THE IMPACT OF SELF-PRACTICE QIGONG ON STRENGTH GAINS AND WELL-BEING DURING OFF-SEASON TRAINING FOR FALL SPORT ATHLETES

A Thesis

presented to

the Faculty of California Polytechnic State University,

San Luis Obispo

In Partial Fulfillment

of the Requirements for the Degree

Master of Kinesiology in the College of Science and Mathematics

by

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June 2015

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ABSTRACT

The Impact of Self-Practice Qigong on Strength Gains and Well-being during Off-Season Training for Fall Sport Athletes

Christopher Shawn White

The use of mind-body therapies, such as Tai Chi, yoga, Qigong, and meditation are frequently reported as a means of coping with anxiety and depression. Despite these findings, there is little knowledge of Qigong exercise being able to impact elite athlete's physical and mental states during off-season training. Purpose: Determine the efficacy of Qigong to facilitate strength gains and well-being in collegiate anaerobically trained athletes. Methods: Seventy-three athletes (47 M, 26 F, 18-22 years) volunteered to participate in a Qigong exercise group or standard care group. Strength gains were measured through a vertical jump test and a 3 RM front squat, bench press, and deadlift before and after a prescribed 8 week, 4 day per week weight training program. Well-being was measured through the Warwick-Edinburgh Mental Well-Being questionnaire which was administered before, weekly, and after the weight training program. Both groups performed the training program and received the well-being questionnaire. In addition to the training program and questionnaire, the Qigong group performed Qigong exercises five days a week for fifteen minutes each day. Results: The Qigong groups average strength values were higher versus the control for bench press (+ 52%; P= 0.00), deadlift (+15%; P= 0.09), front squat (+28%; P= 0.004), and vertical jump (+52%, P= 0.223). Qigong groups had a higher average overall well-being score (+6%; P= 0.00). Conclusion: These data suggest that 8 weeks of Qigong exercises for 15 minutes a day, 5 days per week demonstrates an improvement in exercise performance as well as an enhancement in self-reported feelings of well-being. Further studies examining long-term benefits of Qigong, the collection of inflammatory biomarkers, and any potential association between improvement in well-being and reduction in injury rates may provide additional information that may assist coaches and athletic trainers in providing optimal comprehensive care.

ACKNOWLEDGMENTS

I would like to express my gratitude to my committee chair Dr. Camille O'Bryant as well as the rest of my committee members for their useful comments, remarks and engagement through the learning process of this master thesis. Furthermore I would like to thank Dr. Chris Holder for introducing me to this topic as well for the support on the way. Also, I would like to thank the participants in this study, who have willingly shared their precious time and energy during this process. I would like to thank my loved ones, especially Dr. Kimberly Baker who have supported me throughout the entire process by helping to keep my life balanced. I am forever grateful for your love and support.

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Chapter 1
Introduction

Coaches and athletes are in a perpetual search for competitive advantages both on and off the field. The offseason is paramount for the development of an athlete's physical strength and psychological performance. More specifically, anaerobic power is seen as a primary factor in athletic success (Kraemer & Fleck, 1982) and anaerobic energy is essential to perform sprints, high-intensity runs, and duel plays, all of which may contribute to the final game result (Aziz, Chia, & Teh, 2000). Given that typical football, volleyball, and soccer games last anywhere from 60-90 minutes, it also makes it important for players to include some muscular endurance exercises in these types of athlete's strength training routines (Leveritt, Abernethy, Barry, & Logan, 1999; Marques, 2002).

Muscular adaptation to physical exercise has previously been explained by the classical damage–inflammation–repair pathway. This process involves (a) exercise-induced muscle damage, (b) release of chemo-attractive factors, (c) vasodilatation, (d) leukocyte adhesion, (e) neutrophils and macrophages migration, and (f) activation of satellite cells (Tidball, 1995). Inflammation is the body's initial non-specific response to a wide variety of tissue damage produced by mechanical, chemical, or microbial stimuli and characterized by movement of leukocytes and fluids from blood into extravascular tissues (Gabriel & Kindermann, 1997). The mechanical stress on cellular cytoskeletons triggers acute inflammatory responses, increasing local and systemic markers of inflammation such as interleukin 6 (IL-6) and IL-1β, tumor necrosis factor alpha (TNF-α), the chemotaxis of leukocytes, bradykinin, and C reactive protein (Chatzinikolaou et al., 2010; Chandrashekara, & Vasanthakumar, 2007; Gleeson, 2007; Gokhale, Neubauer, Reichhold, Nersesyan, Konig, & Wagner, 2008; Murase et al., 2010; Nielsen, Pedersen, 2007; Paulsen, Egner et al., 2010). Muscle damage brought on by physical exercise can be expressed through fatigue, inflammatory reactions, high serum levels of muscle-injury biomarkers (creatine kinase, lactate dehydrogenase, myoglobin), oxidative stress, and delayed-onset muscle soreness (DOMS) (Aoi et al., 2004; Ascensao et al., 2008; Iguchi, & Shields, 2010). These biomarkers and ensuing symptoms peak 24 to 48 h post-exercise and can impair muscle function and physical performance for up to 5 or 7 days (Ascensao et al., 2008; Chatzinikolaou et al., 2010; Paulsen et al., 2010). Given these inflammatory reactions and muscle damage, recovery methods are critical for athletic performance. While the precise mechanism through

which Qigong is able to decrease inflammation is unclear, one possible pathway is through Qigong's effect on the immune system. Several studies have indicated that Qigong leads to improved immune function (Yeh, Lee, Chen, & Chao, 2006; Luo & Tong, 1988).

The prevention and treatment of DOMS are important issues for exercise programs. The use of anti-inflammatory non-steroidal drugs, stretching, compression therapy, ultrasound, acupuncture, deep tissue massage, nutritional supplements, anti-oxidants, and electrical stimulation have all been tested, with varying degrees of success, for reducing DOMS symptoms (Arent, Senso, Golem, & McKeever, 2010; Best, Hunter, Wilcox, & Haq, 2008; Cheung, Hume, & Maxwell, 2003; Stay, Richard, Draper, Schulthies, & Durrant, 1998; Zainuddin, Newton, Sacco, & Nosaka, 2005). However, there is no consensus about the most suitable method for effectively preventing DOMS and muscle injury.

Traditional Chines Medicine's (TCM) concept of an organ is much broader than the Western concept. While western anatomy and physiology is primarily concerned with the physical body in its most concrete forms, energetic anatomy and physiology in TCM focus on the underlying patterns of energy that animate and sustain the physical form (Johnson, p. 308). Given the conceptual differences between Western and Eastern medicine, it is paramount to build connections between the two philosophies.

The liver is involved in a wide range of metabolic and regulatory functions and is one of the most important organs in the body for maintaining the health of the blood. The various functions can be categorized into the following areas: metabolism of carbohydrates, proteins and lipids, storage of vitamins and minerals, phagocytosis, and the removal of poisons, drugs, and certain hormones. The functions of the liver described in TCM are similar to those described in Western medicine. However, the liver also stores and regulates the blood, smooth and regulate the flow of Qi or the circulating life force (energy) (Qi, n.d.), govern the tendons, and has specific emotional influences (Johnson, p. 331). During exercise, blood flows into the muscle to nourish the muscle tissue, allowing them to become more pliant. When the muscles are well nourished by the blood, the body maintains a stronger resistance to attacks from external pathogenic factors. After the completion of exercise, the blood flows back in to the liver, allowing the body to restore and recharge its energy (Johnson, p. 331). According to Dr. Johnson (2002), the liver's most important function is the regulation of Qi throughout the entire body. The liver governs the circulation of Qi through all of the body's internal organs as well as regulates the function and control of the tendons and ligaments

via the contraction and relaxation of the muscles, and is the source of the body's physical strength (Johnson, p. 332). If the Qi filled blood from the liver becomes deficient, the body will be unable to moisten and nourish the tendons which often results in symptoms such as muscle cramps, spasms, and an overall lack of strength.

Respiratory function is paramount for success in athletics with the primary purpose being to deliver oxygen to the cells, while removing carbon dioxide. Therefore, the smooth delivery of the blood from the heart into the lung tissue, oxygenating the blood, then pumping it throughout the rest of the body is of critical importance. Anatomically, the lungs surround the heart but in TCM they surround the heart energetically as well (Johnson, p. 348). According to TCM, one of the main functions of the lungs is to govern the Qi and respiration (Johnson, p. 348). Specifically, the lungs send Qi in to the heart and down in to the kidneys. The lungs also regulate breath, controlling both pulmonary and cellular respiration and are the main organs responsible for gathering Heaven Qi which is made up of the forces that the heavenly bodies exert on the earth, such as sunshine, moonlight, and the moon's effect on the tides. It is through respiration that Qi and gasses of the body are exchanged between the interior and exterior of the body. Breathing in oxygen from the air during inhalation and expelling gaseous wastes such as carbon dioxide during exhalation, maintain healthy internal organ regulation. Through this exchange, the body's energetic and physical metabolism function smoothly (Johnson, p. 349).

In addition to the physiological concern of DOMS, there may also be psychological factors that influence winning or losing in sports. Therefore, the influence of stress and anxiety in sport performance is significant. The athlete's optimal state of mind may depend on the relationship between anxiety and performance and the factors that facilitate it. Once a stress response is produced, physiologic and attentional changes occur (ie, increased muscle tension, narrowing of the visual field, and distractibility), thereby increasing likelihood of injury (Williams & Anderson, 1998). One of the most familiar ideas to westerners, which is foundational in all of TCM, is the idea of yin and yang. In TCM, the theory of Yin and Yang energy represents the duality of balance and harmony within the body, as well as within the universe. Yang manifests as active, creative, masculine, hot, hard, light, Heaven, white and bright. Yin manifests as passive, receptive, feminine, cold, soft, dark, Earth, black and shadow (Johnson, 2002, p. 6). When the body is in balance between Yin and Yang health is predominant. In athletes, if the body and environment

are out of balance, performance, recovery and clarity can be disrupted.

Given the need for emotional balance and the effects of emotional imbalance on each organ system, TCM's Five Element theory (Fig. 1.1) is necessary to organize everything in this reality into five interacting, comprehensive patterns. This theory establishes which emotion corresponds to an internal organ and that each organ is very much affected by its related emotion. TCM views emotions as potential "internal pathogens" that have the ability to unbalance the function of our organs. This disruption can occur when we experience an emotion very intensely, suddenly, or when we chronically hold onto any emotion over an extended period of time. From the TCM perspective, emotions must flow unobstructed in order for them not have an adverse effect on your well-being. This wisdom is clearly stated in the *Nei Jing*, a classic text of TCM, written some 2,500 years ago: "Overindulgence in the five emotions—happiness, anger, sadness, worry, and fear—can create imbalances" (Maoshing, 1995, p. 19). The Five Elements are an ancient philosophical concept to explain the composition and phenomena of the physical universe and later used in traditional Chinese medicine to expound the unity of the human body and the natural world, and the physiological and pathological relationship between the internal organs (Beijing Medical College, 1984, p.4).

"The five elements are: wood, fire, earth, metal, and water. They can exist in a helpful and complementary relationship to each other or they can work against one another and so destroy themselves. . . . The Yin-Yang principle and the five elements played an important part in the traditional art of healing, but, because these concepts were handed down in historical documents, their interpretation is difficult and they cannot easily be incorporated into modern medical science" (Palos, 1972, p. 28,30). Through modern holistic practices such as acupuncture, Eastern medicine can now provide an understanding that emotions are powerful energies that strongly affect our Qi and our overall health.

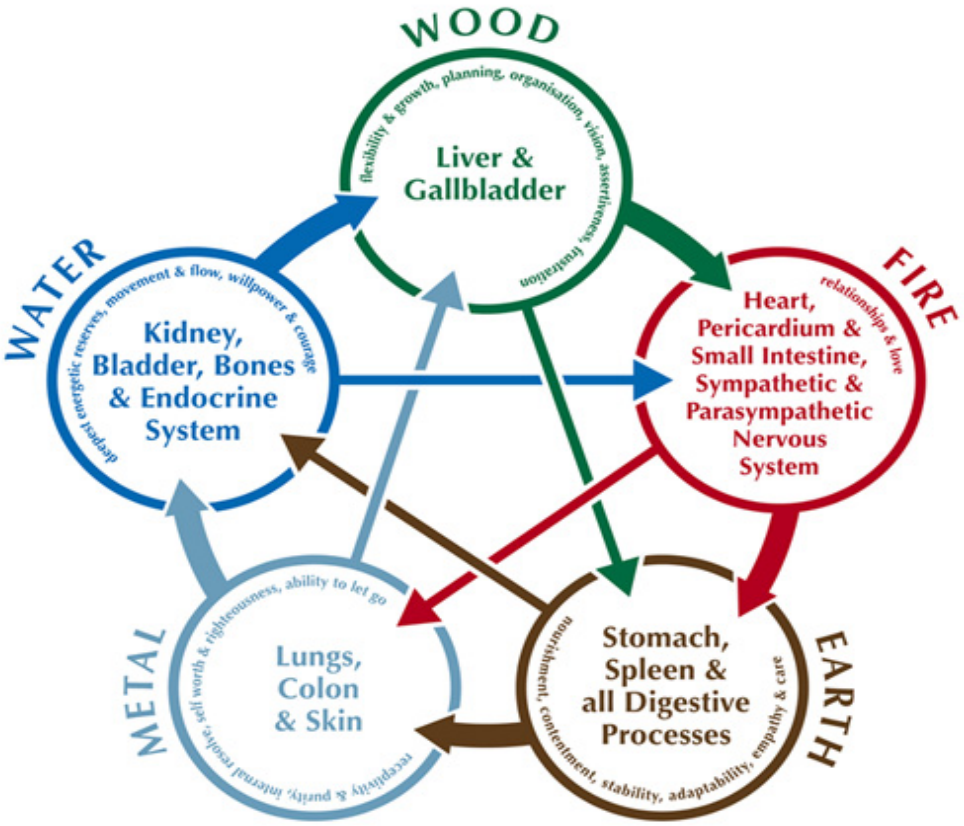


Figure 1.1. Five Element Theory. The five elements in Chinese medicine - Ping Ming Health. (2009). Retrieved May 11, 2015, from http://www.pingminghealth.com/article/125/the-five-elements-in-chinese-medicine/

In TCM, the Lungs, represented by metal, function much in the same way as described in Western Medicine. However, TCM expands the role of the lungs to include psycho-emotional aspects of integrity, attachment, and grief (Johnson p. 347-348). As a consequence, if the circulation of Qi becomes obstructed for long periods of time, the lung Qi stagnation can give rise to chronic emotional turmoil, sometimes manifesting through disappointment, sadness, grief, despair, shame, and sorrow (Johnson p. 350-351).

Represented by wood, the liver's function of ensuring the flow of Qi has an influence on the body's mental and emotional states that each organ generates (Johnson p. 332). If the circulation of liver Qi becomes obstructed, the resulting stagnation gives rise to emotional turmoil. For instance, anger—which also includes feelings of stress, frustration, bitterness and resentment—directly impacts liver function. Anger makes Qi rise, so many of its effects will be felt in your head and neck: headaches are the most

common symptom, yet dizziness, ringing in the ears, red blotches on the front of the neck, and thirst can all be signs of a liver imbalance.

In TCM, the functions attributed to the spleen, represented by earth, are completely different than those identified by western medicine. From an energetic perspective, some of the main functions of the spleen are to rule the muscles and tendons and to distribute emotional and spiritual nourishment. If the spleen is unable to nourish the muscles and tendons, the muscles will become weak and begin to atrophy (Johnson, p. 381). Emotionally, when the spleen Qi becomes stagnate, this can give rise to emotional turmoil such as obsession and doubt (Johnson, p. 382). In western medicine, the spleen's primary functions are to cleanse the blood, immune response, and storing and releasing blood. The spleen can be relatively easily injured as a result of local impact trauma or severe infection. As a precaution, western medicine will remove the spleen due to leukemia or lymphoma.

The functions attributed to the heart, represented by fire, in TCM differ from the functions described by western medicine. Chinese energetic functions include the functions associated with the circulatory system, govern the blood, and emotional aspects. The Qi of the heart is the driving force for the heart's beat, rhythm, rate, and strength (Johnson, p. 392). Eastern and western medicine both agree that the heart pumps blood through arteries to be delivered throughout the body. However, TCM expands on this basic concept and sometimes calls the heart, "The Controller," since it coordinates all of the energetic and emotional functions of the body (Johnson, p. 394). When Qi is flowing normally, an individual will experience peace in his thoughts and actions. On the other hand, if the circulation of Qi is obstructed, this stagnation can give rise to nervousness, anxiety, panic, and guilt (Johnson, p. 395).

Western medicine and TCM have differing views regarding the functions of the kidneys, represented by water. Physiologically in western medicine during exercise, skin and active muscle tissue compete for a limited cardiac output. The increased blood flow to the skin along with the evaporation of sweat allows heat to be dissipated to the environment while increased blood flow to the muscle allows for the delivery of oxygen and energy substrates. In order to accomplish this dual purpose without a decrease in blood pressure, blood flow to the liver, pancreas, gastrointestinal tract, and kidney decreases (Rowell, 1993). The end results are increased sodium and water conservation by the kidneys and the maintenance of mean arterial pressure during exercise. While these adjustments are beneficial for homeostasis, excessive

reductions in renal function can precipitate renal failure (Zambraski, 1996). According to TCM, the main energetic functions of the kidneys include the function of the urinary system, the nervous system, emotional aspects, and spiritual influences (Johnson, p. 420). Emotionally, the kidneys provide the capacity and drive for strength, skill, and hard work. An individual with healthy kidneys will have the ability to work hard and purposefully for long periods of time. However, Johnson (2002) states that when the kidneys are in a state of disharmony, the individual can be driven to states of deficient strength, endurance, confidence, and will power (p. 422).

Given the importance of the Five Element Theory and the disruptions that arise due to emotional disharmony, the Chinese technique Qigong aims to cultivate life force through regular effort, and often combines movements and mind focusing (Chen, 2007). It is considered to be the contemporary offspring of some of the most ancient healing and medical practices of Asia. Earliest forms of Qigong make up one of the historic roots of contemporary Traditional Chinese Medicine theory and practice (Jahnke 2002). Qigong purportedly allows individuals to cultivate the natural force or energy ("Qi") in TCM that is associated with physiological and psychological functionality (Jahnke, Larkey, Rogers, Etnier, & Lin, 2010). Qi is the conceptual foundation of TCM in acupuncture, herbal medicine and Chinese physical therapy. It is considered to be a universal resource of nature that sustains human well-being and assists in healing disease as well as having fundamental influence on all life and even the orderly function of celestial mechanics and the laws of physics. Qigong exercises consist of a series of orchestrated practices including body posture/movement, breath practice, and meditation, all designed to enhance Qi function (that is, drawing upon natural forces to optimize and balance energy within) through the attainment of deeply focused and relaxed states. From the perspective of Western thought and science, Qigong practices activate naturally occurring physiological and psychological mechanisms of self-repair and health recovery (Jahnke et al., 2010). The philosophy of Qigong exercise is that the mind "guides" the person's Qi to a healthy state. If the flow of Qi is disturbed, illness may occur (Chen, 2007). Entering the "Qigong state", being deeply relaxed, may trigger the relaxation response that supports the individual's recovery process (Benson, Greenwood, & Klemchuk, 1975).

Statement of the Problem

The use of mind-body therapies, such as Tai Chi, yoga, Qigong, and meditation are frequently reported as a means of coping with anxiety and depression (Wolsko, Eisenberg, Davis, & Phillips, 2004). Psychological benefits from regular Qigong training include antidepressant effects (Tsang, Fung, Chan, Lee, & Chan, 2006), self-efficacy (Lee, Lim, & Lee, 2004), and stress reduction (Lee, Ryu, & Chung, 2000). Despite these findings, there is little knowledge of Qigong exercise being able to impact elite athlete's physical and mental states during off-season training.

Purpose

Therefore, the purpose of this study was to determine the efficacy of Qigong – specifically the Dao Yin exercises focusing on lungs, kidneys, heart, liver, and spleen – to facilitate strength gains and well-being in collegiate anaerobically trained athletes.

Aims and Related Hypotheses

Aim 1: Determine the efficacy of Qigong exercises on strength gains and well-being in anaerobically trained athletes.

Hypothesis: The Qigong exercises will have a significant impact on strength gains and improve the well-being of the athletes performing the Qigong exercises.

Aim 2: Measure the physical performance of football, women's volleyball, and women's soccer players and assess the difference between Qigong exercises and control group.

Hypothesis: The women's soccer, women's volleyball, and football athletes in the Qigong intervention group will perform better on the physical tests than the control group.

Aim 3: Measure the perceived well-being of the athletes during the intervention.

Hypothesis: The perceived well-being in the Qigong group will be significantly higher than in the control group.

Justification/Rationale

A person is believed to become ill or die when Qi becomes diminished or unbalanced. Health is believed to be returned by rebuilding Qi, eliminating Qi blockages, and correcting Qi imbalances (Holland, 2000). This researcher will aim to increase strength in collegiate athletes, with the potential to improve

sport performance and reduce likelihood of injury. If effective, this Qigong exercise protocol can be implemented in high school, collegiate and professional weight rooms and athletic training rooms. The increased performance could lead to higher monetary value for athletes choosing to play professionally after their collegiate careers are over. Although researchers tend to focus on the effects of aerobic exercise on recovery in varsity athletes (Sporer & Wenger, 2003; Tufano et al., 2012), no studies emerged that have examined the effects of Qigong exercises on the elite anaerobically trained collegiate athletes.

Delimitations

The teams selected for this study were Cal Poly football, women's volleyball, and women's soccer teams. An 8-week strength training cycle was also selected in order to coincide with school schedule. The Qigong exercises that were utilized were the Dao Yin exercises which were performed at 6am, Monday through Friday. The Warwick-Edinburgh Mental Well-Being questionnaire (Tennant et al., 2007) was used pre and post intervention and weekly to track change in mental state.

Limitations

This researcher was unable to measure common biomarkers of inflammation. Cal Poly football, women's volleyball, and women's soccer teams were chosen given their off season training status, and the Qigong exercises were led by a doctor of medical Qigong (DMQ). To assess well-being, the Warwick-Edinburgh Mental Well-Being questionnaire (Tennant et al., 2007) was used.

Operational Definitions

Dantian

Dantians are the body's three main energetic pools, or reservoirs of Qi located in the head, chest and abdomen (Johnson, 2002).

Hypertrophy

Muscular hypertrophy is an increase in muscle mass and cross-sectional area as well as an adaptation to regular, increasing workloads that exceed the preexisting capacity of the muscle fiber (Toigo & Boutellier, 2006).

Mesocycle

Description of a singular training cycle associated with a linear periodization model. This strength

training program is part of the general preparatory phase and included three mesocycles that comprised hypertrophy, strength, and power. Each cycle lasted 2, 4, and 2 weeks.

Power

The product of the force exerted on an object and the velocity of the object in the direction in which the force is exerted (Harman, 1993).

Qi

The circulating life force (energy) whose existence and properties are the basis of much Chinese philosophy and medicine (Qi, n.d.).

Qigong

A powerful system of healing and energy medicine from China. It is the art and science of using breathing techniques, gentle movement, and meditation to cleanse, strengthen, and circulate the life energy (Qi). Qigong practice leads to better health and vitality and a tranquil state of mind (Cohen, n.d.).

Qigong Exercises

A series of orchestrated practices including body posture/movement, breath practice, and meditation (Jahnke, 2010).

Strength

Strength is the ability to exert force under a given set of conditions defined by body position, the body movement by which the force is applied, and the movement type (concentric, eccentric, isometric, plyometric) (Harman, 1993).

Well-being

Huppert (2009), defines well-being as “Psychological well-being is about lives going well. It is the combination of feeling good and functioning effectively (p. 137).”

Chapter 2

Review of Literature

The purpose of this study was to determine the efficacy of self-practice Qigong on strength gains and well-being in fall sport athletes during the off-season. I have divided this review of literature into three primary theoretical areas based on the purpose of the study. The first section contains an overview of the physiological components of fall sport athletes and the effects of anaerobic strength training. The second section contains an overview of the theoretical perspectives related to the relationship between anxiety, stress, and arousal and sport performance. Finally, the third section contains an overview of Qigong and other holistic and traditional approaches to well-being and recovery.

Physiological Factors

Fatigue and by product production. Anaerobic energy is essential to perform sprints, high-intensity runs, and duel plays, all of which may contribute to the final game result (Aziz, Chia, & Teh, 2000). Repetitive movements may induce fatigue in specific muscles during a match or game. Fatigue can be defined as the inability to maintain the required or expected speed of activity or power output (Edwards, 1983). Exercise scientists consider both the central and peripheral mechanisms as causes of fatigue and both levels do contribute to reduced skeletal muscle performance during exercise (Fitts, 1994). The duration and intensity of the exercise will also have a major impact on fatigue.

Studies have reported that the decline in adenosine triphosphate (ATP) resynthesis approximates the muscle's ability to generate force (Hultman et al., 1990). The decline in skeletal muscle force that occurs during anaerobic training can be associated with many metabolic changes. There is a decrease in muscle phosphocreatine (PCr) and ATP with an increase in inorganic phosphate (Pi), hydrogen ions (H+) and adenosine diphosphate (ADP). The accumulation of these products of ATP hydrolysis, in addition to a decrease in muscle pH, is likely to influence fatigue to a large extent during maximal intensity exercise. An accumulation of ADP may inhibit the release of ADP from the cross-bridges in the actin/myosin complex. The result will be a reduction in cross-bridge dissociation, reducing the force generated and the maximal velocity of muscle fiber shortening (Jones and Round, 1990). Jones and Round (1990) have also suggested that Pi has a direct action on the muscle contractile mechanism, slowing the release of phosphate from actin/myosin and leading to an accumulation of cross-bridge attachments where they are unable to develop

force. A decrease in pH as a result of H+ accumulation has been shown to inhibit the regulatory glycolytic enzymes phosphorylase and phosphofructokinase (PFK), which in turn will decrease the glycolytic rate (Hultman et al., 1990). Hydrogen ions also compete with Ca 2+ for binding sites on troponin and therefore increase the amount of Ca 2+ needed to achieve the same tension development (Green, 1990). An increase in H+ has also been shown to limit PCr resynthesis, leading the creatine kinase reaction towards PCr breakdown (Hultman, 1990).

Lactate threshold and performance. Anaerobic glycolysis is completely activated within a few seconds of the onset of sprint exercise (Greenhaff et al., 1996), and results in a production of lactic acid and H+ and an associated reduction in pH. Being a by-product of anaerobic glycolysis, lactic acid almost completely dissociates to lactate and H+ in the muscle (Sahlin, 1986). Lactate production is believed to be the main source of H+ which causes a drop in muscle pH (Hultman & Sahlin, 1986). In low to moderate exercise intensities, pyruvate enters the citric acid cycle and oxidation takes place. The produced H+ combine with nicotinamide adenine dinucleotide (NAD) to produce NADH+ and then pass to oxygen to produce water through the process of aerobic glycolysis. In high intensity exercise, the rate of oxygen demand for this process surpasses supply and both lactate and H+ accumulate.

During maximal intensity exercise, glycolytic lactate accumulates with a similar increase in H+ and drop in pH. The drop in pH depends on the amount of H+ produced and the ability of the muscle to buffer H+ or release it into the circulation (Hultman & Sahlin, 1980). Muscle H+ buffering is dependent on two main systems; physiochemical buffering including the bicarbonate C02 system, and metabolic buffering, particularly from PCr degradation. Ample circulation to the muscle and the ability of the lungs to remove C02 after buffering are vital to metabolism during sprint exercise. Furthermore, improved circulation to the muscle will aid delivery and H+ efflux from muscle, maintaining a more effective intracellular environment. The concept of anaerobic threshold was introduced in order to define the point when metabolic acidosis and also the associated changes in gas exchange in the lungs, occur during exercise (Wasserman, Whipp, Koyl, & Beaver, 1973). During exercise of increasing intensity there is a rise of blood lactate concentration which was first reported half a century ago (Bang, 1936). Trained athletes accumulate less lactate than untrained athletes at a given submaximal workload (Withers, Sherman, Miller, & Costill, 1981). The anaerobic threshold must now be considered as a determinant of physiological

fitness. While the appearance of lactate in blood during exercise is the result of an increased glycogenolysis, it is important to recognize that its concentration is the result of a balance between the rate of production and removal (Brooks, 1986).

Recovery. Two distinct recovery phases have been identified following maximal exercise. The initial rapid phase of recovery of power output over the first 60-90s has been correlated with the restoration of muscle membrane potential and intracellular sodium (Na+) and K+. A second, slower recovery phase lasting for several minutes is linked with the resynthesis of PCr and a reduction in Pi (Balog & Fitts, 1996). A difference in exercise duration and mode, and the type of recovery (active or passive) potentially results in a differing PCr resynthesis pattern (Bogdanis et al., 1995). When blood flow is obstructed to the muscle during and after exercise, PCr resynthesis is reduced (Harris et al., 1976), supporting the importance of O2 in PCr recovery. Since PCr resynthesis is dependent on adequate circulation and oxygen availability, training strategies that can improve muscle O2 supply are likely to enhance PCr resynthesis and improve ensuing exercise performance.

Psychological Factors

Psychic factors may become decisive for winning or losing in sports. Therefore, the influence anxiety has over sport performance is of great importance. The optimal state that an athlete needs to be in may depend on the relationship between anxiety and performance and the factors that facilitate it. Spielberger (1966) hypothesized that anxiety can take two forms: state anxiety or trait anxiety. State anxiety refers to an emotional state consisting of fear or apprehension while trait anxiety refers to a predisposition to perceive situations as potentially threatening and respond with manifestations of state anxiety. State anxiety is "characterised by subjective, consciously perceived feelings of apprehension and tension, accompanied by or associated with activation or arousal of the autonomic nervous system" (p.17) while trait anxiety is an "acquired behavioral disposition that predisposes an individual to perceive a wide range of objectively nondangerous circumstances as threatening and to respond to these with state anxiety reactions disproportionate in intensity to the magnitude of the objective danger" (p. 17). Athletes who are predisposed to higher levels of trait anxiety will perceive sport competition environments as being more threatening then they may actually be and respond with greater state anxiety responses. The expressions of anxiety have been shown to have numerous negative effects on performance. For example, Yoo (1996)

indicated that anxiety is an influential variable in reducing cue-utilization and attentional processes of motor-task performance. Two empiric sport injury models (Fig. 2.1) have evolved to investigate psychosocial factors that may influence the risk of obtaining a sport injury and recovery following injury.

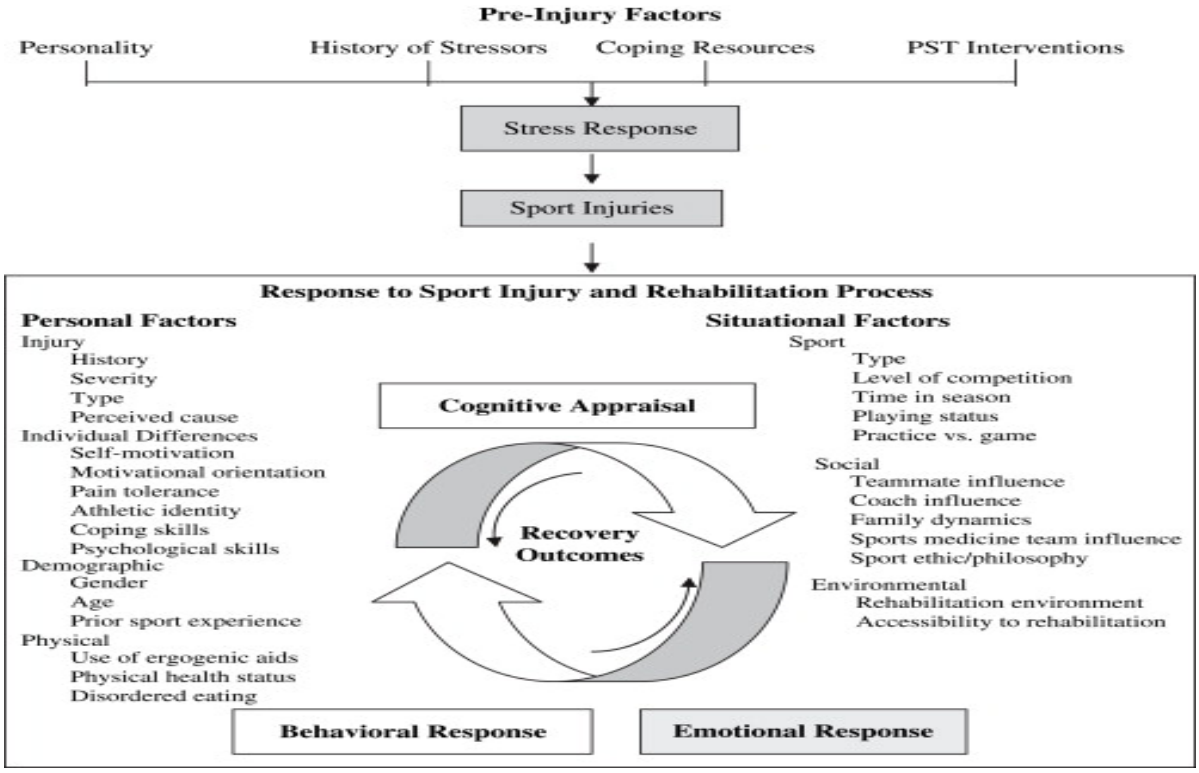


Figure 2.1. An integrated model of response to sport injury. (*Adapted from* Wiese-Bjornstal DM, Smith AM, Shaffer SM, et al. An integrated model of response to sport injury: psychologic and sociologic dynamics. J Appl Sport Psychol 1998;10:46–69

The Andersen and William's model (top portion of Fig. 2.1) provided a framework to examine psychologic precursors, such as personality, history of stressors, and coping resources in relation to sport injury (Anderson & Williams, 1988). The idea of this model is that a psychophysiologic response is elicited if an athlete cognitively appraises a situation (rational or irrational) as stressful, has a history of stressors, has a personality likely to intensify the stress response, and has few coping resources. These variables, alone or in combination, generate a stress response (Anderson & Williams, 1988). Once a stress response is produced, physiologic and attentional changes occur (ie, increased muscle tension, narrowing of the visual

field, and distractibility), thereby increasing likelihood of injury (Williams & Anderson, 1998). It is hypothesized that an athlete's cognitive, emotional, and behavioral response to injury is influenced by personal and situational factors. Personal factors that may affect recovery from injury include injury history and severity, motivation to recover from injury, mood state, and coping abilities. Gender, prior sport experience, and use of ergogenic aids are additional personal factors that may influence injury recovery (Wiese-Bjornstal, Smith, Shaffer, & Morrey, 1998). Situational factors that may potentially affect injury recovery include level of competition, time in season, playing status, and influences from teammates, coaches, and sports medicine professionals (Wiese-Bjornstal, Smith, & LaMott, 1995). While these factors directly affect the cognitive, emotional, and behavioral response, they indirectly affect physical and psychological recovery from injury.

Medical Qigong

The basis of this entire study is to explore the potential of a daily Qigong recharge and its effects on weight trained athletes. Dr. Jerry Alan Johnson Ph.D, DTCM, DMQ(China) has written a five volume series that is a first of its kind. These five texts are considered to be the most comprehensive explanation of ancient esoteric Chinese healing theory that has been foundational in the medical practices in China for millennia. Dr. Johnson is considered to be one of the most influential and respected western born Grandmasters of Martial, Medical and Spiritual Qigong training by the National Qigong Association (NQA).

More than 5000 years ago, the ancient Chinese masters of esoteric healing came to the understanding that everything is composed of the same energetic substance, which they called Qi. These ancient masters observed that there is an oneness and wholeness in all existence and that everything is energetically interconnected as one body (Johnson, 2002, p. 3). Qi is vibrating in constant energetic motion within all things. Within the human body, Qi is stored in form of energetic pools creating the energetic matrix of the internal organs. In addition to the pools, the body’s life-force energy flows in the form of rivers and streams forming the body’s vessels, channels and collateral systems (Johnson, 2002, p. 3). Lastly, the same Qi that creates the matrix of the human organ system is the same Qi that creates the commonly known chakra systems and the body’s dantians. Dantians are the body’s three main energetic pools, or reservoirs of Qi located in the head, chest and abdomen (Johnson, 2002, p. 517). The TCM rabbit

hole can be very deep and complex but for the purposes of this study, the practice that was used focused on developing/cultivating these dantians, specifically the lower dantian of the abdomen and the organ systems themselves.

One of the most familiar ideas to westerners, which is foundational in all of TCM, is the idea of yin and yang. In TCM, the theory of Yin and Yang energy represents the duality of balance and harmony within the body, as well as within the universe. Yang manifests as active, creative, masculine, hot, hard, light, Heaven, white and bright. Yin manifests as passive, receptive, feminine, cold, soft, dark, Earth, black and shadow (Johnson, 2002, p. 6). When the body is in balance between Yin and Yang health is predominant. When the Yin and Yang are imbalanced, disease occurs (Yin-Yang, 2015). The notion of yin and yang balance is the goal of all TCM doctors, healing practices and treatment of illness.

The complexity of Traditional Chinese Medicine (TCM) cannot go understated. TCM is, itself, is an entire system of medicine exclusive to itself. The most closely related medical practice to TCM is the Indian practice of Ayruveda (Ayruveda Medicine, 2013). Unfortunately for the western minded physician, the parallels are practically non-existent which can complicate the attempts to combine the two into one cohesive system. In the United States, Ayruveda and TCM are considered to be complimentary health approaches, rather than stand-alone health systems (Traditional Chinese Medicine, 2013).

The Medical Qigong Doctor is an individual who has spent his medical life working on the ability to move Qi, which includes removing large concentrations of turbid Qi to helping build or tonifying areas of the body where Qi deficiency is found. The practice of Qigong is one that is intention driven accompanied by very specific callisthenic type exercises that create the movement and flow of Qi. Kenneth Cohen (2011), Daoist scholar and Qigong master is quoted as saying both, “use the mind-intent to direct the Qi, the healing energy” and “when the intent arrives, the Qi arrives.” It is common belief that any person can, with the appropriate focused intent, can move not only the Qi in his/her body, but that of others.

A daily Qigong practice is a mix of arriving at a common intent for the day’s training. Understanding the purpose of the routine, setting the intent of that practice and then staying dedicated to performing the predetermined set can vastly improve one’s health. In several cases that involved psychological well-being, anxiety decreased significantly for participants practicing Qigong compared to an active exercise group. (Cheung et al., 2005; Lee, Soo Lee, Kim, & Moon, 2003; Tsai et al., 2003).

Qigong has also been proven to reduce stress symptoms (Johansson, Hassmen, & Jouper, 2008) and to improve physical health (Lee, Ryu, Kim,Woo, & Moon, 2003). Taking it one step further, it can be assumed that the above mentioned “balance” in every person, if not nurtured or cultivated by a practice like Qigong, is likely off. Chen (2006) found that Interleukin-6, an important marker of inflammation, to be significantly modulated in response to practicing Qigong, compared to a no-exercise control group. In athletes, if that harmony is out of reach, performance, recovery and clarity can be disrupted.

Chapter 3
Methods and Procedures

Subjects and Recruitment

A total of 125 collegiate athletes that include women's soccer, football, and women's volleyball were recruited for this study. Participants were recruited from the athletic department at California Polytechnic State University San Luis Obispo utilizing criterion-based sampling. Information regarding inclusion and exclusion criteria was collected through participant applications. To be eligible for the study, athletes were in good health denoted by a physician physical; age 18-22; varsity anaerobically trained athlete on active roster; and free of sports related injuries. Participants were excluded if they were aerobically trained athletes, have any serious current physical problems that limit the ability to exercise, or were unable to attend the Qigong exercise appointment time. Recruitment of athletes was accomplished through verbal advertisement during normal weight lifting sessions. All participants were notified of participation guidelines set by Dr. Christopher Holder and could miss no more than four sessions before being terminated. It was also recommended to female Qigong participants to forgo the swaying exercise during their menstrual cycle to avoid a heavier flow brought on by the heat from the Qi introduced in to their lower dantian.

Experimental Conditions

Design

The study utilized a pretest-posttest randomized-group design and assessment strategy. All participants were placed in either the control or Qigong group in which they volunteered.

Medical Qigong Exercise

Athletes underwent a prescribed 8 week, 4 day a week weight training program for respective team and Qigong exercises five days a week for fifteen minutes each day. Furthermore, in preparation for this study, one of Sifu Johnson's understudies, disciples and doctoral graduates, Dr. Christopher R. Holder DMQ (China) led the entire practice for the athletes each day of the study. The theory involved and the cultivation techniques Dr. Holder used were taught to him directly by Sifu Johnson, and taken from the five Chinese Medical Qigong Therapy texts. The methods used were designed by Dr. Holder and specifically intended for use by anaerobically trained athletes.

a.  b. 

Figure 3.1. Channel Dredging. This is the first of the major purgation exercises for the Qigong set. The practitioner reaches down between their feet and trace their hands up their midline, clearing any turbid or stagnant Qi from the yin channels. The same process was done for the yang channels of the exterior the body.

a.  b. 

Figure 3.2. Counter Swing. Second of the major purgation exercises. The practitioner uses a rotational motion to literally squeeze turbid Qi from the system. He/she visualizes dark Qi from the entire body being rung out and exiting the palms. The counter swing goes rhythmically from left to right until the desired number of repetitions is complete or the practitioner feels as if they are finished.

a.  b. 

Figure 3.3. Dropping the Post. The third of the major purgation exercises. The practitioner bounces on their heels, keeping the body relaxed and imagining the outer shell of their person fracturing like breaking glass. Once the "appropriate level of cracking" has taken place, the practitioner raises high up on his/her toes and then drop to his/her heels with a degree of force, breaking the fractured glass away. The process repeats until the desired number of reps is complete or the practitioner feels finished.

a.  b. 

Figure 3.4.Trembling Horse. This exercise is the fourth major purgation exercise. Starting at the wrists and hands, the practitioner begins to shake, moving up to the elbows and shoulders and then dropping down through the entire body, shaking off anything that isn't of service to them. The exercise is complete when the desired number of repetitions is complete or the practitioner feels as if he/she is finished.

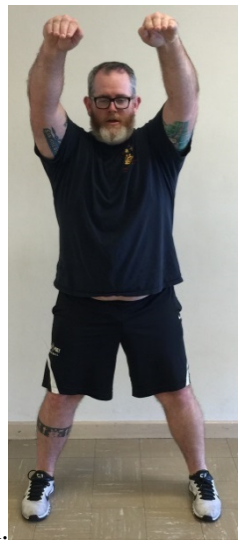
a.  b. 

Figure 3.5. Dolphin Diving. This is a bridging exercise from the purgation to tonification exercises. The practitioner reaches forward, rounding his/her back, down and between the legs lengthening the channels of the back. This exercise is intended to dilate the posterior channels for the tonification work that is coming.

a.  b. 

Figure 3.6. Swaying (Beating and Drumming the Qi). This exercise is first of the major tonifying sets. Swaying is used to introduce clean Qi to replace what was purged during the purgation sets. The intention of the practitioner is to see the Qi from the six directions (above, below, left, right, top and bottom) tonifying the lower dantian. The lower dantian is the home of a person's life force and the cultivation of this area pertains to one's physicality, sexuality and digestive health.

Daoist Five Yin Organ Exercises

The next five exercises focus on tonifying the 5 yin organs of the body (lungs, kidneys, liver, heart, spleen).

a.  b. 

Figure 3.7. Lungs. Connecting the index finger to the thumb, the practitioner imagines breathing in heavenly energy on the inhale and exhaling lung Qi that is turbid or dark. The palms start down with each inhale, move apart and then roll under and back together for the exhale. Nine repetitions were be performed.

a.  b. 

Figure 3.8. Kidneys. With one hand placed on the opposite kidney, the practitioner bends down and imagines reaching into a dark pond and scooping up water. As he/she stands, that water will run down the arm, across the shoulders to the opposite arm, running down into the hand and eventually into the kidneys, tonifying and nurturing. Nine repetitions per side were performed.

a.  b. 

Figure 3.9. Liver. With the hands moving back and forth, the practitioner imagines reaching for the heavens and grabbing emerald green Qi and placing it into the liver. The arms move in an arching motion, rotating and delivering the green Qi to the liver. Nine repetitions were performed.

a.  b. 

Figure 3.10 Heart. Imagining holding a ruby red ball of Qi, the practitioner moves from left to right extending the channels of both the heart and pericardium. As that ball moves past the chest, he or she sees the red Qi of the ball nourishing and tonifying the heart. Nine repetitions were performed to each side.

a.  b. 

Figure 3.11. Spleen. With the index fingers and thumbs connected making a diamond, the practitioner reaches up to the sun, allowing the golden Qi of the sun to run down his/her arms nourishing and tonifying the spleen. Nine repetitions to both sides were performed.

a.  b. 

Figure 3.12. Turtle Breathing. At the conclusion of the Daoist Five Yin Organ exercises, the practitioner gathers the overflowing “extra” energy from the organ exercises by taking five small sniffs to equal one complete breath. The posture was performed by rolling the hands under and then tucking as if to compress the excess Qi into the lower dantian for integration. Five repetitions were performed.

a.  b. 

Figure 3.13. Golden Ball. This is the first regulation exercise in the set. This exercise is intended to facilitate full body integration of the newly tonified Qi throughout the entire body, harmonizing the system. The hands squeeze down low as if pressing two balls together, then trace an outline of a long beard, spread apart and then press the balls together at shoulder level, roll the hands back and push as if moving a heavy boulder, then finishing with the hands slowly settling down to waist level.

a.  b. 

Figure 3.14. Microcosmic Orbit. The last of the regulation set. Imagining a tennis ball sized ball of Qi hovering in front of the face, the practitioners moved the ball with their intention down their front up and under their perineum, up the back and back over the head like the moon orbits the earth. The hands delicately mimic the motion of the orbit in front of the lower dantian to further the depth of intention.

Physical Activity and Perceived Benefits

Intense physical activities were utilized, especially Olympic lifting, power lifting, kettlebell training, and high end anaerobic speed development. To encourage functional strength development, participants were provided with programs that gradually increased in weight weekly.

Measurement of Well-being

Participants received the Warwick-Edinburgh Mental Well-Being questionnaire (Tennant et al., 2007) pre and post intervention and weekly to track change in mental state (see Appendix A). Well-being questionnaires were administered on Thursday preceding max testing and every Friday during the intervention prior to each team's dedicated lifting time. Finally, all scores associated with each question as well as the results of the scores were removed before being administered to each participant.

Measurement of Physical Performance

Athletic trainers and certified strength coaches monitored safety and quality of performance while participants underwent pre study and post study physical testing. Pre and post max testing was performed on the Thursday and Friday before and after the intervention. Tests included bench press, front squat, deadlift, and vertical jump. The three weighted exercises are the most commonly used compound movements in our strength program as well as the most easily tested. The vertical jump test is the premier expression of anaerobic power for athletes and was tested using a jump mat (Just Jump by Power Systems). The physical testing lasted approximately one hour. The bars that were utilized for the front squat and bench press tests were Rogue Fitness Operator Bars (20kg) and the plates were Rogue Bumper Plates by Hi-Temp. The deadlift exercise utilized the Eleiko Olympic WL Training Bar (20kg) and Rogue KG Competition Plates. All participants were given the following guidelines for each of the physical tests:

Bench Press. The athletes were first instructed to remove a bar from a rack with the arms extended at the elbow joint while lying on a bench. The bar was then to be lowered to the chest and then symmetrically raised until the arms are fully extended at the elbow joint to complete the lift.

Deadlift. Athletes were instructed to perform a traditional deadlift with their feet positioned directly underneath their hips and their hands placed on the bar just outside the width of their knees. The bar was to be lifted until the knees and hips were in full extension and then lowered until the bar touched the platform.

Front Squat. Athletes were instructed to symmetrically position the bar on the anterior deltoids, the fingers are located underneath the bar and outside the shoulders, and the upper arm is at least at 90 degrees of flexion with the elbows and wrists being in a flexed state. The lifter then squats down by flexing at the hip, knee, and ankle joints. When the desired squat depth is achieved (minimum 90 degrees), the lifter reverses direction and ascends back to the upright position.

Vertical Jump. Athletes were instructed to stand on a jump mat, quickly drop to a squatting position (counter-movement), and with no pause, jump upwards as high as possible from the bottom of the squat. Athletes were also instructed to leave their hands on their hips throughout the duration of the jump.

Quantitative evidence of strength gains was attained through pre and post intervention max testing as well as qualitative evidence on a daily basis through a weekly well-being questionnaire. Performance was closely watched and monitored by trained strength and conditioning specialists as well as athletic trainers to ensure validity of programming and testing as well as the safety of the participants.

Determining the efficacy of Qigong exercises on a Fall sport athlete's strength gains and well-being (**Primary Aim 1**) was examined using specific statistical analysis designed by Nikolai Andersen using Minitab 16. All participants were prescribed the same pretest and posttest, well-being questionnaire, and general physical preparatory strength training program that is standard for all fall-sport athletes upon their return from winter break. This study lays the foundation for more exploration of holistic practices in physical strength and well-being for Fall sport athletes.

Limitations and Strengths

This researcher was unable to measure common biomarkers of inflammation, neither the participants nor the instructors were blind to the conditions, participation in this study was voluntary, Cal Poly football, women's volleyball, and women's soccer teams were chosen given their off season training status, and only short-term effects of Qigong exercises were measured. To assess well-being, the Warwick-Edinburgh Mental Well-Being questionnaire (Tennant et al., 2007) was used. A strength of the study is that it is one of the first to evaluate the efficacy of medical Qigong relating to the strength gains and well-being of collegiate football, women's soccer, and women's volleyball athletes.

Potential Risks

The proposed procedures have the following potential risk: a) injury during weight training activities; b) injury during max testing c) emotional episodes/discharge due to Qigong practices. Risks of application of additional recovery techniques are considered minimal risks.

Data Analysis

To compare the strength portion of the project, the Rossman/Chance Applet (Randomization, n.d) was used to perform a randomization test for two groups to show the quantitative results. The idea behind this test is to create multiple samples of two groups that are the same size as ours, with the same data values, but randomly assigning them to either group. By repeating this a thousand times, results show the likelihood of the improvement of the intervention group happening by random chance. This likelihood is the p-value that was calculated, with $\alpha=0.05$. Any p-value less than or equal to this alpha value shows that there is a significant difference in means between the intervention group and the nonintervention group for whichever strength test was being looked at.

For the questionnaire portion, the mean question scores (1-5) for each week was analyzed; the trend was then examined over the weeks to see if participants' in the intervention answers were increasing at higher rate than nonparticipants. Running independent t-tests utilizing Minitab 16, we determined the best fit lines for each of the groups (intervention, nonintervention, male and female). The r-squared value was tested, to observe the linearity of each line, but even more important was the p-value for the slope which would indicate whether the group was improving at a rate that could not be by chance ($\alpha=0.05$). Strength was compared between the control and Qigong groups to show that the Qigong group generated a stronger positive trend.

Chapter 4

Results

In this chapter the results of the data analysis are presented. The data were collected and then processed in response to the problems posed in chapter 1 of this thesis. Dependent measures include all four physical tests as well as the well-being questionnaire. Independent measures include Qigong exercises and the absence of Qigong exercises. Two fundamental goals drove the collection of the data and the subsequent data analysis. The goals were to determine the efficacy of Qigong – specifically the Dao Yin exercises focusing on lungs, kidneys, heart, liver, and spleen – to facilitate strength gains and well-being in collegiate anaerobically trained athletes. Findings according to strength measures and well-being measures are presented in this chapter.

Response Rate

A total of 73 athletes that ranged in age from 18 to 22 years participated in the study. Of those 73 athletes, 47 were male and 26 were female. The average body weights of the participants between groups are shown in table 4.1 and average body weights within groups are shown in table 4.2. Significance was shown in measurements of strength between groups (Table 4.3.) and within groups (Table 4.4.) Significance was also shown in measurements of well-being for total score between groups (Table 4.5.) and within groups (Table 4.6.) as well as for each question between groups (Table 4.7) and within groups (Table 4.8). Dropout was relatively high (25%) however, there were nearly an equal amount of participants in each group (54% in the intervention group and 46% in the control).

Table 4.1.
Summary of Body Weight Means between Groups.

	Control	Qigong
Body Weight	M	M
Pre test	186.78	204.55
Post test	188.42	206.45

Body weights are listed in pounds.

Table 4.2.
Summary Body Weight Means within Groups.

	Control		Qigong	
	Female	Male	Female	Male
Body Weight	M	M	M	M
Pre test	140.83	213.04	151.07	233.34
Post test	141.75	215.09	153.64	234.88

Body weights are listed in pounds.

Strength Measurement

Results from our strength tests generally support both the first and second hypotheses that the Qigong exercises will have a significant impact on strength gains and the ability to mentally recover from strenuous exercise as well as that the women's soccer, women's volleyball, and football athletes in the Qigong intervention group will perform better on the physical tests than the control group. Between-group changes and associated P-values in bench press, deadlift, front squat, and vertical are presented in table 4.3. The mean values for all strength measures were higher in the Qigong group (B.P.=10.16, Deadlift=28.3, F.S.=20.79, V.J.=.84) versus the control(B.P.=4.93, Deadlift=24.09, F.S.=14.98, V.J.=.41) and significance was found in all strength measures except vertical jump when comparing the Qigong to the control group. Within-group changes and associated P-values are presented in table 4.4. When compared to the control, significance was found with females in the Qigong group in both bench press (P= 0.05) and vertical jump (P= 0.002). Mean values for all female strength measures were higher in the Qigong versus control; bench press (Diff= 2.98), deadlift (Diff= 2.44), front squat (Diff= 4.083), and vertical jump (Diff= 1.23). When compared to the control, significance was found with males in the Qigong group in both bench press (P= 0.00) and front squat (P= 0.003). Mean values for all male strength measures except for the vertical jump were higher in the Qigong versus control; bench press (Diff= 16.10), deadlift (Diff= 5.04), front squat (Diff= 17.20) vertical jump (Diff= -.013).

Table 4.3.
Summary of Means and P-values for Strength Tests between Groups.

	Control	Qigong	
Exercises	M	M	p
B.P.	4.93	10.16	0.000*
Deadlift	24.09	28.3	0.09
F.S.	14.98	20.79	0.004*
V.J.	0.41	0.84	0.223

Significance was found at $p<0.05$. * denotes statistical significance. Positive numbers denote an increase. Negative numbers denote decrease. All lifts were measured in kilograms and the vertical jump in inches. B.P.= bench press. F.S.= front squat. V.J.= vertical jump.

Table 4.4.
Summary of Means and P-values for Strength Tests within Groups.

	Male			Female		
	Control	Qigong		Control	Qigong	
Exercises	M	M	p	M	M	p
B.P.	5.01	12.31	0.00*	4.79	6.15	0.05*
Deadlift	26.19	31.23	0.147	20.42	22.86	0.38
F.S.	17.47	25.27	0.003*	10.62	12.47	0.19*
V.J.	0.57	0.55	0.48	0.14	1.38	0.002*

Significance was found at $p<0.05$. * denotes statistical significance. Positive numbers denote an increase. Negative numbers denote decrease. All lifts were measured in kilograms and the vertical jump in inches. B.P.= bench press. F.S.= front squat. V.J.= vertical jump.

Well-being Measurement

Data from the analysis of the questionnaire generally supported the hypothesis that the perceived well-being in the Qigong group will be significantly higher than in the control group. Total well-being score between groups is presented in table 4.5 and total well-being score between groups is presented in table 4.6. In both table 4.5 and 4.6, the Qigong groups had a higher average overall score and significance was shown in the Qigong group when compared to the control group. The between group changes and associated p-values are presented in table 4.7. The Qigong group showed significance in every question with the exception of question eleven when compared to the control group. Figures 4.1-4.14 show trends and mean values of the response to each question between groups. Table 4.8 displays the mean values and the associated p-values within each group. Significance was found in all questions with females in the

Qigong group when compared to females in the control group with the exception of question five. Significance was also shown in nine of the fourteen questions with males in the Qigong group when compared to the control group. The mean values of questions for the females in the Qigong group were all higher when compared to the females in the control group. Mean values for the males in the Qigong group were all higher when compared to the control group with the exception of two, which were just slightly lower. Figures 4.15-4.28 show trends and the mean values of each question from the males and females in the control and Qigong groups.

Table 4.5.
Summary of Means and P-values for Total Well-being Score between Groups.

	Control	Qigong	
	M		P
Total Score	52.73	55.66	0.00*

*Mean total well-being score between groups. Significance was found at p<0.05. * denotes significance.*

Table 4.6.
Summary of Means and P-values for Total Well-being Score within Groups.

	Female			Male		
	Control	Qigong		Control	Qigong	
	M		P	M		P
Total Score	51.67	55.56	0.00*	53.33	55.71	0.00*

*Mean total well-being score within groups. Significance was found at p<0.05. * denotes significance.*

Table 4.7.
Summary of Means and P-values for Well-being Scores per Question between Groups.

	Control	Qigong	
Question	M		P
Q1	3.93	4.11	0.00*
Q2	3.89	4.06	0.00*
Q3	3.21	3.67	0.00*
Q4	3.74	4.05	0.00*
Q5	3.1	3.33	0.00*
Q6	3.82	3.94	0.008*
Q7	3.79	3.91	0.019*
Q8	3.82	4.14	0.00*
Q9	3.85	4.14	0.00*
Q10	3.82	4.06	0.00*
Q11	4.07	4.07	0.22
Q12	4.18	4.32	0.00*
Q13	3.79	3.89	0.049*
Q14	3.72	3.97	0.00*

*Mean well-being score between groups. Significance was found at p<0.05. * denotes significance.*

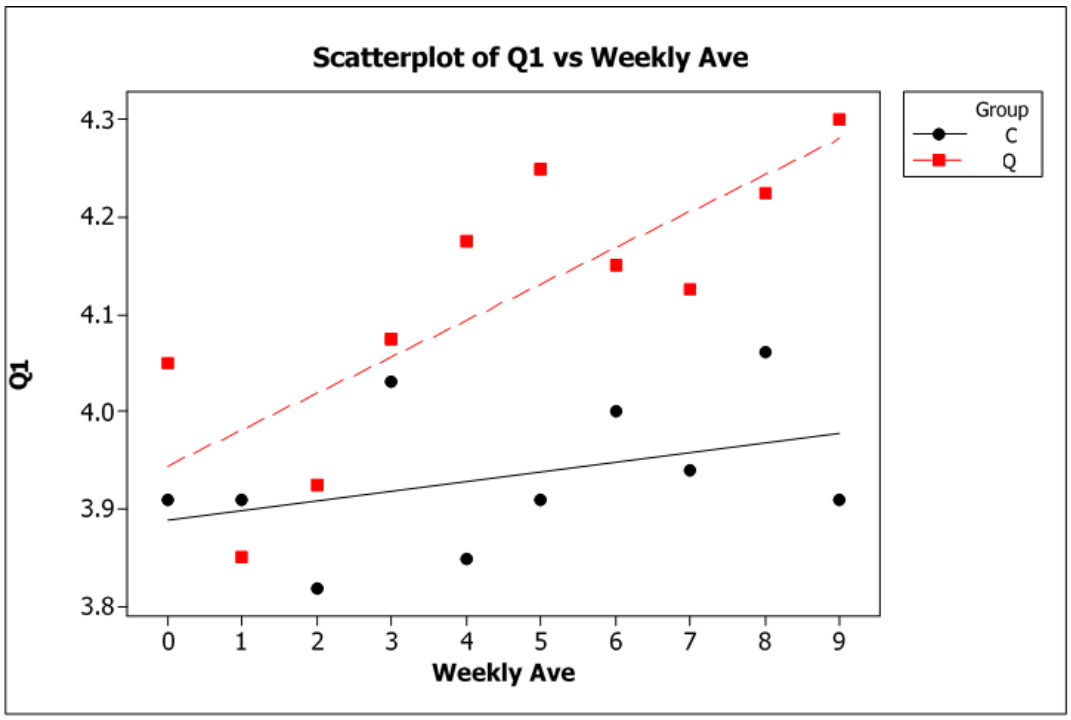


Figure 4.1. Between Group Question 1: I've been feeling optimistic about the future. Trend and average score per week. C=Control, Q=Qigong

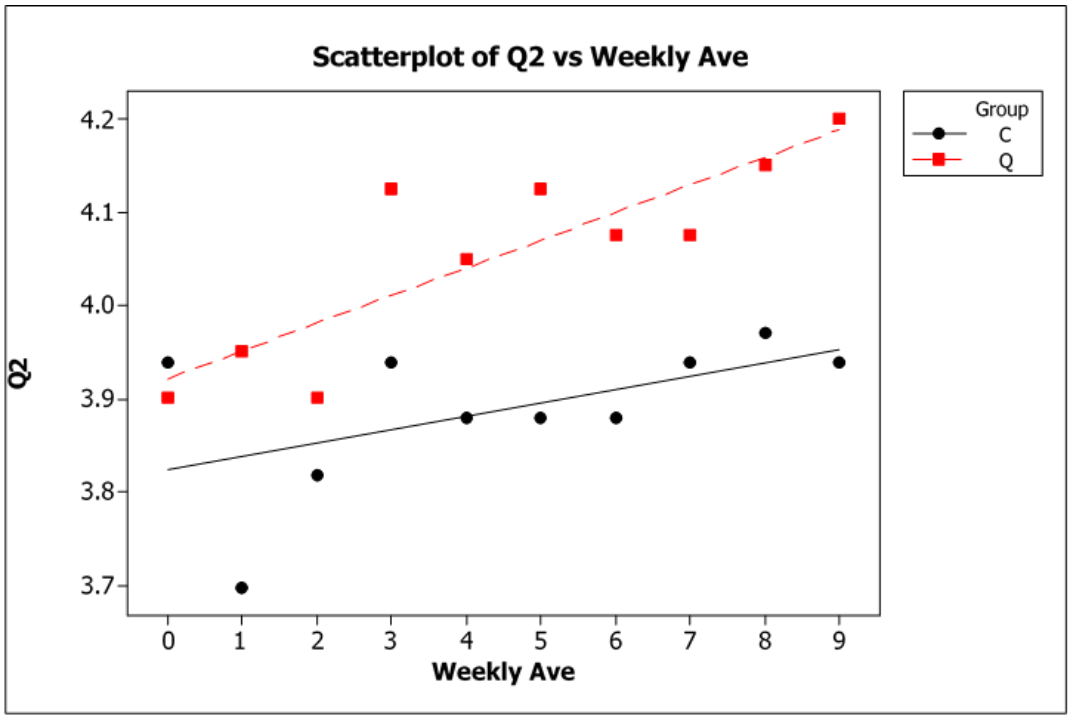


Figure 4.2. Between Group Question 2: I've been feeling useful. Trend and average score per week. C=Control, Q=Qigong

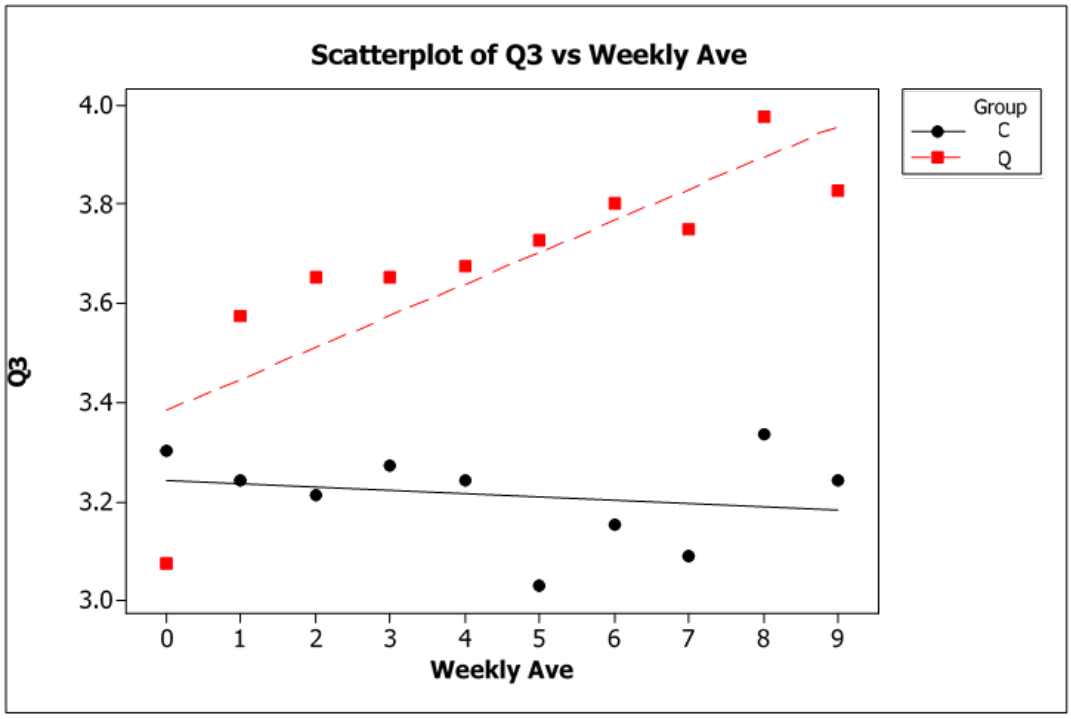


Figure 4.3. Between Group Question 3: I've been feeling relaxed. Trend and average score per week. C=Control, Q=Qigong

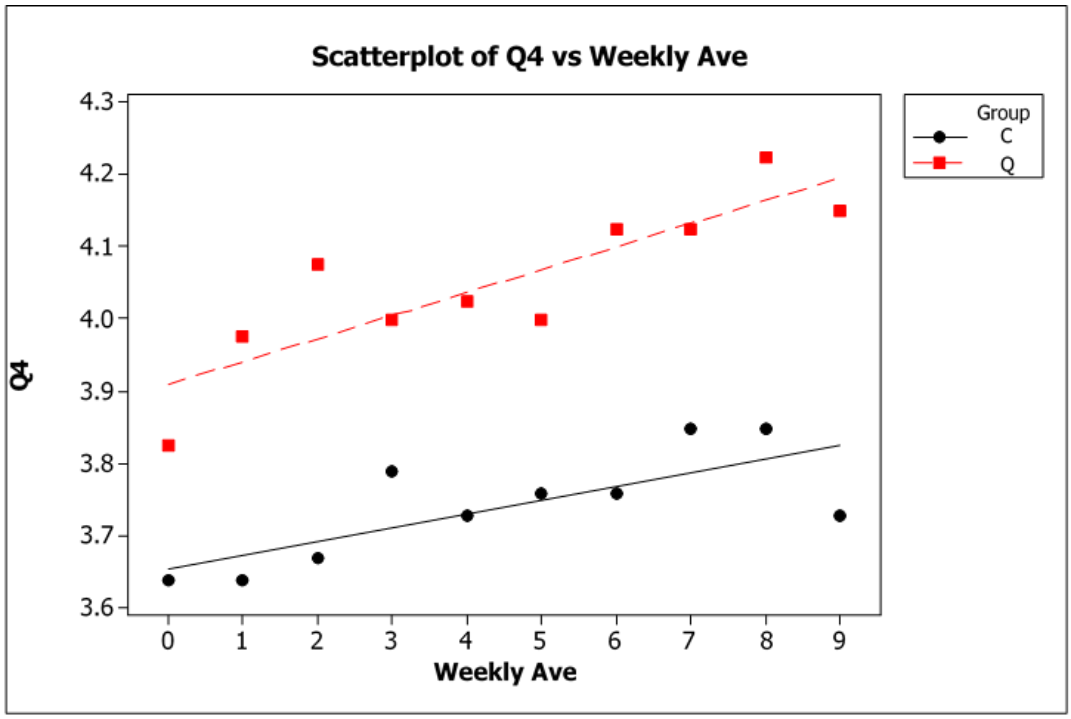


Figure 4.4. Between Group Question 4: I've been feeling interested in other people. Trend and average score per week. C=Control, Q=Qigong

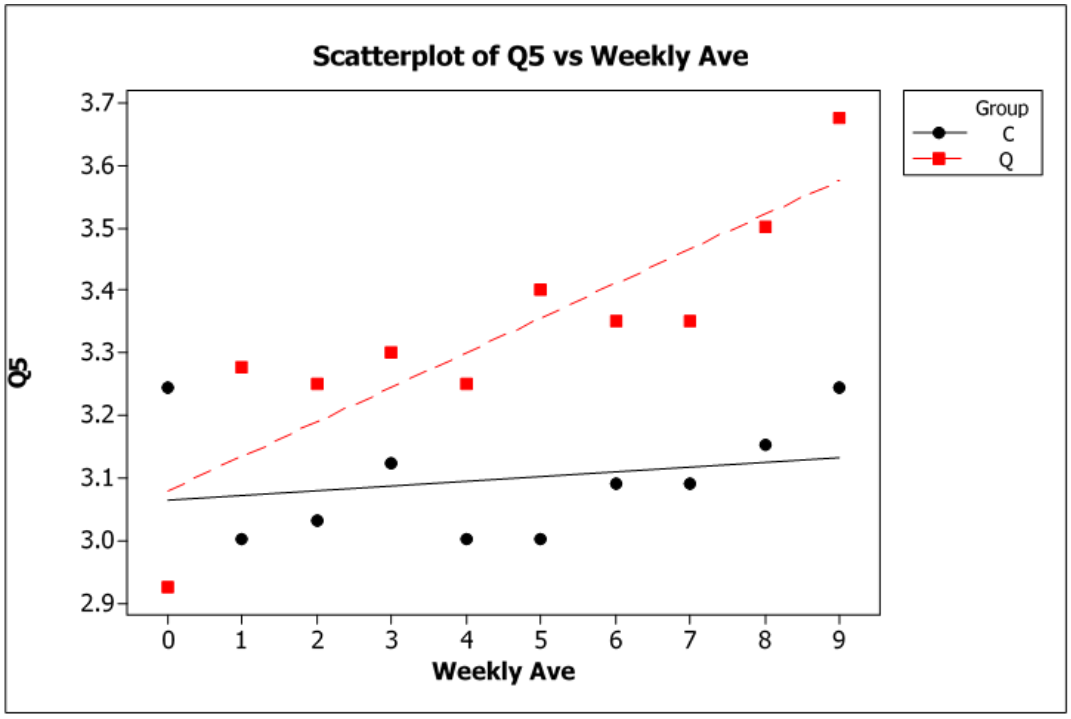


Figure 4.5. Between Group Question 5: I've had energy to spare. Trend and average score per week. C=Control, Q=Qigong

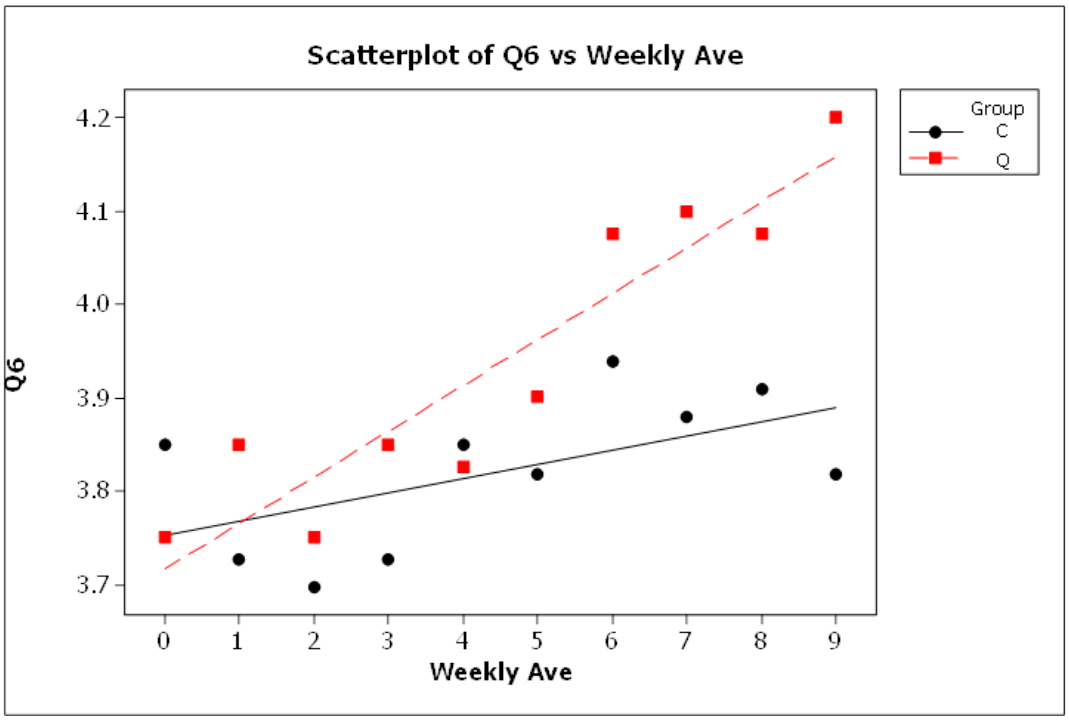


Figure 4.6. Between Group Question 6: I've been dealing with problems well. Trend and average score per week. C=Control, Q=Qigong

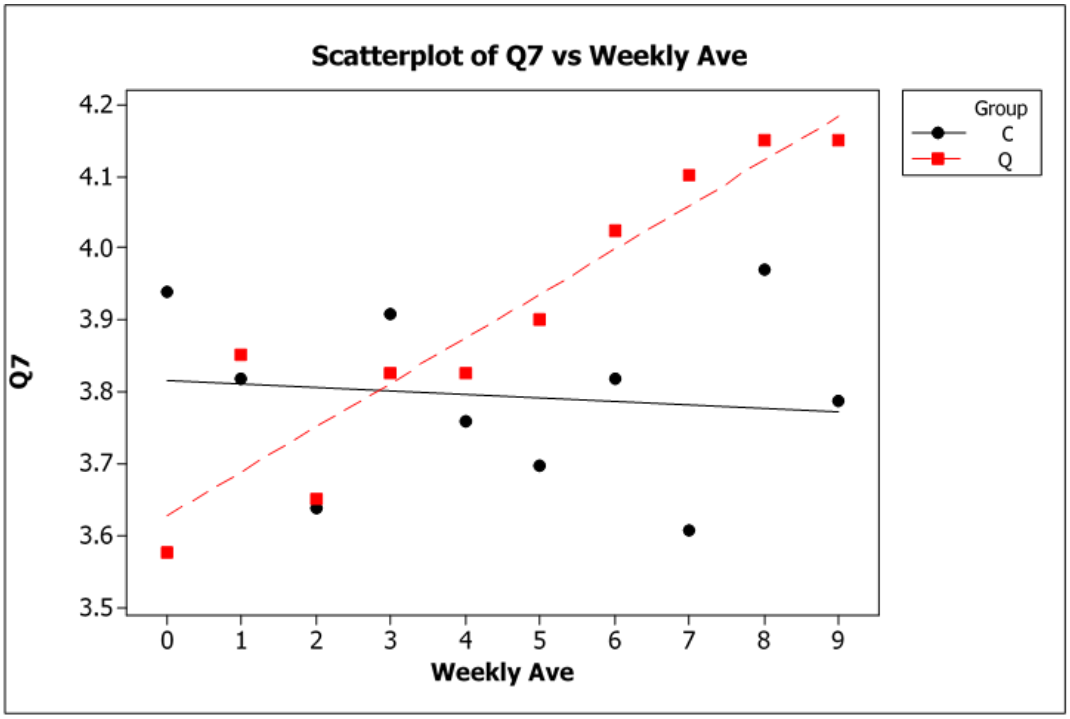


Figure 4.7. Between Group Question 7: I've been thinking clearly. Trend and average score per week. C=Control, Q=Qigong

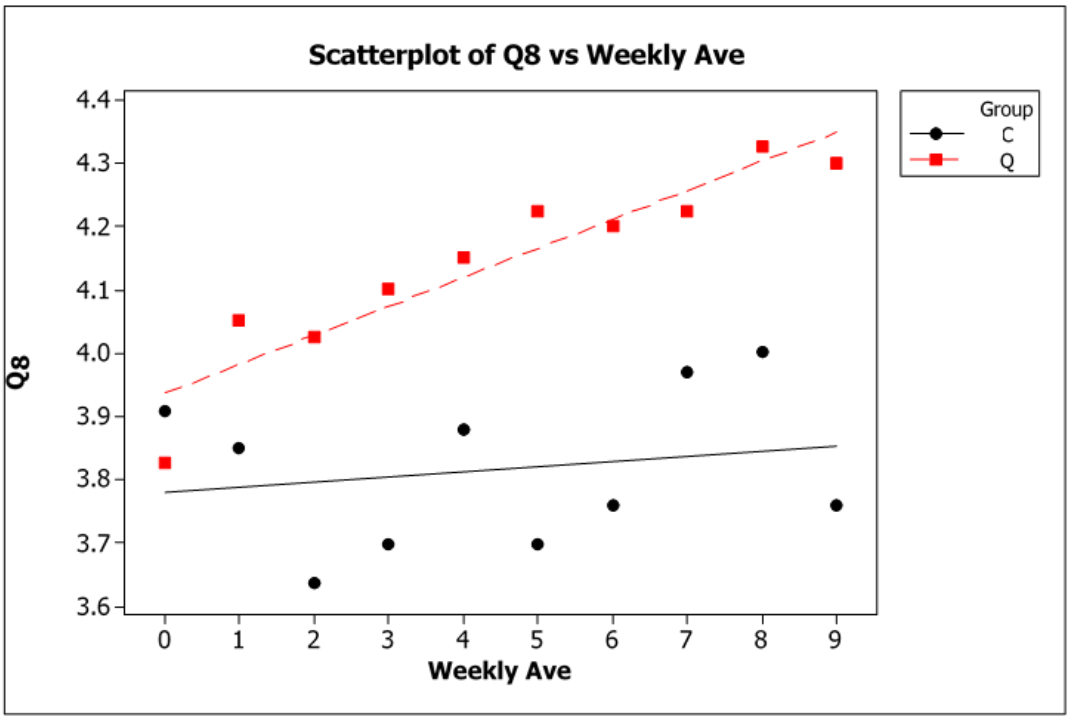


Figure 4.8. Between Group Question 8: I've been feeling good about myself. Trend and average score per week. C=Control, Q=Qigong

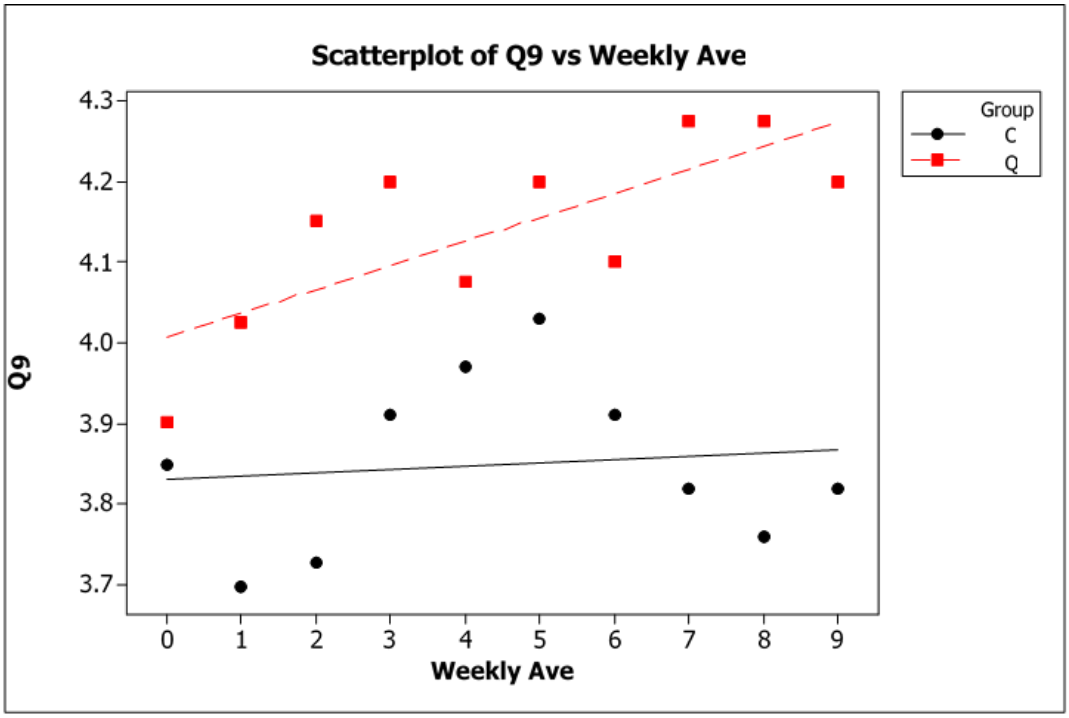


Figure 4.9. Between Group Question 9: I've been feeling close to other people. Trend and average score per week. C=Control, Q=Qigong

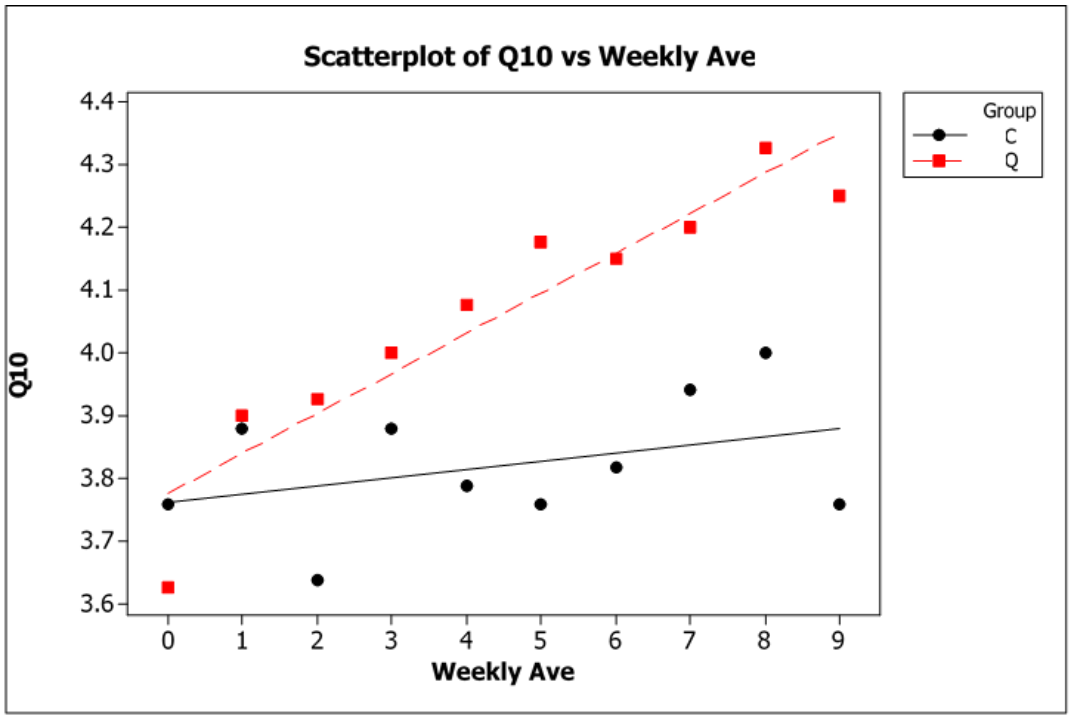


Figure 4.10. Between Group Question 10: I've been feeling confident. Trend and average score per week. C=Control, Q=Qigong

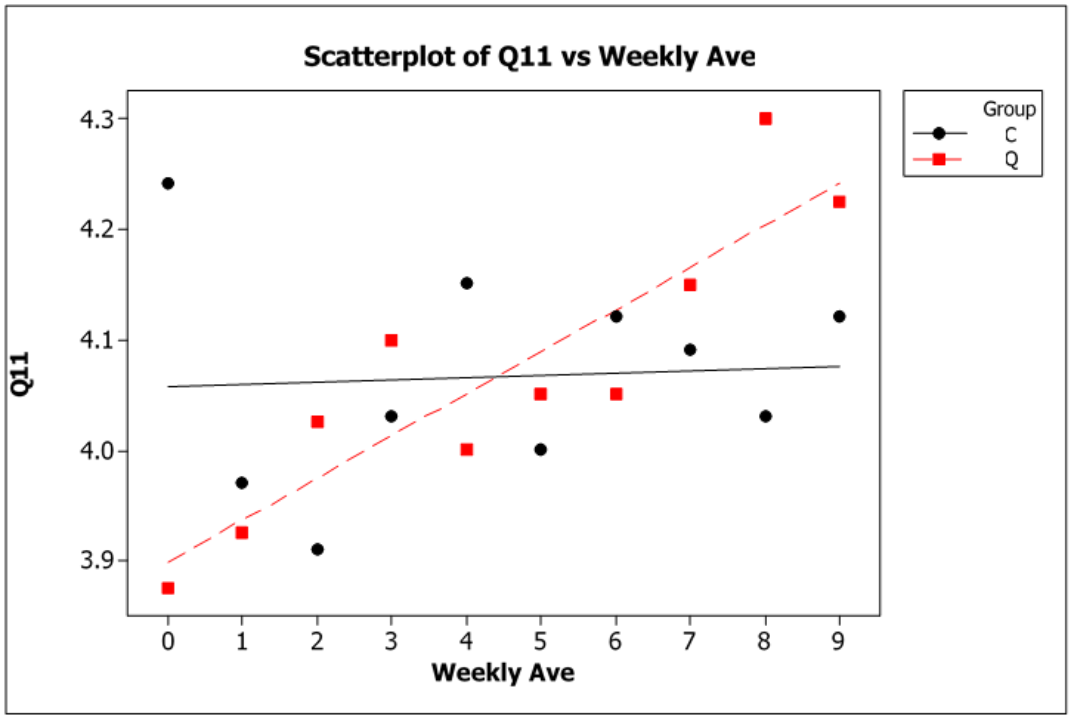


Figure 4.11. Between Group Question 11: I've been able to make up my own mind about things. Trend and average score per week. C=Control, Q=Qigong

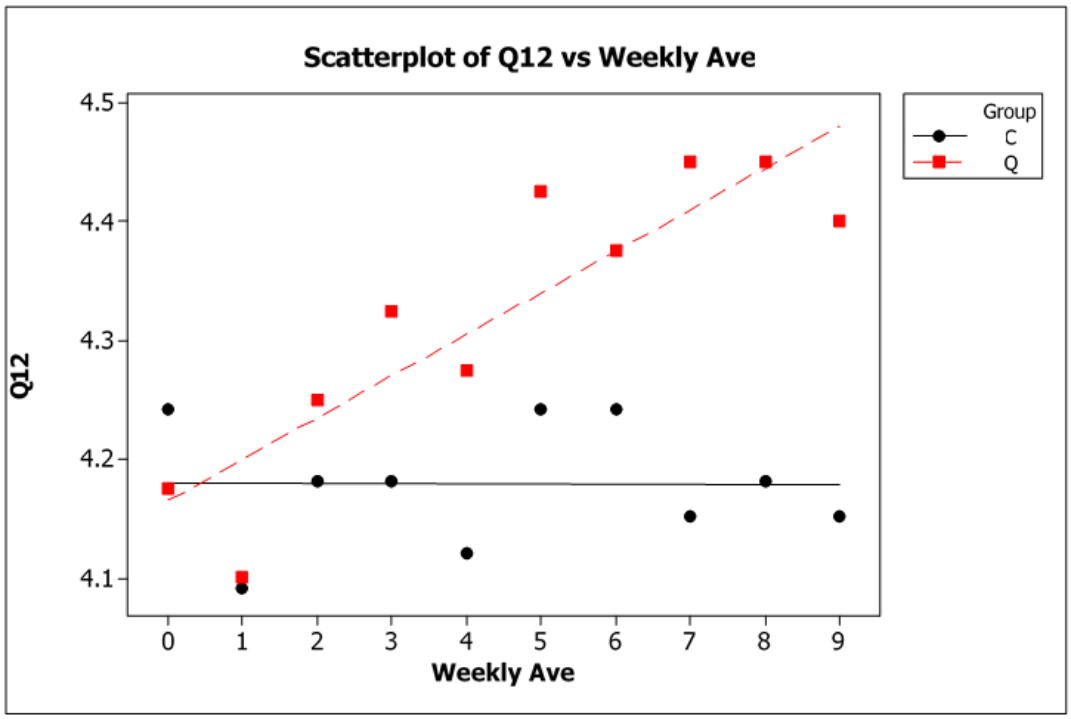


Figure 4.12. Between Group Question 12: I've been feeling loved. Trend and average score per week. C=Control, Q=Qigong

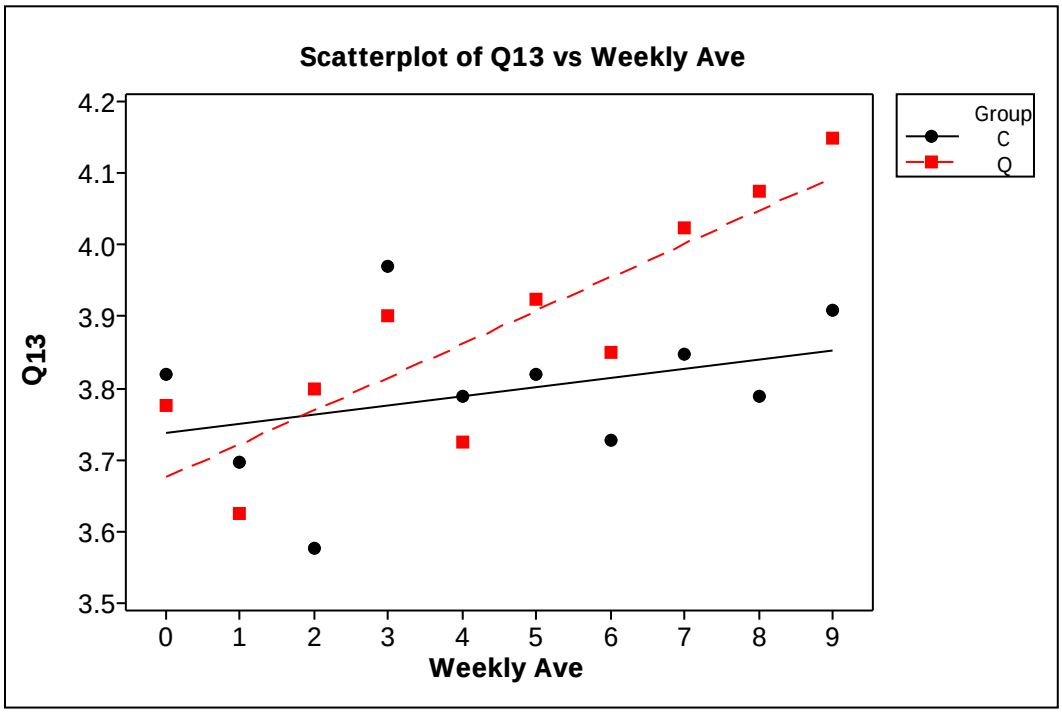


Figure 4.13. Between Group Question 13: I've been interested in new things. Trend and average score per week. C=Control, Q=Qigong

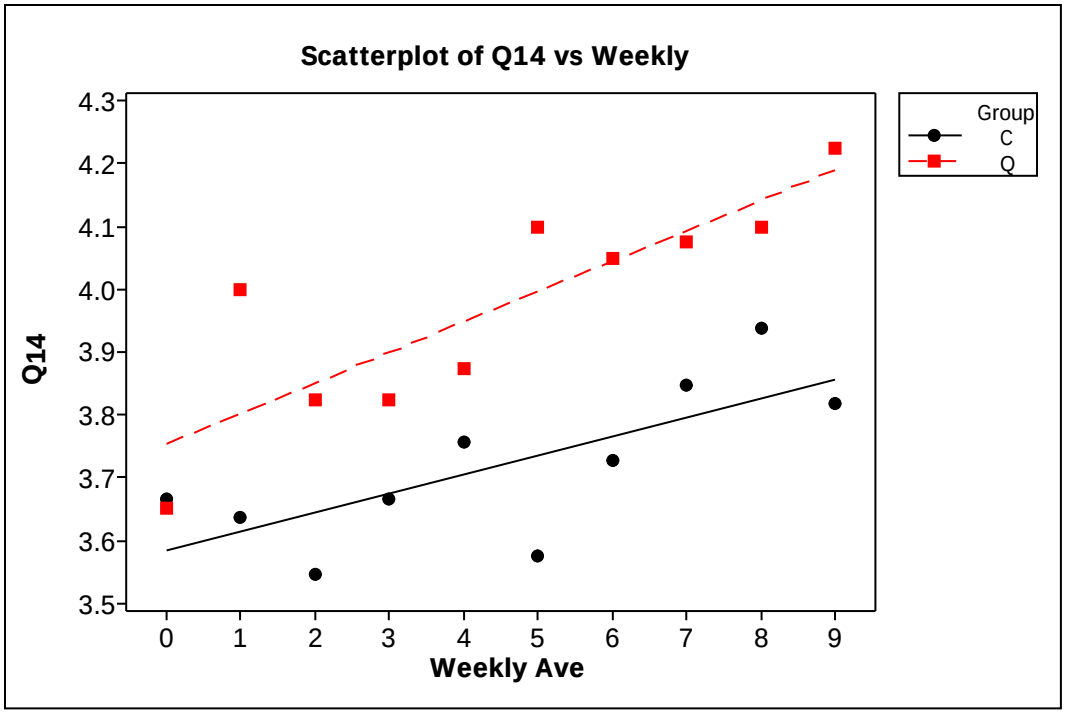


Figure 4.14. Between Group Question 14: I've been feeling cheerful. Trend and average score per week. C=Control, Q=Qigong

Table 4.8.
Summary of Means and P-values for Well-being Scores per Question within Groups.

	Female			Male		
	Control	Qigong		Control	Qigong	
Question	M		P	M		P
Q1	3.81	4.07	0.001*	4.00	4.13	0.015*
Q2	3.8	4.09	0.00*	3.94	4.04	0.035*
Q3	3.1	3.71	0.00*	3.28	3.65	0.00*
Q4	3.85	4.11	0.00*	3.67	4.02	0.00*
Q5	3.15	3.27	0.119	3.06	3.36	0.002*
Q6	3.63	3.94	0.00*	3.93	3.94	0.438
Q7	3.57	3.91	0.002*	3.92	3.9	0.585
Q8	3.66	4.08	0.00*	3.9	4.18	0.00*
Q9	3.86	4.1	0.00*	3.84	4.16	0.00*
Q10	3.62	3.9	0.00*	3.93	4.15	0.012*
Q11	3.88	4.06	0.004*	4.17	4.07	0.963
Q12	4.04	4.33	0.00*	4.26	4.32	0.099
Q13	3.85	3.97	0.028*	3.76	3.84	0.203
Q14	3.79	4.03	0.003*	3.68	3.94	0.001*

*Mean well-being score within groups. Significance was found at $p<0.05$. * denotes significance.*

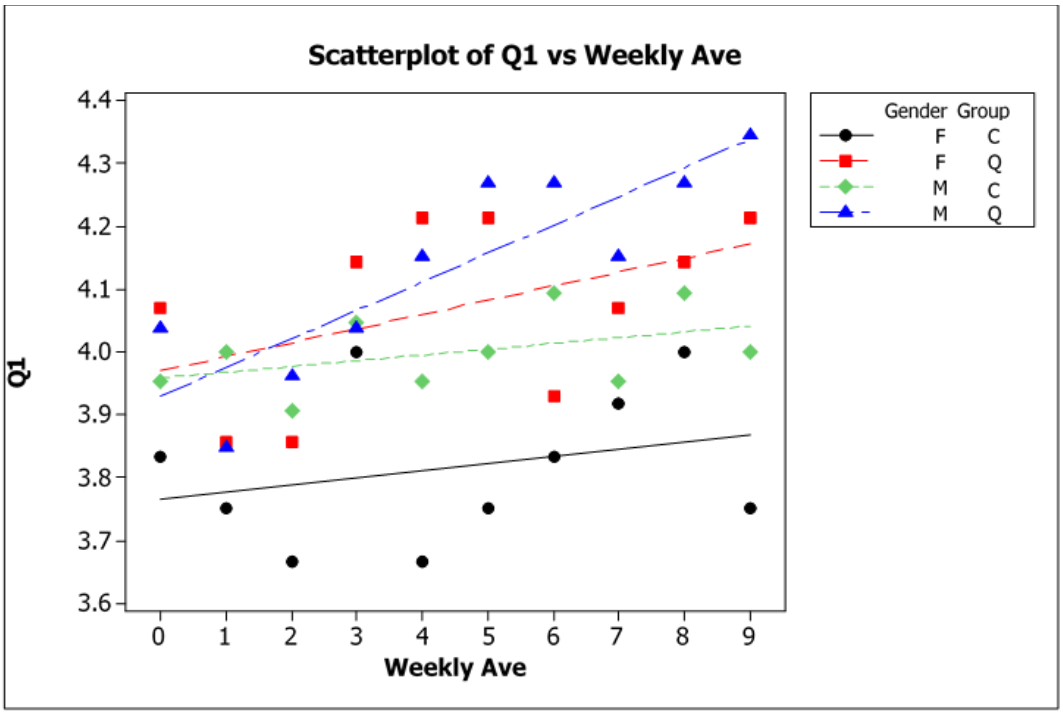


Figure 4.15. Within Group Question 1: I've been feeling optimistic about the future. Trend and average score per week. C=Control, Q=Qigong, F=Female, M=Male

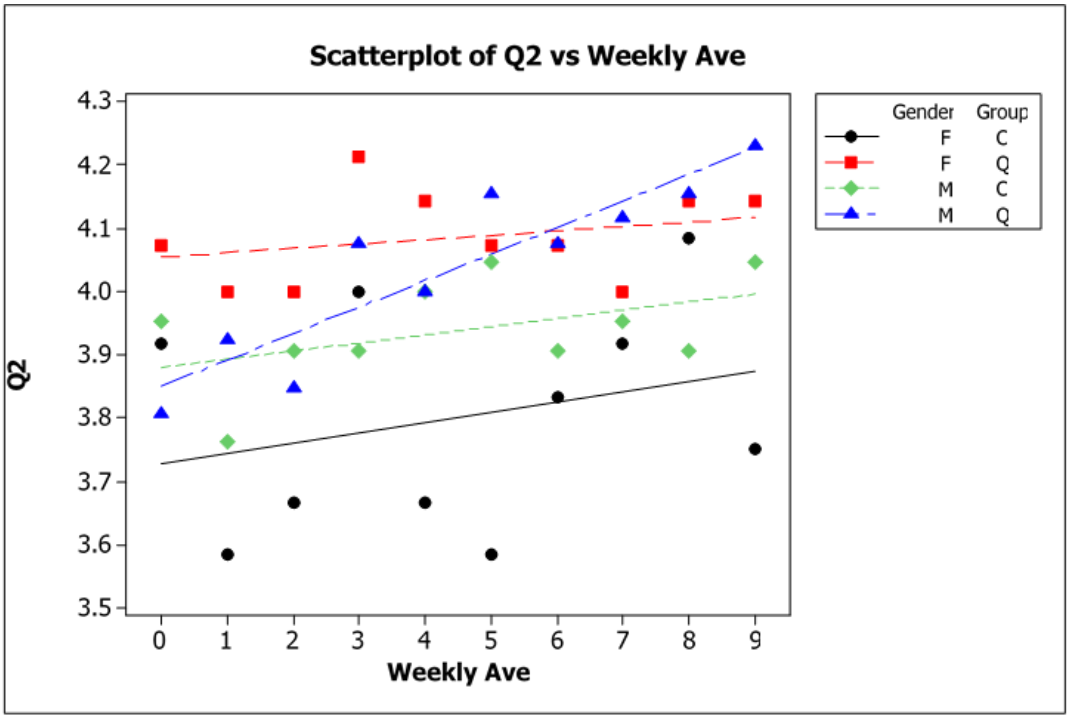


Figure 4.16. Within Group Question 2: I've been feeling useful. Trend and average score per week. C=Control, Q=Qigong, F=Female, M=Male

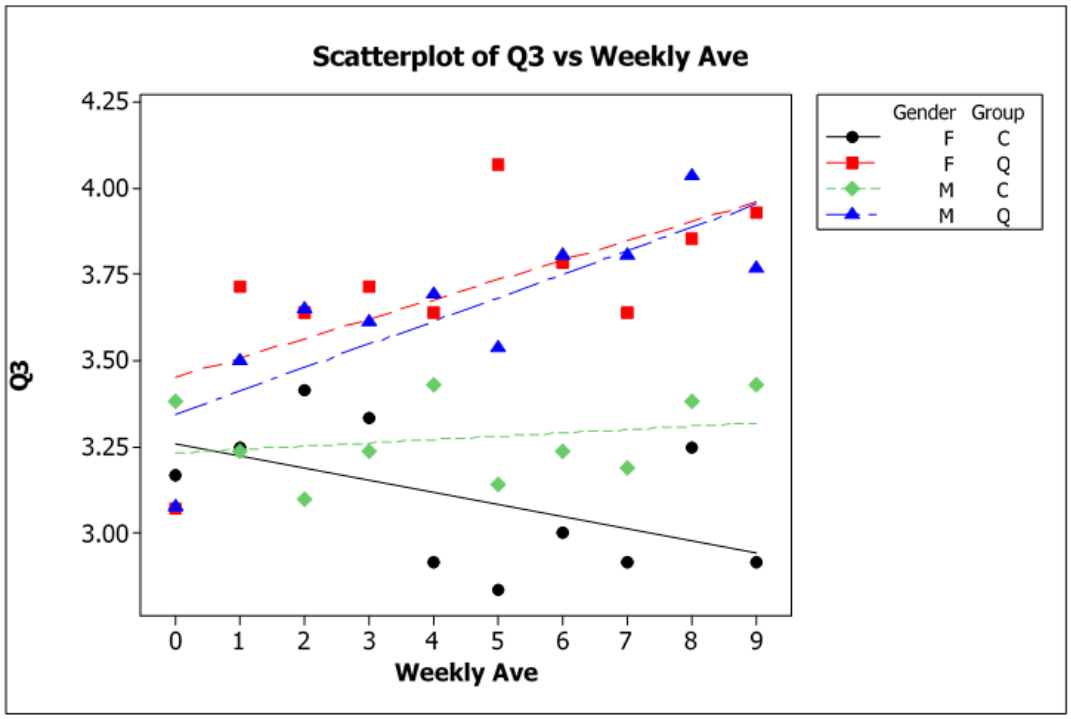


Figure 4.17. Within Group Question 3: I've been feeling relaxed. Trend and average score per week. C=Control, Q=Qigong, F=Female, M=Male

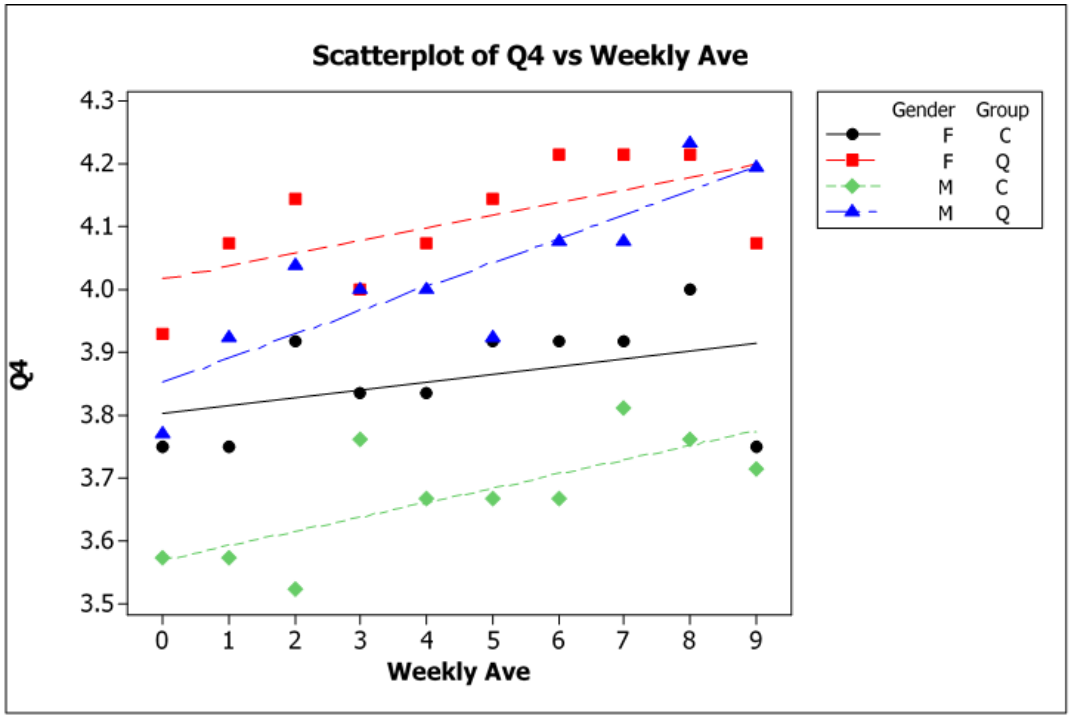


Figure 4.18. Within Group Question 4: I've been feeling interested in other people. Trend and average score per week. C=Control, Q=Qigong, F=Female, M=Male

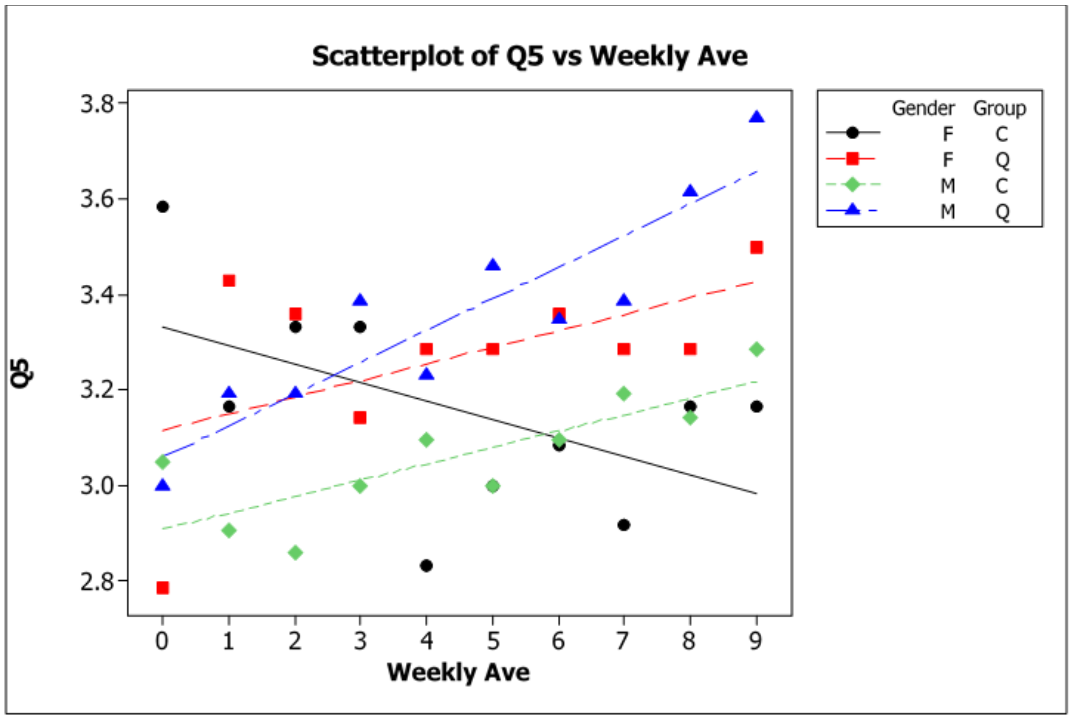


Figure 4.19. Within Group Question 5: I've had energy to spare. Trend and average score per week. C=Control, Q=Qigong, F=Female, M=Male

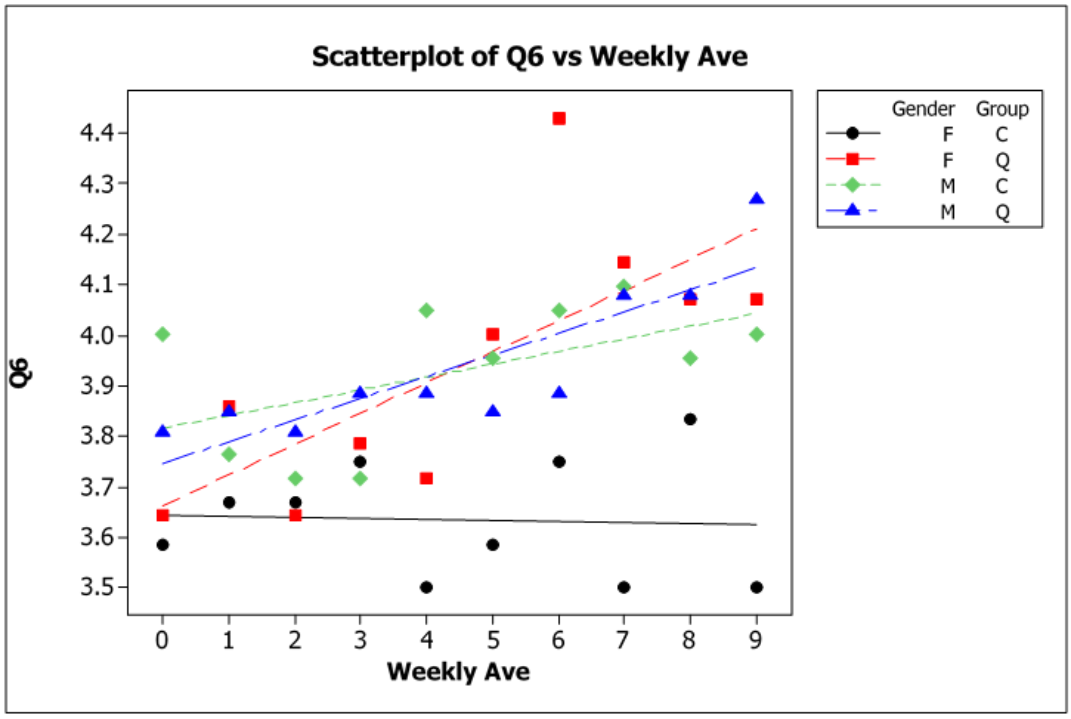


Figure 4.20. Within Group Question 6: I've been dealing with problems well. Trend and average score per week. C=Control, Q=Qigong, F=Female, M=Male

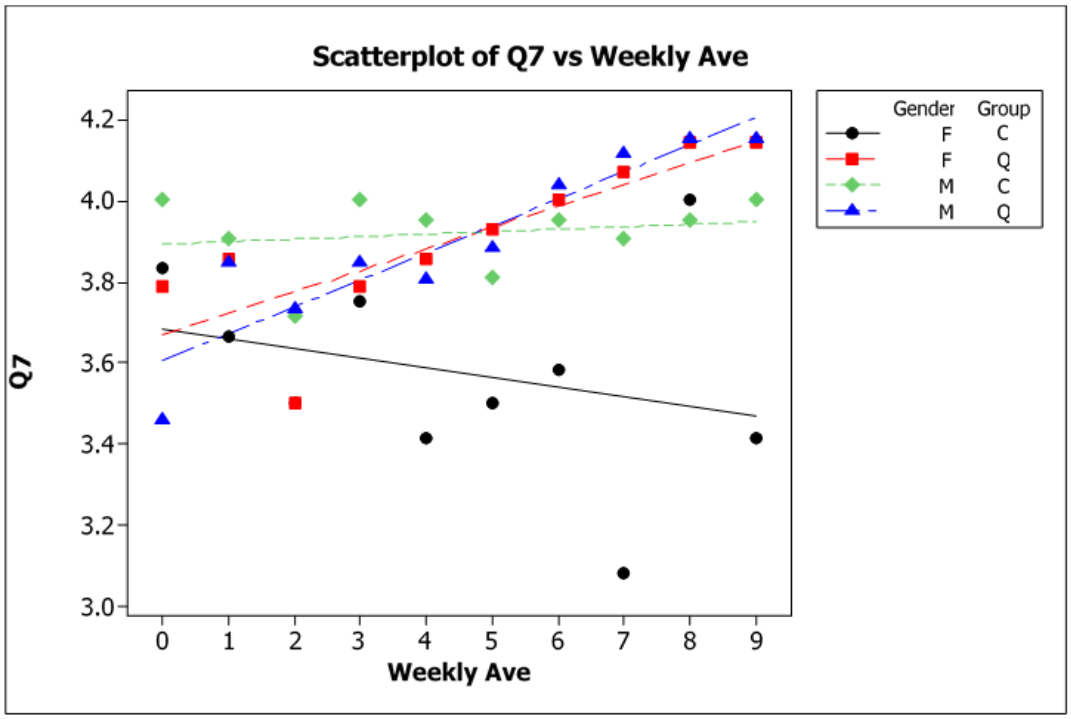


Figure 4.21. Within Group Question 7: I've been thinking clearly. Trend and average score per week. C=Control, Q=Qigong, F=Female, M=Male

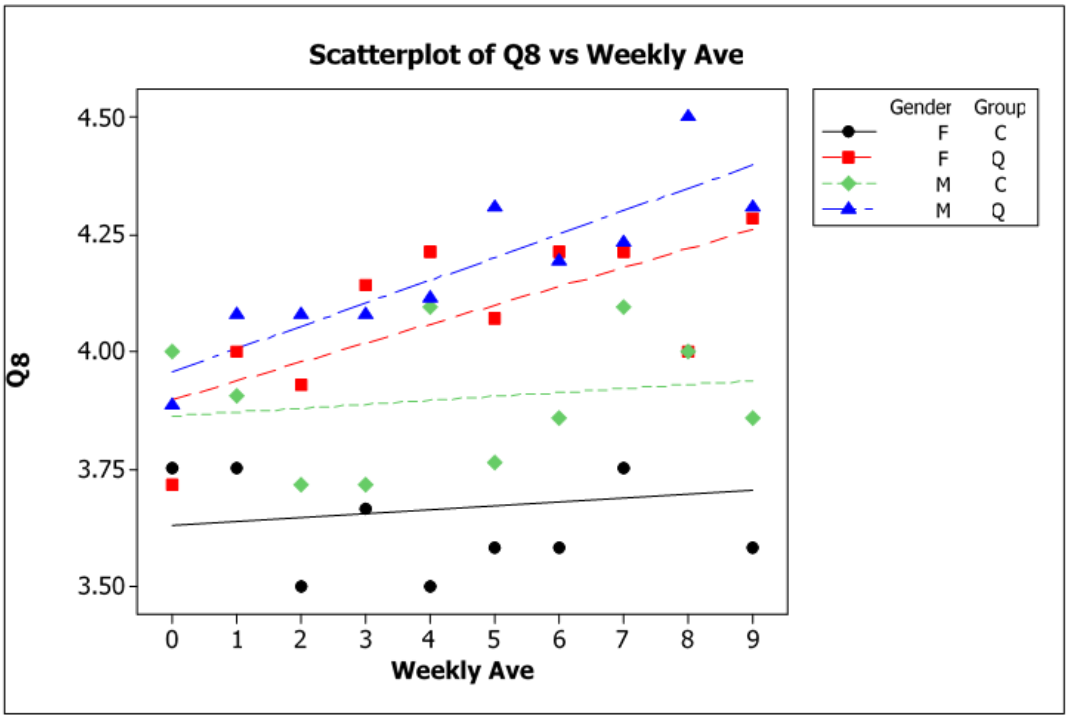


Figure 4.22. Within Group Question 8: I've been feeling good about myself. Trend and average score per week. C=Control, Q=Qigong, F=Female, M=Male

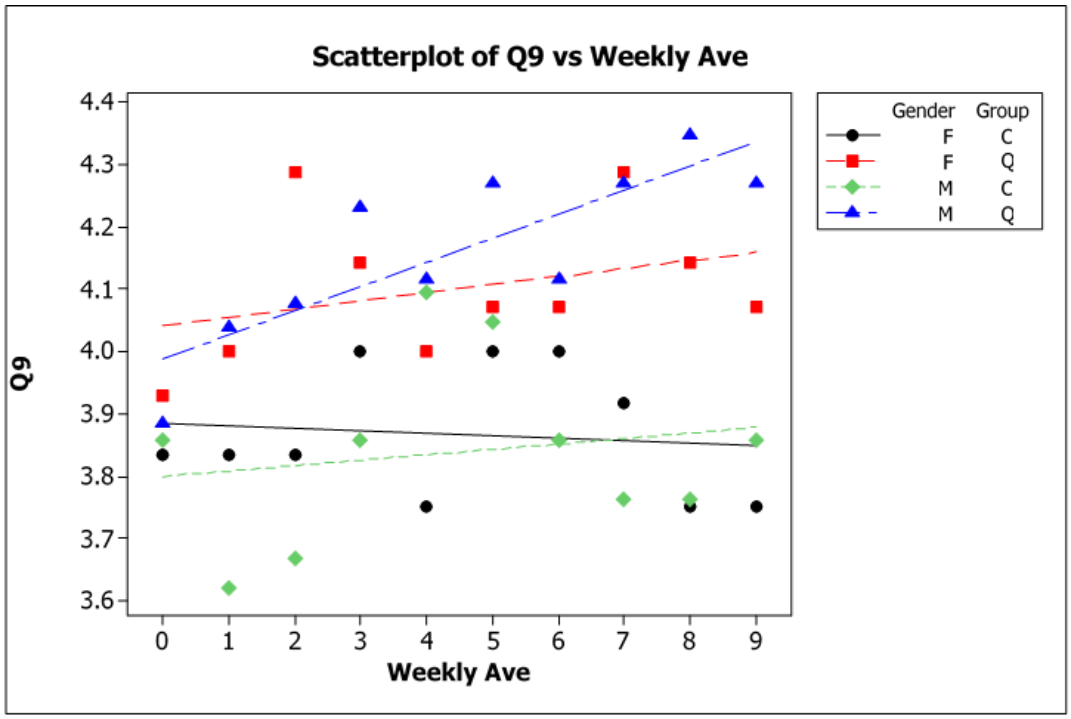


Figure 4.23. Within Group Question 9: I've been feeling close to other people. Trend and average score per week. C=Control, Q=Qigong, F=Female, M=Male

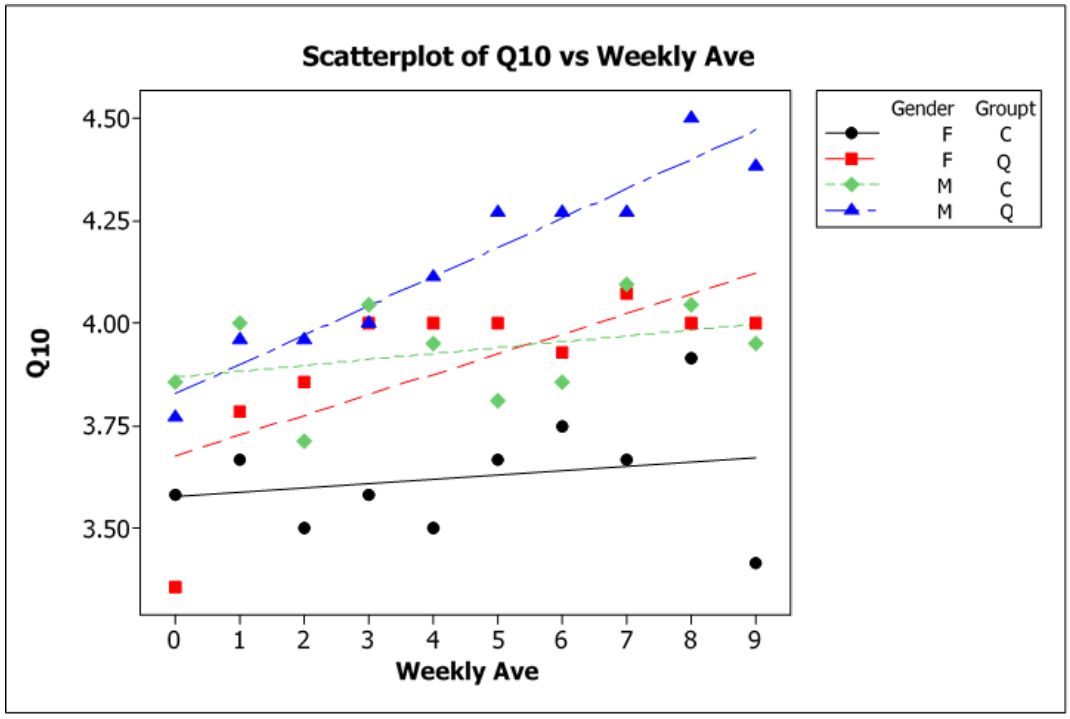


Figure 4.24. Within Group Question 10: I've been feeling confident. Trend and average score per week. C=Control, Q=Qigong, F=Female, M=Male

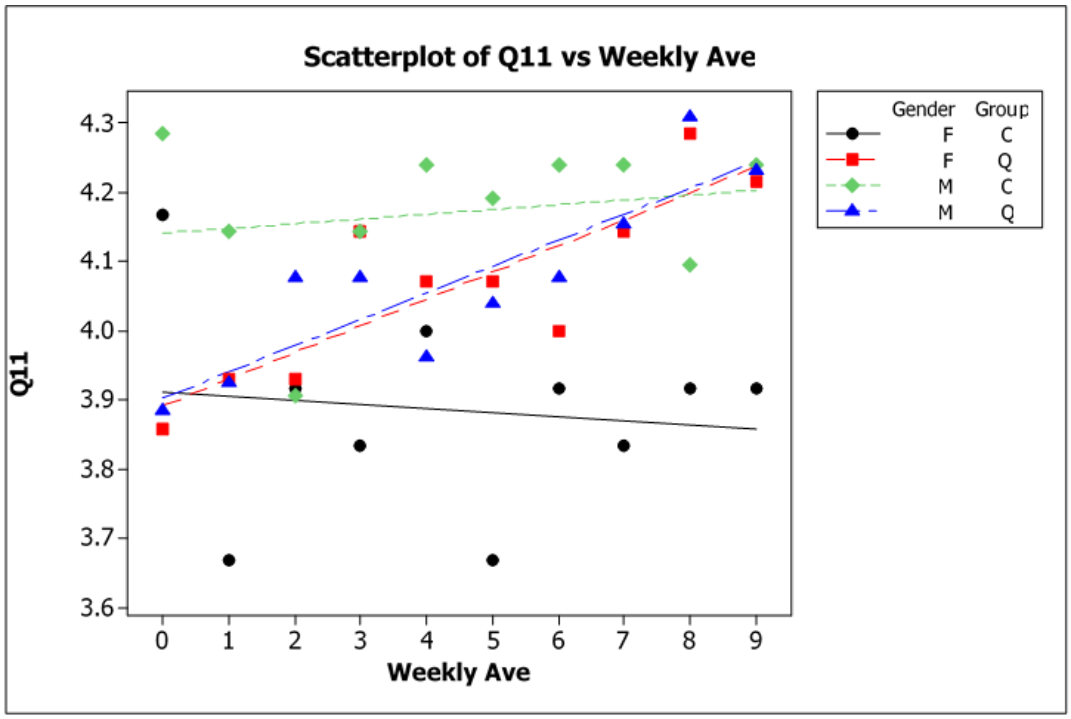


Figure 4.25. Within Group Question 11: I've been able to make up my own mind about things. Trend and average score per week. C=Control, Q=Qigong, F=Female, M=Male

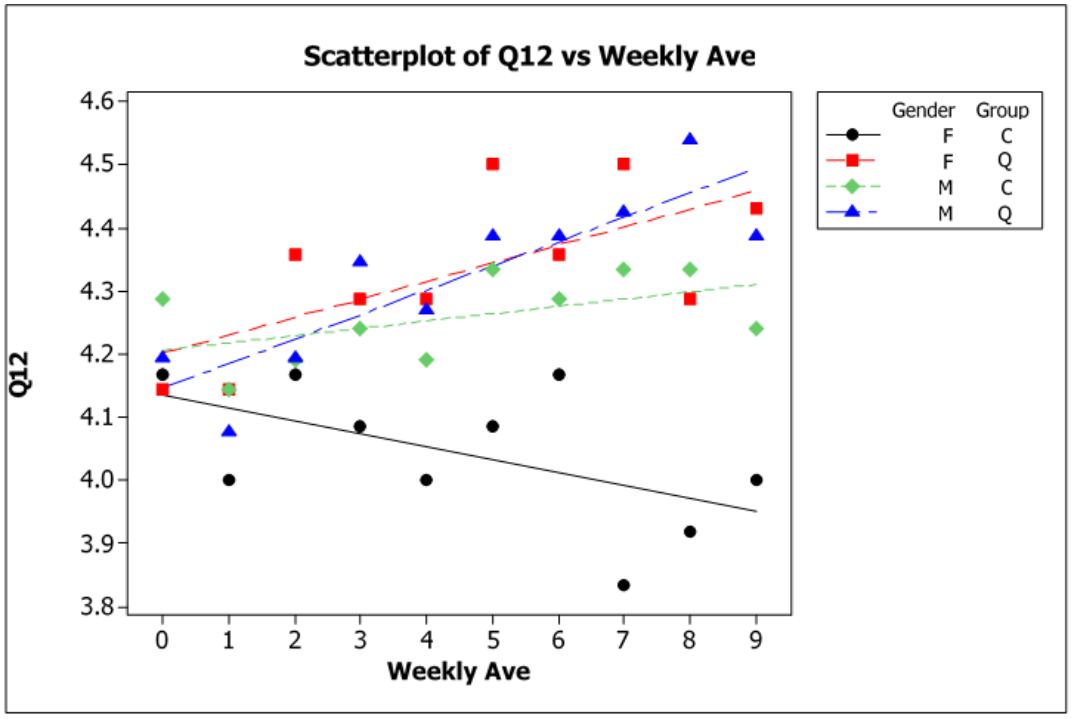


Figure 4.26. Within Group Question 12: I've been feeling loved. Trend and average score per week. C=Control, Q=Qigong, F=Female, M=Male

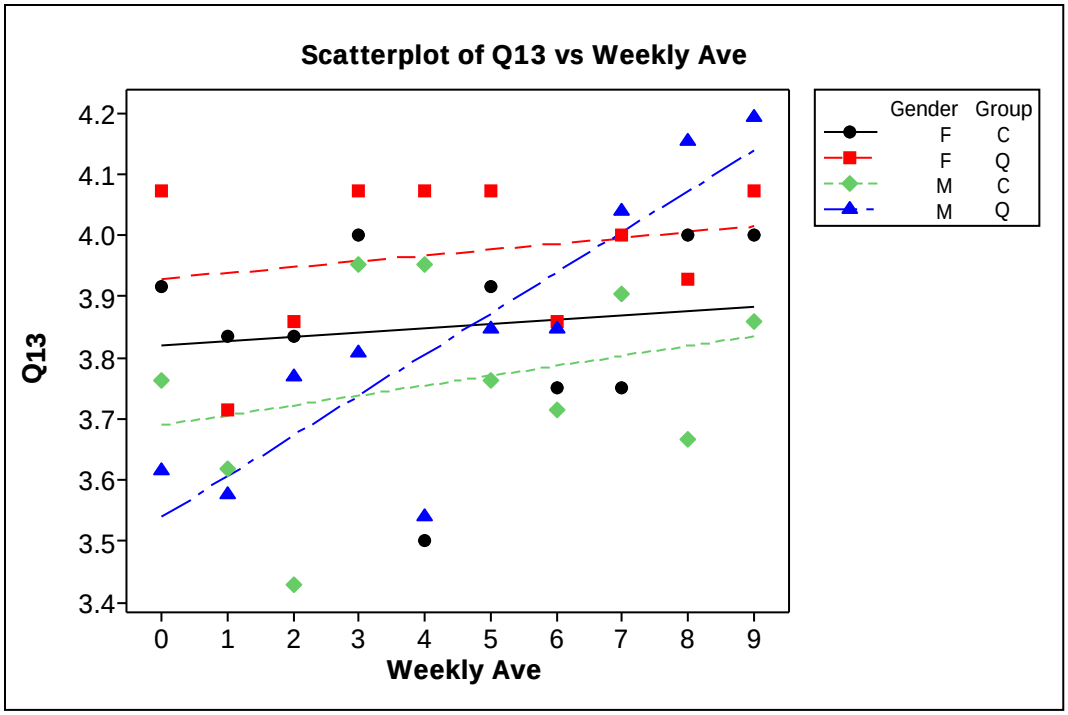


Figure 4.27. Within Group Question 13: I've been interested in new things. Trend and average score per week. C=Control, Q=Qigong, F=Female, M=Male

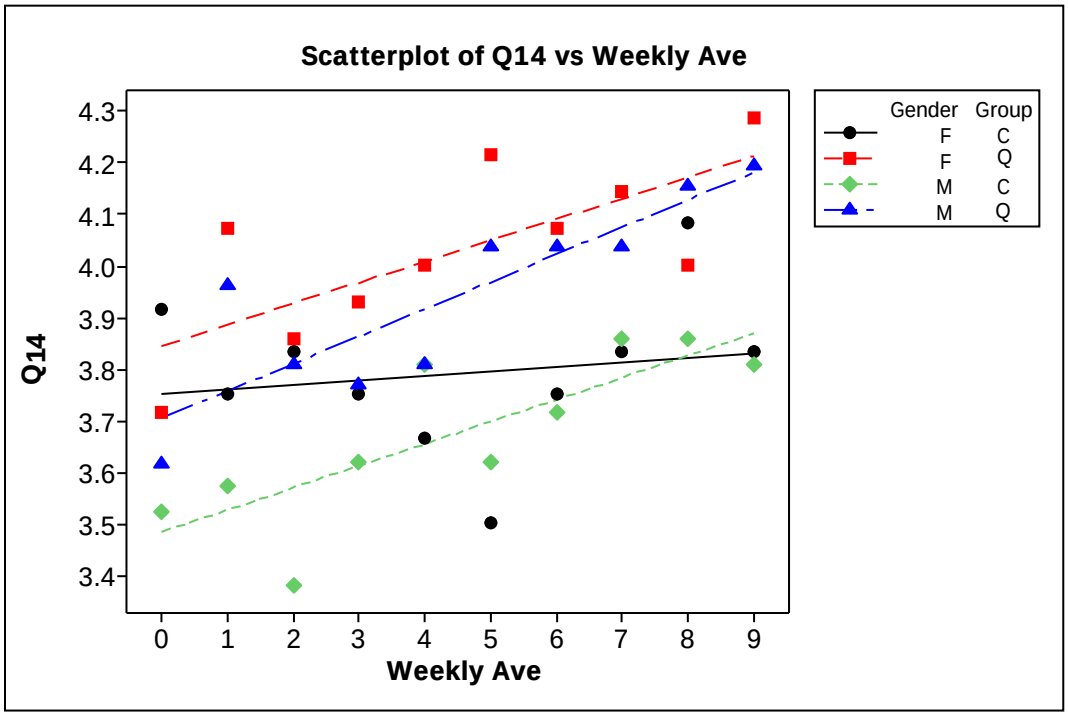


Figure 4.28. Within Group Question 14: I've been feeling cheerful. Trend and average score per week. C=Control, Q=Qigong, F=Female, M=Male

Chapter 5

Summary, Conclusions, and Recommendations

Summary

The overriding purpose of this study was to determine the efficacy of Qigong – specifically the Dao Yin exercises focusing on lungs, kidneys, heart, liver, and spleen – to facilitate strength gains and well-being in collegiate anaerobically trained athletes. To accomplish this purpose, it is necessary to intertwine Eastern and Western medicine. Merging the two ideas and defining how each philosophy was linked to strength and well-being assumed a high degree of importance during the background and literature review conducted for this thesis. Once this had been accomplished, this research was able to be conducted. This chapter reports the conclusions and recommendations that resulted from this study.

Conclusions

The current study is an initial attempt to analyze the impact of Qigong on strength gains and well-being in anaerobically trained athletes. The findings provide evidence for the impact of self-practice Qigong on strength gains in front squat, bench press, deadlift, and the vertical jump as well as well-being of collegiate athletes. Major findings of this study were the improvements on strength measures and the improved scores on questions of well-being measured by the Warwick-Edinburgh Mental Well-Being questionnaire (Tennant et al., 2007) in the Qigong participants versus the control. These results are consistent with the findings of Lee, Ryu, Kim,Woo, & Moon (2003) who have provided evidence that Qigong improves physical health. Occasionally, interventions may lead to improvements in outcomes that, while not statistically significant, may be relevant and important. This was the case in this study, where females in the Qigong intervention averaged 2.4kg and 1.85kg higher on the deadlift and front squat respectively than the control group. Males in the Qigong intervention averaged 5.04kg higher in the deadlift than the control. One anomaly emerged in the Qigong intervention where the males averaged .013 inches less than the control group in the vertical jump. While the men in the Qigong group made large increases in the measures of strength, the female Qigong group made only moderate gains. This may be explained by the lack of participation during the swaying exercise, which was meant to cultivate physicality. While the precise mechanism through which Qigong is able increase strength is unclear, one possible pathway is through Qigong's effect on the immune system. These findings parallel several studies that have indicated

that Qigong leads to improved immune function (Yeh, Lee, Chen, & Chao, 2006; Luo & Tong, 1988). However, due to the lack of biomarkers tested, our findings indicated a need for further research on the impact of Qigong on biological changes, such as immune function, cytokines and inflammation, in order to more fully understand these effects.

Additional significant findings were the positive effects Qigong had on the well-being of the participants in the intervention. In this study, upward trends in well-being scores on the questionnaire were observed in the Qigong intervention. Findings suggest that Qigong may contribute to the balance of psychologic precursors, such as personality, history of stressors, and coping resources that Andersen and William's (2008) model related to causes of sport injury. Findings here also support the work of Cheung et al., 2005; Lee, Soo Lee, Kim, & Moon, 2003; Tsai et al., (2003) who showed that anxiety decreased significantly for participants practicing Qigong compared to an active exercise group. Results indicate that management of well-being may be more effective if improvements in psychological and emotional operations are targeted as well as physical functioning, as in the case of the Qigong intervention. More research is needed to clarify the relationship between Qigong and the specific questions asked on this questionnaire. Differences in the intent of each Qigong participant to move Qi throughout their body could account for some of the divergent results, emphasizing the need for very clear descriptions of Qigong intervention exercises. Finally, no adverse effects of Qigong were reported by the athletes in this trial.

Recommendations

Although these results were positive and promising, limitations to the study and methodological approach should be taken into account when interpreting the results. First, neither the participants nor the instructors were blind to condition. Due to the nature of the intervention, it was not possible to make use of a blinding protocol. As such, it is possible that the benefits reported from the Qigong intervention were due to experimental bias, participants' expectancy (placebo effects) and social interactions. Secondly, participation in this study was voluntary and that may have created a potential selection bias, with those patients interested in Qigong participating and those with no interest in Qigong declining. This limits the generalizability of the findings but does not invalidate the results for this sample. Moreover, this study investigated the short-term benefits of the Qigong intervention but not the long term. Further investigation should examine whether the benefit is sustained in the long term with participants who continue to practice

Qigong at home. Lastly, inflammatory biomarkers were not collected during this study and we are unable to say by which physiological mechanism strength was improved. Despite these limitations, the findings of this study are positive and provide evidence that Qigong is safe and effective in improving strength and well-being in collegiate anaerobically trained athletes as well as demonstrate the potential for merging theory and practice. Further studies examining long-term benefits of Qigong, the collection of inflammatory biomarkers, and any potential association between improvement in well-being and reduction in injury rates, may provide additional information that may assist coaches and athletic trainers in providing optimal comprehensive care.

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APPENDICES

Appendix A

Well-being Questionnaire

How happy are you?

Good mental well-being - some people call it happiness - is about more than avoiding mental health problems. It means feeling good and functioning well.

This tool uses WEMWBS, a scale which is often used by scientists and psychologists to measure well-being.

To get your well-being score, go through the following statements and tick the box that best describes your thoughts and feelings over the last two weeks.

About the well-being scale

This tool uses WEMWBS (The Warwick-Edinburgh Mental Well-being Scale) to measure your mental well-being. WEMWBS was created by mental well-being experts, and is often used by scientists and psychologists.

The WEMWBS questionnaire for measuring mental well-being was developed by researchers at Warwick and Edinburgh Universities (see Tennant R, Hiller L, Fishwick R, Platt P, Joseph S, Weich S, Parkinson J, Secker J, Stewart-Brown S (2007) The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): development and UK validation, Health and Quality of Life Outcome; 5:63 doi:101186/1477-7252-5-63).

QUESTIONS

1. I've been feeling optimistic about the future

a) None of the time (1 point)

b) Rarely (2 points)

c) Some of the time (3 points)

d) Often (4 points)

e) All of the time (5 points)

2. I've been feeling useful

a) None of the time (1 point)

b) Rarely (2 points)

c) Some of the time (3 points)

d) Often (4 points)

e) All of the time (5 points)

3. I've been feeling relaxed

a) None of the time (1 point)

b) Rarely (2 points)

c) Some of the time (3 points)

d) Often (4 points)

e) All of the time (5 points)

4. I've been feeling interested in other people

a) None of the time (1 point)

b) Rarely (2 points)

c) Some of the time (3 points)

d) Often (4 points)

e) All of the time (5 points)

5. I've had energy to spare

a) None of the time (1 point)

b) Rarely (2 points)

c) Some of the time (3 points)

d) Often (4 points)

e) All of the time (5 points)

6. I've been dealing with problems well

a) None of the time (1 point)

b) Rarely (2 points)

c) Some of the time (3 points)

d) Often (4 points)

e) All of the time (5 points)

7. I've been thinking clearly

a) None of the time (1 point)

b) Rarely (2 points)

c) Some of the time (3 points)

d) Often (4 points)

e) All of the time (5 points)

8. I've been feeling good about myself

a) None of the time (1 point)

b) Rarely (2 points)

c) Some of the time (3 points)

d) Often (4 points)

e) All of the time (5 points)

9. I've been feeling close to other people

a) None of the time (1 point)

b) Rarely (2 points)

c) Some of the time (3 points)

d) Often (4 points)

e) All of the time (5 points)

10. I've been feeling confident

a) None of the time (1 point)

b) Rarely (2 points)

c) Some of the time (3 points)

d) Often (4 points)

e) All of the time (5 points)

11. I’ve been able to make up my own mind about things

a) None of the time (1 point)

b) Rarely (2 points)

c) Some of the time (3 points)

d) Often (4 points)

e) All of the time (5 points)

12. I’ve been feeling loved

a) None of the time (1 point)

b) Rarely (2 points)

c) Some of the time (3 points)

d) Often (4 points)

e) All of the time (5 points)

13. I’ve been interested in new things

a) None of the time (1 point)

b) Rarely (2 points)

c) Some of the time (3 points)

d) Often (4 points)

e) All of the time (5 points)

14. I've been feeling cheerful

a) None of the time (1 point)

b) Rarely (2 points)

c) Some of the time (3 points)

d) Often (4 points)

e) All of the time (5 points)

RESULTS

0-32 points

Your well-being score is very low.

Most people have a score between 41 and 59. You may want to begin by talking to a friend or health professional about how you can start to address this.

There are five evidence-based steps we can all take to improve our mental well-being. They are:

- Get active
- Connect with others
- Keep learning
- Be aware of yourself and the world
- Give to others

Go to useful links for more on the five steps.

32-40 points

Your well-being score is below average.

Most people have a score between 41 and 59. Why not take action to improve your mental well-being?

There are five evidence-based steps we can all take to improve our mental well-being. They are:

- Get active
- Connect with others
- Keep learning
- Be aware of yourself and the world
- Give to others

Go to useful links for more on the five steps.

40-59 points

Your well-being score is average.

Most people have a score between 41 and 59. You can still improve your mental well-being by taking action.

There are five evidence-based steps we can all take to improve our mental well-being. They are:

- Get active
- Connect with others
- Keep learning
- Be aware of yourself and the world
- Give to others

Go to useful links for more on the five steps.

59-70 points

Good news, your well-being score is above average.

Most people have a score between 41 and 59. Continue doing the things that are keeping you happy.

There are five evidence-based steps we can all take to improve and maintain our mental well-being. They are:

- Get active
- Connect with others
- Keep learning
- Be aware of yourself and the world
- Give to others