The Effects of Yi Jin Bang Exercise on Shoulder Health of Adults

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1. ***Project Objectives and Long-term Significance***

Shoulder pain is the third most common type of musculoskeletal disorder after back and neck pain in primary care (Van Der Heijden, 1999; Steuri et al., 2017). The prevalence of shoulder pain has been reported between 7% and 26% in the general population, with a life prevalence of up to 67% (Luime et al., 2004). The most common cause of shoulder pain is subacromial pain syndrome (SAPS), accounting for 44-60% of all shoulder disorders (Van Der Windt et al., 1995). Pain caused by SAPS can cause functional impairment and heavy social burden (Littlewood et al., 2012). Before recommending surgery, exercise therapy should be used as the first choice to treat SAPS (Kromer et al., 2009; Diercks et al., 2014; Haik et al., 2016). Several systematic reviews suggested that supervised exercise therapy can effectively improve the function and pain of patients with SAPS (Haik et al., 2008; Kuhn, 2009), while several other systematic reviews illustrated that the equal effectiveness of supervised exercises and home-based exercises (Desmeules et al., 2003; Kromer et al., 2009). Supervised exercise therapy requires substantial and specific resources and may be difficult to apply clinically (Karlsson et al., 2014). Thus, a home-based self-training program may allow individuals to treat SAPS with affordable and easily accessible treatments.

The use of complementary and alternative medicine treatment is growing continuously (Su & Li, 2011). Yi Jin Bang is a form of mind-body exercise and was developed in Hong Kong in the 1950s based on the principle of traditional Chinese mind-body exercise “Yi Jin Jing”. In Chinese, Yi means change, Jin means tendons and sinews, while Bang means stick. As with all other Chinese medical exercise, the focus of Yi Jin Bang is on the cultivation of Qi (energy), which is assumed to harmonize mind and body and so might reduce pain (Von Trott et al., 2009). After reorganizing by physiotherapists, Yi Jin Bang has now become an easy-to-learn exercise program. Many scientific studies have demonstrated the effectiveness of mind-body exercises on pain, such as yoga, Tai Chi, and Qigong (Rendant et al., 2011; Cramer et al., 2013; Hall et al., 2017). However, the efficacy of Yi Jin Bang exercise in SAPS

is not scientifically evaluated.

Objectives

To compare the effectiveness of ten weeks of home-based Yi Jin Bang exercise, versus home-based stretching and strengthening exercise, and versus waitlist control on pain, disability, flexibility, and muscular endurance in adults with SAPS. This study hypothesized that home-based Yi Jin Bang exercise and home-based stretching and strengthening exercise have similar effects in reducing pain and disability and improving flexibility and muscular endurance for individuals with SAPS.

Long Term Impact

The presence of pain in the shoulder can lead to limits on work and/or recreational and domestic activity, thus bring a heavy burden of disease to both the individual and society (Van Den Dolder et al., 2014). Among people with shoulder pain, SAPS has the highest prevalence (Van Der Windt et al., 1995). Although the effectives of non-surgical supervised exercise therapy on SAPS has been demonstrated (Haik et al., 2008; Kuhn, 2009), people begin to support the use of self-training as the cost of supervised exercise therapy increasing (Werner et al., 2002). As an easy-to-learn exercise, Yi Jin Bang exercise may be more economic and more flexible in space compared to supervised exercise protocols. Our empirical evidence accumulated from the feedbacks of Yi Jin Bang practitioners found the positive effect in treating SAPS, however, scientific evidence has yet to be confirmed from randomized controlled trial studies. If proven, Yi Jin Bang exercise can be recommended to patients and physiotherapists, as a low-cost, flexible and easy to learn exercise in the treatment of SAPS. In a long run, medical cost can be reduced, family economic burden can be lower, and the quality of life of people can be improved.

2. *Background of Research*

Work done by others

Shoulder pain is one of the most frequent musculoskeletal pain, with the point prevalence has been reported between 7% and 26% (Luime et al., 2004). The cumulative incidence of shoulder pain in general medical practice is estimated to be 29.3 per 1000 patients-years (Greving et al., 2012). Shoulder pain can cause severe disability and loss of quality of life because it interferes with many activities of daily life (Ginn & Cohen, 2005). There is little information about the costs associated with healthcare use and lost productivity in patients with shoulder pain, but it is considered considerable (Kuijpers et al., 2006). Among the common causes of shoulder pain, SAPS is the most common cause, accounting for 44-60% of all shoulder pains (Van Der Windt et al., 1995). SAPS is characterized by pain and functional restrictions that are exacerbated with repetitive arm activities at or above shoulder level (Haik et al., 2016).

The main goals of treatment for patients with SAPS are to reduce pain-related common impairments and improve upper limb function (Steuri et al., 2017). It has been determined that 15-28% of patients with SAPS may eventually require surgery (Bang & deyle, 2000). Commonly prescribed conservative treatment for SAPS includes corticosteroid injections, non-steroidal anti-inflammatory drugs, stretching and strengthening exercises, and physical therapy modalities (Senbursa et al., 2007). No evidence is available to indicate that the effectiveness of surgery is better than conservative treatment for patients with SAPS (Kvalvaag et al., 2017). A systematic review by Haik et al. (2016) suggested that exercise therapy aimed at restoring flexibility and strength of scapular muscles and the rotator cuff should be recommended to the first-line treatment for patients with SAPS before undergoing surgical treatment. Besides, this systematic review indicated that low-level laser therapy, pulsed electromagnetic field and tape are ineffective in treating SAPS. In another meta-analytical study which investigated the effectiveness of conservative treatment for pain, function, and range of motion (ROM) in adults with SAPS (Steuri et al., 2017), there revealed

that exercise therapy should be considered for all adults with SAPS, and the addition of manual therapy, tape, laser and extracorporeal shockwave therapy might have a little benefit. In addition, the meta-analysis reported that nonsteroidal anti-inflammatory drugs or corticosteroid injection can be a useful alternative only when exercise therapy is not possible.

Exercise therapy is considered to be the most valuable method for treating shoulder disorders and is the cornerstone of physical therapy treatment (Van Der Heijden, 1999), with several systematic reviews have reported its clinically and statistically effects on pain and function in patients with SAPS (Kromer et al., 2009; Kuhn, 2009; Haik et al., 2016). It remains unknown whether exercise therapy should be performed with or without supervision (Van Den Dolder et al., 2014). Several systematic reviews indicated that supervised exercises are effective in improving pain and function in patients with SAPS (Kuhn, 2009; Abdulla et al., 2015; Haik et al., 2016), while several other systematic reviews concluded that home-based unsupervised exercises are as effective as supervised exercises (Desmeules et al., 2003; Kromer et al., 2009). However, supervised training requires substantial and specific resources and may be difficult to apply clinically (Karlsson et al., 2014). In addition, the increasing cost of supervised exercise therapy also supports the use of home-based self-training protocols (Werner et al., 2002).

The use of complementary and alternative medicine treatment is growing continuously (Su & Li, 2011). Yi Jin Bang exercise is a stretching exercise that is beneficial to the mind and body. It was created in the 1950s in Hong Kong, according to the principle of traditional Chinese mind-body exercise Yi Jin Jing. In Chinese, Yi means change, Jin means tendons and sinews, while Bang means stick. Although there is no scientific research evaluating the effects of Yi Jin Bang exercise on pain, there are many scientific studies that have examined the effects of other mind-body exercises (e.g., Qigong, Tai Chi, yoga) on pain. Rendant et al. (2011) reported that six months of supervised Qigong training was more effective than no treatment

on pain in patients with chronic shoulder pain, and improvements in the Qigong group were comparable with those in the supervised exercise therapy group. Besides, Skoglund et al. (2011) indicated that six weeks of video-based Qigong training can improve neck-shoulder pain compared with no treatment. In a recent meta-analysis by Hall et al. (2017), Tai Chi was found effective in the short time for reducing pain and disability in patients with arthritis. A meta-analysis by Cramer et al. (2013) evaluated the effectiveness of yoga on low back pain, which found strong and moderate evidence for short-term effects and long-term effects of yoga in the treatment of low back pain, respectively. Moreover, a randomized controlled trial found that nine weeks of supervised yoga training was effective in treating chronic neck pain (Michalsen et al., 2012). Up to date, no studies have evaluated the effectiveness of Yi Jin Bang on the treatment of SAPS. Therefore, the purpose of this study is to evaluate the effects of Yi Jin Bang exercise on adults with SAPS in terms of pain, disability, flexibility, and muscular endurance.

3. *Research Plan and Methodology*

This will be a three-arm parallel-group randomized controlled trial with blinded outcome assessors. The trial comprises ten weeks of intervention. Participants will be randomly assigned into one of the following three groups: Yi Jin Bang group (group 1), usual exercise therapy group (group 2), or waitlist control group (group 3). The Yi Jin Bang group will practice an active, low-intensity home-based Yi Jin Bang exercise routine. The exercise therapy group will do a home-based stretching and strengthening training program. Participants in the waitlist control group will remain on a waiting list and will be provided either Yi Jin Bang training or usual exercise therapy after ten weeks. Pain, disability, flexibility, and muscular endurance will be evaluated before treatment, after the first treatment session, and after ten weeks in all three groups.

Participants

This study will recruit 18-65 years old adults with symptoms of SAPS. Participants will be eligible if they meet all the following criteria: (1) aged 18 to 65 years old; (2) pain during overhead activities; (3) pain during active movements of the shoulder; (4) pain in the last three months; (5) Hawkins-Kennedy impingement test positive; (6) painful arc test positive; (7) infraspinatus muscle test positive. Participants will be excluded if they exhibited any of following criteria: (1) a history of fracture-dislocation of the shoulder; (2) full-thickness rotator cuff tear; (3) a history of shoulder surgery; (4) inflammatory of the vertebrae; (5) shoulder trauma in the last month; (6) any physical treatment for shoulder pain in the past month. Eligibility will be determined by two licensed physiotherapists through performing the clinical examination prior to entry into the study. Participants in this study will be recruited through mass email. Before the study, participants will be provided with consent forms, and then sign them. They will also be told that they can withdraw from the study at any time. Ethical approval for conducting research will be sought from the ethics committee.

In terms of sample size, the effect size of the ROM exercise on the Shoulder Pain and Disability Index (SPDI) score found in a previous randomized control trial is adopted (Heron et al., 2017). Therefore, based on the estimation of sample size by G*Power (effect size: 0.5; α: 0.05; power: 0.80), a sample size of 14 individuals per group will be needed. Considering a 20% drop rate, we estimated that 18 participants per group will be needed.

Procedures

Participants will be randomly assigned to one of the following three groups: Yi Jin Bang, usual exercise therapy, or control group. Two experimental groups will do home-based Yi Jin Bang exercise and home-based exercise therapy for ten weeks, respectively. The control group will receive no treatment during the period of ten weeks. In addition, during the intervention, participants should not take any other physical therapy, exercise therapy, or medication on the shoulder.

Yi Jin Bang Group

Each participant in this group will do a home-based Yi Jin Bang exercise program four times a week for ten consecutive weeks, which consists of ten minutes of warm-up, 18 minutes of Yi Jin Bang exercise (ten exercises), and ten minutes of cool-down. To learn how to conduct the home-based exercise session, each participant will be invited to one introductory session before starting the prescribed exercise program. Two experienced Yi Jin Bang instructors will lead the introductory session. Besides, in order to monitor participants' adherence and help them to conduct self-training, we will use the Zoom Meeting application. Zoom can capture and record participants' movements through the webcam. During the introduction sessions, we will teach participants how to use Zoom. Furthermore, we will provide support for adherence to the home exercise sessions through telephone calls or e-mail every two weeks.

Usual Exercise Therapy Group

Among exercise therapy in the treatment of SAPS, stretching and strengthening protocols are often used (Ludewig & Borstad, 2003). Therefore, participants in this group will do a standardized home-based stretching and strengthening exercise program four times per week for ten weeks, which is set up according to a previous study (McClure et al., 2004). This self-training program includes four stretching and seven strengthening exercises, which has been demonstrated that can be effective in reducing pain and improving function in patients with SAPS. For strengthening exercises, elastic bands will be used. To learn how to conduct the self-training program, each participant in this group will also be invited to one introductory session before starting the prescribed exercise training. Two certificated physiotherapists will lead the introductory session. In addition, a video demonstration clip will be given to each participant to provide a home reference, and the Zoom Meeting application will be used to help monitor the exercise. We will also provide support for adherence to the home self-training program through telephone calls or e-mail every two

weeks.

Waitlist Control Group

Participants in the waitlist control group will be informed that they will receive either Yi Jin Bang training or exercise therapy after ten weeks have passed. This will be done only for motivational reasons and not for evaluation.

Outcome Measures

All assessments will be performed at baseline, after the first treatment session, and after ten weeks of intervention, except the disability test only performed at baseline and after ten weeks. Onsite assessments will include the completion of study questionnaires, flexibility tests, and muscular endurance tests. A research staff member will present at each collect point to assist participants to complete the self-report questionnaire. Because of the nature of the treatment, it will be rarely impossible to blind participants, Yi Jin Bang instructors, and physiotherapists. However, assessors will be blinded to group assignments when collecting outcome measures.

Functional Disability

Functional disability will be measured using the SPADI. This is a self-reported questionnaire assessing pain and functional status, which consists of five questions regarding pain and eight questions regarding disability. Each question is scored from 0 to 10, and the total score ranges from 0 to 100. Greater scores represent higher levels of pain and disability. The SPADI has provided good psychometric with the test-retest reliability has been reported range from 0.84 to 0.91 (Roy et al., 2009).

Pain Intensity

Pain intensity will be measured on an 11 points numerical rating scale (Huskisson et al., 1976).

Participants will be asked to place a vertical mark on a horizontal line to indicate their current pain degree in rest and activity, where 0 for no pain and 10 for unbearable pain.

Flexibility

According to the method described by Norkin & White (2016), active flexion and abduction ROMs will be measured while the participant in standing position by a standard goniometer. The maximum ROM of three repetitions in each movement will be used for analyzing. Besides, back scratch test will measure participants' ROM by measuring the distance between the middle fingertip of the upper hand and the middle fingertip of the lower hand.

Muscular Endurance

Muscular endurance will be measured using elastic bands. During the test, the participant will in standing position, with the test shoulder off the table and the arm perpendicular to the floor. The participant will be instructed to horizontally abduct his/her arm to 90 degrees at a cadence of 30 beats per minute. Repetitions will be performed until the participant is fatigued, indicated by one of the following conditions: the inability to hold the arm at the top of the arc for the required duration (1 second), compensation with elevation of entire upper torso, or verbal report of the inability to continue.

Statistical Analysis

All values will be reported as mean ± SD. Two-way analysis of variance (ANOVA) with repeated measure (2 times × 3 groups) will be used to analyze differences at baseline and at ten-week post-intervention. Differences between the change within each group will be examined by one-way ANOVA. Post hoc tests will be used when necessary, to verify the pair-wise differences between means. The α level of $p < 0.05$ will be considered statistically significant for all comparisons. All statistical procedures will be performed by SPSS software.

4. *References*

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