Title: Tai Chi Exercise is More Effective than Brisk Walking in Reducing Cardiovascular Disease Risk Factors: A Randomised Controlled Trial

Background: Physical inactivity is a major modifiable lifestyle risk factor associated with cardiovascular disease (CVD). Tai Chi is a safe and popular form of physical activity amongst older adults, yet direct comparisons are lacking between Tai Chi and brisk walking in their ability to reduce CVD risk factors.

Methods: A total of 246 adults (mean age = 64.4 ± 9.8 years, 45.5% men) with hypertension and at least two but not more than three CVD risk factors (i.e., diabetes, dyslipidaemia, overweight, physical inactivity and smoking) were randomly assigned to either Tai Chi (n= 82), brisk walking (n = 82) or control (n = 82) groups. The Tai Chi and brisk walking groups engaged in moderate-intensity physical activity 150 min/week for 3 months; daily home-based practice was encouraged for another 6 months. The primary outcome was blood pressure (BP). The secondary outcomes were fasting blood sugar (FBS), glycated haemoglobin (HbA1c), total cholesterol, triglycerides, high- and low-density lipoprotein, body mass index (BMI), waist circumference, aerobic endurance, perceived stress, quality of life (QOL) and exercise self-efficacy. Data were collected at baseline, post-intervention at 3 months and follow-up assessments at 6 and 9 months. Generalised estimating equation models were used to compare the changes in the outcomes over time between groups.

Results: At baseline, the participants had an average BP = 141/81 and average BMI = 26; 58% were were diabetics, 61% presented with dyslipidemia and 11% were smokers. . No significant difference was noted between groups. Tai Chi significantly lowered the BP (systolic −13.33 mmHg; diastolic −6.45 mmHg), FBS (−0.72 mmol/L), HbA1c (−0.39%) and perceived stress (−3.22 score) and improved the perceived mental health (+4.05 score) and exercise self-efficacy (+12.79 score) at 9 months compared with the control group. Pairwise comparisons indicated significantly greater reductions in BP (systolic −12.46 mmHg; diastolic −3.20 mmHg), FBS (−1.27 mmol/L), HbA1c (−0.56%) and perceived stress (−2.32 score) and improved perceived mental health (+3.54 score) and exercise self-efficacy (+12.83 score) in the Tai Chi group than in the brisk walking group. No significant changes in the other CVD risk indicators were observed over time between groups.

Conclusion: Nurses hold the key role of promoting exercises with the most benefits to clients. Tai Chi is better than brisk walking in reducing several CVD risk factors and should be recommended as a viable exercise for building a healthy life free of CVD.

Keywords: brisk walking, cardiovascular disease, CVD risk factors, exercise, Tai Chi

CCRB Clinical Trials Registry: CUHK_CCT00449
(https://www2.ccrb.cuhk.edu.hk/registry/public/288)

What is already known about the topic?

- Physical inactivity is a major risk factor associated with CVD, and regular exercise contributes to a reduction in CVD mortality.
- Tai chi requires similar energy expenditure to brisk walking and exerts positive health effects on persons with CVD.

What this paper adds?

- Tai Chi is superior to brisk walking in reducing some modifiable CVD risk factors and provides long-term benefits.
- A 3-month Tai Chi intervention is effective in reducing BP and blood glucose, lowering perceived stress and improving the QOL amongst people with CVD risk factors.
- Tai Chi increases the level of exercise self-efficacy, whereas the effect of brisk walking on the level of exercise self-efficacy is inconsistent.

Introduction

Cardiovascular diseases (CVDs) are the leading causes of mortality globally. According to the World Health Organisation (WHO),[1] CVD is the cause of approximately 17.7 million deaths in 2015 and accounts for 31% of all global deaths. From 2002 to 2030, CVDs are projected to remain as the number one cause of death worldwide.[2] Various cardiovascular risk factors have contributed to the increase in the likelihood of CVDs. These risk factors include smoking, diabetes, hypertension, dyslipidaemia, unhealthy diet, family history of CVD, overweight and physical inactivity. In high-income countries, CVD mortality is declining due to a reduction in cardiovascular risk factors and the recent advances in the prevention, treatment and management of these CVD risk factors.[3] Hence, the early detection and management of people at high risk for CVD are imperative. Physical inactivity, an important behavioural risk factor for CVDs, often occurs concomitantly with elevated blood pressure (BP), increased blood lipids, increased blood glucose and overweight or obesity. Conversely, regular physical activity at moderate intensity can prevent or delay the onset of type 2 diabetes, lower BP or reduce the risk for heart attack and stroke.[4] Regular exercise contributes to a reduction in CVD mortality.[5] Nurses could lead clients to engage in exercise programs and can be in the forefront from the development of exercise interventions up to the implementation and evaluation.[6]

In Hong Kong, according to the Behavioural Risk Factor Survey conducted by the Department of Health in 2016, more than half of the respondents (56%) did not meet the recommended level of physical activity suggested by the WHO.[7] Amongst the different types of exercise, walking is the most common type of physical activity. Walking is a beneficial form of physical activity,[8] and a moderate-intensity brisk walking program is effective in reducing metabolic risks amongst postmenopausal women.[9] However, participants in regular walking programs may not completely adhere to the program.[10] The energy expenditure of brisk walking is similar to that of Tai Chi.[11] Tai Chi is a popular physical activity amongst Chinese populations. The social and cultural aspects of Tai Chi may elicit greater adherence than brisk walking, leading to less attrition.[12]

On the basis of the theory of traditional Chinese medicine, practicing Tai Chi involves the development of fundamental energy (*Qi*) that sustains life. Several studies have demonstrated the positive effect of Tai Chi amongst persons with CVD,[13,14] but results are inconsistent.[15,16] Studies comparing Tai Chi with brisk walking amongst those CVD risk factors are limited. To address this research gap, we compared Tai Chi with brisk walking and examined their effects on CVD risk factors. We hypothesised that Tai Chi provides the same

or better benefits than brisk walking in reducing CVD risk factors.

Methods

Study Design

This study was a three-arm parallel randomised controlled trial (RCT). Our previously published study protocol was used[17] and the CONSORT statement was adopted for the study design and reporting.[18]

Participants and Setting

The participants were recruited from two government outpatient clinics in Hong Kong with the following inclusion criteria: hypertension and least two but not more than three CVD risk factors, which are defined by the American Heart Association[19] as diabetes, dyslipidaemia, hypertension, overweight, physical inactivity and smoking.

This research was approved by the Joint Clinical Research Ethics Committee of the Chinese University of Hong Kong and New Territory East Cluster and the Kowloon West Cluster. Informed consent was obtained from every eligible participant. All study procedures were conducted in accordance with the Declaration of Helsinki.[20]

Sample Size and Randomisation

G*Power was used to calculate the sample size based on prior research.[9,21] A total of 61 participants per arm were needed to achieve a power of 80% at a significant level of 5%. Considering a potential attrition rate of 25%,[22] 246 participants were recruited and allocated in a 1:1:1 ratio into one of the following three groups: Tai Chi, brisk walking and usual care control (n = 82 participants/group). The random allocation was performed using a computer-based randomiser. The randomisation list was stored in a password-protected computer only accessible by the research staff responsible for the participant allocation.

Intervention

Tai Chi Group

The participants in the Tai Chi group attended a 24-form Yang Style Tai Chi class for 60 min 2 times a week for 3 months. The Tai Chi classes were held in an indoor activity room of a sports centre. The classes were taught by an experienced and qualified Tai Chi master. The number of participants in each session was limited to 20, which was considered manageable and feasible in terms of teaching and learning. The participants

were also advised to practice Tai Chi at home for 30 min per day for at least 5 days a week. Self-reported exercise logs that included the frequency and duration of the home-based Tai Chi practice were collected by the research assistant weekly. Intervention adherence was defined as ≥80% of the prescribed sessions.

Brisk Walking Group

The participants in the brisk walking group were instructed to walk between 5 and 6 km/h for 30 min every day for at least 5 days per week.[24] A pulse oximeter was provided to each participant to measure their heart rate during brisk walking. The participants were advised to reach an individualised heart rate equal to that in moderate-intensity exercise, based on their age.[24] Self-reported logbooks were provided for the participants to record their heart rate, frequency and duration of brisk walking. The research assistant collected the logbooks weekly and encouraged the subjects' adherence to the intervention.

Control Group

The participants in the control group were advised to continue their usual activity. No additional physical activity was recommended to them.

Attention-Control Activities

The participants in the brisk walking and control groups were asked to participate in non-exercise community activities weekly for 3 months to allow for social interaction.

Data Collection Procedures

Data were collected from the outpatient departments of a public hospital. This study blinded the research assistants responsible for data collection to the group assignment. Data were collected at baseline (T0) and post-intervention at 3 months (T1). The follow-up evaluations were conducted at 6 months (T2) and 9 months (T3) post-intervention to investigate the long-term effects of interventions.

Outcome Measures

Primary Outcome: BP

The participants were asked to sit for at least 10 min in a quiet location. BP was then measured twice at 5 min intervals by using a digital BP monitor (CARESCAPE V100, GE Healthcare). The average of the two BP readings was used for analysis. Both systolic BP

(SBP) and diastolic BP (DBP) were recorded. The calibration procedures and accuracy tests of the digital monitor were conducted regularly or whenever the accuracy of any reading was in doubt.

Secondary Outcomes

The secondary outcomes included fasting blood sugar (FBS), glycated haemoglobin (HbA1c), total cholesterol (TC), triglycerides (TG), high- and low-density lipoprotein (HDL and LDL), body mass index (BMI), waist circumference (WC), aerobic endurance, perceived stress, quality of life (QOL) and exercise self-efficacy.

Blood samples: The participants were instructed to fast for 8 h prior to blood sample collection through point-of-care testing. A finger stick was used to collect blood samples for the FBS, HbA1c, TC, TG, HDL and LDL measurements. A blood glucose analyser (Accu-Chek Performa, model NC, Roche) was used to measure FBS. An Afinion AS100 POCT analyser was used to measure HbA1c. A blood lipid analyser (CardioChek PA, PTS Diagnostics) was used to measure TC, TG, HDL and LDL. All equipment was calibrated prior to data collection.

BMI: BMI was calculated as weight (kg) divided by the square of height (m). Height and weight (measured to the nearest 0.1 kg) were measured with the participant wearing light clothing without shoes.

WC: The WC of the participants was measured to the nearest 0.1 cm at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest by using a stretch-resistant tape.

Aerobic endurance was examined using a 2 min step-in-place test. The participants raised their knees one at a time to a height halfway between the middle of the patella and the iliac crest as many times possible in 2 min. The score refers to the number of times the right knee reaches the minimum height. The test validity was established in prior research.[25]

Psychosocial Variables

Perceived stress (10-item perceived stress scale [PSS-10]): The PSS-10 is a 10-item instrument that measures the levels of perceived stress in the last month. The scores range from 0 to 40; a high score indicates a high perceived stress. The psychometric properties of the Chinese version of PSS-10 were in good agreement with Cronbach's $\alpha > 0.75$ amongst Chinese cardiac patients.[26]

QOL (SF-12v2): SF-12v2 is a popular 12-item measurement tool for assessing

generic health-related QOL. The instrument has adequate internal consistency and test–retest reliability (range = 0.67–0.82). It is suitable, valid and reliable for Chinese populations.[27]

Exercise self-efficacy (Tai Chi self-efficacy [TCSE] or self-efficacy for exercise [SEE]): TCSE was used for the participants in the Tai Chi group, whereas SEE was used for the participants in the brisk walking and control groups. These questionnaires contain similar items and are comparable. The only difference between these questionnaires is the use of 'Tai Chi' as a specific type of exercise in TCSE. The TCSE self-report questionnaire measures an individual's confidence to overcome barriers and perform Tai Chi. TCSE scores range from 0 to100; a high score indicates high self-efficacy. The Chinese version of the TCSE barriers and performance scales adopt Cronbach's α values of 0.95 and 0.97, respectively.[28] Good internal consistency was reported for the Chinese version of SEE with a Cronbach's α of 0.75.[29] This scale contains nine items with scores ranging from 0 (not confident) to 10 (very confident); a high score indicates high exercise self-efficacy. It was transformed to 0 to 100 in this study for data analysis.

Statistical Analysis

All data analyses were conducted using version 23.0 of IBM SPSS (IBM Corp., Armonk, NY, USA). Statistical significance was considered at P = 0.05. Descriptive statistics were applied to portray the baseline characteristics of the participants. Chi-square and one-way ANOVA tests were employed to compare the baseline group differences. Outcome analyses were conducted on the basis of the intention-to-treat principle. Generalised estimating equation (GEE) models with the appropriate link function and distribution assumptions were used to compare the differential changes of the outcomes across time and between groups. The GEE models accounted for intra-correlated repeated measure data and accommodated missing data due to incomplete study assessments or dropouts in RCTs.[30]

Result

Study Enrolment and Baseline Characteristics

Figure 1 illustrates participant inclusion, allocation and follow-up in accordance with the CONSORT flow diagram. A total of 723 men and women from the two outpatient clinics of Our Lady of Maryknoll Hospital were screened for eligibility. A total of 246 participants enrolled in the study and were randomly assigned to one of the three groups. The overall

study retention rates were 88.6% (218/246) at 3 months, 80.1% (197/246) at 6 months and 78.9% (194/246) at 9 months. No statistically significant differences in retention rates were observed at all three time points between the three groups.

The study sample included mainly married (67.9%, n = 167), retired (44%, n = 109) and female (54.5%, n = 134) participants. The average age was 64 years. The majority of the participants had histories of hypertension (100%, n = 246), diabetes (58.5%, n = 144) and dyslipidaemia (61.4%, n = 151) and were overweight (BMI = 26.0 kg/m^2). At baseline, the participants exhibited CVD risk factors with the following average values: SBP = 141 mmHg, DBP = 81 mmHg, FBS = 6.9 mmol/L, HbA1c = 6.9%, TC = 4.2 mmol/L, TG = 1.5 mmol/L, LDL = 2.4 mmol/L, HDL = 1.2 mmol/L and WC = 90 cm (Table 2). No statistically significant difference was observed between the groups at baseline (Tables 1 and 2).

Intervention Adherence

Intervention adherence during the study was good. A total of 90% of participants in the Tai Chi group and 88% of participants in the brisk walking group achieved 80% adherence to the prescribed dosage of interventions at 3 months.

Outcomes

The group outcome variables according to the data collection time points are provided in Table 3.

Primary Outcome

BP

The examination of the BP changes across time indicated that the Tai Chi group achieved a significantly greater reduction in both SBP and DBP post-intervention at the 3-month (T1) and 9-month follow-up assessments (T3) than the control group (*P*s < 0.005; Table 4). No statistically significant differences in the BP changes were observed between the brisk walking and control groups at any of the three time points. Pairwise comparisons indicated that the SBP and DBP reductions were significantly greater in the Tai Chi group than in the brisk walking group at T1 (*P*s < 0.001) and T3 (*P* for SBP < 0.001; *P* for DBP = 0.049) (Table 5).

Secondary Outcomes

CVD Risk Factors

Although the FBS levels showed improvement over time in the Tai Chi and brisk walking groups, only the change at T3 in the Tai Chi group was statistically significant (P = 0.002) compared with the control group. Significant changes in the HbA1c were observed at T3 for the Tai Chi ($P < 0.002$) and brisk walking ($P = 0.028$) groups compared with the control group (Table 4). Pairwise comparisons indicated that the Tai Chi group achieved a significantly greater reduction in FBS and HbA1c levels than the brisk walking group at T2 (Ps < 0.007) and T3 (Ps < 0.003) (Table 4). The Tai Chi group achieved a greater improvement in HDL at T1 ($P = 0.013$) than the control group (Table 4). For the aerobic endurance and other CVD risk indicators, including TC, TG, LDL, BMI and WC, no significant differences in the changes over time were observed across the three study groups (Table 4).

Psychosocial Variables

Perceived stress: Although all the three groups reported a reduction in perceived stress over time, the Tai Chi group achieved a significantly greater reduction at T2 ($P = 0.022$) and T3 ($P = 0.005$) than the control group (Table 4). Pairwise comparisons indicated that the reduction in perceived stress in the Tai Chi group at T3 was significantly greater than that in the brisk walking group ($P = 0.027$) (Table 5).

QOL: The SF-12 physical component improved over time in all the three groups, but only the increase at T2 in the Tai Chi group was statistically significant compared with that in the control ($P = 0.006$) and brisk walking groups ($P = 0.017$) (Tables 3 and 4). For the SF-12 mental component, the control group exhibited a decreasing trend, whereas both intervention groups showed rising trends. However, only the change in the SF-12 mental component at T3 in the Tai Chi group was significantly greater than the changes in the control ($P = 0.001$) and brisk walking groups ($P = 0.006$) (Tables 3 and 4).

Exercise Self-Efficacy: The participants in the control group showed a decreasing trend in exercise self-efficacy over time, with fluctuations in exercise self-efficacy levels in the brisk walking group but an increasing trend in the Tai Chi group (Table 3). GEE results indicate that the increases in exercise self-efficacy at all the three time points were significantly greater in the Tai Chi group than in the control and brisk walking groups (Ps < 0.001). Meanwhile, the brisk walking group achieved a significant increase relative to that in the control group at T1 ($P = 0.024$) (Table 4).

Discussion

Physical exercise is crucial in reducing CVD risk factors. Nurses are suitably positioned for engaging patients in exercise because of their prolonged and sustained contact with patients compared with other health professionals.[6] This study compared the effects of a 3-month intervention of Tai Chi with brisk walking in reducing modifiable CVD risk factors. Over a 9-month follow-up period, Tai Chi improved the BP in the Tai Chi group, but not in the brisk walking and control groups. Tai Chi and regular brisk walking exerted positive effects on blood glucose; the Tai Chi group achieved greater improvements than the brisk walking group. No significant improvements were observed in the blood lipids and anthropometric measures (BMI and waist circumference) over time across the three study groups, apart from an improvement in HDL post-intervention at 3 months in the Tai Chi group compared with the control group. Although all three groups showed some improvement in perceived stress and QOL over time, only the Tai Chi group exhibited a significantly lower perceived stress and greater improvements in QOL than the brisk walking and control groups. The increases in the levels of exercise self-efficacy were significantly high in the Tai Chi group. The brisk walking and control groups exhibited fluctuations and a decreasing trend in the levels of exercise self-efficacy, respectively. These findings indicated that Tai Chi offered greater and long-term benefits than brisk walking in reducing the modifiable CVD risk.

Our primary outcome was BP. High BP is one of the major risk factors for CVDs. On a population level, a small reduction of 2 mmHg in DBP can result in a 17% decrease in the prevalence of hypertension and as a 6% reduction in the risk of coronary heart disease.[32] A reduction of 2 mmHg in SBP can result in a 10% reduction in stroke mortality and approximately 7% reduction in mortality from ischemic heart disease or other vascular causes in middle aged individuals.[33] These findings highlight the clinical significance of small changes in resting BP. In this 3-month Tai Chi intervention, we observed a total reduction of 12.35 mmHg in SBP and a total reduction of 4.75 mmHg in DBP from baseline to the 9-month follow-up assessment. The results were comparable to those of several studies that reported significant reductions in BP, especially when Tai Chi-performing subjects were compared with non-active control groups.[34-36]

Tai Chi is a non-pharmacologic method of BP reduction for patients with hypertension. It may contribute to a reduction in the use of antihypertensive medication or their untoward side effects.[21] In our study, the SBP and DBP of the Tai Chi group were significantly reduced after a 3-month Tai Chi intervention in comparison with the control group. At the 6-month follow-up assessment, the Tai Chi participants manifested a slightly increased SBP possibly due to an adjustment in their BP medication after the initial 3 months of Tai Chi practice. Given the

variation in the type and dose of antihypertensive medications, analysing the effects of adjusting the medications on BP was out of our research scope. Nevertheless, the sustained positive effect of Tai Chi on the BP led to a significant improvement at the 9-month follow-up assessment in comparison with the control group. The study findings were similar to those of a Tsai and colleagues who examined a 12-week Tai Chi exercise training program for adults with high-normal BP or stage 1 hypertension.[21] They reported a significant decrease in SBP of 15.6 mmHg and DBP of 8.8 mmHg; these BP reductions were similar to those of some antihypertensive drugs.[21]

Our findings did not support the findings of prior research on the effect of brisk walking on BP. For example, a meta-analysis on the effects of walking on BP for adults found 2% reductions in SBP and DBP,[37] and another meta-analysis on the effect of walking on CVD risk factors reported similar results.[38] Two other meta-analyses found that walking led to significant reductions in DBP but not in SBP.[39-40] A systematic review reported that CVD risk decreased incrementally with high levels of walking, e.g., higher levels of frequency, duration, distance and, energy expenditure for walking, particularly high walking intensity or walking pace.[41] In the current study, participants in the brisk walking group were advised to perform walking (5 km/h to 6 km/h) for 30 min every day for at least 5 days per week; this regimen meets the moderate-intensity physical activity recommendation for adults by the American College of Sports Medicine and the American Heart Association.[42] Our findings may be partially explained by the participants' over-reporting of their walking activity or walking at a slower pace or shorter duration than prescribed. Future studies must incorporate an objective walking measure, such as a pedometer or accelerometer, to obtain precise estimates of walking duration and intensity. In our study, Tai Chi was better than brisk walking in reducing BP amongst Chinese adults with CVD risk factors and thus shows promise as an alternative exercise option.

Regular physical activity is a well-known lifestyle factor in controlling the type 2 diabetes or impaired glucose tolerance.[43] However, some studies have indicated the benefit of Tai Chi and brisk walking on blood glucose for patients with diabetes,[44-46] whereas some show limited effects or no effect on blood glucose.[47-49] In our study, we found that Tai Chi and brisk walking decreased the FBS and HbA1c in the participants with CVD risk factors. Our findings were similar to those of another RCT where 374 middle-aged participants were examined for the effect of Tai Chi and walking on metabolic syndrome parameters.[50] However, in our study, we found no significant improvements in TC, TG and LDL amongst participants randomly assigned to the Tai Chi or brisk walking; such result was similar to that

of prior research.[38,50] These findings may be partly explained by the use of exercise-only interventions, that is, programs that do not include any other weight reduction intervention or diet modification, whereas the combination of diet and exercise interventions is more effective in regulating blood lipid profiles.[39]

Obesity is another risk factor for CVD. A systematic review on the effect of walking on CVD risk factors found a decrease in BMI and body fat percentage of 1.37 kg and 1.22%, respectively.[38] Another study amongst transitionally frail older adults reported a mean reduction of 1.49 kg in body weight after 48 weeks of Tai Chi training.[51] However, in the current study, 3 months of Tai Chi or brisk walking failed to significantly lower the BMI amongst overweight Chinese adults with CVD risk factors. This may also be partly explained by not including diet modification in this study.

Amongst physically inactive adults, chronic psychosocial stress may further contribute to the development of cardiometabolic and emotional diseases.[52] Several studies reported the beneficial effects of regular physical activity in preventing or ameliorating the metabolic and psychological distresses induced by chronic stress.[53] These benefits are believed to derive from the central effect of exercise in reducing stress sensitivity and peripheral actions influencing metabolic functions, in particular insulin sensitivity and the partitioning of energy toward oxidation rather than storage.[52] In the current study, we found a significantly greater reduction in perceived stress in the Tai Chi group than in the control group after a 3-month intervention. This finding was consistent with that of a previous research on participants with elevated blood glucose after 12 weeks of Tai Chi training[48] and a meta-analysis on the effect of Tai Chi on stress in participants with CVD risk factors.[53] We also found significant improvements in the physical and mental health components of the SF-12, which reflected improved QOL. These findings were consistent with those from a 12-week Tai Chi program amongst adults with elevated blood glucose[48] and those from a 6-month Tai Chi program for adults with coronary heart disease.[15] Therefore, Tai Chi is an inexpensive and effective strategy for promoting psychosocial well-being and improving general health status, especially amongst adults with CVD risk factors.

Self-efficacy is an essential and intrinsic motivating factor for integrating brisk walking into one's activity in daily life and cultivating this action as a daily habit.[54] In the present study, fluctuations in exercise self-efficacy were observed in the brisk walking group, whereas significantly improved exercise self-efficacy was observed in the Tai Chi group. The importance of physical activity in reducing CVD risk factors and promoting physical and psychosocial well-being has been well established. Regular participation in physical activity

is associated with protection against CVDs and improvement in functional ability and psychosocial health.[55,56] This study compared the effect of Tai Chi with that of brisk walking on modifiable CVD risk factors after a 3-month intervention, along with any lasting effect or long-term adherence to regular physical activity. Tai Chi and brisk walking positively affected the BP, blood glucose and psychosocial well-being of the subjects. The participants in the Tai Chi group exhibited significantly greater improvements with sustained positive effects at 9 months than the brisk walking and control groups.

Limitations

The current study was limited by its reliance on the self-reported exercise logbook for the home-based practice of Tai Chi and brisk walking. The participants may have performed their respective interventions incompletely or incorrectly at home, which may have produced biased results, particularly in the brisk walking group. An objective method for monitoring the brisk walking intervention, such as a pedometer or accelerometer, was lacking. However, the random nature of the self-report home-based exercise logs amongst the study groups may have minimised the potential threat to the study's internal validity.

Implications for Nursing Practice

Cardiovascular nurses play a key role in improving patient self-management by encouraging health promotion activities, such as regular exercise.[31] Tai Chi has become increasingly popular. It is estimated to have the largest group of exercise practitioners worldwide.[57] People with CVD risk factors strongly need physiological support to prevent CVDs or ameliorate their chronic conditions. This study provided evidence that a 3-month Tai Chi intervention is better than brisk walking in reducing some modifiable CVD risk factors and can be applied in clinical practice to improve the QOL of persons with CVD risk factors. Richards and Cai[58] stated that nurses are endeavouring to promote physical activity in primary care. Tai Chi can be introduced by primary nurses. Nurses interact with patients at numerous points during a primary care visit and hence are the most suitable players for logical health promotion intervention. Nurses can be influential in increasing the physical activity level of clients and helping them in achieving a satisfactory degree of adherence to exercise. These interventional strategies are well suited for nurses to implement because of their frequent contact with patients. Therefore, nurse recommendations for clients to do regular exercise can positively impact client safety and adherence to an exercise program.

Conclusion

CVDs are among the major health problems worldwide and influence individuals' physical function and psychosocial well-being, which contribute to the overall QOL. Physical exercise is a crucial component of preventive clinical practice in reducing CVD risk factors. This paper presented a 3-month RCT that substantiated the positive effects of Tai Chi and brisk walking in reducing some modifiable CVD risk factors. This work demonstrated that Tai Chi intervention is better than brisk walking in decreasing BP and blood glucose levels and improving psychosocial well-being with long-term benefits. Nurse recommendations for clients to do regular exercise can positively influence health outcomes and can promote adherence to an exercise program. Tai Chi is a promising exercise option in reducing CVD risk factors due to its ease of application and effectiveness as demonstrated in this study.

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