary of In-depth Interview with Subject # 1

Mr. Chan (fake name) is a 60-year-old man who, approximately two years ago, suffered from nasopharyngeal carcinoma (NPC) (a cancer originating in the nasopharynx). Although he improved significantly after chemotherapy and electrotherapy, he was still on medication. He looked pale, very thin, and his vitality was poor when he first came to the qigong program. He spoke slowly and in a low tone. Even when the weather was hot, he had to wear a jacket with long sleeves when he came to our class. His doctor has reminded him to exercise regularly and eat healthily to minimize the risk of cancer recurrence. "Energetic exercise is not suitable for me because I do not have the energy to do so. I feel tired very easily. I need to take a rest even after a 10-minute walk. I've learned *tai chi* but still am not able to finish all the sessions," he said with a weak trembling voice. Over the last two years, suffering from pain, different treatments, and side-effects of drugs had caused him to lose over 30 pounds. His appetite and sleep quality were not good either. "My TCM practitioner has encouraged me to practice qigong and he said it is good for *yang sheng* (養生; health preservation). I noticed your poster in the campus, it seems it is suitable for people with poor vitality like me, it leads me here," he said.

During the first four lessons, he had to rest quite often in the middle of the practice. He complained that the room temperature was too low and he had to put on more clothes while other subjects were sweating. He claimed, "During the first few sessions, I felt very tired. Every time after your qigong class, I have no energy to walk back to my office. I also find it difficult to memorize the steps and poses. Again, I think it is too heavy for me and I question my ability to finish eight sessions. But I find I can sleep better, especially if I practice it before going to bed," he said. When the training continued, as observed by the investigator, he took off his jacket during the class, had to pause less, was more motivated, and asked more questions after lessons. "I can do the standing poses longer and am more able to concentrate. Especially when concentrating on *dantian* (丹田). I can feel something like electric current running from my shoulder to my hands. My hands and arms are warm, and sometimes I even have sweat, which is the feeling I have missed for a long time," he said with a happy face. "I practice three times a day. I think early in the morning is the best time to practice. It refreshes me before I go to work. Each practice can last for 45 minutes to 1 hour. I do benefit from this exercise; my vitality, appetite, and mood have improved a lot. This qigong exercise suits me and I will keep doing it," he concluded.

3.1.8. Summary of the Findings in the Pilot Study

Summing up the quantitative analyses, throughout the 8 weeks of training, the qigong group demonstrated improvements in all the indicators of mental and physical well-being except heart rate. In the follow-up week, ongoing positive effects of qigong were also observed in graphical plots as DASS-S decreased over time while ChQOL-P, ChQOL-E, and ChQOl-OA increased over time. For the subjects in the control group, except for a significant increase in diastolic blood pressure in week 8, their performance was not much different from the baseline scores.

For between-group differences, a significant main effect in week 8 indicated that the stress level of subjects in the qigong group was lower than that of the control group. In week 12, significant ongoing effect also persisted. The diastolic blood pressure of the qigong group subjects was also found to be significantly lower than that of the control group. The Time x Group interaction effects of ChQOL-P and ChQOL-OA were significant in week 8. The Time x Group interaction effects of ChQOL-S was significant in both week 8 and week 10. Other comparisons were not significant. In general, the results of between group comparisons indicated that, over time, the qigong group experienced less stress and lower diastolic blood pressure than the control group. The effect sizes were large indicating that a large proportion of variations in these outcome measures could be explained by the independent variable (i.e., qigong intervention).

The feedback in the follow-up interviews reviewed that the qigong participants commonly became more relaxed with reduced stress, anxiety, and depressiveness after they had practiced qigong for a period of time. Regarding the physical condition, they mostly reported improvements in bodily flexibility, vitality, and energy. The quality of sleep and sociability was enhanced as well.

3.1.9. Discussion of Pilot Study (Phase I)

Based on a small sample, the pilot study evaluated the effects of qigong on various parameters of body-mind well-being. Results showed that within the qigong group, all psychological indicators of well-being improved after 8 weeks of the qigong program. For physiological measurements, cortisol level, systolic and diastolic blood pressure decreased over the study period, but the heart rate remained more or less the same before and after training. The results here are in accordance with other studies, in which qigong, as a mindful exercise is found to be positively related to energetic and friendly characteristics (Lee, 2001; Lee, Huh, et al., 2001); sociability and healthy mood states (Qiu, 2004); positive and outgoing personality, reduction in neuroticism (Leung & Singhal, 2004; Tang, et al., 1995; Yuen, 2000) good quality of life (Tsang, Cheung, & Lak, 2002); improved anxiety and anxiety disorder symptoms (Bahrke, Morgan, 1978; Miller, Fletcher, & Kabat-Zinn, 1995). The findings are consistent with previous research evidence that a moderate exercise regimen can bring a mood elevation similar to that which athletes experience in vigorous exercise (Berger & Owen, 1992).

Regarding the between group comparisons, the significant main effects shown in DASS-S and DiaBP suggested that qigong participants possibly benefited from practicing qigong in stress and blood pressure reduction. The significant Time x Group interaction effects in physical (ChQOL-P), spiritual/vitality (ChQOL-S), and overall domains (ChQOL-OA) indicated that the difference in these three aspects of functioning between two groups changed according to whether the subjects had been practicing qigong or not for 4, 8, or 10 weeks. Our findings corroborate previous studies suggesting that practicing qigong regularly brings improvement in psychological well-being, and physical ability, as well as relieving stress and anxiety (Hui, et al., 2006; Lee & Ryu, et al., 2000). However, other than DASS-S, ChQOL-P, ChQOL-S, CHQOL-OA, and DiaBP, the qigong group did not significantly outperform the psychology group in other aspects. This might be due to a relatively small sample size, which limits the power of the analysis.

3.1.10. Limitations of Pilot Study and Its Reflections on Main Study

3.1.10.1. Extended Follow-up Period

In the pilot study, the qigong program lasted for 8 weeks and covered the pre, mid, and post-measurements. The follow-up measurement was set at the 10th week. It might not be long enough for the ongoing physiological and psychological effects (if any) to express themselves clearly. Therefore, in the main study, the follow-up period was extended to 4 weeks (i.e., 4 weeks after post measurement), such a time frame was once employed in the follow-up measurement of one local study (Tsang, et al., 2006), where only psychological variables were measured.

3.1.10.2. Follow-up Assessment of Physiological Measures

Although systolic blood pressure and salivary cortisol level did not differ significantly throughout the 8 weeks of the qigong program, a significant group difference was found in diastolic blood pressure ($F=5.909$, $p = 0.03$) in the pilot study. In the pilot study, in order to save resources (e.g., money) as the cortisol kits are quite expensive, the physiological data were collected on pre (1st), mid (4th) and post (8th) weeks, but not in the follow-up session (10th). However, Lee, Lee, & Kim, et al., (2003) found there were significant decreases in blood pressure, heart rate, and cortisol level after 10 weeks of qigong practice. Therefore, it might be possible that the physiological reactions will be more obvious after 10 weeks. Consequently, in the main study, physiological measurements were included in the follow-up week (12^{th} week).

3.1.10.3. Matching for Experimental and Control Groups

The qigong group in our pilot study was substantially older than the control group. Although we also had teenage university students interested in participating in our qigong group during the first round of subject recruitment, it is understandable that older subjects are more attracted to qigong exercise. For the control group, the content of psychology class (e.g., stress management skills, etc.) possibly attracted younger subjects such as young couples, white-collar employees, and middle class individuals. The motivation of qigong participants was likely to be quite different from that of the participants in the psychology class. The qigong subjects appeared to be more concerned with health than the psychology class subjects were. They wanted to try the mild exercise, while psychology class participants focused more on learning practical skills to tackle daily issues. In order to avoid the same problem happening again in the main study, a waitlist control group was recruited for comparison with the qigong group. The age and gender of groups would still be matched in the main study, as age and gender are latent factors affecting the physiological performance (e.g., blood pressure), but not the salivary cortisol levels (Ahn, Lee, Choi, Kwon, & Chun, 2007).

3.1.10.4. The Feeling of *Qi*

In the pilot study interview about the benefits of the program, we also asked the participants whether they could feel the *qi*. The eight sensations of *qi* (八觸) are: warm (温熱), cool (冷), pain (痛), itchy (癢), heavy (重), light (輕), numbness (痲), and slippery (滑). The feelings of *de qi* (得氣; reach the *qi*) can feel like swollen hands, electric flow (like pins or needles) inside, ants crawling on the body, and soreness (Cheung, 2009; Lin, 1990). Six of the eight qigong participants felt they had the feelings like hot, itchy, electricity flow inside, etc. The palms and abdomen were the two most common areas where they experienced these feelings. The psychological feelings included inner happiness, tranquillity, and loss of sense of time. In the main study, we used these comments as a reference to further collect information about the *qi* feelings of the participants. As per our knowledge, so far, there are no accredited tools to measure the *qi* feeling; we designed a chart to collect the subjective qualitative experience about *qi* (see Appendix 5). The chart also included some Chinese terms about the psychological feelings of *qi,* such as inner peacefulness (心情恬靜), emptiness (虛空), unity of heaven, and man (天人合一) (Lin, 1990).

3.1.10.5. Home Practice Requirement

Based on the results of the pilot study, the subjects on average practiced about 22 minutes each day at home and most of them practiced over 20 minutes daily. Therefore, we also advised the qigong participants in the main study to do at least 20 minutes of home practice. They were asked to record the daily practice time and any psychological (e.g., relaxed, unable to concentrate, clear mind, etc.), physical feelings (e.g., tired, muscle soreness, chest pain, etc) and any other related experience (e.g., forget the steps, sick, overstep, trip, etc.) on the logbooks provided.

3.1.10.6. Intervention – The Revised *Mindfit* Exercise Protocol

The initial idea of combining meditation, qigong, and progressive muscle relaxation was originated by an ex-supervisor of this project. However, as suggested by the members of the candidature examination panel, these three components in the old version of the *Mindfit* protocol may all individually have some effect on reducing stress and anxiety. As such, it is difficult to conclude whether qigong itself or the other two components lead to emotional relaxation. In order to further examine whether qigong could lead to relaxation effects, some modifications of the *Mindfit* protocol used in the pilot study were needed. The meditation and progressive muscle relaxation components were removed from the protocol in the main study, and the few *qi* activating postures adopted from *ba duan jin* were further reduced to only two poses; thus, leaving pure *chan mi* qigong practice. Simple warm-up and cool-down sections were retained, which was crucial in preparing the participants to do the exercise and minimize the chances of muscle soreness or joints hurting during and after exercising. *Dantian* breathing, *qi*- exercise, and body movements were retained as these are the core elements in most qigong practice, particularly in the original *chan mi gong* step-by-step protocol. The final protocol version consists of about 45 step-by-step postures, which serve different functions (e.g., *qi*-activation, calming the mind, etc.); details are shown in Table 13. As we were not interested in which components of *chan mi* qigong are working, the protocol was not modified any further. Otherwise, we might risk studying fragments of *chan mi gong* or qigong rather than qigong itself.

Qigong is an ancient exercise with a long history. It is an entity of mind regulation, breathing regulation, and body regulation. Sometimes a single posture can include all three elements. Taking away any part is very difficult, and even if we can, it might no longer be qigong itself. That might be the possible reason why to this point, qigong studies investigated the potential effects of a particular qigong style as a whole, rather than focusing on fragmented elements of qigong (e.g., *qi*).

The revised protocol was further reviewed by two experienced qigong masters, one of whom is specialized in *chan mi gong*. In Hong Kong, he is one among the rare few successors of this old qigong school. He learnt *chan mi gong* directly from the grand master of *chan mi gong* (i.e., Master *Liu Han Wen*). He is a TCM practitioner and has taught this traditional qigong for about 25 years. The other expert had been working as a medical doctor in Guangzhou Hospital for many years. He started practicing qigong about twenty years ago. He is now a professor and teaches TCM, *ba duan jin,* and other schools of qigong in a local university.

Table 13: Revised qigong protocol (Mindfit exercise).

Part	Title	Functions
I	Warm-up	To warm-up the muscles, joints; prepare both the body and mind for exercise
II	*Dantian* breathing	Increase concentration, improve breathing rhythm, relieve from stress, clear the mind, prepare the body for intermediate *qi*-exercise
III	*Qi*-spine exercise I (*zhu ji gong*)	Basic *qi*-exercise to improve digestive and circulatory systems; strengthen muscles and increase flexibility of joints, align spine
VI	*Qi*-spine exercise II (*zhu ji gong*)	Intermediate *qi*-exercise to strengthen the spine and increase flexibility, enhance internal *qi* (energy) circulation, improve blood circulation
V	Cool-down	To cool-down body and mind, resume harmony

Summing up the above, the findings of the pilot study provided some support that the qigong intervention had some effects on reducing stress and diastolic blood pressure. However small sample size, lack of randomization, failure to collect salivary samples in the follow-up measurement, and imperfection of the qigong protocol limited the reliability of the results. We, therefore, modified the procedure, the qigong protocol and improved our main study design based on the experience and reflections from the pilot study.

3.2. Main Study

3.2.1. Subject Recruitment

In the main study (Phase II), we had two pairs of comparisons: Phase IIa, the comparisons between the qigong group and the matched waitlist group; and, Phase IIb, the comparisons between the qigong group and the psychology group (non-equivalent groups). We aimed at investigating whether there is any difference between subjects who have and do not have the qigong intervention. Since we were not interested in whether the waiting list group was different from psychology intervention or whether there is any difference among these three groups, we did not compare the three groups together.

The psychology class recruited from the community centre served as a second non-equivalent control group to monitor the placebo effect of the instructor's attention to the subjects. In the psychology class, the subject obtained knowledge about stress and relaxation strategies. The stress and anxiety levels of this psychology group were not expected to reduce much with a knowledge-based course. Table 14 shows periods of recruitment and workshops in Phase IIa and IIb. From January to March 2009, subjects of the psychology class were recruited by a community centre, which provided courses in adult education. Since we could not recruit enough subjects in the first semester of 2009 (from February to April), the community centre allowed us to recruit the psychology subjects from their second semester (from April to June). Finally, 48 participants (42 women, 6 men) of the psychology class expressed interest in our study.

Originally, subject recruitment of the qigong group and the waitlist group was also scheduled in January 2009. However, due to lengthy procedures of obtaining approval from different parties, subject recruitment of the qigong and waitlist control group could only start in late April 2009. Promotional posters about the qigong course and experiment were put up on the notice boards over the campus of the Hong Kong Polytechnic University. More details of the program were also sent through email networks. Over 4 weeks (late May), one hundred and thirty two participants (89 women, 43 men) expressed interest in the qigong program.

Therefore, the subjects of the waitlist control group and the qigong group came from the same pool of potential subjects. Subjects of the psychology group came from a very different source of recruitment. Moreover, this psychology group was also much younger than the other two groups. Due to the policy of the community centre, the psychology class had its own timetable and class size; we were not able to randomize and match it with the qigong group. These variations might have weakened the validity of our analysis if we had compared the three groups together. This was another reason why we separated the main study into two phases and did the analysis by comparing only two groups at a time.

	2008	2009									
Group	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Qigong					recruit		qigong class		follow up		
Waitlist					recruit		wait		follow up	make-up qigong class	
Psy gp	recruit		psy lectures		follow up						
			recruit		psy lectures		Follow up				

Table 14: Schedule of Subject Recruitment and Implementation of Workshops in Main Study (Phase IIa and IIb).

3.2.2. Intervention

Similar to the training program in Phase I, the treatment group practiced the *Mindfit* protocol once every week under the supervision of the instructor for 8 weeks. Each lesson lasted for about 1 hr. 45 mins. Pre-measurement was on the first week, while mid-measurement and post measurements were scheduled on the 4^{th} and 8^{th} weeks respectively. After the 8-week training program had finished, follow-up assessment was held on the 12^{th} week (i.e., 4 weeks after the training had finished). Qigong subjects were required to practice the protocol for at least 20 minutes per day throughout the 12 weeks. They were asked to record the practice time and their physical (e.g., sweating, tired, etc.) and psychological (e.g., relaxed) experience on the logbooks that were provided.

During the 12 weeks of waiting, the waitlist control group also completed the assessments on four occasions, just as the qigong group did. A make-up qigong course would be given to them after the 12-week waiting period. For the second control group (psychology group), knowledge about psychology, which included concepts of body-mind well-being were taught, but there was no practical session. The subjects in the psychology class also met the same instructor once a week and the workshops lasted for 8 weeks. Home assignments (e.g. article reading) were given to them during the class. The two control groups also had to complete four measurements over 12 weeks of time. Other procedures were similar to the pilot study, which also included interviews and program evaluation questionnaires to collect details of their subjective experiences. Figure 27 summarizes the procedures of the main study.

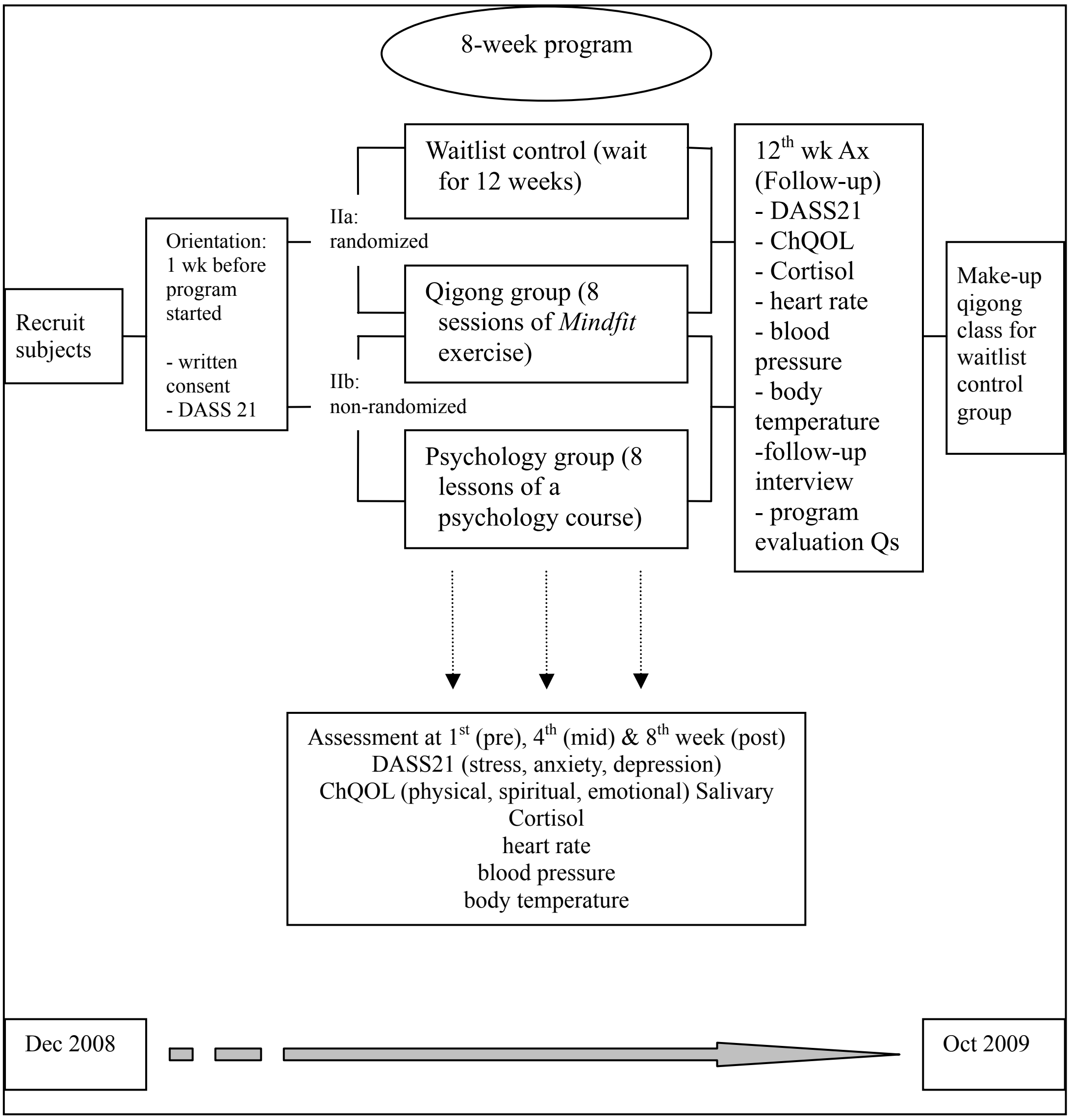

Figure 27: Flow chart of assessment and intervention in main study (Phases IIa and IIb).

3.2.3. Outcome Measures

All the standardized measurement tools (e.g., DASS-21) used in the main study were the same as those used in the pilot study. As described earlier, the qigong protocol was refined (see Table 13); a chart of *qi* feelings was added in the questionnaires to collect subjective feelings of *qi* (see Appendix 5). We also followed the cortisol collection procedures specified in the kit; cortisol collection was added in the follow-up measurement in the main study.

3.2.4. Ethical Issues and Safety Measures

Similar to what was done in Phase I, written informed consent from subjects of the three groups in Phase II were collected before entry into the project. The subjects were told that they have the right to withdraw from this study at anytime and confidentiality will be ensured. The qigong participants were reminded to report to the researcher if they experienced any uncomfortable feelings during and after practice, and they were advised to stop practicing the protocol if necessary. Their health conditions were monitored by measures of blood pressure and heart rate. A registered nurse was there on standby during each training session.

3.3. Phase IIa: Between Qigong Group and Waitlist Control Group

3.3.1. Aims and Hypothesis

The main aim of Phase IIa was to investigate whether qigong exercise helps in reducing stress and anxiety, as well as improving body-mind well-being as indicated by outcome measures of mood states, quality of life, and physiological condition after the qigong program. The study employed a Repeated Measures design to detect group differences in four measurement time-points (pre, mid, post and follow-up) throughout the 12-week study period. We hypothesized that:

Within-group Difference (Change over time)

1) After joining the 8-week qigong class, the participants would have significant improvement in **psychological** well-being outcomes (i.e., lowered DASS-21 and higher ChQOL) when compared with the baseline.
2) After joining the 8-week qigong class, the participants would have significant improvement in **physiological** well-being outcomes (i.e., lowered BP, HR, and cortisol level) when compared with the baseline.

Between-group Difference (Treatment Effect)

3) After joining the 8-week qigong class, the **psychological** well-being (i.e., lowered DASS-21 and higher ChQOL) of participants in the intervention group (i.e., the qigong group) would be significantly different from that of the subjects in the waitlist control group.
4) After joining the 8-week qigong class, the **physiological** well-being

(lowered BP, HR, and cortisol level) of participants in the intervention group (i.e., the qigong group) would be significantly different from that of the subjects in the waitlist control group.

3.3.2. Statistical Analysis

Statistical software SPSS16 was used to analyze the collected data. The independent variable is the group which the participants joined i.e., the intervention (qigong) and waitlist control group. To test for within-group effects (i.e., hypothesis 1 and 2), the data of three main assessment points (pre, mid, and post) and follow-up measurements were analyzed by GLM (Repeated Measures) for each group. This was to see whether there was any improvement in overall body-mind well-being as indicated by the dependent variables: mood states (DASS-21— stress, anxiety and depression scores), quality of life (ChQOL—physical, spiritual, and emotional scores), and physiological conditions (cortisol level, blood pressure, and pulse rate) throughout the study period. Among the subjects of the qigong group, we also did a secondary analysis based on four pairs of comparisons: a) between those who could feel *qi* and those who could not, b) between those who practice more and those who practiced less, c) between men and women, and d) between older subjects and younger subjects.

In order to investigate whether there was any group differences on all of the dependent variables, GLM (Repeated Measures) was also used to analyse the data. In addition, univariate analysis of each dependent variable was also calculated and the effect size of each calculation was computed as well. Post hoc test (Bonferroni) was employed for pairwise comparisons between each assessment time-point to identify where the changes occurred substantially over the 12 weeks. On the other hand, it was found that the baseline cortisol level of the two groups in Phase IIa differed quite a lot; we needed to use the pre-test cortisol values of the two groups as covariate in order to statistically equate the baseline.

Similar to Phase I, the strength of the effect size (η^2, eta squared) was interpreted by employing the generally accepted guidelines given by Cohen (1988). That is, for $\eta^2 \leq 0.01$ indicates small effect, $\eta^2 \leq 0.06$ indicates moderate effect, and $\eta^2 \geq 0.14$ indicates large effect (Kinnear & Gray, 2008; Pallant, 2005).

3.4. Results of Main Study (Phase IIa)

3.4.1. Subjects

Among the subjects recruited, 42 women and 20 men did not meet the inclusion criteria and were excluded from the study. One woman declined to participate because she had found a new job and could not attend the sessions. Another woman declined to join due to personal reasons. Finally, 68 eligible subjects (45 women, 23 men) with a mean age of 44.2 (*SD* = 11.03) years (ranged from 21 to 64) participated in our study. The subjects (*N* = 68) were stratified based on their age and gender and then randomly allocated into two groups with each having 34 subjects. In the qigong group, there were 22 women and 12 men with a mean age of 43.79 (*SD* = 10.37) years. Twenty-three women and eleven men with a mean age of 44.66 (*SD* = 11.86) years were assigned to the waitlist control group (see Figure 28).

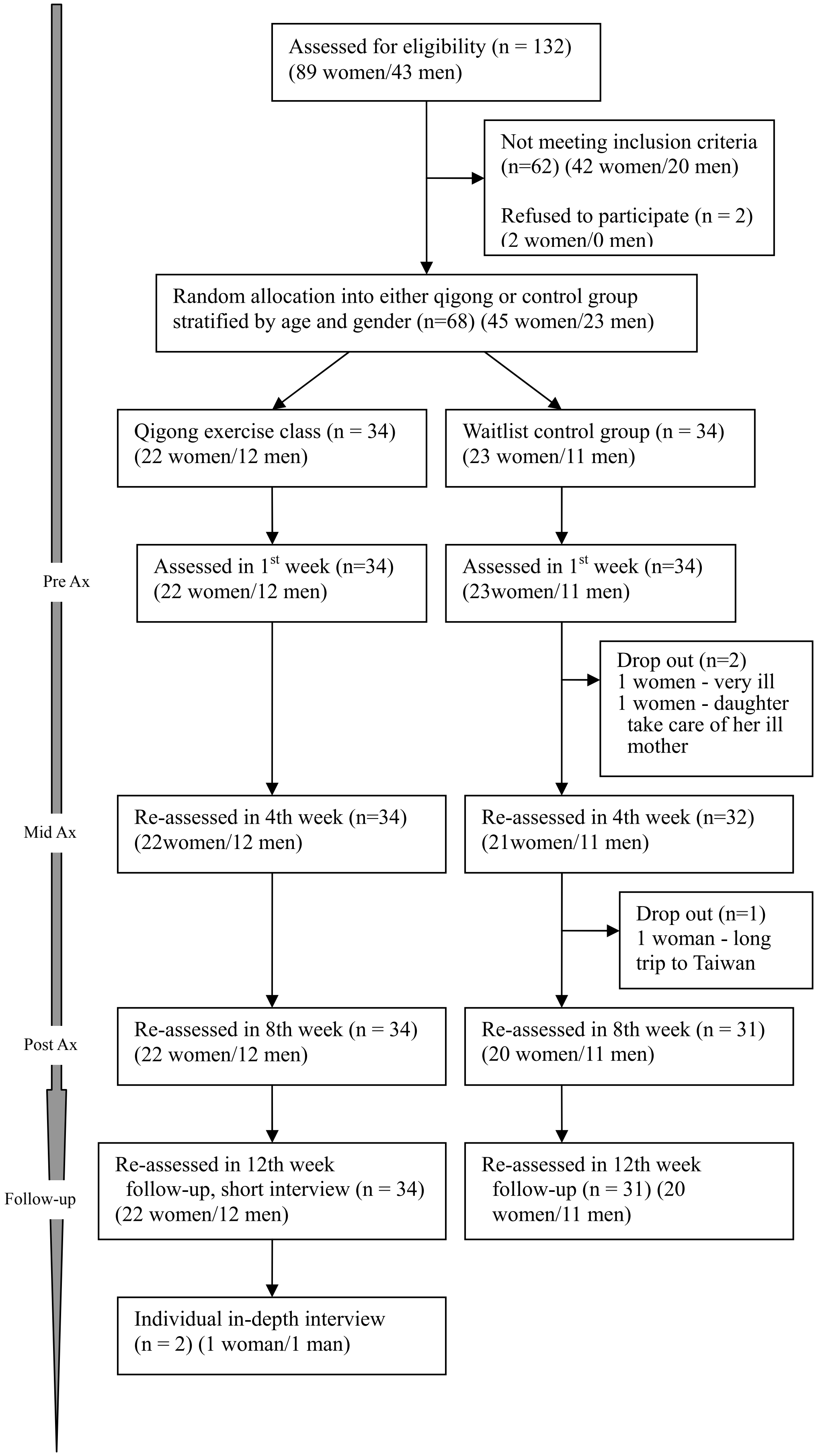

Figure 28: Flowchart of the subjects' flow in Phase IIa.

3.4.2. Adherence to Experimental Protocol

For the attendance of qigong group subjects, twenty-six subjects (76.47%) attended all eight qigong sessions over the research period. Seven subjects (20.59%) attended seven sessions and one subject (2.74%) attended six sessions only. The qigong class was held during the sensitive period of the human swine flu scare. During the prevalence period of this disease, classes were suspended in some schools and community centres. In order to follow the health department advice and university guidance, our participants were suggested not to attend the qigong class if they showed any symptoms of flu (e.g., cough, runny nose, high body temperature, etc.). Body temperature was measured before each lesson started. They also had to sterilize their hands and mattress (for doing exercise). They were also advised to stay at home for two days in case they came back from overseas. On the data collection sessions, salivary samples were not collected from those subjects who showed any symptoms of flu or who had not yet recovered from illness. This procedure was to protect the laboratory assistant from being infected during salivary sample collection, handling, and performing the immunoassays. This implementation of precaution procedures slightly decreased the attendance rate of our qigong class as well as the number of samples collected.

All 34 subjects (100%) of the qigong group and 31 waiting subjects completed the questionnaires of DASS and ChQOL in pre, mid, post and follow-up assessment points. For salivary sample collection, it was supposed that each subject provided four samples over the 12 weeks.

However, two subjects from the qigong group and one subject from the control group could only attend three collection sessions due to illness or an overseas trip; thus, each of them could provide three samples but not four cortisol measurements. Finally, we collected 257 samples from 65 people with analyzable salivary volume. The missing data of cortisol level were replaced by the mean of the other three samples provided by the individual. The qigong subjects reported an average of 30.10 minutes of home practice per day; which was regarded as satisfactory; twenty-eight (82.35%) of them practiced over 20 minutes a day, thus meeting our minimum recommended practice time.

3.4.3. Baseline Difference

The differences of each DV and age between the two groups were calculated by using a *t*-test (see Table 15). The results showed the two groups were significantly different only on salivary cortisol level. Summaries of the analysis about the within group variations over 12 weeks time in the qigong group and waitlist control group are shown in Table 16 and 17 respectively. Table 18 illustrates the results of between group analyses. The post hoc pairwise comparisons (Bonferroni) of the qigong group are shown in Table 19.

Table 15: Comparisons of Pre-test Scores between Qigong Group (Treatment) and Waitlist Control Group.

Outcome measures of Time 1 (pre-test)	*M*(*SD*)		*t*-test	*p*
	Treatment Qigong Group (n =34)	Control Waitlist Group (n = 31)		
Age	43.79 (10.37)	44.65 (11.86)	0.31	0.759
DASS-S	16.65 (3.87)	17.03 (4.09)	-0.39	0.698
DASS-A	8.23 (6.53)	9.10 (6.87)	-0.52	0.606
DASS-D	6.29 (5.33)	6.97 (5.93)	-0.48	0.631
ChQOL-P	57.59 (13.42)	58.15 (12.39)	-0.17	0.862
ChQOL-S	58.63 (16.00)	57.11 (14.78)	0.40	0.693
ChQOL-E	63.17 (15.69)	60.93 (12.77)	0.63	0.533
ChQOL- OA	59.79 (12.68)	58.73 (11.41)	0.36	0.724
Cortisol	3270.25 (1000.19)	2571.06 (1000.29)	2.82	0.007*
Sys BP	108.28 (11.04)	112.13 (9.99)	-1.47	0.147
Dia BP	73.06 (9.01)	76.56 (7.81)	-1.67	0.100
Heart rate	68.21 (7.34)	67.65 (7.17)	0.31	0.757

* $p \leq 0.05$

Table 16: Changes in Outcome Measures of Qigong Group (n=34) over Re-assessments.

Outcome measures	*M* (*SD*) Time 1 (wk 1) pre	*M* (*SD*) Time 2 (wk 4) mid	*M* (*SD*) Time 3 (wk 8) post	*F* (T1- T3)	*p*	η^2 (Effect size#)	*M* (*SD*) Time 4 (wk 12) follow-up	*F* (T1- T4)	*p*	η^2 (Effect size#)
Psychological										
DASS-S	16.65 (3.87)	13.41 (5.15)	11.76 (4.11)	23.850	0.0001*	0.420 (L)	9.18 (4.95)	35.560	0.0001*	0.519 (L)
DASS-A	8.24 (6.53)	6.88 (4.88)	4.71 (3.65)	9.593	0.001*	0.225 (L)	4.18 (3.24)	10.627	0.0001*	0.244 (L)
DASS-D	6.29 (5.33)	5.12 (6.23)	2.94 (3.69)	9.772	0.0001*	0.228 (L)	2.47 (3.38)	10.292	0.0001*	0.238 (L)
ChQOL-P	57.59 (13.42)	61.70 (11.61)	65.09 (9.77)	13.018	0.0001*	0.283 (L)	66.91 (10.26)	13.102	0.0001*	0.284 (L)
ChQOL-S	58.63 (16.00)	63.59 (14.28)	65.60 (14.37)	6.169	0.005*	0.158 (L)	69.55 (14.97)	9.820	0.0001*	0.229 (L)
ChQOL-E	63.17 (15.69)	67.84 (13.18)	71.97 (10.29)	11.688	0.0001*	0.262 (L)	75.38 (10.67)	15.125	0.0001*	0.314 (L)
ChQOL-OA	59.79 (12.68)	63.38 (10.89)	67.55 (9.12)	16.084	0.0001*	0.328 (L)	70.62 (9.88)	19.026	0.0001*	0.366 (L)
Physiological										
Cortisol	3270.25 (1000.19)	3200.47 (868.07)	2656.01 (898.28)	22.400	0.0001*	0.404 (L)	2088.80 (879.90)	33.461	0.0001*	0.503 (L)
Sys BP	108.28 (11.04)	106.54 (11.42)	105.28 (9.84)	2.080	0.146	-	101.75 (10.21)	5.565	0.002*	0.144 (L)
Dia BP	73.06 (9.01)	69.69 (8.62)	70.79 (7.86)	4.389	0.027*	0.117 (M)	69.79 (7.97)	3.509	0.029*	0.096 (L)
Heart rate	68.21 (7.34)	71.96 (7.12)	71.67 (6.75)	6.092	0.006*	0.156 (L)	69.87 (5.94)	4.886	0.008*	0.129 (L)

* $p \leq 0.05$

S = small effect ($\eta^2 \leq 0.01$), M = moderate effect ($\eta^2 \leq 0.06$), L = large effect ($\eta^2 \geq 0.14$)

Table 17: Changes in Outcome Measures of Waitlist Control Group (n =31) over Re-assessments.

Outcome measures	*M*(*SD*)			*F* (T1-T3)	*p*	η^2 (Effect size#)	*M* (*SD*)	*F* (T1–T4)	*p*	η^2 (Effect size#)
	Time 1 (wk 1) pre	Time 2 (wk 4) mid	Time 3 (wk 8) post				Time 4 (wk 12) follow-up			
Psychological										
DASS-S	17.03 (4.09)	15.13 (6.69)	15.35 (5.57)	3.457	0.048*	0.103 (M)	13.94 (5.92)	5.668	0.003*	0.159 (L)
DASS-A	9.10 (6.87)	8.32 (6.79)	8.26 (6.63)	0.605	0.539	-	9.29 (7.02)	0.842	0.465	-
DASS-D	6.97 (5.93)	6.19 (6.27)	6.45 (6.36)	0.663	0.488	-	6.65 (6.40)	0.361	0.746	-
ChQOL-P	58.15 (12.39)	57.31 (14.09)	56.22 (17.15)	0.816	0.413	-	55.74 (16.76)	1.075	0.348	-
ChQOL-S	57.11 (14.78)	57.15 (14.64)	57.16 (18.36)	0.0001	0.999	-	55.94 (21.31)	0.212	0.797	-
ChQOL-E	60.93 (12.76)	60.66 (16.78)	62.65 (16.12)	0.876	0.406	-	61.46 (17.98)	0.583	0.567	-
ChQOL-OA	58.73 (11.41)	58.38 (13.41)	58.68 (15.90)	0.043	0.909	-	57.71 (17.65)	0.248	0.746	-
Physiological										
Cortisol	2571.06 (1000.29)	2739.34 (1323.52)	2636.05 (1163.26)	0.681	0.451	-	2699.51 (1122.84)	0.655	0.475	-
Sys BP	112.13 (9.99)	111.39 (11.51)	111.08 (10.39)	0.309	0.702	-	111.00 (11.35)	0.288	0.802	-
Dia BP	76.56 (7.81)	73.95 (7.15)	73.81 (5.74)	4.659	0.017*	0.134 (M)	73.06 (7.04)	4.237	0.010*	0.124 (M)
Heart rate	67.65 (7.17)	68.27 (10.38)	68.35 (7.92)	0.207	0.737	-	72.13 (7.81)	5.637	0.004*	0.158 (L)

* $p \leq 0.05$ # S = small effect ($\eta^2 \leq 0.01$), M = moderate effect ($\eta^2 \leq 0.06$), L = large effect ($\eta^2 \geq 0.14$)

Table 18: Comparison of Treatment Effects between Qigong Group (n = 34) and Waitlist Control Group (n = 31) over Re-assessments.

	Time 1 to Time 3 Pre to post (wk 1 to wk 8)					Time 1 to Time 4 Pre to follow-up (wk 1 to wk 12)				
Outcome measures	Main effect *F*	*p*	η^2 (Effect size#)	Inter-action effect *F*	*p*	Main effect *F*	*p*	η^2 (Effect size#)	Inter-action effect *F*	*p*
Psychological										
DASS + ChQOL	2.456	0.122	-	3.538	0.016*	4.262	0.043*	0.063 (M)	6.152	0.0005*
DASS-S,A,D	3.145	0.081	-	1.936	0.083	6.377	0.014*	0.092 (M)	3.247	0.003*
DASS-S	3.116	0.082	-	4.558	0.014*	5.767	0.019*	0.084 (M)	6.699	0.0005*
DASS-A	2.186	0.144	-	2.905	0.065	4.719	0.034*	0.07 (M)	5.705	0.002*
DASS-D	1.878	0.175	-	4.375	0.016*	3.901	0.053	0.058 (M)	4.919	0.004*
ChQOL-P,S,E,OA	3.437	0.068	-	3.059	0.011*	6.042	0.017*	0.088 (M)	4.996	0.0005*
ChQOL-P	1.933	0.169	-	9.977	0.0005*	3.883	0.053	0.058 (M)	11.170	0.0005*
ChQOL-S	2.452	0.122	-	3.325	0.043*	4.234	0.044*	0.063 (M)	6.498	0.001*
ChQOL-E	3.707	0.059	-	4.356	0.018*	6.489	0.013*	0.093 (M)	7.282	0.001*
ChQOL-OA	3.437	0.068	-	8.678	0.001*	6.043	0.017*	0.088 (M)	12.173	0.0005*
Physiological										
Cortisol	5.733[a]	0.020*	0.085 (M)	5.108[a]	0.027*	15.908[b]	0.0005*	0.204 (L)	11.047[b]	0.0005*
Sys BP	4.080	0.048*	0.061 (M)	0.464	0.597	6.593	0.013*	0.095 (M)	2.352	0.083
Dia BP	4.367	0.041*	0.065 (M)	0.327	0.682	4.491	0.038*	0.067 (M)	0.228	0.855
BP (sys + dia)	4.587	0.036*	0.068 (M)	0.535	0.685	6.212	0.015*	0.090 (M)	2.016	0.079
Heart rate	2.046	0.158	-	1.932	0.153	0.601	0.441	-	5.566	0.002*

* $p \le 0.05$ # S = small effect ($\eta^2 \le 0.01$), M = moderate effect ($\eta^2 \le 0.06$), L = large effect ($\eta^2 \ge 0.14$)

a: T2 and T3 comparisons (T1 as covariate) b: T2, T3, and T4 comparisons (T1 as covariate)

Table 19: Results of Post Hoc Tests of Qigong Group (n = 34) and Waitlist Control Group (n = 31) over Re-assessments.

Outcome measures	*p*											
	Time 1 vs. Time 2 (wk 1) (wk 4)		Time 1 vs. Time 3 (wk 1) (wk 8)		Time 1 vs. Time 4 (wk 1) (wk 12)		Time 2 vs. Time 3 (wk 4) (wk 8)		Time 2 vs. Time 4 (wk 4) (wk 12)		Time 3 vs. Time 4 (wk 8) (wk 12)	
	Qigong	Waitlist	Qigong	Waitlist	Qigong	Waitlist	Qigong	Waitlist	Qigong	Waitlist	Qigong	Waitlist
Psychological												
DASS-S	0.002*	NS	0.0005*	NS	0.0005*	0.003*	NS	NS	0.0005*	NS	0.0005*	NS
DASS-A	NS	NS	0.002*	NS	0.001*	NS	0.009*	NS	0.003*	NS	NS	NS
DASS-D	NS	NS	0.0005*	NS	0.0005*	NS	0.006*	NS	0.038*	NS	NS	NS
ChQOL-P	0.008*	NS	0.0005*	NS	0.0005*	NS	NS	NS	0.006*	NS	NS	NS
ChQOL-S	NS	NS	0.009*	NS	0.0005*	NS	NS	NS	0.012*	NS	0.039*	NS
ChQOL-E	NS	NS	0.0005*	NS	0.0005*	NS	0.015*	NS	0.001*	NS	0.020*	NS
ChQOL-OA	0.006*	NS	0.0005*	NS	NS	NS	0.013*	NS	0.0005*	NS	0.027*	NS
Physiological												
Cortisol[b]	NA	NA	NA	NA	NA	NA	0.0005*	NS	0.0005*	NS	0.0005*	NS
Sys BP	NS	NS	NS	NS	0.011*	NS	NS	NS	NS	NS	NS	NS
Dia BP	NS	NS	NS	NS	0.013*	NS	NS	NS	NS	NS	NS	NS
Heart rate	0.035*	NS	0.028*	NS	NS	0.0005*	NS	NS	NS	0.02*	NS	0.01*

* $p \leq 0.05$ NS = not significant NA = not available due to T1 scores being covariated

b: T2, T3, and T4 comparisons (T1 as covariate)

3.4.4. Changes in Psychological Well-being (DASS-21 and ChQOL)

Our results indicate that after 8 weeks of qigong exercise training, a significant Time x Group interaction effect was found in the four subscales of quality of life as indicated by the result of a 2 (groups) x 3 (times) x 4 (variables) calculation ($p = 0.011$). When combining all seven dependent variables of psychological well-being, the results of the 2 (groups) x 4 (times) x 7 (variables) calculation showed that the psychological condition of the qigong group was significantly ($p = 0.016$) better than that of the waitlist control after 8 weeks. However, for the three DASS subscales, the 2 (groups) x 3 (times) x 3 (variables) analysis was not significant. No significant main effect was found.

In week 12, when the follow-up data were included in calculations, significant main effects were found in mood state (i.e., three DASS subscales) ($p = 0.014$) as reviewed by the 2 (groups) x 4 (times) x 3 (variables) formula, as well as quality of life (i.e., four ChQOL subscales) ($p = 0.017$) resulting from the 2 (groups) x 4 (times) x 4 (variables) analysis. When combining all seven dependent variables of psychological well-being, the results of the main effect in the 2 (groups) x 4 (times) x 7 (variables) analysis showed that the psychological well-being of the qigong group was significantly ($p = 0.043$) better than that of the waitlist group. Significant Time x Group interaction effects were also found in mood states ($p = 0.003$), quality of life ($p \leq 0.001$) and all seven dependent variables of psychological well-being ($p \leq 0.001$). Most group differences were significant at a medium effect level suggesting that a moderate proportion of between group difference in mood state and quality of life over four check points was accounted for by the qigong intervention (see Table 18).

3.4.4.1. Stress (DASS-S)

The *t*-test results indicated no significant difference of DASS-S scores between the groups at baseline. In the qigong group, the DASS-S score decreased to 13.41 (*SD* = 5.15) in week 4; and further reduced to 11.76 (*SD* = 4.11) in week 8. A significant change was found ($F = 23.85$, $p \leq 0.001$) within groups. In the waitlist control group, the DASS-S score decreased to 15.13 (*SD* = 6.69) in week 4, and then increased to 15.35 (*SD* = 5.57) in week 8. The changes in stress score (DASS-S) from week 1 to week 8 in the waitlist control group was just significant ($F = 3.457$, $p = 0.048$). The Time x Group interaction effect was significant at the 3rd measure point ($F = 4.558$, $p = 0.014$). The effect size was at a medium level ($\eta^2 = 0.067$). The main effect was not significant.

In week 12, the stress level of the qigong group in the follow-up session finally reached 9.18 (*SD* = 4.95). Such an improvement in stress was significant ($F = 35.56$, $p \leq 0.001$). The control group also showed a decreased trend in the 12th week (M =13.94, *SD* = 5.92), which was also a significant change ($F = 5.668$, $p = 0.003$). However, the effect size of the qigong group ($\eta^2 = 0.519$) was much higher than that of the control group ($\eta^2 = 0.159$). For the between group difference, the significant result of main effect ($F = 5.767$, $p = 0.019$) indicated that the qigong group had experienced a satisfactory decline in the stress score, which was lower than that of the waitlist control group after 12 weeks of qigong intervention. The effect size was a medium one ($\eta^2 = 0.84$) as well. The significant Time x Group interaction effect between the two groups ($F = 6.699$, $p \leq 0.001$) and its medium effect size ($\eta^2 = 0.096$) further suggested that a moderate proportion of the between group variability in stress level over the four checkpoints was accounted for by the qigong intervention.

The results of post hoc testing indicate that in the qigong group, there were significant improvements in: Time 1 vs. Time 2 ($p = 0.002$), Time 1 vs. Time 3 ($p \leq 0.001$), Time 1 vs. Time 4 ($p \leq 0.001$), Time 2 vs. Time 4 ($p \leq 0.001$), and Time 3 vs. Time 4 ($p \leq 0.001$), but not Time 2 vs. Time 3. The stress level of the control group in week 12 was also significantly lower than that in week 1; however, other pairwise comparisons were not significant (see Figure 29).

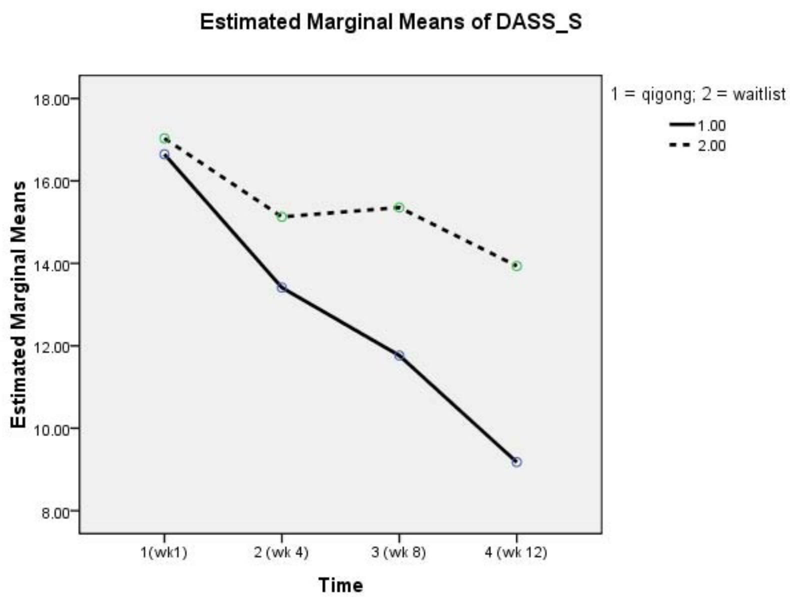

Figure 29: Changes in the DASS-S score of the qigong group (n = 34) and the waitlist control group (n = 31) over four assessments.

3.4.4.2. Anxiety (DASS-A)

At baseline, there was no significant difference between the two pre-test anxiety scores of the treatment group and the control group. For within group analysis, in the qigong group, the DASS-A value decreased to 6.88 (*SD* = 4.88) in week 4 and was further reduced to 4.71 (*SD* = 3.65) in week 8. Such an improvement in anxiety throughout the 8 weeks was significant ($F = 9.593$, $p = 0.001$). In the control group, anxiety values decreased in the 4^{th} and 8^{th} week ($M = 8.32$, $SD = 6.79$ and $M = 8.26$, $SD = 6.63$ respectively); however, it was not significantly different from the baseline level. No significant group difference in DASS-A was found in week 8.

A continuous decline in anxiety level ($M = 4.18$, $SD = 3.24$) was found among the subjects of the qigong group in week 12; it was a significant drop ($F = 10.627$, $p \leq 0.001$). However, in the waitlist control group, the anxiety level showed a U-shape decrease and then an increase back to 9.29 ($SD = 7.02$) in the 12^{th} week, which was not significantly different from the baseline. The qigong group showed considerably lower anxiety levels than the control group as indicated by the significant Time x Group interaction effect ($F = 5.705$, $p = 0.002$, $\eta^2 = 0.083$) and main effect ($F = 4.719$, $p = 0.034$, $\eta^2 = 0.07$). The effect sizes were both at a medium level, which meant a moderate proportion of such variation over time could be explained by the independent variable (i.e., qigong practice).

The results of post hoc calculations showed that significant decreases in anxiety levels were found in: Time 1 vs. Time 3 ($p = 0.002$) , Time 1 vs. Time 4 ($p = 0.001$), Time 2 vs. Time 3 ($p = 0.009$), Time 2 vs. Time 4 ($p = 0.003$), but not Time 1 vs. Time 2, or Time 3 vs. Time 4. No significant pairwise comparison was found in the control group (see Figure 30).

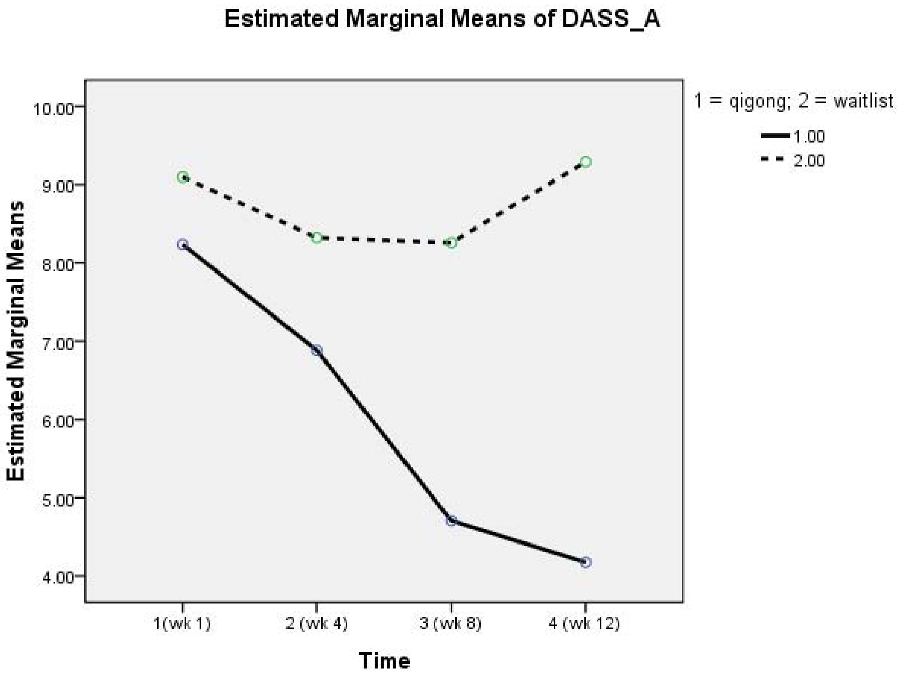

Figure 30: Changes in the DASS-A score of the qigong group (n = 34) and the waitlist control group (n = 31) over four assessments.

3.4.4.3. Depression (DASS-D)

The DASS-D score of the qigong group was not significantly different from the control group at baseline. The depression level significantly decreased to 5.12 (SD = 6.23) in the middle of the training program and ultimately reached 2.94 (SD = 3.69) when the class finished in the 8th week (F = 9.772, $p \leq 0.001$). For the subjects in the control group, their depression values also decreased in week 4 (M = 6.19, SD = 6.27), but increased in week 8 (M = 6.45, SD = 6.36), which resulted in a non-significant change over the 8 weeks of waiting. The Time x Group interaction effect (F = 4.375, p = 0.016, η^2 = 0.065) indicated that the qigong group experienced a substantial alleviation in depressive symptoms during the 8 training weeks while the waitlist control group maintained a rather stable condition. No significant main effect was found in week 8.

The depression level of the intervention group further decreased significantly in the follow-up week (F = 10.292, $p \leq 0.001$) to 2.47 (SD = 3.38). No significant change was found within the waitlist control group. The Time x Group interaction effect was significant (F = 4.919, p = 0.004). Though the effect size of DASS-D (η^2 = 0.072) was a bit less than those of stress and anxiety aspects, it can also be classified as medium level according to Cohen's (1988) criteria. Although very close, the main effect was not significant in week 12.

The results of post hoc analysis showed that when compared with the baseline scores, the qigong group had substantial decreases in depressive levels in week 8 ($p \leq 0.001$) and week 12 ($p \leq 0.001$), but not week 4. Significant changes were also found in: Time 2 vs. Time 3 ($p = 0.006$) and Time 2 vs. Time 4 ($p = 0.038$). The pairwise comparisons of the control group were not significant (see Figure 31).

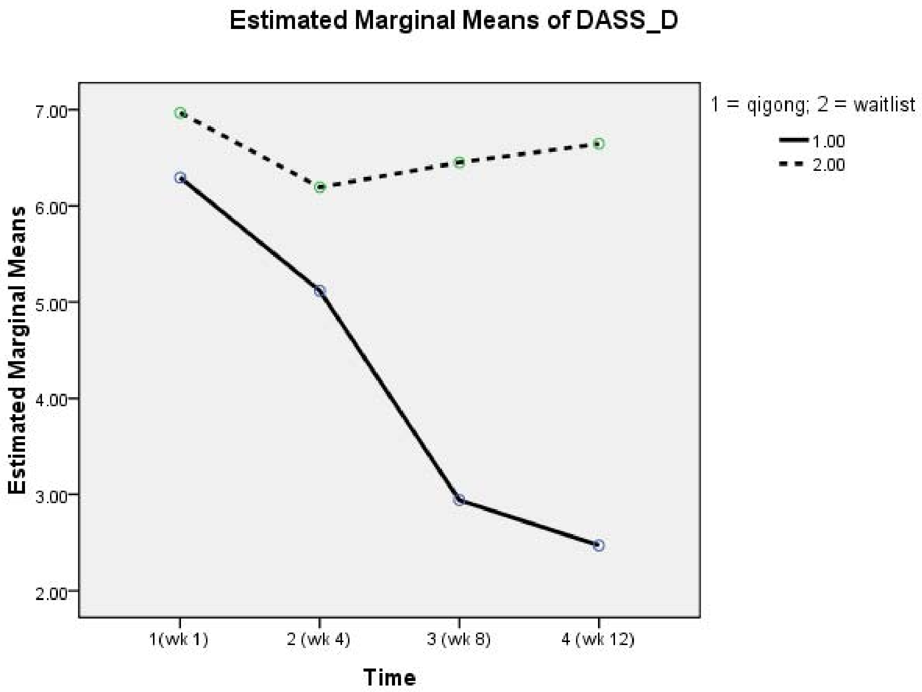

Figure 31: Changes in the DASS-D score of the qigong group (n = 34) and the waitlist control group (n = 31) over four assessments.

3.4.4.4. Quality of Life – Physical Domain (ChQOL-P)

The ChQOL-P scores of the qigong group were not significantly different from that of the control group at baseline. There was a significant improvement in physical functioning with an increase to 61.70 (*SD* =11.61) in the middle of, and 65.09 (*SD* = 9.77) at the end of the 8-week qigong program ($F = 13.102$, $p \leq 0.001$). In the control group, their quality of life in physical domain showed a deteriorated trend with the mean value decreasing to 57.31 (*SD* = 14.09) in week 4 and 56.22 (*SD* = 17.15) in week 8. However, such changes were not significant. The group comparison in week 8 was significant as indicated by the Time x Group interaction effect ($F = 9.977$, $p = 0.0005$). The effect size ($\eta^2 = 0.137$) was moderate.

Four weeks after the eight training sessions had finished, the improvement in physical functioning among the 34 qigong subjects still continued with a mean value significantly increased to 66.91 (*SD* = 10.26) ($F = 13.102$, $p = 0.0001$). No significant difference was found in the waitlist control group, though the mean value further decreased to 55.74 (*SD* = 16.76). The result of interaction effect achieved a significant level ($F = 11.170$, $p \leq 0.001$). The effect size was a large one as indicated with $\eta^2 = 0.151$. The main effect was not significant in either week 8 or week 12.

When compared with their physical functioning level before the qigong training started, the post hoc tests indicated that the qigong group had significant improvements in week 4 ($p = 0.008$), week 8 ($p \leq 0.001$), and week 12 ($p \leq 0.001$). Significant changes were also found between week 4 and week 12 ($p = 0.006$). The steady trend of the control group did not yield significant pairwise comparisons over time (see Figure 32).

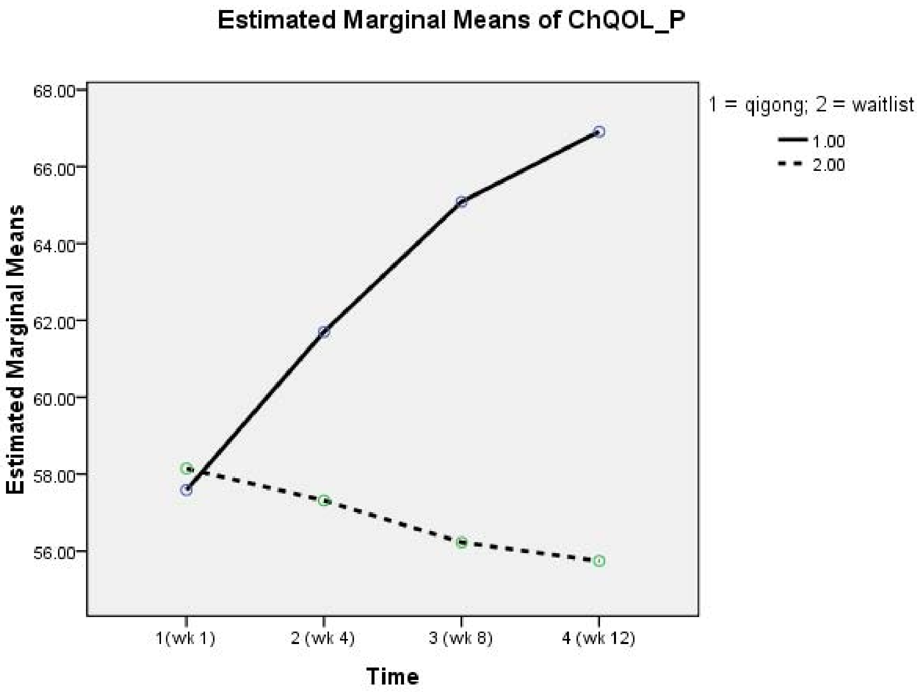

Figure 32: Changes in ChQOL-P score of qigong group (n = 34) and waitlist control group (n = 31) over four assessments.

3.4.4.5. Quality of Life – Spiritual and Vitality Domain (ChQOL–S)

Regarding the aspect of spiritual and vitality domain, no significant difference was found between the pre-test score of the control group and that of the treatment group. The values of the qigong group increased in week 4 and week 8 ($M = 63.59$, $SD = 14.28$ and $M = 65.60$, $SD = 14.37$ respectively) along a significant trend ($F = 6.169$, $p = 0.005$). No significant change was shown in the data given by the control group. The significant Time x Group interaction effect showed that qigong group subjects enjoyed better spirituality and vitality than the subject of the control group ($F = 3.325$, $p = 0.043$). The main effect was not significant in week 8.

From week 8 to week 12, each group had an individual development. The qigong group showed a continuous significant improvement in spiritual functioning with the mean value increasing to 69.55 ($SD = 14.97$) ($F = 9.820$, $p \leq 0.001$). In contrast, the subjects on the waiting list demonstrated a mild decline in vitality during their waiting period and finally reached 55.94 ($SD = 21.31$), though they did not reach a significant level. The main effect ($F = 4.234$, $p = 0.044$) and the Time x Group interaction effect ($F = 6.498$, $p = 0.001$) were both significant in week 12. As indicated by the medium effect sizes, over 12 weeks, the qigong intervention constituted a moderate effect on the variability between the two groups in this spiritual and vitality aspect.

Post hoc pairwise comparisons showed that when compared with the baseline scores, the qigong group had substantial improvements in vitality and spirituality in week 8 ($p = 0.009$) and week 12 ($p \leq 0.001$), but not week 4. Significant differences were also found in Time 2 vs. Time 4 ($p = 0.012$) and Time 2 vs. Time 4 ($p = 0.039$). No significant pairwise comparison was found in the waitlist control group (see Figure 33).

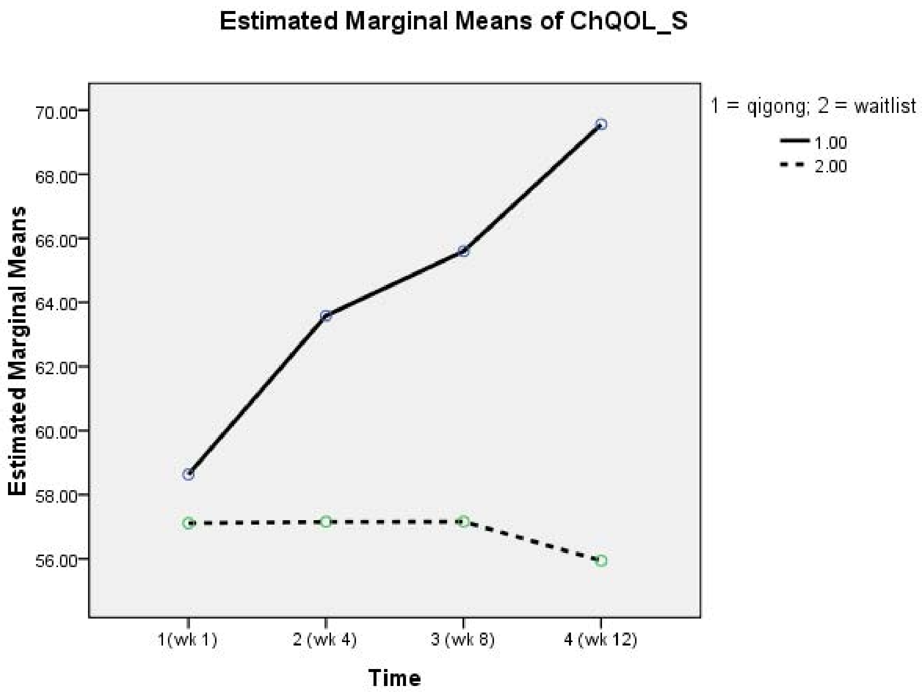

Figure 33: Changes in ChQOl-S score of qigong group (n = 34) and waitlist control group (n = 31) over four assessments.

3.4.4.6. Quality of Life – Emotional Domain (ChQOL–E)

The ChQOL-E scores of the qigong group were not significantly different from those of the control group at baseline. The profiles in this emotional dimension of the two groups were similar to those in the physical and spiritual dimensions as the qigong group improved, but the control group did not. Within group analysis revealed that the condition of the qigong group significantly improved since week 4 (M = 67.84, SD = 13.18) and finally reached 71.97 (SD = 10.29) in the last training week (F=11.688, p = 0.0001). The mean values of the control group also increased a bit throughout the 8 weeks, but did not reach a significant level. The Time x Group interaction effect indicated that the group difference reached a significant level at the end of week 8, (F = 4.356, p = 0.018, η^2 = 0.065).

In the follow-up session, the two groups were more different from each other. The qigong participants experienced a continuous elevated emotional state to 75.38 (SD = 10.67) (F = 15.125, p = 0.0001). The waiting subjects showed a little bit of a declined emotional state (M = 61.46, SD = 17.98) as compared with week 8. The between group differences yielded a significant main effect (F = 6.489, p = 0.013) and interaction effect (F = 7.282, p = 0.001). A relatively higher effect size (η^2 = 0.93) of the main effect, though still categorized as medium, resulted in week 12.

The results of pairwise comparisons demonstrated that the emotional functioning of the qigong group subjects improved significantly in all pairs of comparisons ($p \leq 0.02$), but not Time 1 vs. Time 2. No significant pairwise comparison was found in the control group (see Figure 34).

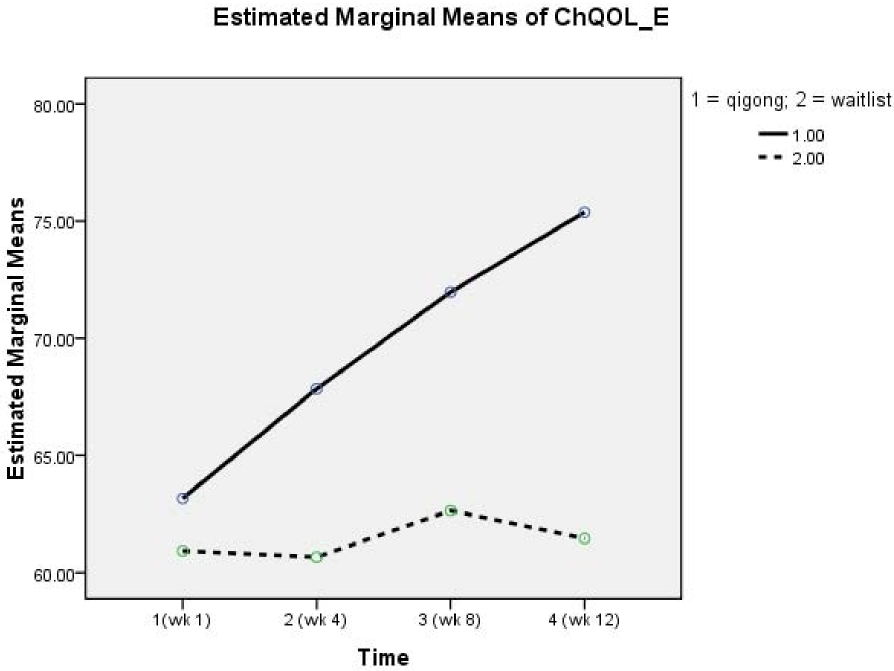

Figure 34: Changes in the ChQOL-E score of the qigong group (n = 34) and the waitlist control group (n = 31) over four assessments.

3.4.4.7. Quality of Life – Overall Functioning (ChQOL-OA)

The ChQOL-OA scores of the qigong group were not significantly different from those of the control group at baseline. Since ChQOL is the average of physical, emotional, and spiritual/vitality domains, it is not surprising that the trends turned out to be similar to the three individual aspects. The qigong group demonstrated an improved overall condition quality of life while the control group experienced a declined state. For the qigong group, there was a significant improvement in overall functioning with an increase to 63.38 (SD = 10.89) in the middle of, and 67.55 (SD = 9.12) at the end of the 8-week qigong class ($F = 16.084$, $p \leq 0.001$). In the control group, their overall functioning showed a rather stable trend with the mean value maintained at 58.38 (SD = 13.41) in week 4 and 58.68 (SD = 15.90) in week 8. Such changes were not significant. In week 8, the overall condition of the qigong group was better than that of the control group as demonstrated by the significant Time x Group interaction effect ($F = 8.678$, $p = 0.001$).

In the follow-up week, the improvement in physical functioning of the qigong participants continued with a mean value significantly increasing to 70.62 (SD = 9.88) ($F = 19.026$, $p \leq 0.001$). No significant difference was found in the waitlist control group, though the mean value slightly decreased to 57.71 (SD = 17.65). The main effect was significant in week 12 (F= 6.043, $p = 0.017$, $\eta^2 = 0.088$), though not in week 8. The Time x Group differences were significant (F =12.173, $p \leq 0.001$) in week 12, too.

Post hoc results indicated that significant improvements were found in all pairs of comparison ($p \leq 0.027$) except Time 1 vs. Time 4. However, the control group did not have obvious improvements (see Figure 35).

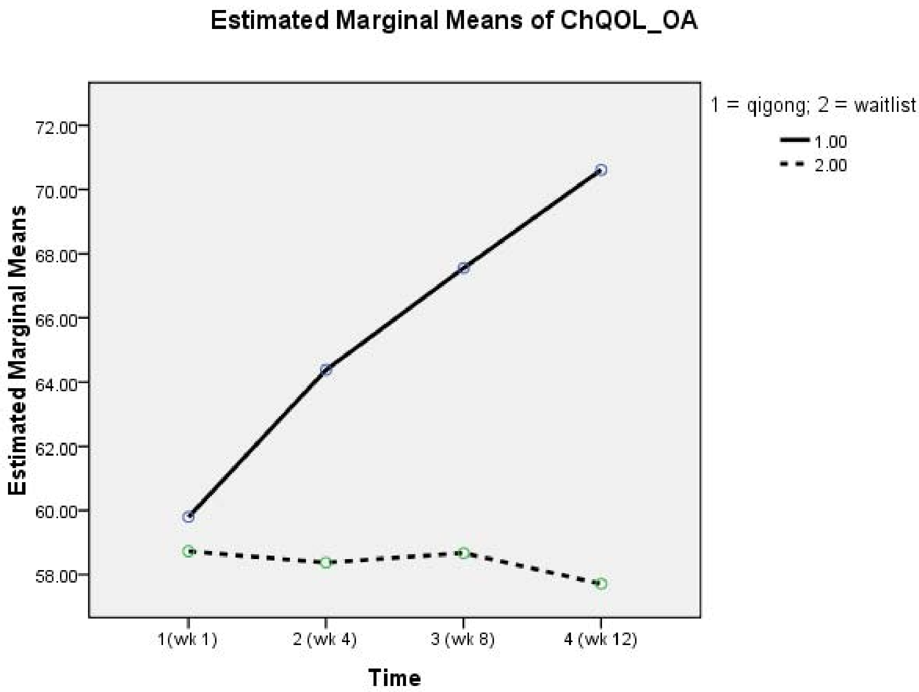

Figure 35: Changes in the ChQOL-OA score of the qigong group (n = 34) and the waitlist control group (n = 31) over four assessments.

3.4.5. Changes in Physiological Well-being (Cortisol, BP, and HR)

In order to investigate whether there was any group difference in the four dependent variables (DV) indicating physiological well-being: systolic blood pressure, diastolic blood pressure, heart rate, and salivary cortisol, GLM (Repeated Measures) were used to analyse the data. As mentioned earlier, the baseline values of salivary cortisol of the two groups were significantly different. Therefore, a univariate model was also employed in comparing the salivary cortisol levels of the two groups, so that covariates could be entered into the calculations. Thus, the differences between groups were estimated with the differences in pre-test scores of salivary cortisol being removed.

In week 8, significant group differences in cortisol level were indicated by the main effect ($p = 0.02$) and the Time x Group interaction effect ($p = 0.027$). The findings of a significant main effect in the 2 (groups) x 3 (times) x 2 (SysBP and DiaBP) calculation suggested that the qigong group had lower blood pressure than the waitlist control ($p = 0.036$). In week 12, significant main effects were found in blood pressure ($p = 0.015$) and cortisol level ($p \leq 0.001$), suggesting that the qigong group had lower blood pressure and cortisol level than the control group. The Time x Group interaction effects further indicated that, over the 12 weeks, the qigong group had a significantly lower heart rate ($p = 0.002$) and cortisol level ($p \leq 0.001$) than the control group.

Besides looking at mean differences between two groups, we further compared the changes of blood pressure between those subjects of each group with relatively high blood pressure. The commonly adopted desirable ranges of systolic blood pressure and diastolic blood pressure are 90 - 119 mm/Hg and 60 - 79 mm/Hg respectively (American Heart Association, 2011). Therefore, those subjects with systolic blood pressure higher than 119 mm/Hg or diastolic blood pressure higher than 79 mm/Hg were regarded as borderline high blood pressure subgroups. Further comparisons were conducted between high blood pressure qigong subgroup and high blood pressure waitlist subgroup so as to investigate whether qigong has a positive regulatory effect (i.e. resume to normal range) on blood pressure.

3.4.5.1. Salivary Cortisol

Salivary cortisol level of the qigong group at baseline was significantly higher than that of the waitlist group ($p = 0.007$). The value of the qigong group decreased to 3200.47 pg/ml ($SD = 868.07$) in the 4th week and then dropped substantially to 2656.01 pg/ml ($SD = 898.28$) in the 8th week. The decreased path was a significant one ($F = 22.4000$, $p \leq 0.001$). In the waitlist group, the cortisol level gradually climbed up to 2739.34 pg/ml ($SD = 1323.52$) in the middle stage; but showed a bit of decline in week 8 ($M = 2636.05$ pg/ml, $SD = 1163.26$); nonetheless, such changes were not significant. Such distinctive group differences yielded a significant main effect ($F = 5.733$, $p = 0.02$) and a Time x Group interaction effect ($F = 5.108$, $p = 0.027$).

In the follow-up week, the cortisol level of the qigong group further decreased to 2088.81 pg/ml ($SD = 879.90$) at a significant level ($F = 33.461$, $p \leq 0.001$). No significant difference was found in the waitlist control group. The main effect was significant ($F = 15.908$, $p \leq 0.001$, $\eta^2 = 0.204$). The results of the Time x Group interaction effect indicated that the qigong subjects showed a significant lower cortisol level than the waiting subjects ($F = 11.047$, $p \leq 0.001$, $\eta^2 = 0.151$). The effect sizes increased from medium effect in week 8 to large effect in week 12.

Pairwise comparisons of post hoc tests revealed that when compared with the cortisol level in week 4, the qigong group had significant decreases in week 8 ($p \leq 0.001$) and week 12 ($p \leq 0.001$). The difference between week 8 and week 12 was also significant ($p \leq 0.001$). No significant pairwise comparison was found in the control group (see Figure 36).

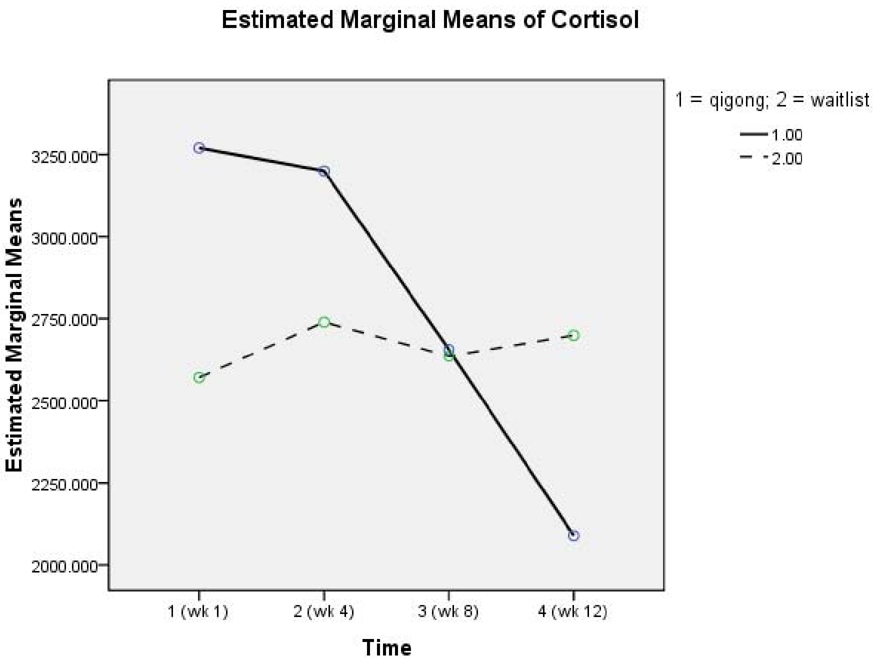

Figure 36: Changes in salivary cortisol of the qigong group (n = 34) and the waitlist control group (n = 31) over four assessments (Time 1 to 4).

Note. Pre-test (Time 1) values of two groups were treated as covariate .

3.4.5.2. Blood Pressure (BP)

Regarding another physiological variable, significant main effects were found. In week 8, a single 2 (groups) x 3(times) x 2 (sys and dia BP) calculation indicated that the blood pressure of the qigong group was significantly lower than that of the waitlist group ($F = 4.587$, $p = 0.036$, $\eta^2 = 0.068$). The results of a 2 (groups) x 4 (times) x 2 (sys and dia BP) analysis also indicated a significant difference in the follow-up session ($F = 6.212$, $p = 0.015$, $\eta^2 = 0.09$).

Systolic Blood Pressure (SysBP)

The systolic blood pressure scores of the qigong group were not significantly different from that of the control group at baseline. The qigong subjects showed a slight decline from 106.54 mm/Hg (*SD* = 11.42) in the middle stage to 105.28 mm/Hg (*SD* = 9.84) in the last session of qigong class. For the control group, the systolic blood pressure was rather steady throughout the first 8 weeks of waiting as indicated by mean values of 111.39 mm/Hg (*SD* = 11.51) and 111.08 mm/Hg (*SD* =10.39) in the 4th and 8th week respectively. The between group analysis indicated a significant main effect ($F = 4.080$, $p = 0.048$) at the 3rd checkpoint and the effect size was at a moderate level ($\eta^2 = 0.061$).

In week 12, the qigong group provided a further lower mean (*M* = 101.75, *SD* = 10.21 mm/Hg) and the control group showed little variation (*M* = 111.00 *SD* =11.35 mm/Hg). The main effect resulted at the 4th checkpoint achieved a significant level with $F = 6.593$ ($p = 0.013$). The effect size was a medium one as indicated by the eta squared value (η^2 = 0.095). The interaction effects were not significant in either week 8 or week 12.

In the qigong group, a significant change was found in comparison between Time 1 and Time 4 (p = 0.011), but not in other pairs of post hoc comparisons (see Figure 37).

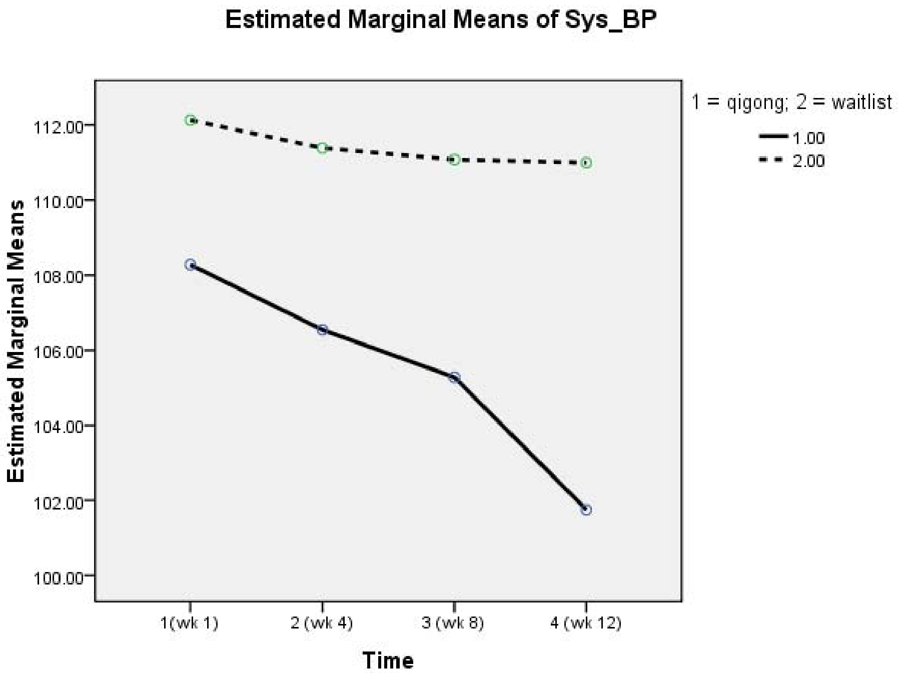

Figure 37: Changes in systolic blood pressure level of the qigong group (n = 34) and the waitlist control group (n = 31) over four assessments.

Comparisons between two subgroups with relatively high systolic blood pressure

There were eight qigong subjects and eight waitlist subjects with pre-test values of systolic blood pressure at relatively high levels (i.e. above 119 mm/Hg). The baseline SysBP values of these two subgroups were not significantly different. The SysBP level of qigong subgroup subjects dropped from 123.69 mm/Hg (*SD* = 6.49 mm/Hg) at the beginning to 114.12 mm/Hg (*SD* = 10.35 mm/Hg) in week 8 and further reached 109.62 mm/Hg (*SD* = 15.13 mm/Hg) in week 12. The systolic blood pressure level of this qigong subgroup fell within the healthy range. For the waitlist subgroup, the mean SysBP started at 125.31 mm/Hg (*SD* = 6.92 mm/Hg) and dropped to 120.06 mm/Hg (*SD* = 14.54 mm/Hg) in week 8 and finally reached 120.19 mm/Hg (*SD* = 15.08 mm/Hg) in week 12 which was at borderline high normal level. Although the between group difference was not significant, the percentage of decrease in systolic blood pressure of the qigong subgroup (11.38%) is larger than that of the waitlist subgroup (4.09%). The trend was more encouraging for the qigong subjects (see Figure 38).

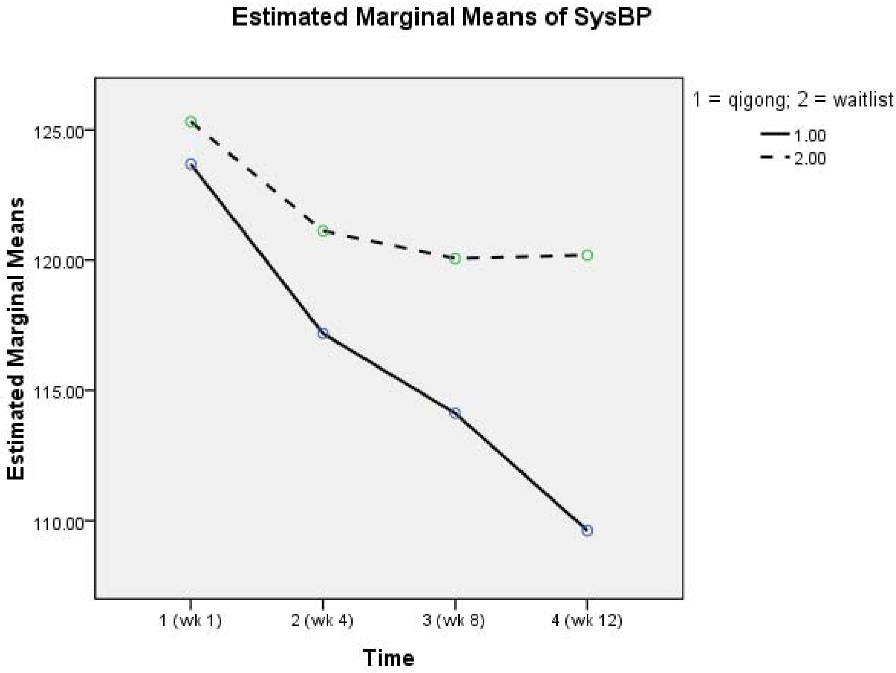

Figure 38: Changes in systolic blood pressure level of the high SysBP qigong subgroup (n = 11) and the high SysBP waitlist subgroup (n = 11) over four assessments.

Diastolic Blood Pressure (DiaBP)

The results of the *t*-test indicate that the diastolic blood pressure of the qigong group was not significantly different from that of the waitlist control group at baseline. The diastolic blood pressure of the qigong group significantly declined to 69.69 mm/Hg (*SD* = 8.62) in the 4^{th} week and further decreased to 70.79 mm/Hg (*SD* = 7.86) in the 8^{th} week, which yielded a significant within group variation ($F = 4.389$, $p = 0.027$). The waitlist control group also demonstrated a significant decrease and reached 73.81 (*SD* = 5.75 mm/Hg) in week 8 (F = 4.659, $p = 0.017$). The result of the between group difference was substantial as indicated by a significant main effect ($F = 4.367$, $p = 0.041$) with the qigong group who had lower diastolic blood pressure than the waitlist control group in week 8.

For within group changes, the DiaBP of the qigong group further dropped considerably to 69.79 mm/Hg (*SD* = 7.97) in week 12 ($F = 3.509$, $p = 0.029$). The DiaBP of the control group also continued to decline in a significant manner ($F = 4.237$, $p = 0.01$). Between group analyses revealed a significant main effect ($F = 4.491$, $p = 0.038$) indicating that the diastolic blood pressure of the qigong subjects was substantially lower than that of the subjects in the waitlist group. The effect sizes were categorized as moderate as reflected by $\eta^2 = 0.065$ in the 8^{th} week and $\eta^2 = 0.067$ in the 12^{th} week. The interaction effects were not significant in week 8 or week 12.

No significant post hoc comparison was found in the qigong group except between week 1 and week 12 ($p = 0.013$) (see Figure 39).

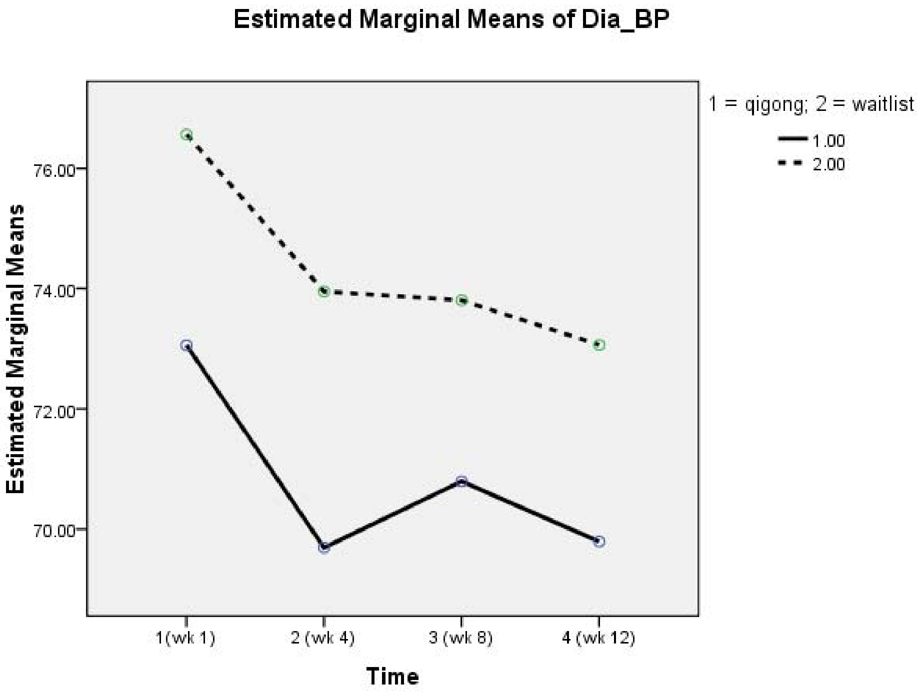

Figure 39: Changes in diastolic blood pressure level of the qigong group (n = 34) and the waitlist control group (n = 31) over four assessments.

Comparisons between two subgroups with relatively high diastolic blood pressure

There were eleven qigong subjects and eleven waitlist subjects with diastolic pressure at relatively high levels (i.e. above 79 mm/Hg). The baseline DiaBP values of these two subgroups were not significantly different. The DiaBP level of the qigong group dropped from 83.45 mm/Hg (*SD* = 3.00 mm/Hg) at the beginning to 76.00 mm/Hg (*SD* = 8.16 mm/Hg) in week 8 and further reached 75.00 mm/Hg (*SD* = 9.06 mm/Hg) in week 12. For the waitlist subjects, the mean values started at 84.36 mm/Hg (*SD* = 4.74 mm/Hg) and dropped to 78.18 mm/Hg (*SD* = 5.87 mm/Hg) in week 8 and finally reached 77.95 mm/Hg (*SD* = 6.05 mm/Hg) in week 12. Thus, the diastolic blood pressure of both subgroups resumed to normal range. Although the between group difference was not significant, the percentage of decrease in systolic blood pressure of qigong subgroup (10.13%) is larger than that of the waitlist subgroup (7.60%). The trend was more promising for the qigong subjects (see Figure 40).

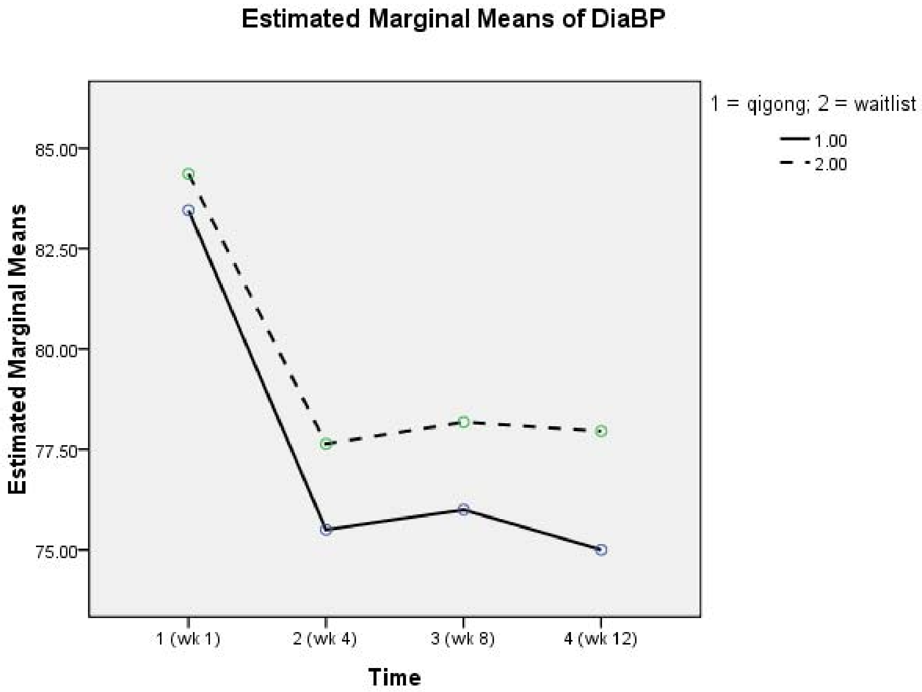

Figure 40: Changes in diastolic blood pressure level of the high DiaBP qigong subgroup (n = 11) and the high DiaBP waitlist subgroup (n = 11) over four assessments.

3.4.5.3. Heart Rate (HR)

The two baseline values were not found to be significantly different from each other. In the qigong group, significant changes ($F = 6.092$, $p = 0.006$) in pulse rate occurred over the first 8 weeks with the mean heart rate increasing to 71.96 beats/min ($SD = 7.12$) in week 4 and 71.67 bpm ($SD = 6.75$) in week 8. Although the pulse rate increased slightly to 68.27 ($SD = 10.38$) beats/min (4^{th} week) and 68.35 bpm ($SD = 7.92$) (8^{th} week), the change in the control group was not significant.

Whereas the heart rate of the qigong group significantly ($F = 4.886$, $p = 0.008$) dropped to 69.87 bpm ($SD = 5.94$) in the follow-up week, the heart rate of the control group rose significantly ($F= 5.637$, $p = 0.004$) to 72.13 bpm ($SD = 7.81$) beats/min. A significant Time x Group interaction effect was found in week 12 ($F = 5.566$, $p = 0.002$, $\eta^2 = 0.081$). The main effects were not significant at either the 3^{rd} or the 4^{th} checkpoints.

The results of post hoc tests indicated that when compared with the baseline values, the heart rates of the qigong group subjects were significantly higher in week 4 ($p = 0.035$) and week 8 ($p = 0.028$). The heart rate of the control group subjects had significant increases in week 12 when compared with week 1 ($p \leq 0.001$), week 4 ($p = 0.020$), and week 8 ($p = 0.01$) (see Figure 41).

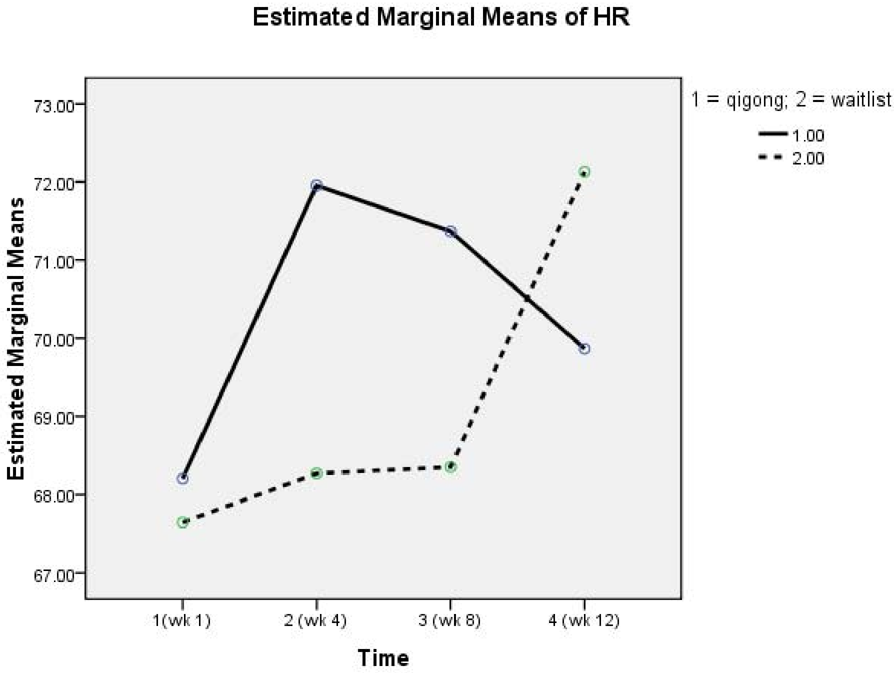

Figure 41: Changes in heart rate of the qigong group (n = 34) and the waitlist control group (n = 31) over four assessments.

3.4.6. Secondary Analysis – Within Qigong Group

In order to gain more details about the changes within the qigong group, further analyses were done based on four pairs of comparisons: a) between those who could feel *qi* and those who could not, b) between those who practice more and those who practiced less, c) between men and women, and d) between older subjects and younger subjects. The significant results are shown in Table 20.

Table 20: Results of Secondary Analysis within the Qigong Group (n = 34).

Outcome measures	*Qi*-subjects (n = 10) vs. non-*qi* subjects (n = 9)						More practice (n =17) vs. less practice (n = 17)						Females (n = 22) vs. males (n = 12)					
	Time 1 to Time 3			Time 1 to Time 4			Time 1 to Time 3			Time 1 to Time 4			Time 1 to Time 3			Time 1 to Time 4		
	F	*p**	η^2	*F*	*p**	η^2	*F*	*p**	η^2	*F*	*p**	η^2	*F*	*p**	η^2	*F*	*p**	η^2
DASS-S	7.330	0.016	0.314	13.742	0.002	0.462	-	-	-	-	-	-	-	-	-	-	-	-
HR	5.597	0.031	0.259	5.364	0.034	0.251	5.197	0.029	0.14	6.280	0.017	0.164	-	-	-	-	-	-
Sys BP	-	-	-	-	-	-	-	-	-	-	-	-	6.039	0.02	0.163	4.181	0.049	0.119
Dia BP	-	-	-	-	-	-	-	-	-	-	-	-	5.717	0.023	0.152	5.031	0.032	0.136

* $p \leq 0.05$

3.4.6.1. Did Participants Who *De Qi* (Could Feel the *Qi*) Benefit More Than Those Who Could not Feel the *Qi*?

De qi (得氣, reach the *qi* energetically) is regarded as mastery of the essence of qigong on a deeper level. Cohen (1997) suggested that *de qi* is important in healing and treatment. When one has *de qi*, one will sense a vibration, warmth, or energy. Therefore, in the questionnaires, we asked the qigong participants whether they could feel the existence of *qi* during practice. They were asked to rate on a 5-point scale representing from "no feeling" to "very obvious." We also asked them to identify which part of the body they could feel the *qi* (palms, *dantian*, etc.) and what kind of feeling it looked like (e.g., lightness, numbness, etc.). There were 14 subjects (5 men, 9 women) who felt that they could feel the existence of *qi.* Ten (5 men, 5 women) among them could clearly identify the parts of the body where the *qi* feeling was more obvious. There were nine subjects (4 male, 5 female) who did not have much feeling or felt nothing about *qi*. The remaining 11 subjects were not quite sure about whether they could feel the *qi* and were rather confused with the area and feelings. Therefore, we only compared the 10 subjects (labelled "*qi*-subjects") who provided relatively clear answers about *qi*-feelings and nine subjects (labelled "non-*qi* subjects") who stated they could not feel the *qi*. The two groups did not differ much on age, home practice time and other variables, except the initial values of DASS-S (t = 2.31, p = 0.033) and HR (t = -2.66, p = 0.016). Therefore, the baseline scores of stress level and heart rate were entered as covariates when the between-group comparisons were conducted.

In week 8, the stress level of the 10 *qi*-subjects dropped to 10.00 (*SD* = 3.39) while the nine non-*qi* subjects also had reduced stressfulness (*M* = 13.11, *SD* = 3.99). The significant main effect suggested that such a group difference was substantial (F= 7.330, p = 0.016, η^2 = 0.314). It was further found that the *qi*-subjects experienced significant (F = 13.742, p = 0.002) lower stress levels (*M* = 7.6, *SD* = 3.1) when compared to the nine non-*qi* subjects (*M* =12.67, *SD* = 5.1) in week 12. The effect size was large as indicated by η^2 = 0.462. No significant interaction effect was found here (see Figure 42).

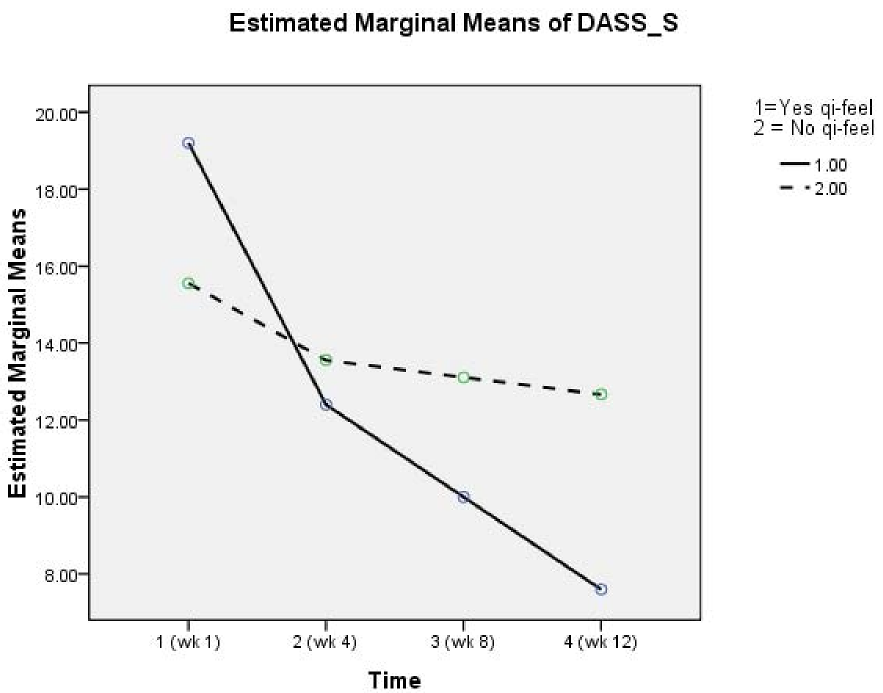

Figure 42: Changes in the DASS-S score of *qi*-subjects (n = 10) and non-*qi*-subjects (n = 9) over four assessments.

Note. Pre-test (Time 1) values of the two groups were treated as covariate.

In week 8, the mean heart rate of *qi*-subjects decreased to 66.70 beats/min ($SD = 6.87$), but the average heart rate of non-*qi* subjects increased to 75.61 bpm ($SD = 5.72$). Such a group difference was significant as reflected by the findings of main effect ($F = 5.597$, $p = 0.031$, $\eta^2 = 0.259$). In the follow-up assessment, the *qi*-subjects also demonstrate a significantly ($F = 5.364$, $p = 0.034$) slower heart rate ($M = 66.85$ bpm, $SD = 2.31$) than the non-*qi* subjects ($M = 71.61$ bpm, $SD = 5.41$), and with large effect size ($\eta^2 = 0.251$). The time x group interaction effect was not significant here (see Figure 43).

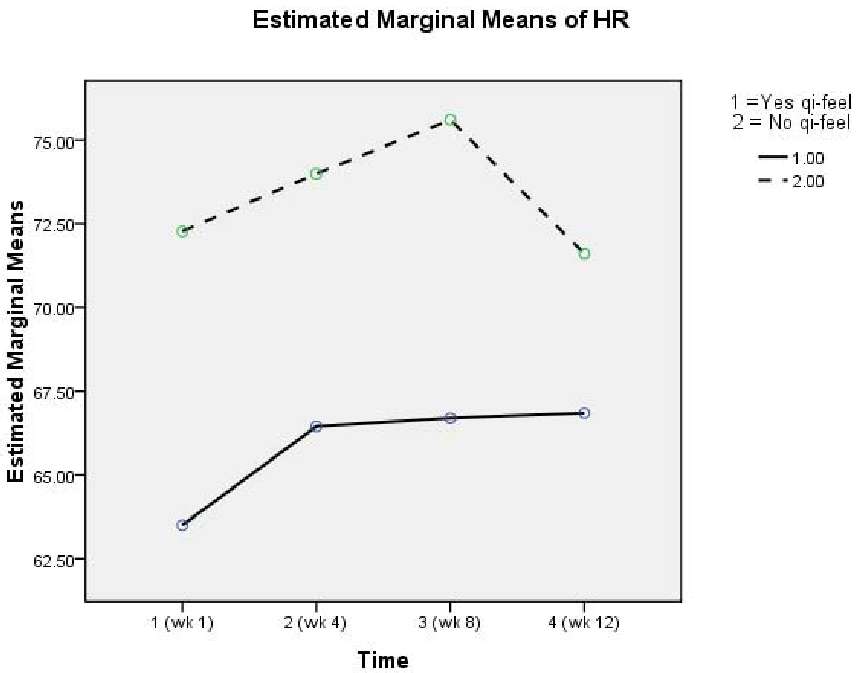

Figure 43: Changes in heart rate of *qi*-subjects (n = 10) and non-*qi*-subjects (n = 9) over four assessments.

Note. Pre-test (Time 1) values of the two groups were treated as covariate.

3.4.6.2. Did Participants Who Practice More Perform Better Than Those Who Practice Less?

We provided each qigong participant with a logbook to record minutes of home practice per day. In order to see whether those who practice more at home benefit more from qigong than those less hard-working, we divided the qigong group into two subgroups for comparisons. The mean practice time of qigong group was 30.10 mins/day (*SD* =14.99). However, we used the median time (25.63 mins/day) as the threshold so that we could split the whole group into equal halves, i.e., the “more practice” group (9 male; 8 female) and the “less practice” group (3 male; 14 female). The results of the *t*-test indicated that these two groups differed only significantly in baseline values of ChQOL-P (t = -2.27, p = 0.032), but not in age and other variables.

The heart rate of the “more practice” group increased from 66.18 beats/min (*SD* = 6.40) in week 1 to 69.68 bpm (*SD* = 6.08) in week 8. Similarly, the heart rate of the “less practice” group also rose from 70.24 bpm (*SD* = 7.83) in week 1 to 73.06 bpm (*SD* = 7.15) in week 8. The findings of main effect indicated that the “more practice” group experienced significantly lower heart rate than the less practice group (F = 5.197, p = 0.029, η^2 = 0.14). In follow-up measurement, heart rate of the “more practice” group dropped to 67.41 bpm (*SD* = 3.70) when the heart rate of the “less practice” group decreased to 72.32 bpm (*SD* = 6.81). The significant main effect showed that the “more practice” group experienced significantly slower heart rate than the “less practice” group with large effect size (F =

6.280, $p = 0.017$, $\eta^2 = 0.164$) throughout the 12 weeks. Other comparisons between these two groups were not significant (see Figure 44).

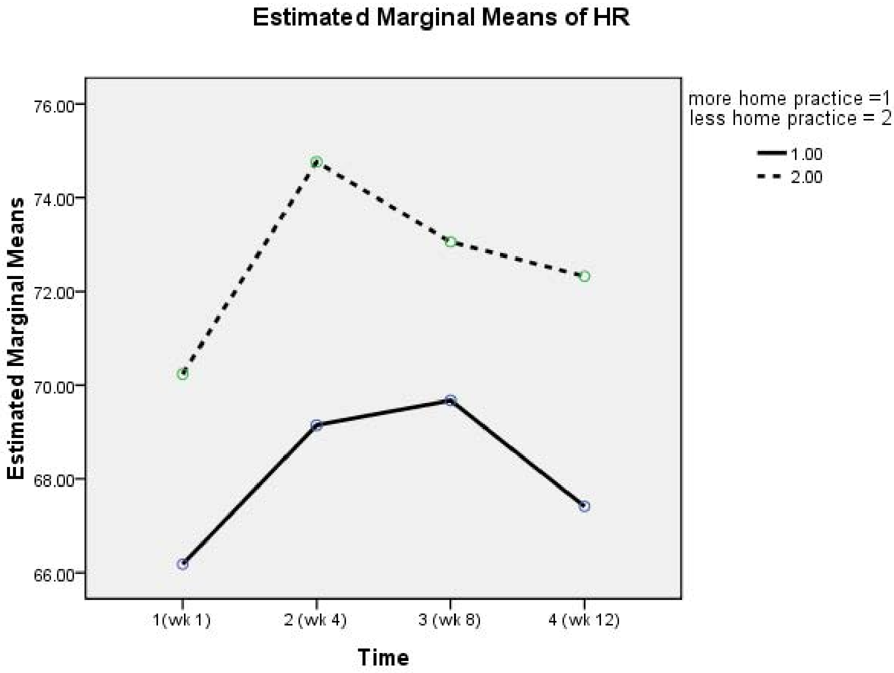

Figure 44: Changes in heart rate of more practice group (n = 17) and less practice group (n = 17) over four assessments.

3.4.6.3. Did Male Qigong Subjects Perform Better Than Female Subjects or Vice Versa?

Twenty-two women and twelve men differed significantly on home practice time (t = -2.72, p = 0.011), pre-test scores of ChQOL-S (t = -2.26, p = 0.031), cortisol level (t = -2.54, p = 0.02), and systolic blood pressure (t = 2.00, p = 0.045), but not in other variables.

The initial diastolic blood pressure of the women was 71.00 mm/Hg (SD = 7.77) and the mean of the men was 76.8 mm/Hg (SD =10.23). In week 8, the diastolic blood pressure of the men dropped to 74.95 mm/Hg (SD = 9.47), which was higher than that 68.52 mm/Hg (SD = 5.91) of the women and yielded a significant main effect (F = 5.717, p = 0.023, η^2 =0.152). In week 12, the diastolic blood pressure of the women further dropped to 68.45 mm/Hg (SD = 6.28), which was lower than that of the men (M = 72.25 mm/Hg, SD = 10.25). The results of main effect showed that group difference at the 4th checkpoint was significant as well (F = 5.031, p = 0.032, η^2 = 0.136), which suggested that the women experienced ongoing lower diastolic blood pressure than the men. Other comparisons were not significant here (see Figure 45).

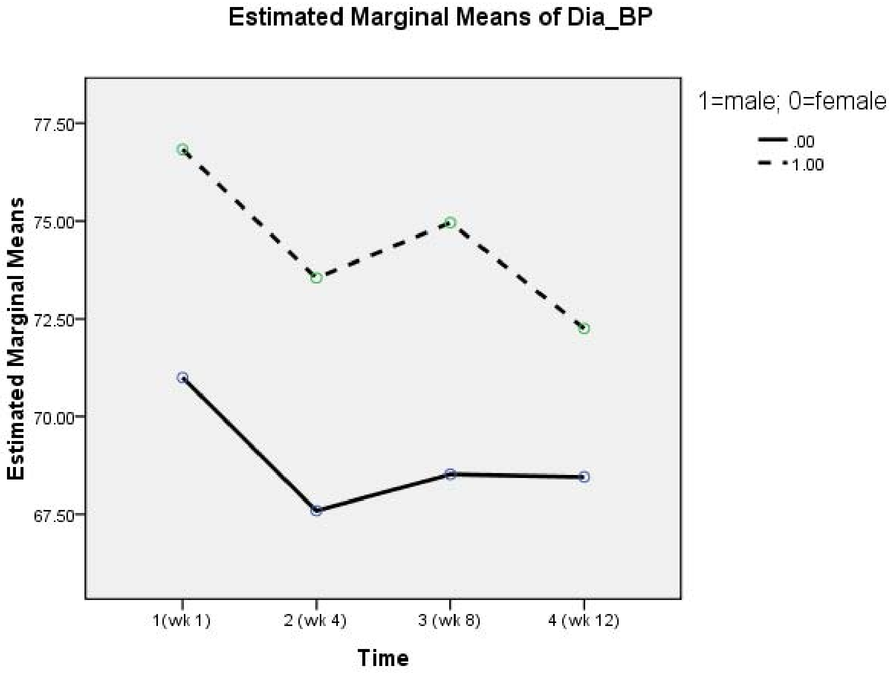

Figure 45: Changes in diastolic blood pressure of men (n = 12) and women (n = 22) over four assessments.

The baseline systolic BP scores of men (*M* = 113.38 mm/Hg, *SD* = 12.28) and women (*M* = 105.50 mm/Hg, *SD* = 9.47) were covariated when calculating the group differences over time. In post measurement, the systolic blood pressure of men increased to 111.58 (*SD* = 9.73 mm/Hg), while the level of women decreased to 101.84 (*SD* = 8.21 mm/Hg). Such a group difference was significant ($F = 6.039$, $p = 0.02$) with large effect size ($\eta^2 = 0.163$). In the follow-up assessment, the blood pressure level of men (*M* = 104.88 mm/Hg, *SD* = 14.46) was higher than that of women (*M* = 100.05 mm/Hg, *SD* = 6.76). The significant group difference ($F = 4.181$, $p = 0.049$, $\eta^2 = 0.119$) indicated that women generally experienced lower systolic blood pressure than the men did throughout the 12 weeks of our study. Interaction effect and other comparisons were not significant (see Figure 46).

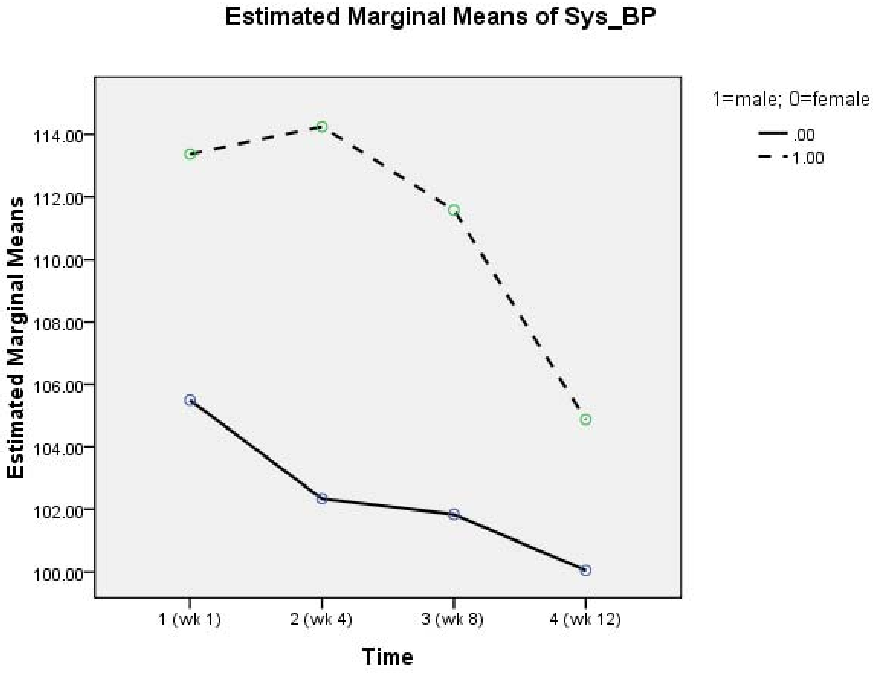

Figure 46: Changes in systolic blood pressure of men (n = 12) and women (n = 22) over four assessments.

Note. Pre-test (Time 1) values of two groups were treated as covariate.

3.4.6.4. Did Older Qigong Participants Perform Better Than Younger Participants or Vice Versa?

We divided the qigong subjects into two equal halves by employing the median age (44.5 yrs) as a cut-off point instead of the mean age 43.79 yrs (*SD* = 10.37). The older group consisted of eight men and nine women and the younger group had four men and 13 women. These two groups only significantly differed in baseline values of systolic blood pressure ($t = 2.304$, $p = 0.028$), but not in home practice time and other variables. Regarding the Repeated Measures analysis, no significant group difference was found in any of the psychological and physiological variables.

3.4.7. Qualitative Analysis

3.4.7.1. Psychological and Physical Changes Experienced by the Participants

Similar to what we had done in the pilot study phase, we also invited the participants to evaluate their personal experience on both physical and psychological functioning. The qigong subjects further elaborated their improvements in the open-ended questions. All 34 qigong participants completed and returned the questionnaires. For psychological states, a high percentage of them (97.06%) agreed that they experienced emotional relief, decreased stress (91.17%), and relaxed mood states (91.18%). The feelings of anxiety and depression decreased in 28 participants (82.35%) and 27 participants (79.41%) respectively. A majority of them (85.29%) were more able to concentrate. A large portion of them (82.35%) felt younger after the qigong program. In general, similar to the participants in the pilot study, most of them felt that they were more relaxed, positive, happy, energetic, and attentive than the days before they had qigong training. This is illustrated by what one subject said, "I have more energy, I found myself happier and more positive than before."

For physical conditions, nearly all participants reported improved flexibility in muscles and joints (97.06%); and many reported that they could relax their bodies more easily (94.11%). One participant explained it thus, "My blood circulation has improved, my hands and legs feel much warmer, joints and muscles become more flexible." Thirty subjects (88.23%) reported that they felt more energetic and less likely to become tired. Most of them found that they had become more physically fit and healthy. Improved *qi* (氣; energy) and *xi* (息; vitality) was a common comment given by them. A majority of them (82.35%) experienced a better quality of sleep and said that there was some relief in their own specific physical problems (such as constipation, back pain, and edema). One subject said, "I easily got sore throat and flu in the past. Now, the frequency of sore throat becomes less. My *qi* and *xi* improved a lot. I find myself easier to concentrate than before and can enjoy good quality sleep now. In particular, right after qigong practice, my spirit becomes so good and I feel more positive towards life. Thank you." From the social perspective, about two-thirds of them (64.71%) reported that the small group practice was helpful in improving their social life, through increased sociability and having more interaction with other participants (see Table 21).

Table 21: Summary Statistics on Psychological and Physical Benefits Perceived by the Qigong Group (n = 34).

After 8 weeks of training, how do you feel about your physical and psychological states?

Evaluation Criteria	Strongly agree n (%)	Agree n (%)	Dis-agree n (%)	Strongly disagree n (%)	No opinion n (%)	Mean (SD)
情緒得到舒緩 Emotional relief	11 (32.35)	22 (64.71)	-	-	1 (2.94)	4.29 (0.52)
專注力得到提高 More attentive	11 (32.35)	18 (52.94)	3 (8.82)	-	2 (5.88)	4.09 (0.87)
生活壓力得到舒緩 Released Stress	12 (35.29)	19 (55.88)	-	-	3 (8.82)	4.26 (0.62)
焦慮感減少 Decreased anxiety	7 (20.59)	21 (61.76)	-	-	6 (17.65)	4.03 (0.63)
抑鬱的心境得到緩解 Reduced depressiveness	9 (26.47)	18 (52.94)	1 (2.94)	-	6 (17.65)	4.03 (0.76)
肌肉和關節都能放鬆 Improved relaxation in joints and muscle	22 (64.71)	11 (32.35)	-	-	1 (2.94)	4.62 (0.55)
肌肉和關節較以往靈活 Improved flexibility in joints and muscle	21 (61.76)	11 (32.35)	-	-	2 (5.88)	4.56 (0.61)
精神和心境都能放鬆 Relaxed mood states	13 (38.24)	18 (52.94)	1 (2.94)	-	2 (5.88)	4.26 (0.71)
感覺充滿活力、不易疲倦 Feelings of being energetic and less tired	10 (29.41)	20 (58.82)	1 (2.94)	-	3 (8.82)	4.15 (0.70)
感覺輕鬆、年輕了 Feel younger	10 (29.41)	18 (52.94)	1 (2.94)	-	5 (14.71)	4.09 (0.75)
小組練習有助擴闊社交生活 Small group practice helps sociability	7 (20.59)	15 (44.12)	1 (2.94)	-	11 (32.35)	3.82 (0.80)
睡眠質素得到改善 (e.g., 較易入睡、一覺瞓天光) Improved quality of sleep (e.g., fall asleep easily)	11 (32.35)	17 (50.00)	1 (2.94)	-	5 (14.71)	4.12 (0.77)

* *Note*. Judgement was made on 5-point scales (1 = Strongly disagree; 2 = Disagree; 3 = No opinion; 4 = Agree, and 5 = Strongly agree)

3.4.7.2. Difficulties Encountered

The subjects also provided answers to the questions about the difficulties they had encountered during qigong practice. Half of the participants found that it was not easy to find more than half an hour a day to do home practice, especially during weekdays for the working class. However, most of them still managed to practice 30 minutes (M = 30.10, SD = 14.99) per day, which exceeded our minimum requirement of 20 minutes per day. In fact, they practiced longer on weekends. The second common problem was that the noisy home environment and other distractions made it difficult to concentrate when doing home practice. As one woman stated, “I am sometimes interrupted by my kids, telephone, domestic helper, etc.” Nearly all of the subjects were interested in the qigong exercises. A majority of the qigong group was able to manage the techniques while less than one-third of them sometimes found the postures not so easy to do. One participant commented, “I do not have much problem in acquiring the techniques, but sometimes I forget the steps and techniques.” They regarded their motivation to practice together during regular class sessions to be better than at home; as one participant said, “When nobody supervises me at home, I easily become lazy” (see Table 22).

Table 22: Summary of Feedback Given by Qigong Group Regarding the Difficulties They Encountered during Practice.

在練習期間曾否遇以下困難?
Did you encounter any of the following difficulties during practice?

	沒有發生 Never n (%)	間中發生 Occasional n (%)	常常發生 Always n (%)	Mean (SD)
沒有時間在家中練習 Not enough time to do home practice	5 (14.71)	12 (35.29)	17 (50)	1.65 (0.73)
難於掌握技巧 Difficult to manage the techniques	23 (67.65)	10 (29.41)	1 (2.94)	2.65 (0.54)
家中環境嘈雜、不易集中 Home environment is too noisy to concentrate	11 (32.35)	9 (26.47)	14 (41.18)	1.91 (0.87)
對整套運動沒有興趣 Not interested in the qigong protocol	32 (94.12)	2 (5.88)	-	2.94 (0.24)

* *Note*. Judgement was made on a 3-point scale (1 = Always; 2 = Occasional, and 3 = Never)

3.4.7.3. The Subjective Experience of *Qi*

Fourteen qigong subjects (5 male, 9 female) regarded themselves as being able to feel the *qi* during practice, while 10 (5 male, 5 female) of them could clearly identify in which body parts the *qi* feelings manifested. The most commonly reported bodily feelings included warmth, heat, numbness, swelling, and *qi*-flow inside the body. The feelings were more obvious in the *dantian*, abdomen, centre of palms, face and some said the whole body. The mental sentiments reported by the subjects included inner peacefulness, inner happiness, and feeling of *xing fu* (幸福; felicity) (see Table 23).

Table 23: The Subjective Experience of Qi Given by Qigong Group (n = 14).

	No. of subjects	Percentage (%)
Physical Feelings		
熱 Warm heat	11	78.57
漲 Swelling	9	64.29
氣體遊動感 *qi* flow	6	42.86
痲 Numbness	5	35.71
輕 Lightness	4	28.57
蟻行感 Ants crawl	4	28.57
電流通過感 Electrical flow	3	21.43
涼 Cool	2	14.29
重 Heaviness	1	7.14
癢 Itchy	1	7.14
緊縮感 Tightness	1	7.14
Psychological Feelings		
心情恬靜 Inner peacefulness	8	57.14
內在喜悅 Inner happiness	5	35.71
幸福感 Felicity	4	28.57
天人合一 Unity of man and heaven	3	21.43
時間、空間感消失 Lose sense of time and space	3	21.43
虛空 Emptiness and tranquillity	2	14.29

3.4.7.3. Summary of Two Individual Interviews

Subject #1

Ivy (fake name) is a middle-aged homemaker. She has suffered from adhesive shoulder capsulitis (also named frozen shoulder) for about 6 months. When lying on the bed, she found it so difficult to move and turn her body to the other side, she was unable to sleep all through the night, and thus her vitality was deeply affected. Her arms could not rise higher than 45º, which greatly limited the mobility and function of her arms. She said, “During the most serious moments, I cannot even take off and pull up my pants. It is so painful.” She had consulted the medical doctor and was given drugs for reducing pain. When she took the drugs, the pain reduced. However, the sharp pain reappeared once she stopped taking the drugs. She discontinued the medication 2 weeks after receiving the prescription. She had received physiotherapy, which helped to lessen the pain. Nevertheless, she also ceased the treatment after 4 weeks. The pain continued and she could not do much of her housework, which included, but was not limited to preparing dinner, packing things, and escorting her 3-year old son. Her mood state and quality of life were negatively affected. It drove her to seek alternative therapy to reduce her pain and it brought her to our qigong study.

During the first three sessions of the qigong program, her arms hurt when doing the exercise. However, when the lesson was finished, the pain disappeared. The flexibility and mobility of her arms also increased immediately after the lessons. “These are the reasons that motivate me to continue practicing the protocol though my arms hurt when doing the poses," she claimed. Nevertheless, the painfulness was still there when she woke up the next morning. It was not until the fourth qigong session when she felt less pain in the mornings and all throughout the days. She said, "Since then (the 4th lesson), I can do daily household work and do not feel much pain. I can raise my arms over my head and have not been able to do this for nearly half a year." The positive outcomes encouraged her to keep doing the home practice. "Even if I practice for as little as about 15 minutes a day, the condition of my arms can be maintained at a satisfactory level. I feel so good and have better *qi xi* (氣息; energy and vitality) and I have been eager for this for a long time!" Ivy stated with a smiling face. She also agreed that her mood was more relaxed after practicing qigong for a couple of weeks. Regarding the feelings during exercising, she said, "I can sense there is warm heat in the abdomen area and sometimes on both palms. The heat can be very intense. I can also feel some electric-like sensation on the skin of my arms; it sometimes mixes with a feeling of ants crawling."

Subjects # 2

Alvin (fake name), male, is a young university student. He easily got frustrated by his homework. He said, "I always feel stressful and anxious. When things do not happen according to my expectation, I find myself very depressed." He had poor sleep and lost his appetite for several months. He looked pale and skinny. He had difficulty concentrating on his work and was unable to submit his assignments on time. He got sick (e.g., cold) easily, which highly affected his cognitive ability, emotional state and physical well-being. His social life was also affected, as he did not have the energy and desire to go out with peers. “During the worst days, I still feel bad and tired even when I wake up late in the morning. Then, I lock myself in my room, not eating meals and I refuse all phone calls.” His poor health condition aroused the worries of his parents, who advised him to seek counselling from the university counselling service. The counsellor suggested he do some relaxation exercise as well as stress management techniques. However, he stopped following the counsellors advice because he found the techniques were not working well. He saw our poster about the qigong program in the campus, which lead him to our study.

“I found it difficult to concentrate when doing the part of dantian breathing of the qigong protocol. My mind was filled with trivial thoughts and thus I could not calm down and relax. I had thought of giving up the class,” Alvin said. “However, I fell asleep earlier on the days I had qigong lesson. I slept well too,” he continued. Therefore, every night before bed, he practiced the postures and spine movements for about 20 minutes. In the middle of the training course, his appetite improved and his vitality strengthened, thus allowing him to focus on his schoolwork. He claimed, “Everytime, after practicing the qigong exercises, I feel less stressful and anxious, I gain a better mood. My mom is happy to see me eating more and in relatively good condition.” Regarding the *qi*-feelings, Alvin stated clearly that he could feel a ball of warm heat originating from his *dantian*, and sometimes flowing inside his body. There was also a sense of numbness and lightness, especially in his limbs. The feelings were comfortable and accompanied with inner peacefulness and happiness.

3.4.8 Summary of Phase IIa Results

For the physiological measures, after 8 weeks of qigong intervention, the results of between-group comparisons indicated that the qigong group had a significantly lower cortisol level, as well as systolic and diastolic blood pressure than the waitlist control group. With increased significant levels and effect sizes, the significant group differences in these three outcome measures were also found in week 12.

For the psychological outcome measures, in week 8, the stress and depressive levels of the qigong subjects were significantly lower than that of the subjects on the waiting list. As indicated by the significant group differences in all four subscales of ChQOL, the qigong subjects also enjoyed a better quality of life than the waiting subjects did. In week 12, the significant between-group differences further indicated that the psychological improvements of the qigong group continued after the 8 weeks of face-to face qigong lessons. The effect sizes ranged from moderate to a large level.

The results of post hoc tests indicated that significant improvements of qigong group subjects mainly started in Time 2 (week 4). Nevertheless, a decrease in stress level (DASS-S), as well as improvements in ChQOL-P and ChQOL-OA happened earlier—between week 1 and week 4. Improvements in *qi xi* (氣息; energy and vitality), moods, and muscles and joints flexibility were commonly reported by the qigong subjects in the questionnaires. The results of secondary analysis showed that with the *qi*-subjects, more home practice subjects, and the female subjects appeared to benefit more from qigong training than their counter parts in terms of reduced stress level, heart rate, and blood pressure.

3.5. Phase IIb: Comparison between Qigong Group and Psychology Group

3.5.1. Aims and Hypothesis

This comparison aimed to monitor the potential placebo effects due to the attention given by the instructor to the subjects. For qigong group subjects, the intensity of face-to-face interaction with the researcher (i.e., the qigong instructor) was higher than it was with the subjects in the waitlist control group. Since we had qigong training every week, the qigong group met the researcher weekly. However, the waitlist control group only came back to campus on four data collection sessions (i.e., pre, mid, post and follow-up), thus, not weekly. Therefore, we included a psychology class as the second control group for comparisons. This group of participants joined a psychology class, which was an interest class for adults, organized by a community organization in Hong Kong. The advertisement of this psychology class was published in the newspaper together with other adult classes. Interested individuals could enrol in this psychology class via online procedures or in-person. We approached the chairperson of the centre and gained the consent from him to enrol participants of this class to be our subjects.

Ideally, we could randomly allocate the subjects into the qigong group and this second control group. However, due to the policy of the community organization, we could do neither randomization nor matching. Nevertheless, we still managed to arrange both the psychology class and the qigong class to be conducted by the same person (the researcher). The psychology class met the instructor once a week; each session lasted for two hours for eight lessons. Total contact hours and intensity were similar to that of the qigong class. The inclusion criteria of subjects were the same as those used in Phase IIa. We hypothesized that:

<u>Within-group Difference (change over time)</u>

1) After joining the 8-week qigong class, the participants would have significant improvement in **psychological** well-being outcomes (i.e., lower DASS-21 and higher ChQOL) when compared with the baseline.
2) After joining the 8-week qigong class, the participants would have significant improvement in **physiological** well-being outcomes (i.e., lower BP, HR, and cortisol level) when compared with the baseline.

<u>Between-group Difference (Treatment Effect)</u>

3) After joining the 8-week qigong class, the **psychological** well-being (i.e., lower DASS-21 and higher ChQOL) of participants in the intervention group (i.e., the qigong group) would be significantly different from that of the subjects in the control group (i.e., psychology group).
4) After joining the 8-week qigong class, the **physiological** well-being of participants (i.e., lower BP, HR, and cortisol level) in the intervention group (i.e., the qigong group) would be significantly different from that of the subjects in the control group (i.e., psychology group).

3.5.2. Statistical Analysis

Like Phase IIa, GLM (Repeated Measures) were also used in Phase IIb. There were significant group differences in age, basal values of DASS-A, ChQOL-P, etc., between the psychology and qigong groups. When investigating group effects between these two groups, for instance, in the case of DASS, instead of a single 2 (qigong and psychology groups) x 4 (times) x 3 (DASS-S, -A, and -D) calculation, multiple univariate analysis of each dependent variable was used here.

Besides age differences, at the beginning, the two groups also differed significantly in heart rate. Therefore, we needed to use the baseline values as covariate when computing the group differences. Moreover, only 14 participants participated in the follow-up cortisol assessment while the qigong group had 34 participants. Therefore, for physiological well-being, multiple univariate analysis of each physiological dependent variable was more appropriate than a 2 (qigong and psychology groups) x 4 (times) x 4 (cortisol, SysBP, DiaBP, and HR) calculation. The effect size, similar to the method used in Phase IIa, was also interpreted by employing the generally accepted guidelines given by Cohen (1988).

3.6. Results of Main Study Phase IIb

3.6.1. Subjects

Initially, 48 participants (42 women and 6 men) of the psychology class showed interest in our study. However, six could not finish the class due to work commitments and eight did not meet the inclusion criteria. After screening, 34 eligible subjects (31 female and 3 male) aged 30 to 45 years (mean 37.71, SD = 4.34) participate in the study. Similar to the ethical procedures in Phase IIa, all 34 subjects provided written informed consent before the start of the study. However, since the nature of this psychology class and qigong class were quite different and the participants were recruited from different orientations, it was expected that the demographic variables (e.g., age, gender) of these two groups of people would be quite different. Although both the qigong group and the psychology class both contained 34 people, there were more men (n = 12) in the qigong group than this second control group (n = 3). The mean age of the qigong group subjects ($M = 43.79$, $SD = 10.37$) was significantly older than that of the psychology group ($t = 3.159$, $p = 0.003$). As mentioned earlier, though age had no significant influences on DASS scores (Crawford & Henry, 2003), quality of life (Jho, 2001), and salivary cortisol levels (Ahn, et al., 2007), we would still need to be cautious when interpreting the physiological differences (e.g., blood pressure) between these two groups. Therefore, we covariated age and the baseline scores when analysing the outcome measures of physiological well-being so as to minimize the possible age effect on physiological changes.

3.6.2. Baseline Differences

Besides age difference, these two groups also differed in some other aspects. The initial anxiety level of the psychology group was significantly lower than the qigong group ($t = 2.324$, $p = 0.024$). The participants of the psychology class generally enjoyed a better quality of life in the physical domain ($p = 0.012$), spiritual/vitality domain ($p = 0.033$), and overall condition ($p = 0.022$), than the qigong group. The mean heart rate of the psychology class subjects was significantly higher than that of the qigong group subjects ($p = 0.006$) (see Table 24).

Table 24: Comparisons of Baseline Scores of Qigong Group (Treatment) and Psychology Group (Control).

Outcome measures of Time 1 (pre-test)	M(SD)		t	p
	Treatment Qigong group (n =34)	Control Psychology group (n = 34)		
Age	43.79 (10.37)	37.71 (4.34)	3.16	0.003*
DASS-S	16.65 (3.87)	16.41 (4.74)	0.23	0.823
DASS-A	8.24 (6.53)	5.23 (3.75)	2.32	0.024*
DASS-D	6.29 (5.33)	4.00 (4.09)	1.99	0.051
ChQOL-P	57.59 (13.42)	65.00 (9.99)	-2.59	0.012*
ChQOL-S	58.63 (16.00)	66.64 (14.33)	-2.18	0.033*
ChQOL-E	63.17 (15.69)	67.65 (13.85)	-1.25	0.215
ChQOL-overall	59.79 (12.68)	66.43 (10.59)	-2.34	0.022*
Cortisol ^	3270.25 (1000.19)	2954.07 (1541.87)	0.71	0.488
Sys BP	108.28 (11.04)	109.09 (11.43)	-0.3	0.767
Dia BP	73.06 (9.01)	73.17 (9.05)	-0.05	0.961
Heart rate	68.21 (7.34)	73.28 (7.43)	-2.83	0.006*

*$p \leq 0.05$ ^ based on 14 subjects of the psychology group

3.6.3. Adherence to Study Protocol

Among the 34 subjects, 24 (70.59%) of them completed all the eight psychology lessons. There were seven (20.59%) participants who attended seven lessons, two people (5.59%) who attended six lessons, and one (2.94%) who attended only five sessions. Feeling not well, work commitment, and overseas trips were the main reasons for absence. Nevertheless, there was no significant difference in the attendance rate between the qigong group and the psychology group. The subjects in this psychology group also finished the home assignments (e.g. worksheets). All 34 subjects (100%) completed the questionnaires of DASS and ChQOL in pre, mid, post, and follow-up assessment points. For the cortisol measures, we collected 96 samples from 32 people (each subject had three samples: pre, mid and post) with analyzable salivary volume. Two participants were not able to provide salivary samples due to personal reasons. Moreover, only 14 subjects (41.18%) attended the last salivary sample collection session. Since our 4th assessment point was scheduled 4 weeks after the whole eight-session psychology course was completed, it was rather difficult for the participants to come back for sample collection. Therefore, for cortisol analysis of the 1st, 2nd, and 3rd checkpoints, we could use the data from 96 samples with adequate volume provided by 32 subjects (29 females, 3 males). However, for analysis of changes from week 1 to week 12, we could only use 56 samples provided by 14 subjects (12 females, 2 males) in all four checkpoints. A summary of within group analyses of the psychology class over the whole study period is shown in Table 25 below. The summary of within group changes of the qigong group is shown earlier in Table 16 (p.

133). For between group comparisons, the summary is shown in Table 26.

The results of post hoc pairwise comparisons are shown in Table 27.

Table 25: Changes in Outcome Measures of Psychology Group over Re-assessments (n = 34).

Outcome measures	*M* (*SD*) Time 1 (wk 1) pre	Time 2 (wk 4) mid	Time 3 (wk 8) post	*F* (T1–T3)	*p*	η^2 (Effect size#)	*M* (*SD*) Time 4 (wk 12) follow-up	*F* (T1–T4)	*p*	η^2 (Effect size#)
Psychological										
DASS-S	16.41 (4.74)	15.00 (5.47)	15.06 (4.68)	1.360	0.264	-	15.00 (4.38)	0.982	0.396	-
DASS-A	5.24 (3.75)	5.35 (4.26)	6.47 (4.78)	1.722	0.187	-	6.76 (5.59)	2.076	0.111	-
DASS-D	4.00 (4.09)	3.18 (3.38)	3.59 (3.90)	0.729	0.479	-	4.06 (4.01)	0.719	0.537	-
ChQOL-P	65.00 (9.99)	63.01 (8.97)	61.78 (11.26)	2.968	0.065	-	64.23 (11.56)	2.378	0.083	-
ChQOL-S	66.64 (14.33)	64.58 (15.01)	64.82 (12.96)	0.692	0.494	-	65.30 (12.58)	0.523	0.636	-
ChQOL-E	67.65 (13.85)	71.61 (12.67)	70.66 (12.92)	3.291	0.046*	0.091 (M)	71.31 (12.69)	2.417	0.082	-
ChQOL-OA	66.43 (10.59)	66.40 (9.74)	65.75 (10.36)	0.170	0.828	-	66.94 (10.62)	0.229	0.799	-
Physiological										
Cortisol^	2954.07 (1541.87)	3056.57 (1814.19)	3069.71 (1775.41)	0.110	0.861	-	2532.14 (1466.25)	2.019^	0.150	-
Sys BP	109.01 (11.43)	108.05 (9.79)	108.68 (13.31)	0.347	0.667	-	112.19 (13.82)	3.528	0.024*	0.097(M)
Dia BP	73.17 (9.05)	72.89 (9.97)	72.66 (11.46)	0.099	0.884	-	75.29 (11.65)	1.964	0.133	-
Heart rate	73.28 (7.43)	73.44 (7.14)	73.23 (7.57)	0.016	0.979	-	75.50 (10.23)	1.390	0.255	-

* $p \leq 0.05$ # S = small effect ($\eta^2 \leq 0.01$), M = moderate effect ($\eta^2 \leq 0.06$), L = large effect ($\eta^2 \geq 0.14$) ^ based on 14 subjects of the psychology group

Table 26: Comparison of Treatment Effects between Qigong Group (n = 34) and Psychology Group (n = 34) over Re-assessments.

	Time 1 to Time 3 Pre to post (wk 1 to wk 8)					Time 1 to Time 4 Pre to follow-up (wk 1 to wk 12)				
Outcome measures	Main effect *F*	*p*	η^2 (Effect size#)	Inter-action effect *F*	*p*	Main effect *F*	*p*	η^2 (Effect size#)	Inter-action effect *F*	*p*
Psychological										
DASS-S	2.942	0.091	-	4.281	0.019*	9.517	0.003*	0.126 (L)	8.635	0.0005*
DASS-A	2.942 [a]	0.091	-	8.239	0.006*	7.313 [b]	0.009*	0.101 (M)	3.144	0.05*
DASS-D	0.461 [a]	0.500	-	4.264	0.043*	3.118 [b]	0.082	-	3.974	0.026*
ChQOL-P	13.136 [a]	0.001*	0.168 (L)	3.572	0.063	13.580 [b]	0.0001*	0.173 (L)	1.880	0.159
ChQOL-S	4.674 [a]	0.034*	0.061(M)	0.102	0.751	7.984 [b]	0.006*	0.109 (M)	1.608	0.205
ChQOL-E	0.648	0.424	-	3.379	0.04*	0.070	0.792	-	5.273	0.003*
ChQOL-OA	6.644 [a]	0.012*	0.093 (M)	3.269	0.075	11.353 [b]	0.001*	0.149 (L)	3.588	0.034*
Physiological										
Cortisol	0.0005 [ac]	0.984	-	3.641	0.061	5.404 [bc^]	0.025*	0.109 (M)	2.506	0.094
Sys BP	1.766 [c]	0.188	-	0.331	0.709	5.101 [c]	0.027*	0.073 (M)	8.194	0.0005*
Dia BP	0.985 [c]	0.325	-	0.992	0.373	2.132 [c]	0.149	-	3.157	0.03*
BP (sys + dia)	1.446 [c]	0.234	-	0.742	0.563	3.740 [c]	0.057	-	6.124	0.0005*
Heart rate	2.733 [ac]	0.103	-	0.113	0.738	0.542 [bc]	0.464	-	2.886	0.06

*p ≤ 0.05 # S = small effect ($\eta^2 \leq 0.01$), M = moderate effect ($\eta^2 \leq 0.06$), L = large effect ($\eta^2 \geq 0.14$)

^ based on 14 subjects of the psychology group a: T2 and T3 (mid and post comparisons), T1 as covariate

b: T2 to T4 (mid, post and follow-up comparisons), T1 as covariate c: age as covariate

Table 27: Results of Post Hoc Tests of Qigong Group (n = 34) and Psychology Group (n- = 34) over Re-assessments.

Outcome measures	*p*											
	Time 1 vs. Time 2 (wk 1) (wk 4)		Time 1 vs. Time 3 (wk 1) (wk 8)		Time 1 vs. Time 4 (wk 1) (wk 12)		Time 2 vs. Time 3 (wk 4) (wk 8)		Time 2 vs. Time 4 (wk 4) (wk 12)		Time 3 vs. Time 4 (wk 8) (wk 12)	
	Qigong	Psy gp	Qigong	Psy gp	Qigong	Psy gp	Qigong	Psy gp	Qigong	Psy gp	Qigong	Psy gp
Psychological												
DASS-S	0.003*	NS	0.0005*	NS	0.0005	NS	NS	NS	0.0005*	NS	0.005*	NS
DASS-A	NA	NA	NA	NA	NA	NA	0.016*	NS	0.012*	NS	NS	NS
DASS-D	NA	NA	NA	NA	NA	NA	0.019*	NS	0.029*	NS	NS	NS
ChQOL-P	NA	NA	NA	NA	NA	NA	NS	NS	0.009*	NS	NS	NS
ChQOL-S	NA	NA	NA	NA	NA	NA	NS	NS	0.013*	NS	NS	NS
ChQOL-E	NS	NS	0.0005*	NS	0.0005*	NS	0.028*	NS	0.003*	NS	NS	NS
ChQOL-OA	NA	NA	NA	NA	NA	NA	NS	NS	0.001*	NS	0.039*	NS
Physiological												
Cortisol[bc^]	NA	NA	NA	NA	NA	NA	0.0005*	NS	0.0005*	0.021*	0.004*	NS
SysBP[c]	NS	NS	NS	NS	0.003*	NS	NS	NS	0.015*	0.046*	NS	NS
DiaBP[c]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Heart rate[bc]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

* $p \leq 0.05$ NS = not significant NA = not available due to T1 scores being covariated

^ based on 14 subjects of the psychology group b: T2, T3 and T4 comparisons (T1 as covariate) c: age as covariate

3.6.4. Changes in Psychological Well-being (DASS-21 and ChQOL)

Our results indicated that after 8 weeks of qigong/psychology classes, significant Time x Group interaction effects were found in DASS-S (p = 0.019), DASS-A (p = 0.006), DASS-D (p = 0.043), and ChQOL-E (p = 0.04). Significant main effects were found in ChQOL-P (p = 0.001), ChQOL-S (p = 0.034), and ChQOL-OA (p = 0.012). In week 12, significant Time x Group interaction effects were found in DASS-S (p = 0.0005), DASS-A (p = 0.05), DASS-D (p = 0.026), ChQOL-E (p = 0.003) and ChQOL-OA (p = 0.034). Significant main effects were found in DASS-S (p = 0.003), DASS-A (p = 0.009), ChQOL-P ($p \leq 0.001$), ChQOL-S (p = 0.006), and ChQOL-OA (p = 0.001).

3.6.4.1. Stress (DASS-S)

In within group comparisons, although the mean stress level of the psychology group decreased to 15.06 (*SD* = 4.68) in the 8^{th} week, such changes were not significant. The between group differences were calculated without using pre-test values as a covariate because *t*-tests showed no significant difference in the two baseline mean values. The results indicated that the main effect was not significant. However, the Time x Group interaction effect was significant (F = 4.281, p = 0.019, η^2 = 0.061).

When data from the follow-up measurements were included in the analysis, no obvious within group difference was found in the psychology group. A significant main effect was found (F = 9.517, p = 0.003). The Time x Group interaction effect was significant as well (F = 8635, $p \leq 0.001$) with a moderate effect size (η^2 = 0.116).

The results of post hoc analysis indicated that in the qigong group, significant differences were found in all pairs of comparisons ($p \leq 0.003$), but not Time 2 vs. Time 3. The pairwise comparisons of the psychology group were not significant (see Figure 47).

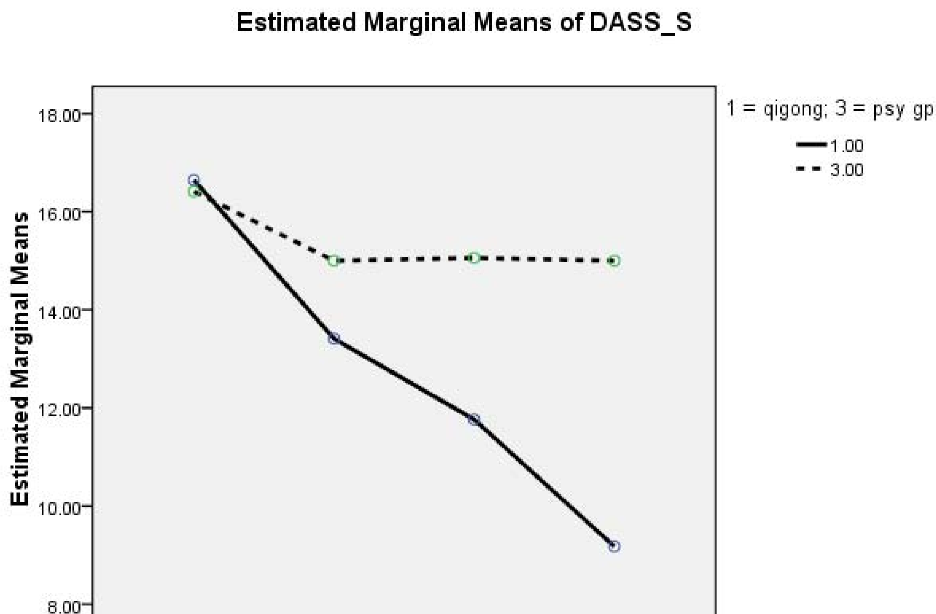

Figure 47: Changes in DASS-S score of qigong group (n = 34) and psychology group (n = 34) over four assessments.

3.6.4.2. Anxiety (DASS-A)

For the subjects in the psychology class, the mean anxiety level increased to 6.47 (*SD* = 4.78) at the end of the 8-week course and then rose to 6.76 (*SD* = 5.59) 4 weeks after the course had finished. However, such an elevated trend was not significant in either week 8 or week 12.

For between group comparisons, the pre-test values were treated as covariate since the *t*-test showed significant differences ($p = 0.024$). The interaction effect at the 3rd checkpoint was significant ($F = 8.239$, $p = 0.006$, $\eta^2 = 0.112$). The main effect was not significant. In week 12, the qigong group showed a further drop in anxiety to 4.18 (*SD* = 3.24), which was substantially lower than that of the psychology group as indicated by the significant main effect ($F = 7.313$, $p = 0.009$) and interaction effect ($F = 3.144$, $p = 0.05$, $\eta^2 = 0.046$).

Post hoc analysis showed that in the qigong group, significant differences were found in Time 2 vs. Time 3 ($p = 0.016$) and Time 2 vs. Time 4 ($p = 0.012$). No significant pairwise comparison was found in the psychology group (see Figure 48).

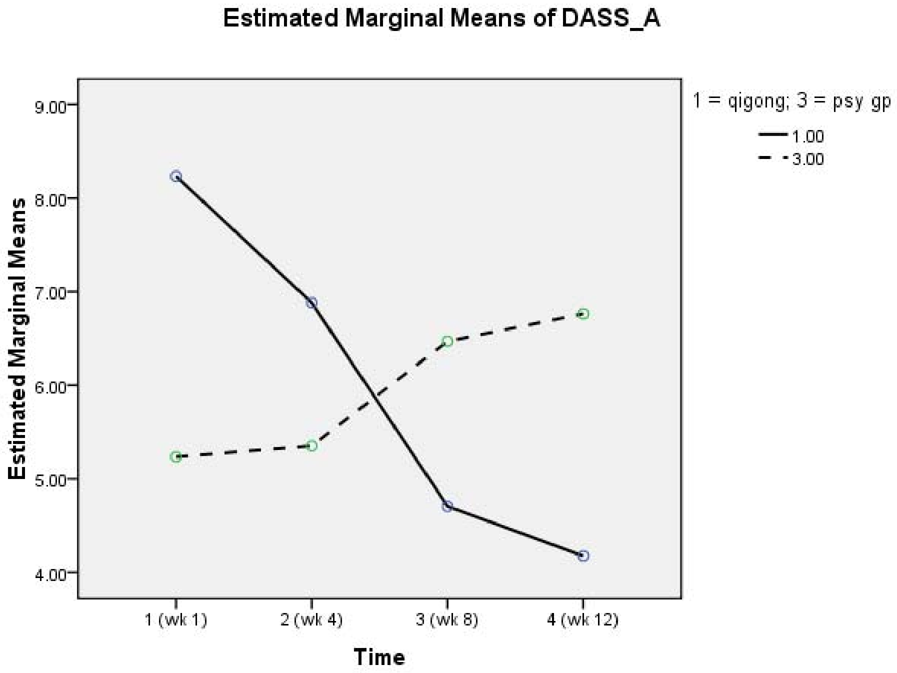

Figure 48: Changes in DASS-A of the qigong group (n = 34) and the psychology group (n = 34) over four assessments.

Note. Pre-test (Time 1) values of two groups were treated as covariate.

3.6.4.3. Depression (DASS-D)

The level of depressiveness in the psychology class subjects showed little fluctuations as it decreased to 3.59 (*SD* = 3.90) after eight lessons, and then rose to 4.06 (*SD* = 4.01) 4 weeks later, however such changes were not significant.

In the follow-up week, the qigong group showed further alleviation in depressiveness (*M* = 2.47, *SD* = 3.38), which was substantially lower than that of the psychology group. The results of *t*-test indicated that the difference between the two groups was close to significant ($p = 0.051$) at the beginning, the baseline scores were covariated when analysing group difference. Significant interaction effects were found in week 8 ($F = 4.264$, $p = 0.043$, $\eta^2 = 0.062$) and week 12 ($F = 3.974$, $p = 0.026$, $\eta^2 = 0.058$). The main effects were not significant in either week 8 or week 12.

Post hoc tests indicated that the depressive level of the qigong group in Time 3 was significantly lower than that in Time 2 ($p = 0.019$) and the scores of Time 4 were also significantly lower than the scores of Time 2 ($p = 0.029$). No significant difference was found in the psychology group (see Figure 49).

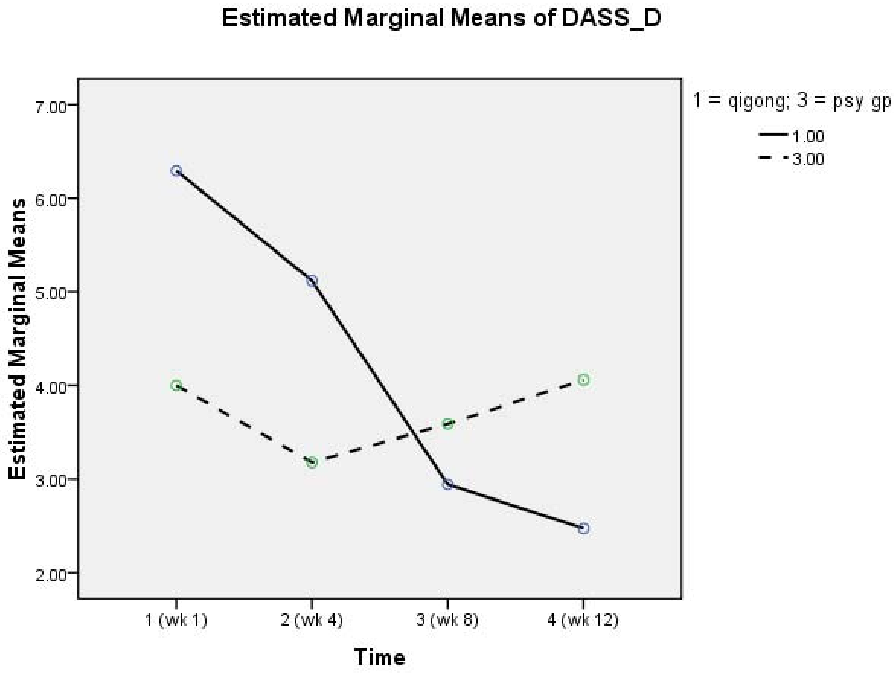

Figure 49: Changes in DASS-D of the qigong group (n = 34) and the psychology group (n = 34) over four assessments.

Note. Pre-test (Time 1) values of two groups were treated as covariate.

3.6.4.4. Quality of Life – Physical Domain (ChQOL-P)

Regarding the physical functioning of the psychology group, the mean value decreased to 61.78 (*SD* = 11.26) in the 8th week, and then climbed up to 64.23 (*SD* = 11.56) in week 12. Such changes, however, did not reach a significant level.

Regarding the between group performance, the qigong group provided a rising slope and the psychology group gave a gradually declining one. After covariating the baseline scores, the results indicated that the main effects were significant in week 8 (F =13.136, p = 0.001) with a large effect size (η^2 = 0.168). In week 12, the physical quality of the qigong group increased to 66.91 (*SD* = 10.26), which was significantly higher than that of the psychology group (F =13.580, $p \leq 0.001$). The effect size was also large (η^2 = 0.173). No significant interaction effect was found here.

Post hoc results indicated that the physical functioning of the qigong group in Time 4 was significantly better than that in Time 2 (p = 0.009). Other comparisons were not significant (see Figure 50).

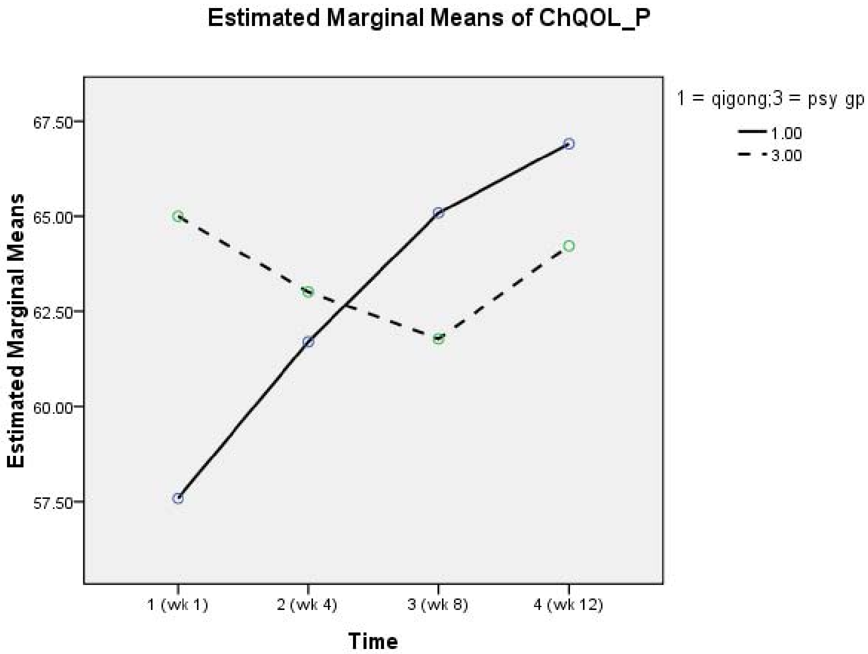

Figure 50: Changes in ChQOL-P of the qigong group (n = 34) and the psychology group (n = 34) over four assessments.

Note. Pre-test (Time 1) values of the two groups were treated as covariate.

3.6.4.5. Quality of Life – Spiritual and Vitality Domain ChQOL-S

Regarding the spiritual and vitality domain of the quality of life, the psychology class, as compared with the condition in week 1, experienced a decline in vitality (M = 64.82, SD = 12.96) after the 8 psychology lessons and a mild improvement in the follow-up week (M = 65.30, SD = 12.58). These changes, however, did not reach a significant level.

Each group had its own distinctive trend in the spiritual and vitality aspect of quality of life over the four checkpoints, which yielded significant main effects, but not interaction effects. Due to a significant t-test result (p = 0.033), the baseline scores of the two groups were covariated over time when calculating the group differences. The qigong group experienced significantly better spiritual and vitality functioning than the psychology group at the 3rd (F = 4.674, p = 0.034) and 4th checkpoints (F = 7.984, p = 0.006). As indicated by η^2 = 0.061 (3rd checkpoint) and η^2 = 0.109 (4th checkpoint), the qigong intervention constituted a moderate effect on the variability between the two groups in this aspect.

Post hoc pairwise comparisons indicated that significant improvement only happened between week 4 and week 12 (p = 0.013) in the qigong group. Other comparisons were not significant (see Figure 51).

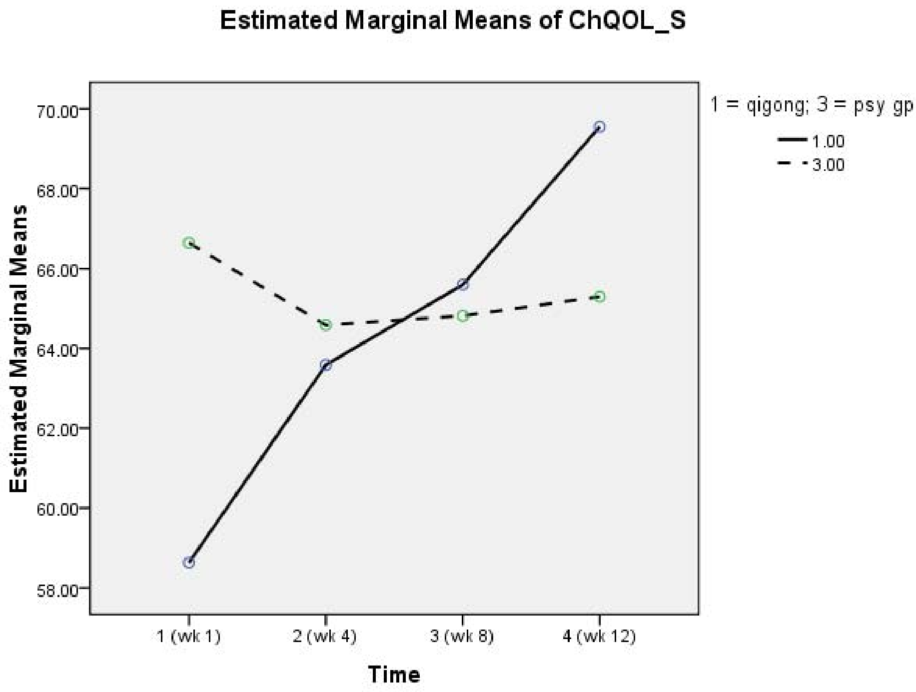

Figure 51: Change in ChQOL-S of the qigong group (n = 34) and the psychology group (n = 34) over four assessments.

Note. Pre-test (Time 1) values of the two groups were treated as covariate.

3.6.4.6. Quality of Life – Emotional Domain (ChQOL-E)

In the emotional dimension, the psychology group showed significant within group improvements during the first 8 weeks when the emotional functioning increased significantly from week 1 to 70.66 (SD = 12.92) in week 8 ($F = 3.291$, $p = 0.046$). The mean value climbed to 71.31 (SD = 12.69) in week 12, however this was not a significant increase.

The group differences were calculated without using the pre-test as covariate because the *t*-test showed no significant difference in the two baseline mean values. The interaction effect was significant ($F = 3.379$, $p = 0.04$, $\eta^2 = 0.049$) in week 8. In the follow-up session, the two groups differed to a greater degree than previous. As indicated by a significant interaction effect ($F = 5.273$, $p = 0.003$, $\eta^2 = 0.074$), the qigong subjects had a better emotional state ($M = 75.38$, $SD = 10.67$) than the subjects in the psychology class. No significant main effect was found here.

Post hoc analysis revealed that for the qigong group, significant differences were found in Time 1 vs. Time 3 ($p \leq 0.001$), Time 1 vs. Time 4 ($p \leq 0.001$), Time 2 vs. Time 3 ($p = 0.028$), and Time 2 vs. Time 4 ($p = 0.003$). No significant pairwise comparison was found in the psychology group (see Figure 52).

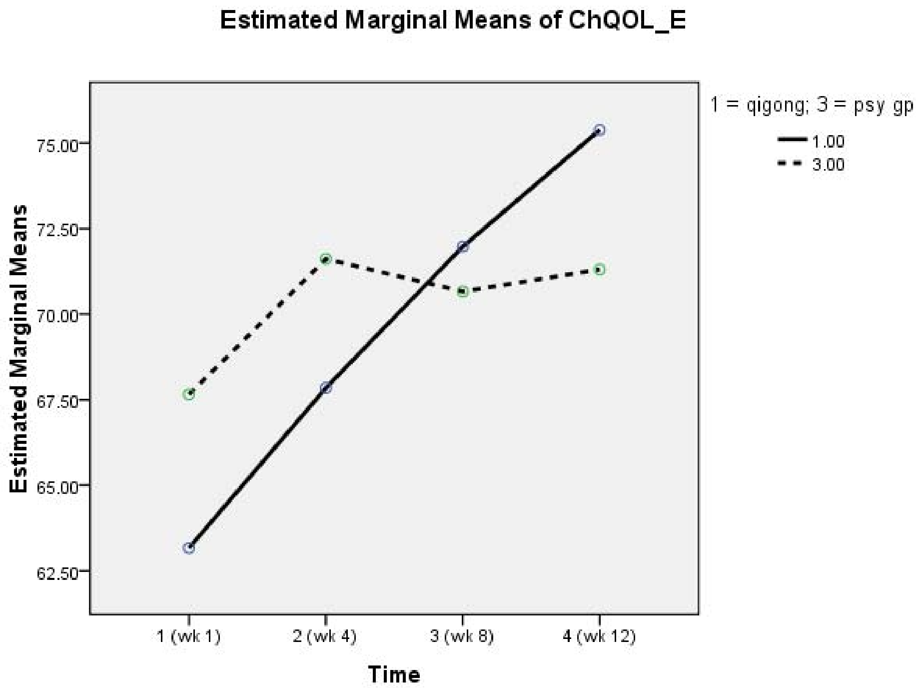

Figure 52: Changes in ChQOL-E of the qigong group (n = 34) and the psychology group (n = 34) over four assessments.

3.6.4.7. Quality of Life – Overall Domain (ChQOL-OA)

The qigong group demonstrated a substantial improvement in overall quality of life, while the psychology group experienced a relatively constant condition. The psychology group did not show a significant improvement as reflected by the means in week 8 (M = 65.75, SD = 10.36) and week 12 (M = 66.4, SD = 10.62) when compared with the baseline value.

Due to a significant t-test result (p = 0.022), the baseline scores of the two groups were covariated when calculating the group differences over time. In week 8, a significant main effect was found (F = 6.644, p = 0.012, η^2 = 0.093). However, the interaction effect was not significant. The main effect (F =11.353, p = 0.001, η^2 = 0.149) and interaction effect (F =3.588, p = 0.034, η^2 = 0.052) were also significant at the 4th checkpoint when the qigong group attained a higher mean value (M = 70.62, SD = 9.88) than the psychology group participants.

The results of pairwise comparisons showed that the overall functioning of the qigong group in Time 4 was significantly higher than those in Time 2 (p = 0.001) and Time 3 (p = 0.039). The psychology group did not demonstrate any obvious improvement (see Figure 53).

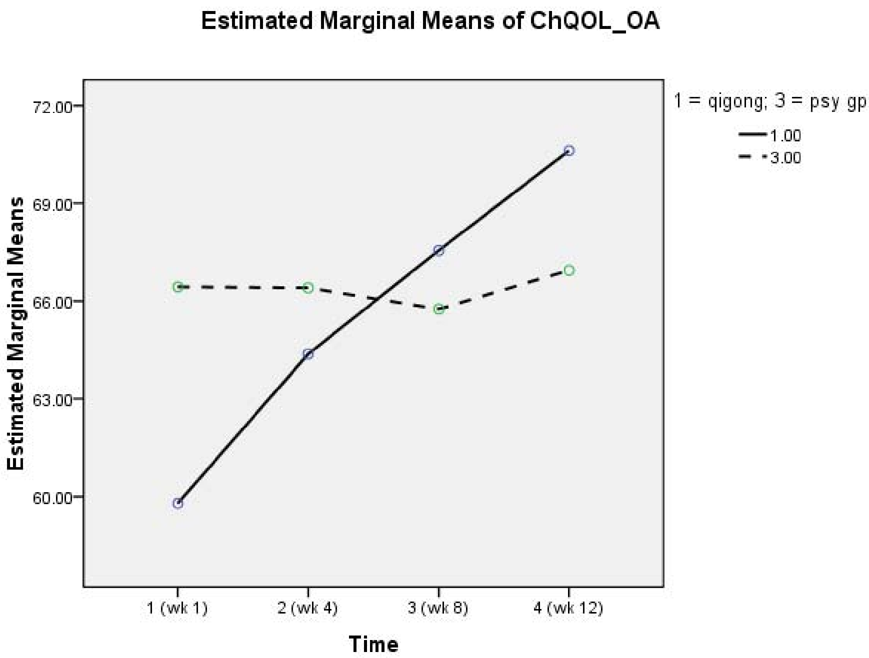

Figure 53: Change in ChQOL-OA of the qigong group (n = 34) and the psychology group (n = 34) over four assessments.

Note. Pre-test (Time 1) values of the two groups were treated as covariate.

3.6.5. Changes in Physiological Well-being (Cortisol, BP, and HR)

In order to investigate whether there was any group difference in the four dependent variables (DV) indicating physiological well-being: systolic blood pressure, diastolic blood pressure, heart rate, and salivary cortisol, GLM (Repeated Measures) were used to analyse the data. As mentioned earlier, the age and baseline heart rate of the two groups were significantly different, therefore the baseline scores of HR and age were treated as covariates in the univariate analysis. In week 8, there were no significant group differences in any of the physiological indicators of well-being. As indicated by the significant main effect ($p = 0.025$), in week 12, the qigong group had a lower cortisol level than the psychology group. As suggested by the significant Time x Group interaction effect ($p = 0.0005$) in the 2 (groups) x 4 (times) x 2 (SysBP and DiaBP) calculations, the qigong group also had a substantially lower blood pressure than the psychology group.

Similar to Phase IIa, besides looking at mean differences between two groups, further comparisons were conducted between high blood pressure qigong subgroup and high blood pressure psychology subgroup so as to investigate whether qigong has a positive regulatory effect (i.e. resume to normal range) on blood pressure.

3.6.5.1. Salivary Cortisol

As is shown by the *t*-test result, the baseline values of the two groups did not differ significantly from each other. However, the qigong group participants were significantly older than the subjects in the psychology group were (t = 3.159, p = 0.003). Age might possibly affect the physiological performance of the subjects. Therefore, the baseline cortisol values and age were covariated when doing group comparisons. If we only consider the first three check points and analyze the data provided by 32 participants of the psychology group, their cortisol level dropped from 2888.54 pg/ml (*SD* = 2130.08) at the beginning to 2684.10 pg/ml (*SD* =2254.70) in week 8; however, it did not reach a significant level. The between group difference was not significant either.

The initial mean cortisol level of those 14 psychology participants who provided samples in all four check points was 2954.07 pg/ml (*SD* =1541.87). It increased to 3069.71 pg/ml (*SD* =1775.41) after they completed the psychology course, and then decreased to 2532.14 pg/ml (*SD* =1466.25) in the follow-up week. Nevertheless, such changes were not significant.

For between group comparisons, though no significant difference was found in week 8, a significant main effect was found in week 12 (F = 5.404, p = 0025, η^2 = 0.109), indicating that the qigong group experienced a substantially lower cortisol level than the psychology group, which can be moderately explained by qigong intervention. The interaction effect was not significant in this case.

Post hoc comparisons indicated that for the qigong group, a significant difference occurred between Time 2 and Time 3 ($p \leq 0.001$), between Time 2 and Time 4 ($p \leq 0.001$), and between Time 3 and Time 4 ($p = 0.004$). For the psychology group, the cortisol level in Time 4 was also significantly lower than that in Time 2 ($p = 0.021$) (see Figure 54).

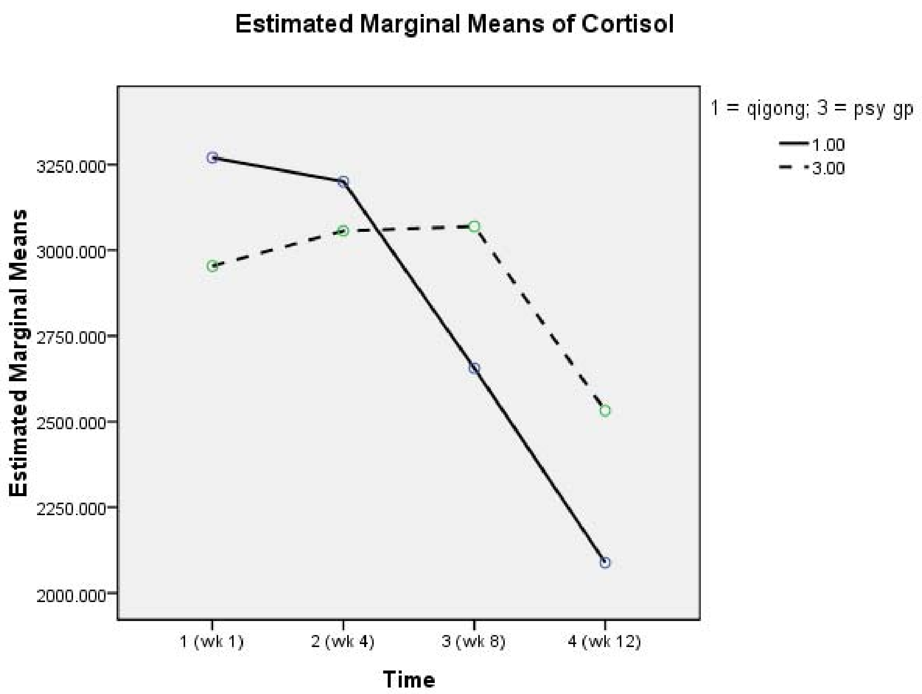

Figure 54: Change in salivary cortisol of the qigong group (n = 34) and the psychology group (n = 14) over four assessments

Note. Pre-test (Time 1) values of the two groups were treated as covariate.

3.6.5.2. Systolic Blood Pressure (SysBP)

The systolic blood pressure of the psychology participants showed a slight decrease in week 8 (M = 108.68 mm/Hg, SD = 13.31) as compared with the baseline value. The blood pressure significantly climbed to 112.19 mm/Hg (SD =13.82) in week 12 (F = 3.528, p = 0.024).

For between group analysis, since the two baseline systolic values were not significantly different from each other, as shown by the t-test, we only covariated the age when calculating the group difference; the result was non-significant in week 8. However, both the main effect (F = 5.101, p = 0.027, η^2 = 0.112) and the interaction effect (F = 8.194, $p \leq 0.001$) recorded at the 4th check point achieved a significant level, which indicated that the qigong group had a significantly lower systolic blood pressure than the psychology group.

The results of post hoc comparisons indicated that in the qigong group, a significant decrease in systolic blood pressure occurred in Time 1 vs. Time 4 (p = 0.003) and Time 2 vs. Time 4 (p = 0.015). For the psychology group, a significant increase occurred between Time 2 and Time 4 (p = 0.046) (see Figure 55).

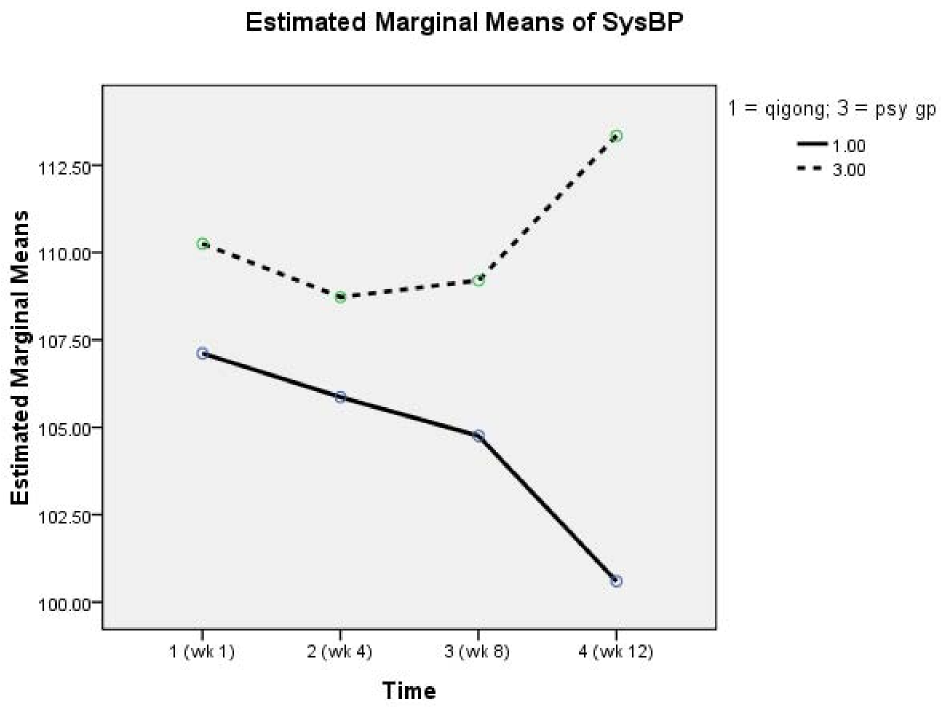

Figure 55: Changes in systolic BP of the qigong group (n = 34) and the psychology group (n = 34) over four assessments.

Comparisons between two subgroups with relatively high systolic blood pressure

There were eight qigong subjects and five waitlist subjects with pre-test values of systolic blood pressure at relatively high levels (i.e. above 119 mm/Hg). The age and baseline SysBP values of these two subgroups were not significantly different. For the high SysBP subjects of the psychology group, the mean SysBP started at 130.30 mm/Hg (*SD* = 6.51 mm/Hg) and increased to 132.30 mm/Hg (*SD* = 12.44 mm/Hg) in week 8 and finally reached 140.00 mm/Hg (*SD* = 6.90 mm/Hg) in week 12. The blood pressure level was beyond the healthy range of systolic blood pressure. The group difference between high SysBP qigong subgroup and high SysBP psychology subgroup was significant (F =15.31, p = 0.002) in week 12 (see Figure 56).

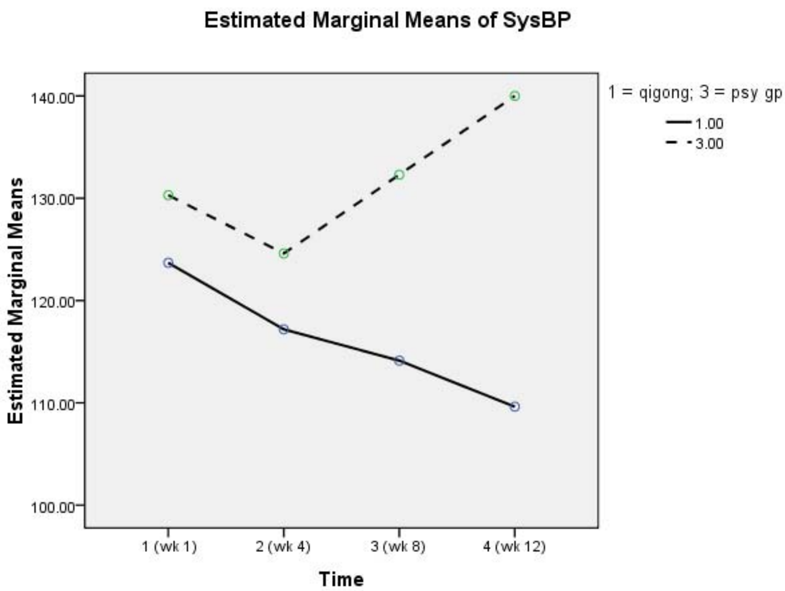

Figure 56: Changes in systolic blood pressure level of the high SysBP qigong subgroup (n = 8) and the high SysBP psychology subgroup (n = 5) over four assessments.

3.6.5.3. Diastolic Blood Pressure (DiaBP)

For the subjects of the psychology class, the mean diastolic blood pressure dropped to 72.66 mm/Hg (*SD* = 11.46) in week 8 and then rose to 75.29 mm/Hg (*SD* = 11.65) in week 12. These fluctuations were not significant.

Similar to the case in systolic BP, the two baseline diastolic BP values did not differ significantly from each other as shown by the results of the *t*-test. We only covariated the age when calculating the group difference. The group difference was not significant in week 8. In the follow-up measurement, a significant interaction effect was found ($F = 6.124$, $p \leq 0.001$, $\eta^2 = 0.086$) showing that the qigong subjects had lower diastolic blood pressure (*M* = 69.79, *SD* = 7.97 mm/Hg) than the psychology group. The main effect was not significant in week 12.

No significant difference was found in the pairwise comparisons either (see Figure 57).

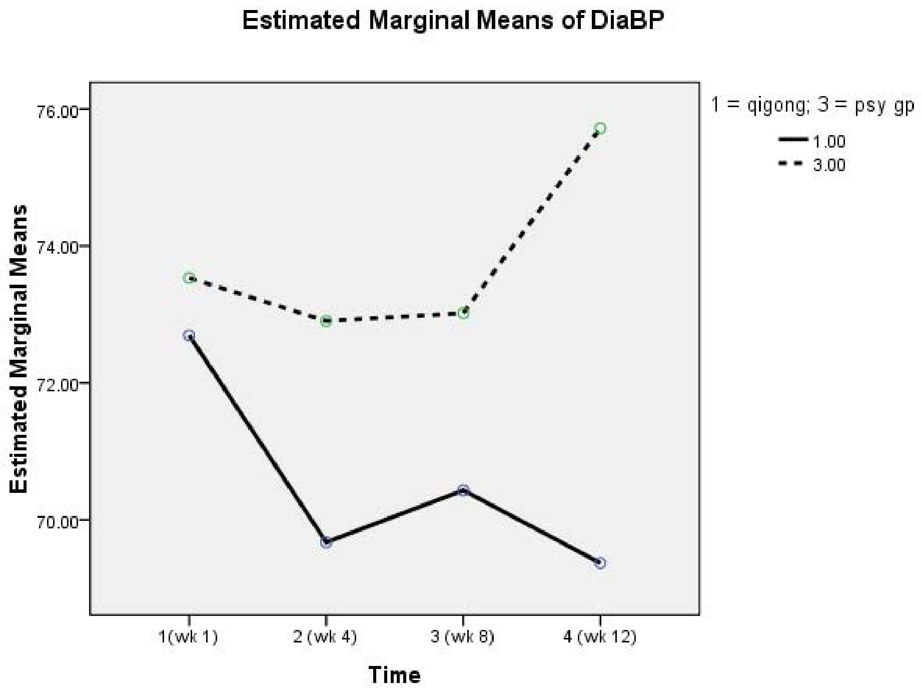

Figure 57: Changes in the diastolic BP of the qigong group (n = 34) and the psychology group (n = 34) over four assessments.

Comparisons between two subgroups with relatively high diastolic blood pressure

There were eleven qigong subjects and six waitlist subjects with diastolic pressure at relatively high levels (i.e. above 79 mm/Hg). The age and baseline DiaBP values of these two subgroups were not significantly different. For the high DiaBP subjects of the psychology group, the mean values started at 88.30 mm/Hg (*SD* = 8.81 mm/Hg) and dropped to 87.13 mm/Hg (*SD* = 17.28 mm/Hg) in week 8, however finally increased to 91.58 mm/Hg (*SD* = 16.61 mm/Hg) in week 12. The blood pressure level was beyond the healthy range of diastolic blood pressure. The group difference between high DiaBP qigong subgroup and high DiaBP psychology subgroup was significant ($F = 5.402$, $p = 0.035$) in week 12 (see Figure 58).

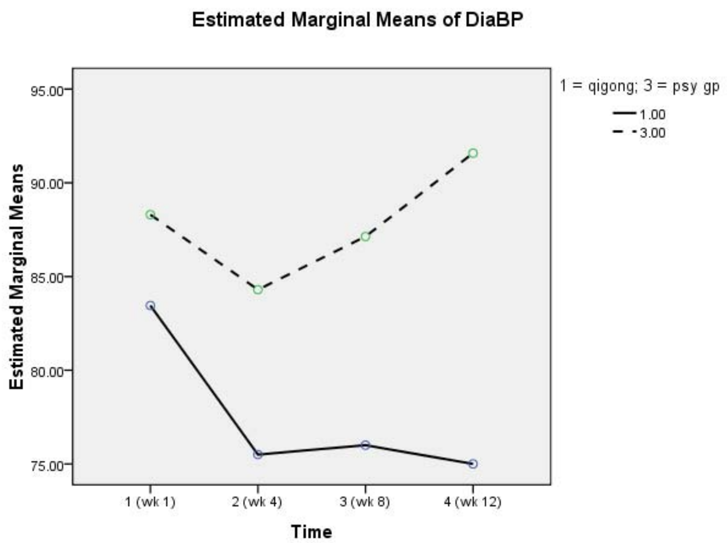

Figure 58: Changes in diastolic blood pressure level of the high DiaBP qigong subgroup (n = 8) and the high DiaBP psychology subgroup (n = 6) over four assessments.

3.6.5.4. Heart Rate (HR)

The mean pulse rate of the psychology class subjects did not differ much in week 8 (*M* = 73.23 beats/min, *SD* = 7.57) as compared with the baseline. It increased to 75.50 bpm (*SD* =10.23) in the 4th assessment; however this was not significant.

The two groups differed significantly in baseline scores (t = 2.832, p = 0.006). After the baselines and age were entered as covariates, the group difference in week 8 was not significant. In week 12, although the heart rate of the qigong group (*M* = 69.87, *SD* = 5.94 bpm) was lower than that of the psychology group, such a group difference was not significant either (see Figure 59).

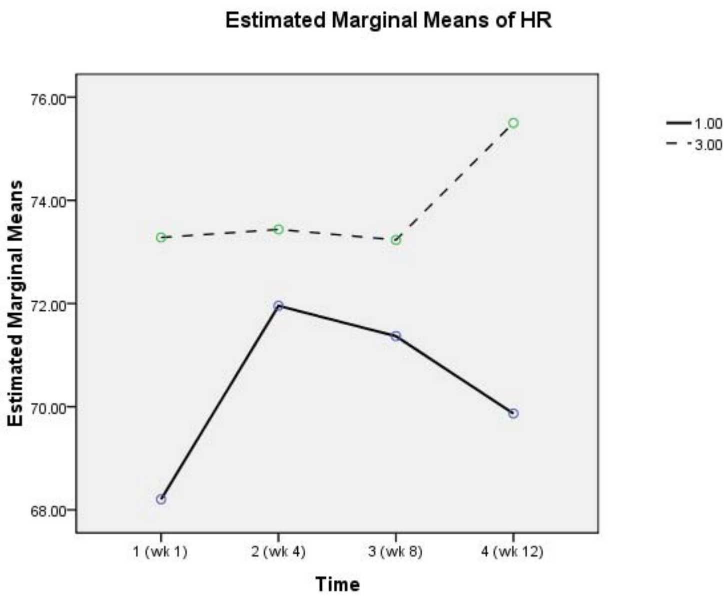

Figure 59: Changes in heart rate of the qigong group (n = 34) and the psychology group (n = 34) over four assessments.

Note. Pre-test (Time 1) values of the two groups were treated as covariate.

3.7. Comparisons between Waitlist Control Group and Psychology Group

The results of the *t*-test indicated that these two control groups were significantly different from each other on DASS-A (p = 0.008), DASS-D (p = 0.024), ChQOL-P (p = 0.018), ChQOL-S (p = 0.011), ChQOL-E (p = 0.047), ChQOL-OA (p = 0.007), heart rate (p = 0.003), and age (p = 0.002) at the beginning. Therefore, we covariated the baseline values and age calculating between group differences. Our findings showed no significant group difference on any of the dependent variables over the 12 weeks of the study period.

3.8. Summary of Main Study (Phase IIa and IIb) Results

3.8.1. Within Group Variations

Summing up the above quantitative analyses, our analyses of within group differences indicated that throughout the 8 weeks of qigong training, the qigong group demonstrated significant improvements in all the indicators of mental and physical well-being except systolic blood pressure. Ongoing effects were observed in the follow-up session on all variables, which included systolic blood pressure. For the subjects in the control group, except for a significant decrease in stress level and diastolic blood pressure after 8 waiting weeks and in the follow-up session, their performance was not much different from the baseline scores. In contrast, the heart rate of the waitlist subjects showed a significant increase in week 12 when compared with their mean score at pre-test. For the psychology group, except for a significant improvement in quality of life (emotional domain) in week 8 and a significant increase in systolic blood pressure in week 12, their performance was not much different from the baseline scores.

3.8.2. Between Group Comparisons: Qigong Group and Waitlist Group

When comparing the physiological reactions between the qigong group and the waitlist control group, group differences appeared earlier in week 8 as significant differences were found in cortisol levels, systolic and diastolic blood pressure, but not in heart rate. The effect sizes were moderate. Qigong subjects also showed significantly lower cortisol levels, and systolic and diastolic blood pressure than the waiting subjects in the 4th measurement, with increased significant levels and effect sizes. The heart rate values of the qigong group subjects first increased and then decreased while the waitlist group first decreased and then increased over the 12 weeks. Though such fluctuations did not yield a significant main effect, the interaction effect was significant in week 12. Though the comparisons between high blood pressure qigong subgroup and high blood pressure waitlist subgroup was not significant, the DiaBP and SysBP trends of qigong subgroup were more encouraging as the blood pressure resumed to desirable healthy range after short-term qigong intervention.

Regarding the psychological outcome measures, in week 8, the qigong participants generally enjoyed better mood states and quality of life than the waiting subjects over time as indicated by the significant as indicated by significant interaction effects in nearly all seven subscales except the DASS-A, however the main effects were not significant yet. The psychological improvements of qigong group subjects and variations between two groups (including DASS-A) became more obvious when significant group differences appeared at the follow-up period (week 12) where the main effects of DASS-D & ChQOL-P were close to significant level. The effect sizes mainly ranged from moderate to large levels.

The results of post hoc tests indicated that significant improvements of qigong group subjects mainly started in Time 2 (week 4). Nevertheless, a decrease in stress level (DASS-S) improvements in ChQOL-P and ChQOL-OA happened earlier between week 1 and week 4.

3.8.3. Between Group Comparisons: Qigong Group and Psychology Group

Regarding the physiological outcome measures, the between group difference was not so obvious in week 8. Until week 12, the qigong group experienced significantly lower cortisol level and blood pressure values than the psychology group. The effect sizes were mostly at a moderate level. However, the two groups did not differ significantly in heart rate. The significant group differences in blood pressure between high blood pressure qigong subgroup and high blood pressure psychology subgroup indicated that the blood pressure of qigong subgroup subjects resumed to a healthy range while the blood pressure of psychology subgroup subjects increased beyond the healthy range in week 12.

Regarding the psychological conditions, in week 8, the qigong participants experienced a better quality of life than the psychology participants in ChQOL-P, ChQOL-S and ChQOL-OA as indicated by the significant main effects where ranging from moderate to large effect sizes. The significant interaction effects in three scales of DASS and ChQOL-E further showed that the qigong group generally enjoyed better mood states and emotional condition than the psychology group over the eight weeks, however the main effects were not significant. In week 12, the differences were more obvious as shown by increased significant levels. The qigong group also demonstrated substantially lower stress and anxiety levels, better physical (ChQOL-P), spiritual (ChQOl-E) and overall (ChQOL-OA) conditions than the psychology group. The interaction effects further showed that the qigong group had lower depressive level and better emotional condition (ChQOL-E) than the psychology group over twelve weeks, nevertheless the main effects were not significant. The effect sizes ranged from moderate to large.

3.8.4. Qualitative Information and Secondary Analysis

According to the information given by the qigong participants in the questionnaires and interviews, many reported that they had improvements in *qi xi* (氣息; energy and vitality), moods, muscles, and joints flexibility. Some subjects further attributed the relief of their illnesses to the practice of qigong. The physical feelings of *qi* (e.g., warm heat, lightness, etc.) and psychological sentiments, such as inner peacefulness and happiness, were commonly reported by those qigong participants who could vividly verbalize their subjective *qi* feelings.

Those who reported they could feel the *qi* demonstrated significantly lower stress levels in both the 3rd and 4th check points (large effect sizes) than those who did not feel much *qi* during practice. The heart rate of the *qi*-subjects was lower than the non-*qi* subjects, which also yielded large effect sizes in the 3rd and 4th measurements. If we divided the qigong subjects into more home practice group and less home practice group, in week 8, in a significant manner and with a large effect size, the heart rate of the “more practice” group was slower than that of the “less practice” group. Such a phenomenon replicated in week 12 as well. When comparing the performance between male and female qigong subjects, female subjects experienced significantly lower diastolic and systolic blood pressure than the males throughout the 12 weeks, the effect sizes ranged from moderate to large. However, other comparisons were not significant.

CHAPTER 4

DISCUSSION and CONCLUSION

4.1. Interpretations and Implications of Results

After a period of qigong practice, the qigong participants had better mood states as indicated by substantial decreases in stress (DASS-S), anxiety (DASS-A), and depressive (DASS-D) levels. They also experienced a better quality of life as reflected by obvious increases in physical (ChQOL-P), spirituality and vitality (ChQOL-S) domains, emotional (ChQOL-E), and overall (ChQOL-OA) functioning. Although heart rate had some fluctuations, improved physical conditions were further supported by statistically significant decreases in salivary cortisol levels and blood pressure. As reported by the participants, improved *qi xi* (氣息; energy and vitality), relaxed mood, and body were common changes after qigong practice. Those who could feel the *qi* seemed to benefit more from qigong exercise, especially in stress and heart rate reduction. Those who practiced more also experienced lower heart rates than the subjects who practiced less. The effect sizes were large, which indicated that a large proportion of variations in stress level and heart rate were associated with whether the subject could feel *qi* or whether s/he practiced hard enough. Moreover, it is likely that the female participants benefited more than males as the females experienced lower blood pressure than the males.

The qigong group significantly outperformed the waitlist control group in different outcome measures of body-mind well-being. Thus, our hypotheses were supported by the progressive performance of the qigong group and the substantial group differences between with and without qigong intervention. The qigong group also outperformed the psychology group significantly, especially in stress and anxiety. Therefore, qigong intervention might be more effective in improving mood state than the educational program. The qigong group also enjoyed a significantly better quality of life, as well as lowered cortisol and blood pressure levels than the psychology group, which added further support to our hypotheses.

The effect sizes mostly ranged from medium to large. Therefore, at least a moderate proportion of variance of the outcome measures can be explained by the qigong intervention. Besides the significant main effects, the significant Time x Group interaction effects, which further suggested that the improvements in psychological and physiological well-being made across the four assessments (i.e., week 1, 4, 8, and 12) were dependent on the type of groups (i.e., qigong, waitlist, and psychology) (Ho, 2006). Post hoc analysis provided a more detailed picture that major changes started in Time 2 (i.e., week 4) and the improvement continued after the routine qigong classes were finished (i.e., week 12). In general, our findings implied that short-term qigong practice possibly helped in reducing stress, anxiety, and enhancing body-mind well-being.

4.2. Psychological and Physiological Mechanisms Underlying the Effects of Qigong

Considerable experimental evidence supports a positive relation between physical exercise and psychological well-being. To explain the effects of physical exercise on well-being, six theories are often used mainly from the perspective of sports science: cognitive behaviour, distraction, social interaction, cardiovascular fitness, amine, and endorphin theories (Cox, 1994, 1998; Gosselin & Taylor, 1999). As illustrated earlier in Figure 4 (p. 42), we recently proposed to borrow these six theories from sports science and re-organize them into psychosocial and physiological perspectives, and further integrate them with the "mind regulation," "body regulation," and "breath regulation" framework of qigong (Chow & Tsang, 2007). We therefore adopted the model here to discuss the effects of qigong on mood states and body-mind well-being enhancement.

4.2.1. Physiological Effects of Qigong

The results of the main phase of our study showed that in the qigong group, except for systolic blood pressure, all physiological indicators of well-being have significantly decreased after 8 weeks of the qigong program. In the follow-up week, all aspects continued to show significant improvements, including systolic blood pressure. Our findings are consistent with an earlier study, which showed that cortisol levels and heart rate of healthy adults decreased significantly after 14 weeks of Guolin qigong training (Jones, 2001).

Moreover, our results of significant comparisons in all outcome measures between the qigong and the waitlist control group, replicated the results of those previous studies, which also included control groups for comparison. That is, the qigong group reported a lower mean cortisol level (Lee, Kang, Lim, et al., 2004), and lessened systolic (Lee, Kim, et al., 2000; Hui, et al., 2006) and diastolic blood pressure (Lee, Lee, Choi, et al., 2003; Lee, Lim, et al., 2004) than the control group. The comparisons between the qigong group and the psychology group also demonstrated similar outcomes in that the qigong intervention lowered the cortisol and systolic blood pressure of the qigong subjects. The systolic blood pressure of the psychology class subjects, on the other hand, increased considerably after 12 weeks. Our findings supported earlier claims that *chan mi gong* has positive effects on blood pressure regulation (Zhang, Fu, & Zhao, 1990).

4.2.1.1. Cardiovascular Fitness Theory

Researchers suggest that a moderate exercise regimen can improve cardiovascular functions (Durham, 2005); and bring comparable mood improvement as athletes experience in kinetic activities (Berger & Owen, 1992). The “breath regulation” in qigong requires one to practice diaphragmatic breathing. Both qigong and yoga involve rhythmic abdominal breathing and require the trainees to concentrate on the *dantian*. Training of *dantian* breathing was also included in our *Mindfit* protocol. Results from previous studies provided experimental evidence to the cardiovascular fitness theory and suggested that such a rhythmical breathing possibly serves as an autonomic or endocrine training that improves cardiac output, ventilatory efficiency, oxygen consumption, carbon dioxide production, mood stabilization, and flexibility of ANS, consequently achieving a homeostasis state (Lan, Chou, Chen, Lai & Wong, 2004; Lee, Lee, Choi, et al., 2003; Lim , Boone, Flarity, & Thompson, 1993). Qigong could thus help to attain cardiovascular fitness and mood elevation much like aerobic exercise does.

4.2.1.2. Neurological Mechanism: HPA System, Amine, and Endorphin Theories

The emotional condition (e.g., anxiety level) might be affected by the complex interactions between the neuroendocrine and immune systems through hormonal and neural channels. When we are under stress, an increase in heart rate and the release of stress hormones (e.g., adrenaline, noradrenaline, and cortisol) are amplified bodily reactions due to activation of the sympathetic nervous system (McKinney, Antoni, Kumar, & Tims, 1997; Lindforts & Lundberg, 2002; Lovallo, 2005). However, persistent and excessive amounts of stress hormones can weaken the immune system (Bloomfield, 1998). The hypothalamic-pituitary-adrenal (HPA) axis is highly responsive to the inhibitory input of ACTH, which consequently lowers the level of cortisol. Qigong therapy may modify the hypothalamic-pituitary-andrenocortical system for long-term stress coping. Positive psychological functioning is related to the decrease of cortisol levels (Lindforts & Lundberg, 2002; McKinney, et al., 1997). The findings of the present study showed that qigong group subjects had significant lower cortisol levels than subjects from the two control groups. Skoglund and Jansson (2007) further found that qigong training leads to a more efficient psycho-neurophysiological network, which was manifested by the reduction in heart rate, finger temperature, and emotional irritability. Therefore, qigong training possibly augments the stress response via neurohormonal modulation (Lee, Kim, et al., 2000; Lee, Kang, Lim, et al., 2004).

According to amine and endorphin theories, the enhancement of parasympathetic tone and the reduction of sympathetic activity are manifested by the decrease of blood pressure, levels of noradrenaline, adrenaline, adrenocorticotropic hormone (ACTH), cortisol, anxiety and stress levels after short-term practice of qigong (Jones, 2001; Lee, Hong, et al., 2003; Lee, Kang, Lim, et al., 2004). Our findings support that qigong training stabilizes psychological and physical functions via neuroendorcrine modulation (Lee, Kang, Ryu, & Moon, 2004). The significant lowered blood pressure, cortisol level, decreased stress and anxiety symptoms of qigong subjects when compared with psychology participants and waiting subjects, provided empirical evidence to substantiate what the amine and endorphin theories have suggested. "Body regulation" in qigong requires the participants to practice specific qigong movements, which help the regulation of blood circulation and physical functions (Du & Zhang, 2005; Zeng, 2004). Our *Mindfit* protocol involves a lot of tapping, stretching, massaging, walking, twisting, and pressuring of the spine, internal organs, and muscle groups. These actions may possibly enhance body flexibility and physical health. In fact, evidence has shown that the unique spinal twisting and swinging movements in *chan mi gong* are related to improvement of blood circulation (Du, et al., 1992).

Nevertheless, in our study, the heart rate of the qigong group subjects did not differ much from the psychology group subjects over the 12 weeks. It might be possible that the subjects in our study were relatively healthy individuals when compared with the patients used in other qigong studies who had chronic illnesses (e.g., essential hypertension). In fact, the mean baseline heart rates of our subjects in the qigong group (M = 68.21, SD = 7.34 bpm) and the psychology group (M = 73.28, SD = 7.43 bpm) were within the normal range of 60 to 100 bpm (Vorvick, 2009). It is not surprising to have non-significant group differences when there were normal variations in pulse rate in the two groups throughout the study period. Our findings agree with previous qigong studies, which also used healthy volunteers as subjects, where no significant group difference was found in heart rate (Du, et al., 1992, Lim, et al., 1993).

4.2.2. Psychological Effects of Qigong

Results of the main phase showed that among the qigong subjects, all psychological indicators of well-being improved considerably right after 8 weeks of qigong practice. Ongoing effects were also found after a further four weeks of solely home practice. The results here are in accordance with other studies, which used relatively healthy volunteers and found that qigong intervention helps reduce anxiety and depressiveness (Li, 1999; Hu & Liu, 2008; Johansson & Hassmen, 2008). For group differences, the qigong group experienced better mood states and quality of life than the waitlist control groups after 12 weeks. Our findings replicated the results of another longitudinal study, which also employed a group of healthy people as waitlist control group and matched the two groups before comparisons (Griffith, et al., 2008). When comparing the mental performance between the qigong group and the psychology group, qigong subjects showed more improvement in stress, anxiety, and depressive levels than did the subjects in the psychology class. Regarding the conditions of quality of life in physical, spiritual/vitality, and overall aspects, the qigong participants were substantially better in these three areas than the psychology participants and there were further enhancements with four more weeks of home-practice. Our results corroborate the findings of a Korean study, which indicated that people with longer qigong training tend to have higher stress coping abilities as reflected by less depressiveness and anxiety symptoms (Lee, Ryu, et al., 2000).

4.2.2.1. Cognitive Behavioural and Distraction Theories

Cognitive behavioural theory suggests that visual imagery helps athletes to regulate emotions, keep focusing under pressure, and increase pain tolerance, which are essential for optimal performance. Qigong also requires the person to clear wandering thoughts and focus on here-and-now visual imagery (e.g., *qi*-circulation). As suggested by distraction theory, the cognitive based activity possibly temporarily distracts the subjects from daily stress and worries. To facilitate achieving the state of *ru jing* (入静; entering tranquillity) in "mind regulation," qigong practitioners commonly use positive autosuggestions (e.g., relax), which were also employed in our qigong program. Positive self-suggestions probably give support and speed up the healing process. The literature revealed that *qi* therapy significantly enhances the mental and emotional relaxation of patients with chronic fatigue syndrome. It brought them strength to overcome pain and fatigue (Yong & Lee, 2005). Studies have also shown that practicing qigong regularly brings improvement in psychological well-being, and physical ability, as well as relieving psychosomatic, and stress related disorders (Hui, et al., 2006; Lee, Kim, et al., 2000). Findings from the questionnaires indicated that after qigong training, a majority of the qigong trainees found that they experienced emotional relief, and a more relaxed mind with reduced stress, anxiety, and depressive mood. Physically, they generally (the majority) agreed they were more energetic and less tired after a short-term qigong program.

4.2.2.2. Social Interaction Theory

According to social interaction theory, satisfaction in social life is related to an increase in acceptance and positive mental health (Fu &Yang, 2005). Unfair judgement and poor performance in competitive sports (e.g., baseball) are likely to stimulate aggressiveness in athletes. Qigong is a non-competitive sport focusing on introspective awareness rather than comparison with others. Participants can enjoy sharing with companions during qigong practice. The leisurely and relaxed nature of qigong practice might have a beneficial impact on the personality and interpersonal functioning of an individual. From the narratives of the subjects, we ascertained that 22 (64.71%) qigong subjects agreed that group practice was beneficial to their social life. This included interaction and discussion with other group members and thus their social circle was expanded.

4.3. The Uniqueness and Value of this Study

4.3.1. Mindful Exercise and the Sedentary Population

Although a number of studies have demonstrated the positive value of physical exercise on body-mind well-being, attention given to mindful exercise in terms of research effort and public awareness is much less than that for aerobic exercise (Daley, 2002; Scully, Kremer, Meade, Graham, & Dudgeon, 1998). As compared with vigorous physical exercise, low-weight bearing qigong is a unique form of physiological activity that involves neuromuscular coordination, low velocity of muscle contraction, and low impact. It involves no jumping or vigorous movements and might thus be more attractive for those who prefer low intensity exercise. Previous studies in the sports field might not be able to capture this group of people. In spite of much evidence supporting the health benefits of physical activity, including mindful activity, some 56% of the Hong Kong population was found to lead a sedentary lifestyle (HKSDB, 2002). Qigong could be a major form of mindful exercise, which is more suitable for the Hong Kong population.

4.3.2. Style of Qigong

Among the 40 research studies, which were exported from different databases, there were five studies on *chan mi gong,* which were done in the 1990s in Mainland China (Du, et al., 1992; Hong, et al., 1990; Qu & Xu, 1992; Wang, et al., 1990; Zhang, Fu, & Zhao, 1990). Furthermore, no local or Western researchers have studied this style of qigong. Thus, there is no up to date data on this form of qigong. Moreover, all these five studies solely focused on physiological measurements, none measured stress, anxiety, or mental well-being. *Chan mi gong* consists of some specific spine movements, which distinguish it from other schools of qigong. Such movements are believed to be beneficial to both mental and physical health (Liu, 1989). Our study might provide more updated evidence on the latent effects of *chan mi gong* on body-mind well-being.

4.3.3. Research Design – Follow-up Assessment and Qualitative Information

Among those 40 research studies that studied different forms of qigong, only seven studies focused on emotional health and used both psychological and physiological outcome measures (Cheung, et al., 2005; Hu & Liu, 2008; Hui, et al., 2006; Lee, et al., 1997; Lee, Kang, Lim, et al., 2004; Lee, Lee, Kim, et al., 2003; Li, et al., 2002). Nevertheless, among them, only two were done locally (Cheung, et al., 2005; Hui, et al., 2006). No follow-up assessment was found in these two local studies, which weakened the convincing power of the ongoing effects of qigong. Our follow-up assessments on both psychological and physiological aspects further revealed whether qigong could still exert effects on the subjects over a longer period after the formal classes are finished.

From the perspective of research methodology, all 40 qigong research studies focused on quantitative data and few examined the qualitative narratives of the subjects. In this study, we tried to capture what changes or improvements the subjects had after the qigong program and we gathered some additional information about the perceived physical and mental benefits, as well as bodily feelings of *qi*. In both the pilot and main phases, we undertook short interviews with all 42 qigong subjects and supplemented these with three in-depth interviews to examine their personal experience and views. So far, to the best of our knowledge, follow-up narrative was not highlighted in published qigong studies. Our study focused on both qualitative and quantitative assessments and looked into the changes of three groups of subjects from the beginning to the follow-up session, which enabled us to investigate the effects of qigong in a more comprehensive manner than previous studies.

4.3.4. Feeling of *Qi* and Its Significance

The feeling of *qi*, which is a key element in qigong, was rarely mentioned in earlier studies and is difficult to be captured by standardized questionnaires. In fact, we gathered some valuable information through interviews and questionnaires about the subjective feelings of *qi* (e.g., itchy, warm, electric flow, etc.). Our findings also indicated that those who *de qi* (得氣; reach the *qi)* seemed to benefit more from qigong, especially on stress and heart rate reduction. As responding to what Cohen (1997) claimed that *de qi* is important in healing and treatment, our study is possibly the first to demonstrate that *de qi* probably catalyses the effectiveness of qigong in reducing stress and heart rate.

4.3.5. Significance of Gender and Practice Hours

It also seems that women subjects in qigong group react more obviously in terms of blood pressure regulation than men. In a recent study about the effect of qigong on mental hygiene in China, it is suggested that women are more suitable and more easily gain satisfaction when practicing moderate impact exercise, like qigong. However, men will benefit more and find higher satisfaction in doing more vigorous exercise to cultivate mental health (Zhai, 2006). Moreover, the findings of our comparisons between the “more practice” group and the “less practice” group are able to demonstrate that regular practice can be a factor that promotes the positive effects of qigong, especially on stabilizing the heart rate. The significance of gender and daily practice hours is rarely documented in the available literature.

4.3.6. Measuring Instruments

Regarding the physiological indicator of stress (i.e., cortisol), so far, only two Korean and one local study measured cortisol levels in plasma (Lee, Kang, Lim, et al., 2004; Lee, Lee, Kim, et al., 2003). As far as we know, we are the first (i.e. 2008) to attempt using saliva cortisol instead of plasma cortisol in the qigong research field. One benefit of using saliva is the less intrusive nature, which might create less stress to one who is afraid of needles. State arousal of stress due to needles and pain might pollute the DASS results. Moreover, our study is most likely the only one that measured the possible benefits of practicing *chan mi gong* in terms of both psychological and physiological indicators.

4.3.7. Preventive and Promotion Value

Among the five local qigong studies, only one recruited healthy volunteers, while the remaining four recruited elderly patients. One of our aims is to introduce a nonpharmacological modality, which can reduce stress and anxiety at an early stage among the general public before they develop more serious psychological problems (e.g., anxiety disorders). It is advocated that the traditional and old-fashioned presentation of qigong needs to be re-packaged with modernized elements (e.g., trendy sports clothing) if we want to promote it to a younger population that includes females and healthy individuals other than the elderly and patients with poor health (Tan & Tian, 2008a, 2008b). Modern yoga is an example of the successful integration of ancient mindful exercise into modern fitness concepts. The *Mindfit* exercise is a newly designed qigong protocol. Our study is a rather innovative trial in terms of developing a fashionable and comprehensive qigong protocol. We hope that it can meet the current fitness trend and workout structure. In fact, among the applicants who were interested in joining the qigong group, we did attract a group of young females. During practice, the instructors and participants commonly wore comfortable sports outfits as well.

Therefore, to the best of our knowledge, the present study is pioneering as it re-packaged Asian qigong exercise into a new step-wise workout structure and demonstrated possible benefits of reducing stress and anxiety. The effects of *chan mi gong* on body-mind well-being is firstly reviewed here based on self-report questionnaires and physiological data given by healthy volunteers collected from three major assessment points. A follow-up measurement was included to capture the ongoing changes in the qigong participants. Although, in our study, group differences between the psychology group and the qigong group were not significant in heart rate, it does not undermine the uniqueness and potential contribution of our study. In fact, with such a relatively small sample, it is not easy to have significant group differences. Nevertheless, in week 12, group comparisons between the qigong group and the waitlist control group indicated that the qigong group had a significantly better mood state, quality of life, and physiological wellness (including slower heart rate) than the waiting subjects. The subjective experience of the qigong trainees was also demonstrated here in a qualitative way. This study provided us with some substantial evidence about the potential effects of our new qigong protocol on well-being enhancement, thus worthy for promoting to the public.

4.4. Limitations of the Study

4.4.1. The Subjects and Generalizability

Besides the limitation of a small sample size, some subjects in the psychology group did not attend the follow-up assessment, which created more missing data in cortisol levels. The subjects were mainly recruited from the HK Polytechnic University, though they came from different walks of life (e.g., professors, students, homemakers, etc.). The female subjects out-numbered the male subjects in our study. The demographic characteristics (e.g., age) of the psychology group were quite different from the qigong group. It might be better if we could match the subjects and then allocate them into either group. All these limitations might affect the generalizability of the present findings.

4.4.2. Experimenter Effect

Although we tried to deal with the problem of placebo effect by introducing the second control group for comparison, we still faced the possibility of experimenter-expectancy effect. It is a form of reactivity, in which a researcher's cognitive bias causes him/her to unconsciously influence the participants of an experiment. Since the investigator has a dual role (i.e., researcher and workshop instructor) in this study, her unconscious bias might discount the internal validity of our results.

4.4.3. Psychology Group not Randomized

Moreover, it was not easy to get the approval from the community centre for recruiting their members to be our subjects in the psychology group. Due to their policy, we were not able to do randomization in the psychology group. It possibly discounted the reliability of the results of the comparisons between the qigong group and the psychology group. The results should be regarded as supplementary information and cited with care. Attention given and home assignments were not perfectly balanced between these two groups as well. Therefore, we suggest future studies to employ a double-blind experimental design with randomization to minimize the problems.

4.4.4. Statistical Analysis

Moreover, when investigating group effects between the psychology group and the qigong group, due to a significant difference in age, baseline values of DASS-A, ChQOL-P, etc., we needed to use the pre-test scores of these dependent variables as covariates. Therefore, instead of a single 2 (qigong and psychology groups) x 4 (times) x 3 (DASS-subscales) calculation, univariate analyses were used for variables of DASS and ChQOL. For comparisons between qigong group and waitlist group subjects, univariate analysis was also used in some outcome variables such as physiological indicators (i.e., cortisol, BP, and HR). Conducting multiple tests probably increased the probability of Type I error. Therefore, caution should be used when interpreting the findings.

4.4.5. The *Mindfit* Protocol

Furthermore, although the qigong protocol was assessed by an expert panel who agreed that it was suitable for people to practice, we did not have an objective assessment tool to indicate how much the sujects could master the exercise. Like other mindful exercises (e.g., yoga) and some sports (e.g., Karate), the performance of the athlete is commonly assessed by the experience of the master or coach. It is not common to use tools to evaluate this. "Mind regulation," "breath regulation," and "body regulation" are three key elements of qigong. Whether the participant can do well in these three aspects might have an effect on the outcome of body-mind well-being. The effects of qigong might be discounted if some subjects could not follow the protocol. To tackle this problem, we provided the qigong trainees with PowerPoint files and handouts for home practice. From our observations, at the beginning, some qigong trainees had difficulty in doing certain postures. After a few weeks, they were more accustomed to the protocol and showed much improvement. Nevertheless, 11 (32.35%) participants occasionally had difficulties in managing the techniques. It might be due to the sedentary lifestyle of the subjects before they joined this program. Therefore, even though we revised it once after our pilot phase, the level of difficulty should be further reduced if our *Mindfit* protocol is to be used again in future investigations. Moreover, a cross-sectional design comparing the veterans (e.g., practiced over two years) and the novices might allow us to better ascertain if the length of practice time is related to the effectiveness of qigong.

4.4.6. Influence of Social and Economic Events

From the subject recruitment in the pilot phase, to the last follow-up session in the main phase, the whole data collection period lasted more than a year (July 2008–October 2009). Within such a relatively long period of time, significant life events (e.g., economic crisis) could happen and might have an impact on the subjects. Therefore, if subjects of the intervention and control groups are recruited in different periods, the social and economic events they face can be quite different. It might decrease the homogeneity of the two groups, which is not desirable for statistical comparisons. For example, the pilot phase was implemented when the financial tsunami swamped the global economy during the second half of 2008. Nevertheless, we still managed to recruit subjects for both qigong and psychology groups and run the two workshops during the same eight weeks of time. Ideally, in the main phase, we should also recruit all subjects and run the workshops of both qigong and psychology groups during the same period to minimize varied influence by external factors (e.g., economic stability). However, due to different administrative and approval procedures of our university and the community centre, especially in the main phase, we could not recruit subjects of both the qigong and psychology groups at the same time, and we could not arrange qigong and psychology workshops to be implemented within exactly the same 8 weeks.

In the main phase, the psychology group was recruited and workshops were scheduled during the days (i.e., first half of 2009) of economic instability as reflected by a rapid decrease of stock market value. The qigong subjects were recruited in the spring of 2009 and the qigong program was carried out during that summer, unfortunately at that time, there was also an outbreak of human swine flu (H1N1) in Hong Kong. The possible impact of these external social and economic factors during different seasons might further decrease the homogeneity between the qigong group and the psychology group, and the willingness of subjects in participating in the group and assessments. Nevertheless, it does not discount the role of the psychology group in monitoring the placebo effect. Moreover, the subjects of the waitlist control group and the qigong group were from the same recruitment sample and then stratified for comparisons. The 8 weeks of qigong program and the waiting period fell within the same 2 months of time.

4.4.7. Limited Resources – the Physical Environment

We were advised that our qigong program should be conducted in the summer since classroom availability would be much better than during the class term. We tried to find a bigger classroom for the qigong group to have more space for exercising. More space might allow us to recruit more subjects to increase the sample size. However, the classroom that we used was already the biggest room in the department. In addition, we spent 12 weeks on the qigong group, 8 weeks on the make-up qigong class for the waitlist group, which was arranged right after the qigong group had finished all the four measurements. Therefore, the total time that our qigong practice lasted was 20 weeks, or almost 5 months. Due to a limited room supply, we could not extend the period any longer.

Moreover, the psychology course was scheduled in the evening; but our qigong class was arranged in the morning. The venues of the two classes were different as well. The psychology class was held in the community centre located in Wan Chai; while the qigong class was held in the HK Polytechnic University. However, on those four special days of data collection, we required the subjects of both groups to go to the same venue and at the same time slot in the morning. The purpose was to minimize the environmental variations (e.g., a.m., p.m.) that might affect the mood state or physical reactions (e.g., blood pressure) of the subjects. Another reason is that saliva collection should be done in the morning since cortisol level is at its highest right after waking up. Moreover, the two groups were encountered by the same group of personnel (e.g., nurse, laboratory assistant, and instructor) throughout the study period.

A similar arrangement also applied to the waitlist control group. In addition, the subjects were stratified and then allocated to either the waiting list or the qigong exercise list so as to minimize the variations in demographic backgrounds. The qigong class was also provided to the waitlist subjects after the four measure time-points so as not to disappoint them from learning the qigong exercise, and to minimize possible negative moods due to not being selected at the first round. Although our arrangement was not perfect, we still managed to have the psychology group maintain a similar intensity of attention (i.e., once a week) from the instructor as that of the qigong group.

4.4.8. Limited Resources – Labour & Money

Throughout the last four years, much effort and resources including time, workers, and money were used in both the pilot study and the main study. This project was a self-financed project, which means there was no funding from our university or any third party. Therefore, the investigator had to donate money to support all the expenses, which included but were not limited to purchasing of cortisol assay kits, blood pressure monitors, photocopying of questionnaires and hundreds of posters, conference attendance, etc. The nurse and the laboratory assistant are both volunteers and could not guarantee how long they could help during our study period. In fact, they also have their own jobs. Each cortisol analysis takes two full days to complete, which included quite a number of steps, sometimes it required a few hours between two steps. Therefore, the laboratory assistant had to spare his private time and did the analysis only on weekends. Every time, when we collected the data, the nurse and the laboratory assistant had to come repeatedly to help in collecting salivary samples, BP, and HR data at different times of assessment for the qigong, waitlist, and psychology groups, during the pilot and main study periods over the last few years of implementation.

It would be better to collect three or more salivary samples at different times in a day from a subject. Then we could have more reliable data on the physiological adjustment response during the day. However, we did not have enough money to purchase more cortisol kits. Moreover, the subjects would be requested to come back at three specified time in a day to provide salivary samples, which would be rather difficult to do especially for those who need to work. We could not afford extra manpower to stand by all day and collect the samples during the four measurement days as well. If we asked the subjects to collect samples three times at home by themselves and then bring back the samples, it could create much burden for them. Failure to follow the storage procedure (e.g. frozen in home freezer), forgetting to collect, inability to collect at specified time, poor handling during travel and inability to refrain from certain food and drinks throughout the whole day would further decrease the quality and quantity of samples collected. As mentioned in an earlier study, despite careful explanation and teaching about specimen collection, about 30% of the total subjects were not able to provide a useful salivary cortisol sample. Issues affecting the collection included the need for early morning arising, smoking and caffeine cessation, and daily routine modifications (Bay, Hagerty, Williams, & Kirsch, 2005). After considering the possible alternatives within limited resources, we collected the sample at one time in the morning. Therefore, with our limited data on salivary cortisol measures from a single daily collection, the effectiveness of qigong on reducing cortisol levels should be taken with care. Further sophisticated investigations are needed.

Moreover, as an incentive, if the subjects completed all the four assessments, s/he would be given a health report, which indicated his/her changes in heart rate, blood pressure, etc. at different measure time-points. Therefore, sometimes, within one Saturday morning, the investigators and the two helpers had to handle two to three groups of subjects for different tasks (e.g., training, explanation of reports, etc.). After each session, we also had to do the data input, laboratory work on saliva samples, and preparation of about one hundred health reports for all subjects. In addition, the investigator also had to teach qigong or psychology in each workshop throughout the whole study period. We thus were very exhausted and this might have decreased the quality of our performance. Therefore, hopefully, the promising results of this study could stimulate some interest in the field to invest more resources in investigating the effects of this ancient Chinese exercise so that the size and period of the qigong program can be increased.

4.4.9. The Measurement Tools

Since to date, no previous reference on the subjective assessment of *qi* feelings was available, our questionnaire about *qi* feelings is a preliminary exploration. The data collected were not analysed by sophisticated statistical calculations. It is also possible that the subjects would mix up normal feelings with *qi* feelings (e.g., warm heat). Though we were able to understand some ideas about *de qi* from them, sometimes it is rather difficult to collect such personal feelings by questionnaire. Therefore, the results about *de qi* and its significance are subject to further verification. Nevertheless, by using the questionnaires, we could still manage to collect feedback from all 34 qigong subjects regarding their changes after 12 weeks of qigong practice, individual experience of *qi,* and how *qi* manifested itself on the body (e.g., itchy) and the mind (e.g., inner peace). Hoping that, in future designs, a more systematic and representative tool can be formulated to capture the feelings of *qi,* which might be beneficial to the scientific study of qigong and to uncover the mysterious mask of the invisible *qi*. If more funding is available, we suggest future studies to include EEG measurements to detect the brain activities of the *de qi* state.

Though our study did not primarily adopt a qualitative approach, we used questionnaires for short semi-structured interviews with the 34 qigong subjects. We also selected one subject in the pilot phase and two subjects in the main phase for more in-depth interviews. Ideally, it would be better to do more than three in-depth interviews to gain more information for qualitative analysis. However, when labour was exhausted, time and room supply were very tight, and we could only do our best. The last day that we met the qigong subjects for follow-up interviews was the same day of the first make-up qigong lesson for the waitlist control group. The investigator and two helpers were too busy to handle two groups of people doing the training, interviews, collecting cortisol samples, administering different inventories (e.g., DASS-21) and explaining of health reports. Therefore, we could only manage to do few in-depth interviews and 34 short interviews. The *qi*-feelings and qigong experience can be very subjective and the available standardized inventory might not be able to measure. It is rare to have qigong studies that supplement quantitative data analysis with qualitative materials. Our information gathered from both short and in-depth interviews may, though very limited, add some detail to the field. For future studies, we suggest the integration of more individual interviews if more resources are available.

4.4.10. Experimental Design

One fundamental weakness of the experimental design is that we cannot control everything in social life. Since we did not conduct our study inside a laboratory or use animals as subjects, some extraneous factors could affect body-mind well-being like the qigong intervention. For example, family problems, health problems, job security, loss of money in the stock market, etc., could affect the mood states of the subjects to a great extent. In our study, we could only take certain demographic factors into account. For instance, subjects who had a history of smoking and alcoholic behaviour, previous mental problems, experience in mindful exercise, habits of doing exercise regularly, chronic health problems (e.g., heart disease), etc., were excluded from our study. The age, gender, and number of subjects were matched in the qigong and waitlist groups to minimize and balance out the potential influence of these factors on cognitive ability in learning the qigong protocol, physical strength when exercising, and especially on the physiological performance (e.g., blood pressure).

It is also suggested that the regulatory effect of qigong is not uni-directional (Zhang, Fu, & Zhao, 1990). The authors demonstrated that the practice of *chan mi gong* helped those who suffered from high blood pressure to decrease their blood pressure. On the other hand, the blood pressure could increase if one had low blood pressure. Cardiac arrhythmia could be alleviated as well. Therefore, qigong might help the body to achieve an equilibrium condition. In TCM, a balanced internal state is regarded as a healthy condition. In our study, the results of the comparisons of the relatively high blood pressure subjects provide some support to the regulative potential of *chan mi gong* as the blood pressure of high blood pressure qigong group resumed to a normal range after short-term qigong intervention. However, in our study, we did not employ patients with either hypertension or hypotension as was done by previous researchers. We were not able to replicate the possible bi-directional potentials of *chan mi gong* in regulating the blood pressure as demonstrated by the studies done in China in the 1990s. The number of subjects with relatively high blood pressure in our study was small as well. It might be due to the fact that we recruited subjects in relatively good healthy conditions. However, it is rare in local research to use healthy adults as the subjects. This further distinguishes our study from others.

Moreover, due to the limitations stated above, we could not extend the training for more than eight sessions and could only manage to have one follow-up measurement 4 weeks after the qigong classes ended. We tried to telephone the subjects 6 months after the program. Among those who could still be contacted, only one of them continued to practice our protocol. They stated that as the class no longer met, their motivation to practice gradually decreased. It was very difficult to be self-disciplined to keep regular practice. They commonly requested when the class will be held again. Therefore, we suggest future studies to extend the training for a longer period and to include more follow-up measurements (3-months and 6-months afterwards). It might maintain the interest of the participants and provide more information of the possible ongoing effects. Moreover, promoting this qigong exercise to the community can allow more people to benefit from it.

4.5. Suggestions for Further Study

Although physiological differences between the qigong group and the waitlist group occurred in week 8 of the qigong intervention, the psychological differences mainly occurred between 8 and 12 weeks. One possible reason might be that the physical body seems to react earlier than the mind. This was seldom demonstrated in previous studies, especially those that solely focused on physiological assessments. However, it is also likely that other factors happened after 8 weeks of the qigong program that helped to improve their mood and quality of life. For instance, as mentioned earlier, our qigong program was held during the most sensitive period of the human swine flu. Practicing exercise together with more than 30 participants in a rather crowded classroom might cause stressfulness and anxiety to some subjects. After 8 weeks of intensive training, when they did not have to come back for training regularly, the stress and anxiety levels might decrease. Therefore, in future studies, the qigong training can be extended to 12 weeks to see whether the promising results still exist.

Longitudinal or repeated measurement studies often have missing data, either by design or happenstance (e.g. subjects may miss appointments, drop out or be absent at follow-up). In our study, though we could manage to have all thirty-four qigong subjects, thirty-one waitlist subjects and thirty-four psychology subjects complete both the questionnaires and physiological measurements in all the four check-points, more than half of the subjects in the psychology group did not attend the salivary sample collection session in week 12. Future designs can use both A.M. (e.g. seminar session) and P.M. sessions (e.g. practice session) in a day to engage the participants for longer time so that salivary specimen collection can be enhanced and the number of collection times within a day can be increased. Alternatively, the number of collection can be extended to three or more times within an hour. Hair cortisol assessment is also a possible alternative option.

To compensate for the potential 15% dropout rate, the sample size was adjusted to be not less than 31 for each group. As a result, three out of thirty-four subjects (8.8%) of the waitlist control group dropped out in the middle of the study, which was less than our expected rate. However, we still could not avoid having missing data. For future studies with repeated measurements, GEE analysis might be more helpful when there is unbalanced or incomplete data. It takes the dropout into consideration. An intention to treat (ITT) analysis can also be used as it analyses every subject who is randomized at the beginning, regardless of subsequent withdrawal or noncompliance.

Furthermore, the psychology group outperformed themselves in the emotional aspect of quality of life (ChQOL-E) after 8 weeks of psychology training. The stress coping skills taught in the psychology class might also help in stress management. The waitlist control group, without qigong intervention, also experienced a reduced stress level and diastolic blood pressure in weeks 8 and 12; although, their mean heart rate increased considerably in week 12. Therefore, the effects of qigong on body-mind well-being of participants cannot concluded yet. A replication of this study with larger samples is needed prior to making conclusions regarding the effects of qigong on reducing stress, anxiety, and enhancing body-mind well-being. A double- blinded design might increase the validity and reliability of the findings. More sophisticated measurements of *qi* supplemented with qualitative analysis and increased follow-up checkpoints can possibly help us to understand qigong in a more comprehensive way. A cross-sectional study comparing veterans and novices might be meaningful to study the ongoing effects of qigong. Recruitment of subjects should be extended to the community to include more people with different socio-economic background, which might increase the generalizability of the results.

4.6. Conclusion

Our findings are in line with our hypothesized biopsychosocial model of qigong effects. They provide some feasible and efficacious data for the effectiveness of mindful exercise. The present findings suggest that qigong, despite its mysterious mask of *qi* and unique meridians theory, is suitable for people with different physical strengths; and helps in mood augmentation, especially on reducing stress, anxiety, and improving quality of life. We therefore propose qigong as an original mindful exercise that can meet the increasing demand of nonpharmacological modality and act as a complimentary therapy in achieving body-mind well-being for the general population. However, a small sample size, multiple statistical tests, age difference between groups, etc., might limit the generalizability of this study. Further sophisticated research designs are warranted to determine the possible therapeutic effects of qigong in reducing stress and anxiety, and ultimately enhancing mood states and body-mind well-being.

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Appendix 1: PAR-Q Inventory

體能活動適應 能力問卷 —PAR-Q (修訂版—2006 年)

體能活動適應能力問卷與你

（一份適用於 15 至 69 歲人士的問卷）

經常進行體能活動不但有益身心，而且樂趣無窮，因此，愈來愈多人開始每天多做運動。對大部分人來說，多做運動是很安全的。不過，有些人則應在增加運動量前，先行徵詢醫生的意見。

如果你計畫增加運動量，請先回答下列 7 條問題。如果你介乎 15 至 69 歲之間，這份體能活動適應能力問卷會告訴你應否在開始前諮詢醫生。如果你超過 69 歲及沒有經常運動，請徵詢醫生的意見。

普通常識是回答這些問題的最佳指引。請仔細閱讀下列問題，然後誠實回答：

請答「是」或「否」

是	否	
☐	☐	1. 醫生曾否說過你的心臟有問題，以及只可進行醫生建議的體能活動？
☐	☐	2. 你進行體能活動時會否感到胸口痛？
☐	☐	3. 過去一個月內，你曾否在沒有進行體能活動時也感到胸口痛？
☐	☐	4. 你曾否因感到暈眩而失去平衡，或曾否失去知覺？
☐	☐	5. 你的骨胳或關節(例如脊骨、膝蓋或髖關節)是否有毛病，且會因改變體能活動而惡化？
☐	☐	6. 醫生現時是否有開血壓或心臟藥物（例如 water pills）給你服用？
☐	☐	7. 是否有其他理由令你不應進行體能活動？

如果你的答案是：

一條或以上答「是」

在開始增加運動量或進行體能評估前，請先致電或親身與醫生商談，告知醫生這份問卷，以及你回答「是」的問題。

- 你可以進行任何活動，但須在開始時慢慢進行，然後逐漸增加活動量；又或你只可進行一些安全的活動。告訴醫生你希望參加的活動及聽從他的意見。
- 找出一些安全及有益健康的社區活動。

全部答「否」

如果你對這份問卷的全部問題誠實地答「否」，你有理由確信你可以：

- 開始增加運動量——開始時慢慢進行，然後逐漸增加，這是最安全和最容易的方法。
- 參加體能評估——這是一種確定你基本體能的好方法，以便你擬定最佳的運動計畫。此外，亦主張你量度血壓；如果讀數超過 144/94，請先徵詢醫生的意見，然後才逐漸增加運動量。

→

延遲增加運動量：

- 如果你因傷風或發燒等暫時性疾病而感到不適——請在康復後才增加運動量；或
- 如果你懷孕或可能懷孕——請先徵詢醫生的意見，然後才決定是否增加運動量。

請注意：如因健康狀況轉變，致使你隨後須回答「是」的話，便應告知醫生或健身教練，看看應否更改你的體能活動計畫。

適當使用體能活動適應能力問卷：

The Canadian Society for Exercise Physiology、Health Canada 及其代理人毋須為進行體能活動的人承擔責任。如填妥問卷後有疑問，請先徵詢醫生的意見，然後才進行體能活動。

不得更改問卷內容。歡迎複印整份問卷(必須整份填寫)

注：　如一名人士在參加體能活動或進行體能評估前已獲得這份問卷，本部分可作法律或行政用途。

本人已閱悉、明白並填妥本問卷。本人的問題亦已得到圓滿解答。

姓名 ______________________________ 身份證明文件號碼 ________

____

簽署 __________ 日期 ______________________________

備註：

如果在上述問卷中有一個或以上「是」的答案，即表示參加者的身體狀況可能不適合參加有關活動。故為其安全起見，參加者請先行諮詢醫生的意見；並須在報名時出示醫生紙，證明其身體狀況適宜參加有關活動。如未能出示醫生紙，參加者須填妥「申請人聲明」，並于報名時連同報名表一併遞交。

此問卷由填寫當天起計 12 個月內有效。如因健康狀況轉變，致使你隨後對上述的任何問題答「是」的話，則本問卷即告無效。

Appendix 2: Life Style & Body-mind Health Questionnaire
生活模式與身心健康問卷

1. Did you consult a psychiatric practitioner during the past 12 months?
   Yes/ No

   在過去 12 個月內，你曾否向精神科醫生求診?
   是 / 否

   If your answer is "Yes", please specify the problem(s) which lead you to the consultation

   ____

   若你答 "是", 請列明求診因由

   ____

2. Did you need to take psychiatric medication (e.g. anti-depressants, tranquillizers, etc.) during the past 6 months?

   Yes/ No

   在過去 6 個月內，你是否需要服食精神科藥物 (如: 抗抑鬱藥、鎮靜劑等)?
   是 / 否

   If your answer is "Yes", please indicate the name/ type / function of the drugs

   ____

   若你答 "是", 請列明藥物名稱/種類/用途

   ____

3. Besides psychiatric drugs, do you need to regularly take other kinds of medication (e.g. drugs for hypertension, diabetes, heart problem etc.) ?
Yes/ No

除精神科藥物外，你是否需要長期服食其他藥物 (如: 血壓藥、糖尿藥、心臟藥等)?
是 / 否

If your answer is "Yes", please indicate the name/ type / function of the drugs

____

若你答"是"， 請列明藥物名稱/種類/用途

____

4. Have you ever learned certain kinds of mindful exercise or relaxation techniques (e.g qigong, yoga, tai chi, meditation, self-hypnosis, etc.?
Yes/ No

你是否曾學習/修鍊某些心靈/養生運動或身心鬆弛技巧 (如: 氣功、瑜珈、靜坐冥想、自我催眠等)?
是 / 否

If you answer is "Yes", what is/are the exercise(s)/ technique(s)?

____

若你答"是"， 請列出是哪種運動/技巧?

____

When did you start learning that exercise or technique?

____

哪是何時開始學習/修鍊的?

____

5. Are you regularly practicing some kinds of mindful exercise or relaxation techniques?
   Yes/ No

   你現在是否仍恆常地學習/修鍊心靈/養生運動或身心鬆弛技巧?
   是 / 否

   If you answer is “Yes”, what is/are the exercise(s)/ technique(s)?

   ____

   若你答“是”, 請列出是哪種運動/技巧?

   ____

6. Do you smoke?
   Yes/No

   你是否有吸煙的習慣?
   是 / 否

7. Are you pregnant or may be pregnant?
   Yes/No

   你現在是否懷孕或可能懷孕?
   是 / 否

8. During the last week, on average, how many hours did you sleep on **each day**?

   在過去一星期內，你<u>每天</u>平均睡眠時間是多少?
   ___________hours/小時

9. During the last week, where did you spend most during your leisure time?

在過去一星期內，你的餘暇活動多集中在哪些地方?

( ) Air-conditioned indoor environment (e.g. plaza, gymnasium) 有空調的室內地方 (如: 商場, 健身室)

( ) Outdoor environment in cities (e.g. streets, market) 鬧市的户外地方 (如: 街道, 市集)

( ) Outdoor environment in country-side (e.g country park) 郊外的户外地方 (如: 郊野公園)

( ) Home 家裡

( ) Others 其他 __________________ (Please specify 請列明)

10. During the last week, how many hours **<u>in total</u>** did you spend with your friends and/or relatives?

在過去一星期內，你跟朋友及/或家人的相聚時間<u>總共</u>約多少?

( ) Less than 5 hours (少於 5 小時)

( ) 5 – 10 hours (小時)

( ) 11 – 15 hours (小時)

( ) 16 hours / more (16 小時/以上)

11. During the last week, how many days **<u>in total</u>** did you have breakfast?

在過去一星期內，你<u>總共</u>有多少天有進食早餐?

( ) none(完全沒有)

( ) 1 - 2 days (日)

( ) 3 – 4 days (日)

( ) 5 – 7 days (日)

12. During the last week, on average, what is the proportion of vegetable in each of your dinner?

在過去一星期內，在你每份晚餐中，蔬菜所佔的份量平均是多少?

( ) less than 1/3 (少於 1/3)

( ) 1/2

( ) 2/3

( ) 3/3

Appendix 3 : Depression Anxiety & Stress Scales 21-item version

DASS21

Name: *Date:*

The content of this questionnaire is mainly base on English, Chinese translation is for reference only.

此問卷內容以英文為主，中文解釋只作輔助用途。

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

請小心閱讀以下每一個句子，並在其右方圈上一數字，表示「過往一個星期」如何適用於你。

答案並無對錯之分。請不要花太多時間在某一句子上。

The rating scale is as follows:

0 Did not apply to me at all 0＝不適用
1 Applied to me to some degree, or some of the time 1＝頗適用，或間中適用
2 Applied to me to a considerable degree, or a good part of time 2＝很適用，或經常適用
3 Applied to me very much, or most of the time 3＝最適用，或常常適用

1	I found it hard to wind down 我覺得很難讓自己安靜下來	0	1	2	3
2	I was aware of dryness of my mouth 我感到口乾	0	1	2	3
3	I couldn't seem to experience any positive feeling at all 我好像不能再有任何愉快、舒暢的感覺	0	1	2	3
4	I experienced breathing difficulty (eg, excessively rapid breathing,breathlessness in the absence of physical exertion) 我感到呼吸困難（如:不是做運動時也感到氣促或透不過氣來）	0	1	2	3
5	I found it difficult to work up the initiative to do things 我感到很難自動去開始工作	0	1	2	3
6	I tended to over-react to situations 我對事情往往作出過敏反應	0	1	2	3
7	I experienced trembling (e.g. in the hands) 我感到顫抖（例如手震）	0	1	2	3

8	I felt that I was using a lot of nervous energy 我覺得自己消耗很多精神	0	1	2	3
9	I was worried about situations in which I might panic and make a fool of myself 我憂慮一些令自己恐慌或出醜的場合	0	1	2	3
10	I felt that I had nothing to look forward to 我覺得自己對將來沒有甚麼可盼望	0	1	2	3
11	I found myself getting agitated 我感到忐忑不安	0	1	2	3
12	I found it difficult to relax 我感到很難放鬆自己	0	1	2	3
13	I felt down-hearted and blue 我感到憂鬱沮喪	0	1	2	3
14	I was intolerant of anything that kept me from getting on with what I was doing 我無法容忍任何阻礙我繼續工作的事情	0	1	2	3
15	I felt I was close to panic 我感到快要恐慌了	0	1	2	3
16	I was unable to become enthusiastic about anything 我對任何事也不能熱衷	0	1	2	3
17	I felt I wasn't worth much as a person 我覺得自己不怎麼配做人	0	1	2	3
18	I felt that I was rather touchy 我發覺自己很容易被觸怒	0	1	2	3
19	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat) 我察覺自己在沒有明顯的體力勞動時，也感到心律不正常	0	1	2	3
20	I felt scared without any good reason 我無緣無故地感到害怕	0	1	2	3
21	I felt that life was meaningless 我感到生命毫無意義	0	1	2	3

Appendix 4 : Chinese Quality of Life Instrument (ChQOL)
中華生活質素問卷

Name: ____________________
Date:

ChQOL (HK) 2007

【指示】

我們想利用這份問卷瞭解你的生活質素。生活質素是指你對生活各方面的評價和感受，包括你的健康狀況、身體功能和情緒等。我們想知的是你最近兩星期的感受。請按照你自己的標準和個人期望來回答。如果你對某個問題沒有肯定的答案，請選擇一個最接近的答案。請回答所有問題。

這份問卷以被訪者親自填寫的方式進行，每個問題下面列有五個選項，由"最不好"到"最好"排列，你要在五個選項中選出最能反映你真實感受的一個，然後在格內劃上「..」號。

例題：

1. 你胃口好?
☐很差 ☐差 ☐不差也不好 ☐好 ☐很好

請你根據<u>最近兩星期</u>的情況在最適合的方格內劃上「√」號。

2. 你生活快樂嗎？
☐不快樂 ☐有點快樂 ☐某程度快樂 ☐很大程度快樂 ☐極快樂

快樂屬於個人感受，每個人對快樂的定義可能不同，你只需根據自己對快樂的理解和標準作答。以上五個選項中，你覺得哪一個最能代表你在<u>最近兩星期</u>的感受？請在適當的 方格內劃上「√」號。

1. 你面色好嗎？

☐ 很 差　☐ 差　☐ 不 差 也 不 好　☐ 好　☐ 很 好

2. 你面色光亮潤澤嗎？

☐沒有光亮潤澤 ☐有點光亮潤澤 ☐某程度有光亮潤澤 ☐很大程度有光亮潤澤 ☐極有光亮潤澤

3. 你口唇顏色好嗎？

☐ 很 差　☐ 差　☐ 不 差 也 不 好　☐ 好　☐ 很 好

4. 你口唇潤澤嗎？

☐不潤澤 ☐有點潤澤 ☐某程度潤澤 ☐很大程度潤澤 ☐極潤澤

5. 你有失眠嗎？（指不易入睡、睡後易醒、或整夜難眠）

☐從來沒有 ☐很少有 ☐有時有 ☐很多時有 ☐不停有

6. 做夢影響你的睡眠質素嗎？

☐不影響 ☐有點影響 ☐某程度影響 ☐很大程度影響 ☐極影響

7. 你睡得好嗎？

☐ 很 差　☐ 差　☐ 不 差 也 不 好　☐ 好　☐ 很 好

8. 你走路腳步輕鬆嗎？

☐不輕鬆 ☐有點輕鬆 ☐某程度輕鬆 ☐很大程度輕鬆 ☐極輕鬆

9. 你容易疲倦嗎？

☐不容易 ☐有點容易 ☐某程度容易 ☐很大程度容易 ☐極容易

10. 你經常四肢乏力嗎？

☐從來沒有 ☐很少有 ☐有時有 ☐很多時有 ☐不停有

11. 你經常精力充沛嗎？

☐從來沒有 ☐很少有 ☐有時有 ☐很多時有 ☐不停有

12. 你經常力不從心嗎？（指心裏想做某事，但精神或體力不足）

☐從來沒有 ☐很少有 ☐有時有 ☐很多時有 ☐不停有

13. 你容易上氣不接下氣嗎？

☐不容易 ☐有點容易 ☐某程度容易 ☐很大程度容易 ☐極容易

14. 你經常食而無味嗎？（指覺得任何食物都沒有味道）

☐從來沒有 ☐很少有 ☐有時有 ☐很多時有 ☐不停有

15. 你經常消化不良嗎？

☐從來沒有 ☐很少有 ☐有時有 ☐很多時有 ☐不停有

16. 你食量正常嗎？
□不正常 □有點正常 □某程度正常 □很大程度正常 □完全正常

17. 你胃口好嗎？
□ 很 差 □ 差 □ 不 差 也 不 好 □ 好 □ 很 好

18. 你能夠適應季節的改變嗎？
□不能夠 □稍為能夠 □某程度能夠 □很大程度能夠 □完全能夠

19. 氣候變化對你的身體有影響嗎？
□不影響 □有點影響 □某程度影響 □很大程度影響 □極影響

20. 你的病情/身體狀況經常隨著早晚時間而改變嗎？
□ 從 來 沒 有 □ 很 少 有 □ 有 時 有 □ 很 多 時 有 □ 不 停 有

21. 你頭腦清醒嗎？
□不清醒 □有點清醒 □某程度清醒 □很大程度清醒 □極清醒

22. 你對外界能作出適當反應嗎？
□不能夠 □稍為能夠 □某程度能夠 □很大程度能夠 □完全能夠

23. 你能集中精神嗎？
□不能夠 □稍為能夠 □某程度能夠 □很大程度能夠 □完全能夠

24. 你記憶力好嗎？
□ 很 差 □ 差 □ 不 差 也 不 好 □ 好 □ 很 好

25. 你反應快嗎？
□ 不 快 □ 有 點 快 □ 某 程 度 快 □ 很 大 程 度 快 □ 極 快

26. 你思路清楚嗎？
□不清楚 □有點清楚 □某程度清楚 □很大程度清楚 □極清楚

27. 你思考周詳嗎？
☐不周詳 ☐有點周詳 ☐某程度周詳 ☐很大程度周詳 ☐極周詳

28. 你思維敏捷嗎？
☐不敏捷 ☐有點敏捷 ☐某程度敏捷 ☐很大程度敏捷 ☐極敏捷

29. 你目光有神嗎？
☐沒有神 ☐有點神 ☐某程度有神 ☐很大程度有神 ☐極有神

30. 你眼睛靈活嗎？
☐不靈活 ☐有點靈活 ☐某程度靈活 ☐很大程度靈活 ☐極靈活

31. 你說話發音清晰嗎？
☐不清晰 ☐有點清晰 ☐某程度清晰 ☐很大程度清晰 ☐極清晰

32. 你能用說話表達自己的想法嗎？
☐不能夠 ☐稍為能夠 ☐某程度能夠 ☐很大程度能夠 ☐完全能夠

33. 你心情愉快嗎？
☐不愉快 ☐有點愉快 ☐某程度愉快 ☐很大程度愉快 ☐極愉快

34. 你生活快樂嗎？
☐不快樂 ☐有點快樂 ☐某程度快樂 ☐很大程度快樂 ☐極快樂

35. 你心情平靜嗎？
☐不平靜 ☐有點平靜 ☐某程度平靜 ☐很大程度平靜 ☐極平靜

36. 你生活有樂趣嗎？
☐沒有樂趣 ☐有點樂趣 ☐某程度有樂趣 ☐很大程度有樂趣 ☐極有樂趣

37. 你容易心煩嗎？
☐不容易 ☐有點容易 ☐某程度容易 ☐很大程度容易 ☐極容易

38. 你容易發怒嗎？
☐不容易 ☐有點容易 ☐某程度容易 ☐很大程度容易 ☐極容易

39. 你容易急躁嗎？
☐不容易 ☐有點容易 ☐某程度容易 ☐很大程度容易 ☐極容易

40. 你經常暴躁嗎？
☐從來沒有 ☐很少有 ☐有時有 ☐很多時有 ☐不停有

41. 你能夠控制自己的情緒嗎？
☐不能夠 ☐稍為能夠 ☐某程度能夠 ☐很大程度能夠 ☐完全能夠

42. 你凡事擔心嗎？
☐不擔心 ☐有點擔心 ☐某程度擔心 ☐很大程度擔心 ☐極擔心

43. 你經常感到悲傷嗎？
☐從來沒有 ☐很少有 ☐有時有 ☐很多時有 ☐不停有

44. 你經常絕望無助嗎？
☐從來沒有 ☐很少有 ☐有時有 ☐很多時有 ☐不停有

45. 你經常悶悶不樂嗎？
☐從來沒有 ☐很少有 ☐有時有 ☐很多時有 ☐不停有

46. 你經常想大哭一場嗎？
☐從來沒有 ☐很少有 ☐有時有 ☐很多時有 ☐不停有

47. 你經常憂愁嗎？
☐從來沒有 ☐很少有 ☐有時有 ☐很多時有 ☐不停有

48. 你經常無緣無故恐懼嗎？
☐從來沒有 ☐很少有 ☐有時有 ☐很多時有 ☐不停有

49. 你經常缺乏安全感嗎？
☐從來沒有 ☐很少有 ☐有時有 ☐很多時有 ☐不停有

50. 你容易受驚嗎？
☐不容易 ☐有點容易 ☐某程度容易 ☐很大程度容易 ☐極容易

---- 完 ----

Appendix 5: *Mindfit* Exercise Program Evaluation Form

Mindfit Exercise 課程評估表

您的姓名 ：_____________________ (可隨意選擇是否填寫)

I. 您的個人體會:

經過 8 星期的練習後，您覺得身體功能及心理狀況有哪些改善?

	十分同意	同意	不同意	十分不同意	無意見
情緒得到舒緩					
專注力得到提高					
生活壓力得到舒緩					
焦慮感減少					
抑鬱的心境得到緩解					
肌肉和關節都能放鬆					
肌肉和關節較以往靈活					
精神和心境都能放鬆					
感覺充滿活力、不易疲倦					
感覺輕鬆、年輕了					
社交生活豐富了					
睡眠質素得到改善 (e.g. 較易入睡、一覺瞓天光)					

您還有哪些方面得到改善? (e.g. 手腳冰冷減少、精神咗、身型改善、氣息改善、心情開朗 等)

____

____

在練習期間曾否遇以下困難?

	沒有發生	間中發生	常常發生	無意見
沒有時間在家中練習				
難於掌握技巧				
家中環境嘈雜、不易集中				
對整套運動沒有興趣				

您還有哪些方面遇到困難?

____

II.　對導師的評估:

您會怎樣評估本課程的導師在以下各項的表現 ：

	十分同意	同意	不同意	十分不同意	無意見
對身心運動富認識					
清　講述技巧					
積極回應學員提問					
教學態度認真					
充足的準備功夫					
儀表大方得體					
待人親切友善					
能照顧每位學員					
其他義務人員能照顧您的需要					

您最欣賞導師或工作人員的地方是:

____

____

您認為導師或工作人員可改善的地方是:

____

III. 對課程內容的評估:

您會怎樣評估本課程的教學內容 ：

	十分同意	同意	不同意	十分不同意	無意見
講義清　而詳盡					
講義內容易於明白					
講義中的英文指引易於明白					
講義中圖片有助理解					
講義中的中文指引足夠					
講義有助您在家中練習					
課程內容趨時及有新意					
日誌表有助監察在家練習的時間和身體狀況					
運動技巧難度恰當					
課程節數(8 節)長短恰當					
上課環境舒適					
上課時段 (星期六上午)恰當					

您最欣賞本課程的哪些內容是:

您認為本課程的內容可加插、刪減或改善的地方是:

IV. 對各項檢測的評估:

您會怎樣評估本課程的各項檢測內容 ：

	十分同意	同意	不同意	十分不同意	無意見
檢測程序有條理					
兩份檢測問卷長度適中					
兩份檢測問卷題目易於明白					
兩份檢測問易於填寫					
收集唾液方法容易掌握					
檢測報告內容充份					
檢測報告能令您更了解及關注自己的身心狀態					

您最有興趣的檢測內容是: (問卷、唾液檢測、血壓)

您認為各項檢測的內容可加插、刪減或改善的地方是:

您還有些什麼寶貴的意見?

您曾否感覺到「氣感」的存在 :(合適答案加『√』)

完全沒感覺	感覺不太明顯	中間	感覺明顯	感覺十分明顯

您曾有以下的「氣感」嗎? (可選多項)

	有的加『√』	身體部份 (圈出合適答案, 可選多項)
漲		手掌 / 丹田 / 全身 / 其他 ____________
痲		
温熱		
癢		
輕		
重		
涼		
氣體遊動感		
電流通過感		
蟻行感		
緊縮感		
心情恬靜		
虛空		
幸福感		
內在喜悅		
天人合一		
時間、空間感消失		
其地 (請列明)		

個人資料:
您的學歷 : 小學或以下 ( ) 中學 ( ) 大學 ( )
其他 ( )

總括而言，您對本課程的整體感覺是 :

十分滿意	滿意	滿意	十分 滿意

謝謝您 !

Appendix 6 : *Mindfit* Exercise Protocol Evaluation form for Expert Panel

***MINDFIT* EXERCISE TO REDUCE STRESS, ANXIETY AND IMPROVE MIND-BODY WELL-BEING**

BACKGROUND

Our study aims at investigating the effectiveness of mindful exercise (心靈運動) on the psychological and social well-being of people suffering from medium to high level of anxiety features. We have developed an innovative mind-body intervention protocol which is named "*Mindfit Exercise*". It consists of the therapeutic elements of qigong, yoga and progressive muscle relaxation exercises. The qigong part of this protocol is main composed of *ba duan qin* (八段錦) and *chan mi qi*-spine exercise (脊髓功). Qigong, which is a traditional exercise for *yang sheng* (養生) and *bao jian* (保健), relies on its unique principles of *tiao xin* (調心), *tiao shen* (調身) and *tiao xi* (調息). Literature has shown its effectiveness in reducing anxiety and depression and improving mind-body well-being. In this protocol, self *qi*-massaging, *qi*-yogic body alignment, cool-down postures in different positions (i.e. sitting, standing, supine & prone) are included. Progressive muscle relaxation is also integrated into it so as to maximize its relaxation effect.

As an expert in the field, you are required to watch the powerpoint which presents the protocol of the "*Mindfit Exercise*" and fill in the following 45-item questionnaire which taps your opinion on different aspects of the protocol. If you choose '1' (not at all) or '2' (fairly) in any of the following items, please give your valuable comment for us to improve this protocol. With your input, we will further refine the protocol before it is put into another stage of clinical test.

No.	Statement	Not at all	Fairly	Average	Much	Very much	Don't know	Comment to improve this item
	Biological Aspect	1	2	3	4	5	0	
1.	This protocol enforces "deep and slow" breathing pattern in a natural way.							
2.	The practice of diaphragmatic breathing improves ventilation efficiency for oxygen uptake and carbon dioxide production.							
3.	This protocol enables the participants to develop a sense of control over their breathing.							
4.	This protocol enhances cardiac parasympathetic tone, thus improves heart regulation							
5.	This protocol helps stabilize blood pressure.							
6.	This protocol leads to a decrease in respiratory rate and metabolic rate.							
7.	This protocol enforces coordination between respiration and movements (i.e., inspiration coordinates with trunk extension; expiration coordinates with trunk bending)							
8.	This protocol is a physical exercise enhancing the physical balance through isotonic and isometric slow motions.							
9.	This protocol promotes functional mobility and balance by stimulating & aligning the spine.							
10.	The postures of this protocol enforce adequate stretching to muscles and soft tissue of the trunk, neck and upper limbs.							
11.	The massaging part of the protocol enforces adequate massage to internal organs, different parts of the head, neck and shoulder..							
12.	This protocol helps regulate neurohormonal system and reduce the level of stress hormones (e.g. cortisol).							
13.	This protocol stabilizes the sympathetic nervous system.							

14.	This protocol helps strengthen immune system.							
15.	This protocol helps reduce the feeling of fatigue.							
16.	From the TCM (中醫) perspective, the qigong protocol can promote good health through the practice of reciprocal movements which are essential to the balance of "ying" (陰) and "yang" (陽), that is : - bending versus extending, - breathing in versus breathing out, - movements versus relaxed posture, etc. of the qigong, etc.							
17.	From the TCM perspective, the movements of the qigong stimulate acupoints of the body (穴位) and then enforce the flow of *qi* within the meridian system (經脈系統), which is essential to physical well-being.							
18.	Please indicate if there are any biological benefits that are not covered in above items.							
	Psychological Aspect	1	2	3	4	5	0	Comments
19.	This protocol facilitates participants to relax emotional irritability and develop peaceful mind.							
20.	This protocol facilitates participants to concentrate their mind.							
21.	The progressive muscle relaxation part facilitates participants to relieve unpleasant feelings, e.g. anxiety, stress, depressed moods.							
22.	This protocol helps relief symptoms of depression.							
23.	This protocol facilitates participants to develop confidence to deal with their emotions, especially anxiety.							
24.	The meditation part serves as a							

		1	2	3	4	5	0	Comments
	stabilizing agent for mental health by decreasing practitioners' neuroticism.							
25.	The breathing and meditative part of this protocol helps to relax and increase alpha-wave.							
26.	This protocol helps improve the quality of sleep.							
27.	This protocol can achieve the same effect as the other breathing and relaxation exercises commonly used in mood regulation and stabilization.							
28.	Please indicate if there are any psychological benefits that are not covered in above items.							
	Social Aspect	1	2	3	4	5	0	Comments
29.	As this protocol is a culturally relevant activity, the participants of our community would be interested in engaging in the activity.							
30.	Group practice of this protocol under relaxing environment promotes more social contacts among participants.							
31.	Group practice helps promote sociability of the participants.							
32.	Group practice helps promoting participant's self-efficacy in social life.							
33.	Increased interpersonal communications during practice enables more extrovert and friendliness personality of the participant.							
34.	Please indicate if there are any social benefits that are not covered in above items.							
	Learning material & Context	1	2	3	4	5	0	Comments
35.	The participants should have no difficulty in learning the qigong as the contents of the self-learning powerpoint manual is easily understood.							

36.	The participants should have no difficulty in learning the qigong as the design of the self-learning powerpoint manual is user friendly.							
37.	The participants should have no difficulty in learning the qigong, as there are at least fourteen 75-min training sessions under the supervision of a well-trained coach besides the self-learning material,.							
38.	The participants should have no difficulty in learning the qigong as the training sessions give adequate feedback specific to individual performance.							
39.	The participants should have adequate confidence to comply to the qigong protocol as the protocol can be adapted to activity tolerance of each individual.							
40.	The participants should have adequate confidence to comply with the protocol as there is detailed information related to formulating a daily training schedule.							
41.	The participants should have adequate confidence to comply to the protocol as it can be practiced within the home environment; even if the environment is not spacious.							
42.	The participants should have adequate confidence to comply with the protocol as it covers adequate precautions to guard against any potential harm or injury.							
43.	The health conditions of the participants are being adequately monitored as they are required to check the pulse rate and blood pressure during each practice lesson.							
44.	The protocol is suitable for physically healthy people with medium to high level of anxiety to practice.							

45.	Please advice if you have any other comments to improve the learning material and context of this protocol.

For analysis purposes please kindly assist to leave your particulars.

Name : Dr./Mr./Ms./Miss ________________________

Professional (listed in alphabetical order); can tick more than one -

( ) Medical doctor
( ) Occupational Therapist
( ) Psychiatrist
( ) Psychologist [clinical /health/sports/others ____________ (please select/specify)]
( ) Qigong master
( ) Sports Coach
( ) TCM practitioner (中醫師)
( ) Other experts ____________________ (please specify)

Years of practice in your professional field : __________________________________

Are you a certified practitioner in your field? ________ Yes ___________ No

Contact details:
Telephone :_______________________ (office); __________________________ (mobile)

Email: ____

Postal address :____

____

____

Should you have other questions and comments, please feel free to contact the following persons at The Hong Kong Polytechnic University:

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Thanks a lot for your valuable comments.

Appendix 7: Summary of 40 Qigong Studies (1950-2009)

Author(s)	Year	Country	Intervention			Subjects		control gp	Follow-up	Psychologic measures (self-report Q)	Physiological measures	Results
				Period	patient or normal people	# subj Qg gp	mean age(SD)		effect			
Sun, Lei, et al.	1989	PR China	Zhanzhuang gong, meditative qg	cross-sec & longitudinal (after 6mth)	NP elderly Qi-trainees train 2yr+	C-S: 48(32M:16F) L-T :19 (12M:7F)	62.65(5.92) 66.63y(7.07)	C-S:Y (RCT) L-T : N	Y (6 mth)		EEG, STM, concentration, cognitive flexibility	C-S: Qg gp↑STM, speed, ↓mental age1.62yr than control L-T: ↑STM, speed, ↓mental age1.32yr after 6mth qigong
Liu, Jiao, et al.	1989	PR China	Xingshenzhuang qigong	1 mth	P with chronic physical illness (e.g. cardiac)	68(44M:24F)	48	N	N	-	5-HT, dopamine (DA), nonepinephrine(NE)	↓5-HT; ↑DA & NE
Wang, Hong, et al.	1990	PR China	Chan mi gong	20 dy	NP & P w/ high BP, heart disease, etc.	50 (38M:12F)	47.10	N	N	-	blood volume, rheoencephalogram	sign↑ elasticity & resistance of blood vessels
Hong, Tao, et al.	1990	PR China	Chan mi gong	20 dy	NP practice Qg for at least 1 yr	15	-	Y	N	-	cerebral blood flow to brain, immune function	Qg gp improve sign in immunogenicity & microcirculation
Zhang, Fu,et al.	1990	PR China	Chan mi gong	10 dy	P with high & low BP	120	-	N	N	-	HR, BP, BMR	sign improve in BP & BMR, ↓HR
Qu & Xu	1992	PR China	Chan mi gong	3 mth	NP university students	20	-	N	N	memory & attention task, etc.	-	sign improve in memory & cognitive ability
Du, Zhang, et al.	1992	PR China	Chan mi gong	b/a 30 min	NP practice Qg for 2.83 ± 1.79 yrs	28 (24M:4F)	59.89 (7.05)	Y	N	-	HR, BP, cardic output, blood	Qg gp improve sign in cardic functions

											volume ,etc.	
Lim, Boone, Flarity, et al	1993	USA	-not specified	10 dy	NP college students	10 (5M:5F)	-	N	N	-	HR, oxygen uptake, CO2 produce	not sign decrease HR; sign decrease in respiratory exchange
Tang, Wei, Zhang, et al.	1995	PR China	Xiang gong/ Yangshen qg/Zhineng qg/He Xiang qg/ Dayan qg	longitudinal (2m-2y)	NP Qi-trainees 2m- 2y; middle age adult & young Univ. sdt	20(6M:14F);45(12M:33F)	52.3(8.8);19.0(1.1)	Y	Y	neutroticism, extroversion	-	↓neuroticism, ↑extroversion
Lee, Bae, Ryu, et al.	1997	Korea	ChunDoSunBup	b/a 60 min	NP Qi-trainees 1-3yrs	13(7M:6F)	25	N	N	state anxiety level	EEG	sign↓state anxiety & activation coefficinets after practice Qg
Lee, Jeong, Oh, et al.	1998	Korea	ChunDoSunBup	cross-sec	NP Qi-trainees train 1 to over13 mths	41	20.98 (5.39)	N	N	emotional distress, Symtom Chek List-90R	-	Qg -ve relate to all subscales but phobic anxiety not
Li	1999	PR China	Ru yi lun jin gang fa	cross-sec	NP university std train Qg 1yr+	430(268M:162F)	20(1.5)	N	N	anxiety, depression, hostility	-	anxiety, depression, hostility sign lower than normal pop
Lee, Kim, Huh, et al	2000	Korea	ChunDoSunBup	b/a 70 min	NP Qi-trainees train 1.3 ± 0.2 yrs	11(9M:3F)	28 (9)	N	N	-	HR, BP, respiration rate (RR)	sign decrease in HR,RR & SBP
Lee, Ryu & Chung	2000	Korea	ChunDoSunBup	cross-sec	NP Qi-trainees train 1.63;8.54;24.68 mth	180	34.07	Y	N	stress, anxiety, depression, muscle tension	-	stress of Qg gp lower than control; further reduce w/ longer training

Yu, Shen & Chai	2000	PR China	- not specified	60min;1mth;1yr	NP Qi-trainees train 5 yrs+	18 (16M:2F)	-	N	N	-	heart rate variability (HRV)	Qg regulate HR via ANS
Jones	2001	HK	Guolin qigong	14wk	NP healthy volunteers	19(7M:11F)	43.9(7.9)	N	N	-	plasma cortisol, cytokine, BP, HR	↓cortisol, type I cytokine, HR, but **not BP**
Lee, Huh, Kim, et al.	2002	Korea	ChunDoSunBup	b/a 70 min	NP Qi-trainees vs sedentary men	20 (M)	24.6 (0.9)	Y	N	-	heart rate variability (HRV)	Qg gp sign higher cardiac parasympathetic tone
Li, Chen & Mo	2002	USA	PanGu gong	10 dy	P - heroin addicts	34	33.3(6.5)	Y (RCT)	N	anxiety	BP	↓anxiety in both medication & Qg gp, not control gp
Kuo, Ho & Lin	2003	Taiwan	Neiyang qigong	b/a one session	NP healthy volunteers	56 (20M:36F)	18-24	N	N	-	EEG,ECG,EMG,skin cond'ce (SCL),finger pulse (FPA)	alpha wave ↑left forebrain; ↑SCL & FPA after Qg practice
Lee, Jeong, Kim, et al.	2003	Korea	ChunDoSunBup	b/a 70 min	NP Qi-trainees train 1.0 ± 0.5 yrs	9(M)	26(4)	N	N	-	superoxide product, neutrophils	sign enhanced superoxide, reaction velocity
Lee, Lee, Choi, et al.	2003	Korea	Shuxinpingxuegong	10 wk	P w/ essential hypertensions	29 (10M:9F)	55.8 (6.3)	Y (RCT)	N	-	BP, HR, ventilatory function	Qg gp sign reduce SBP,DBP, norepinephrine, epinephrine., HR non-sign
Lee, Lee,Kim, et al.	2003	Korea	- not specified	10wk	P w/ essential hypertensions	29	56.0(5.9)	Y (RCT)	N	stress level	BP, HR, NE, EPI, plasma cortisol	↓sign SBP,DBP,HR, NE, EPI,cortisol,stress level

Tsang, Mok, Au-yeung, et al.	2003	HK	Ba duan qin	12 wk	P with chronic physical illness	50(2M:24F)	72.9(9.5)	Y(RCT)	N	depression,self-concept	-	Qg gp sign improve on phy & psy health; depression not sign diff btn 2 gps
Fong, Hung & Huang	2004	Taiwan	- not specified	cross-sec	NP Qi-trainees	15	-	Y	N	-	EEG	↑ alpha wave , more +ve emotions, relax
Lan, Chou, Chen, et al.	2004	Taiwan	Qg vs Tai chi	cross-sec	NP Qi-trainees 2.3yrs vs Tai chi trainees 4.7yrs	12(M) vs 12(M)	58.6(6.9); 58.8(7.9)	Y	N	-	HR, Bp, O2 uptake, etc.	TCC bettter training effect; Qg enhance breathing efficiency
Lee, Kang, Ryu & Moon	2004	Korea	ChunDoSunBup	b/a 70 min	NP Qi-trainees young vs elderly	18	26 (4); 65 (2)	N	N	-	superoxide generation, adhesion	sign enhanced superoxide, adhension of neutrophils
Lee, Lim & Lee	2004	Korea	Shuxinpingxuegong	8 wk	P w/ essential hypertensions	22	52.6(5.1)	Y	N	self efficacy, self esteem	BP	Qg gp sign changes in SBP & DBP, increase in self efficacy
Lee, Kang, Lim & Lee.	2004	Korea	ChunDoSunBup	b/a one session	NP healthy young men	16	30.5(5.9)	Y (RCT)	N	anxiety level	plasma cortisol, ACTH, aldosterone	↓sign cortisol, ACTH, aldosterone
Cheung,Lo,Fong, et al.	2005	HK	Guolin qigong	16 wk	P with essential hypertension	47(21M:26F)	57.2(9.5)	Y(RCT)	N	stress, depression, SF-36 health status	BP, cholesterol, HR,etc.	conventional ex & Qg gp both sign ↑in psy & phy health, group diff **not sign**
Lee, Choi, Yook, et al.	2005	Korea	- not specified	8 wk	P with anxiety disorders	24	-	Y (RCT)	N	anxiety, depression, hostility	-	Qg gp sign improve on anxiety & hostility; depression & phobic anxiety **not sign.**

Hui, Wan, Chan, et al.	2006	HK	Lam Ching qigong	8 wk	P with cardiac diseases (Qg vs Prog. Relax)	65	65	Y	N	stress, anxiety, SF-36 health status	BP,HR	Qg gp ↓ stress, anxiety, ↓SBP;HR,non-sign, Prog relax better in somatic domain
Jouper, Hassmen & Johansson	2006	Sweden	Biyun qigong	cross-sec	NP Qi-trainees train 5yrs+	253(38M:215F)	58(13)	N	N	perceived health now & before	-	↑concentration, health
Tsang, Fung, Chan, et al.	2006	HK	Ba duan qin	16 wk	P with depression (elders)	48(10M:28F)	82.11(7.19)	Y(RCT)	Y (4wk,8wk aft)	self-concept, depression, self efficacy	-	Qg gp sign increase in seif-efficacy and well-being, ↓ depression
Griffith, Hasley, et al.	2008	USA	Ba duan qin	6 wk	NP hospital staff	25 (4M:12F)	52 (9)	Y (RCT)	N	stress, pain, vitality, soc function	-	Qg gp sign decrease stress, pain, imcrease soc function
Johansson & Hassmen	2008	Sweden	Biyun qigong	b/a 30min; 60min	NP qigong instructors & trainees; 6.9yr+	41(6M:35F)	56.7(12.4)	N	N	stres, anxiety, depression, anger, etc.	-	after 30 mins Qg; ↓anxiety, ↑+ve mood, pleasure
Jouper & Hassmen	2008	Sweden	Biyun qigong	cross-sec	NP leisure-time qigong exercisers	279 (25M:254F)	60.1(11.6)	Y	N	preceived stress, concentration, etc.	-	↓stress, ↑energy & motivation corr sign with concentrate on qi-flow.
Tsai, Chen,Lin, et al.	2008	Taiwan	I chin ching	8 wk	NP middle aged women	37	49(4.13)	Y	N	-	body fat, waist-to-hip ratio, BMI	sign diff btn 2 gps in muscle endurance, body composition
Hu & Liu	2008	PR China	Ba duan qin	20 wk	NP university students	100 (65M:35F)	-	N	N	self confident, anxiety, depression,etc.	body weight, lung volume	sign improve in emotion & physical ability

Stenlund et al.,	2009	Sweden	Cogn. Beh. Rehab combined with qigong (67) vs qigong only (69)	12 mth	P of burnout	136(40M: 96F)	41.6(7.4)	Y (RCT)	Y (6 & 12 mth aft)	SMBQ, ELSS, CIS, CPRS-S-A measuring psy-traits (e.g. anxiety, depression, etc.)	-	2 gps- sign ↑ psycho-vari & ↓sick leave aft rehab pgm & in f-up period. **No sign** diff btn 2 gps though eta of combined treatment > plainly qg interv'n.
Yu, Wu & Niu	2009	PR China	- not specified	3 mth	NP healthy free-living elders	-	52 - 73 yrs	Y	N	-	BP, cholesterol, etc.	Qg gp sign better BP & plasma lipid
Our Qigong study	2008	HK	Chan mi gong	8 wk	NP healthy free-living adults	34 (12M:22F)	43.79(10.37)	Y	Y (4wk aft)	stress, anxiety, depression, quality of life	Salivary cortisol, BP, HR	Qg gp sign stress, anxiety, depression; ↑QOL; ↓cortisol & BP but HR not sign. Control gp sign ↑DBP. Group diff sign in stress & DBP