



ORIGINAL SCIENTIFIC ARTICLE

EFFECTS OF TAI CHI AND RESISTANCE BAND TRAINING ON ELDERLY'S BALANCE AND STRENGTH

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Abstract

Study purpose. The research aimed to study the effects of tai chi and resistance band training on elderly's balance and strength.

Materials and methods. The participants were 40 elderly females aged 62 to 76. They were selected by systematic random sampling, using balance score as the criterion. They were divided into two equal groups of 20 people each, namely, the Tai Chi and resistance band training (TCR) experimental group was trained for 8 weeks, 3 days a week for 60 minutes each day, and the control group (C) was not trained. The participants volunteered to sign the consent forms to participate in this research. Quantitative data was collected by measuring balance, hand muscle strength, and leg muscle strength. Qualitative data was collected via interviews and participant observation.

Results. The research found that (1) balance, hand muscle strength, and leg muscle strength were no different before the training. Post-training of Tai Chi and resistance band trainings (TCR) of the 4th and the 8th weeks, the experimental group had the mean of balance, hand muscle strength, and leg muscle strength better than the pre-training and the differences between the experimental group and the control group were statistically significant ($p < 0.05$). (2) The experimental group had balance, strength, good flexibility, relaxed body and good mental health.

Conclusions. As regards the benefits to the physical fitness, tai chi and resistance band training (TCR) and combination exercise improve balance, hand muscle strength and leg muscle strength. This makes the elderly have good health and physical fitness.

Keywords: tai chi, resistance band training, balance, strength, elderly.

Introduction

Globally, the old people population continues to increase, and their health problems become a big issue as a result (Choi et al., 2011; Sun-Young & Yun-Hee, 2021). The old people gradually weaken their muscle strength and muscle tone due to aging, and their muscle mass and basal metabolic rate decrease (Bechshoft et al., 2016; Brown et al., 2000). May reduce their ability to perform daily activities, resulting in health problems (Scott et al., 2015). Whereas the habit of exercising on a regular basis prevents aging and increases physical strength, thus reducing the incidence of disease (Ngandu et al., 2015). It also has a positive effect on the physical and mental health of the old people, such as

preventing chronic diseases, improving physical function, increasing muscle strength, reducing depression, and relieving stress (Graham & Reid, 2000; Hicks et al., 2003; Sangwan & Ji-Youn, 2020). Therefore exercise is necessary for the health and physical fitness of the elderly.

Exercise is essential for active healthy aging without functional impairment (Van Roie et al., 2010; Sun-Young & Yun-Hee, 2021) and contributes to improving quality of life (Acree et al., 2006; Atlantis et al., 2004; Daskapan et al., 2005). Tai Chi Chuan is a valuable exercise for the older adults (Lida et al., 2018). This type of exercise is a traditional Chinese exercise, consisting of isometric, aerobic, isotonic, and meditative movements (Larkey et al., 2009; Tsang et al., 2003). It may result in improved trunk strength and movement abilities in the elderly (Wolf et al., 1996; Klarod et al., 2020). Tai Chi Chuan is effective in preventing falls and improving balance, muscle strength, proprioception, and endurance in older adults (Hu et al., 2016; Lan et al., 2013;

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Logghe et al., 2010) help in the development of proper body posture control (Vikas et al., 2022; Nontakhod et al., 2022).

Resistance training is an effective exercise modality for increasing muscle strength and mass, which are important components of fitness and health (Bird et al., 2005; Winett & Carpinelli, 2001; Daniel, 2020). Incorporating resistance training as part of a preventive exercise program can improve flexibility, balance (Lopes et al., 2019), muscle strength (Kim et al., 2021), and functional capacity in older adults (de Oliveira et al., 2017; Minjoon et al., 2022).

However, in Southeast Asia little is known about the combination of Tai Chi and resistance training. This is because balance and strength play an important role in daily activities of the elderly. Therefore it is necessary to summarize current knowledge on this topic. As a guideline for maintaining the health and physical fitness of the elderly to have a good quality of life.

Materials and methods

Study participants

The participant were 40 elderly females, aged between 62-76 years old. They were selected by systematic random sampling, using balance score as the criterion. It was divided into two equal groups of 20 people each, the Tai Chi and resistance band training experimental group was trained for 8 weeks, 3 days a week for 60 minutes each day, and the control group was not trained. Quantitative data was collected by balance measure, hands muscle strength, and legs muscle strength. Qualitative data was collected via interviews and participant observation. The eligible criteria of research participations (1) The elderly aged between 62-76 years or over, be eligible to participate throughout the data collection. (2) There were no underlying or chronic diseases that hindered Tai Chi and resistance band training. The eligible criteria of research participations were not selected (1) The samples got injured and ill, they couldn't participate in the training/absence more than 3 times. (2) The samples requested to withdraw and didn't want to join in the training for a specified time.

Study organization

Researchers collected data by defining the samples to Tai Chi and resistance band training (TCR), 3 days a week, 60 minutes a day for 8 weeks to perform a balance testing (Osness Test), hands muscle strength (Arm Curl Test), and legs muscle strength (30-Second Chair Stand) of pre-training, post-training of the 4th and the 8th week. Qualitative data were collected via semi-structured interviews and participant observation.

Statistical analysis

Quantitative data analysis was performed by testing the difference of the mean balance, hands muscle strength, and legs muscle strength. Data were analysed by the different tests of the pre-training, post-training for the 4th and 8th weeks of the samples, it was analysed by one-way repeated measures ANOVA, comparison of differences in pairs of the mean of each repeated measures. Qualitative data were collected via semi-structured interviews and participant observation.

Results

The research found that following, (1) Balnace, hand muscle strength, leg muscle strength before the training was no different. Post-training of Tai Chi and resistance band trainings of the 4th and the 8th weeks, the experimental group had the mean of balance, hands muscle strength, legs muscle strength better than the pre-training and the control group were the statistically significant $p < 0.05$. difference at 0.05. (2) The experimental group had balance, strength, good flexibility, relax body and good mental health.

Table 1, it could be summarized that the participant were named pseudonym T.Y.1 (means the sample 1) aged between 62-76 years, mean age was 68.2 years, weight was 54.5 kg, height was 151.7 cm., body mass index (BMI) was 23.66, health problems were joint pain and body aches.

Table 1. Characteristics of the participant

Given name	Age	Weight	Height	BMI	Health Problems
T.Y.1	71	40	150	17.77	Backache
T.Y.2	68	43	144	20.73	Shoulder pain
T.Y.3	72	45	145	21.40	Frozen shoulder
T.Y.4	64	51	160	19.92	Leg pain
T.Y.5	63	55	149	24.77	Leg pain
T.Y.6	75	57	159	22.54	Frozen shoulder
T.Y.7	65	71	160	27.73	Backache
T.Y.8	65	49	147	22.67	Backache
T.Y.9	63	51	156	20.95	Waist pain
T.Y.10	75	49	146	22.98	Knee pain
T.Y.11	72	60	156	25.96	Knee pain
T.Y.12	68	55	152	23.80	Frozen shoulder
T.Y.13	60	71	163	26.73	Knee pain
T.Y.14	68	61	155	23.39	Leg pain
T.Y.15	65	66	153	27.76	Hip pain
T.Y.16	70	59	151	25.87	Shoulder pain
T.Y.17	74	44	143	21.51	Shoulder pain
T.Y.18	63	64	146	29.55	Leg pain
T.Y.19	69	52	149	23.41	Leg pain
T.Y. 20	74	49	151	22.71	Leg pain
X	68.2	54.5	151.7	23.66	

Table 2. Summary of findings

The benefits of tai chi and resistance band training
1. Improved strength and balance
2. Good flexibility

Table 2, could be summarized as follows; 1) More balance and strength 2) Good flexibility.

The interview and observation could be described as following.

More good balance and strength

Tai Chi and resistance band training are the movement of the exercises of the core muscles that take a long time to move and must maintain balance while stillness or movement. When training Tai Chi and resistance band will affect more balance and strength, as the sample TY.2 said that “In the past, there was no much strength, easily tired, after training, I was strong” in accordance with TY.9 said that “In the past, I couldn’t walk for a long time, hands pain, legs pain, maybe there was a stagger. But it’s okay now, I don’t feel tired, get stronger, whenever I walk it balances”. Likewise, TY.11 stated that “When I trained Tai Chi and resistance band, it was comfortable to walk like stronger muscles. I don’t feel tired like the past”. TY.12 supported that “In the past, each work was easy to get tired, not much energy, but when I often get training, I don’t feel tired. Maybe my children have to tell me to take a break”. TY.15 summarized that “In the past, I went to buy my stuff, I had to stop several times, sometimes I staggered, arms and legs are powerless, it was difficult to walk. After I trained Tai Chi and the resistance band I could walk comfortably, no stagger anymore. I don’t even know where to walk without concentration”.

Good flexibility

Tai Chi training is a continuous movement of the body. This makes muscles and joints moves in more angles and directions, whereas resistance band training improves muscles and joints stronger. As the sample TY.7 said that “First, the muscles and bones didn’t stretch, didn’t lift it up, later the post-training made me better”. TY.8 supported that “Firstly, I couldn’t stand up, but when I often trained Tai Chi and resistance band, I could lift it up the hands and legs easily”. TY.16 summarized that Tai Chi and resistance band training, firstly, have not been done by me before, hands and leg couldn’t lift it up, the post-training later could be done by me easily, it was very comfortable to stand up”. It was consistent with the observation that was found that the samples trained Tai Chi and the resistance band improved more flexibility such as both hands put down in the land, and the resistance band training improved the upper arms and lower muscles groups.

Quantitative data analysis was performed by testing the difference of the mean balance, hands muscle strength, and legs muscle strength. Data were analysed by the different tests of the pre-training, post-training for the 4th and 8th weeks of the samples, it was analysed by one-way repeated

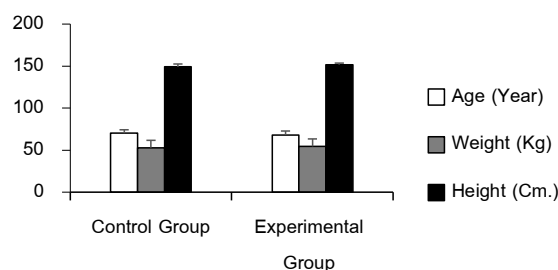


Fig. 1. Comparison results of the mean age, weight of the control and experimental group.

measures ANOVA, comparison of differences in pairs of the mean of each repeated measures.

Figure 1 shows the comparison results of the mean age, weight of the control and experimental group. Mean $\pm$ Standard Deviation. The mean difference was statistically significant between the groups, $p < 0.05^*$. The mean was statistically different within the group, $p < 0.05^*$.

Figure 2 shows the comparative results of the average balance before training. After the 4th week of training and

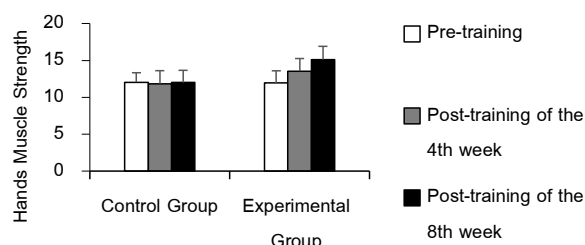


Fig. 2. Comparison of the average balance before training. After the 4th week of training and after the 8th week of the control and experimental groups ($p < 0.05^*$).

after the 8th week of the control group and the experimental group. Mean $\pm$ Standard Deviation. The mean difference was statistically significant between the groups, $p < 0.05^*$. The mean was statistically different within the group, $p < 0.05^*$.

Figure 3 show the comparative of the average arm muscle strength before training. After the 4th week of training and

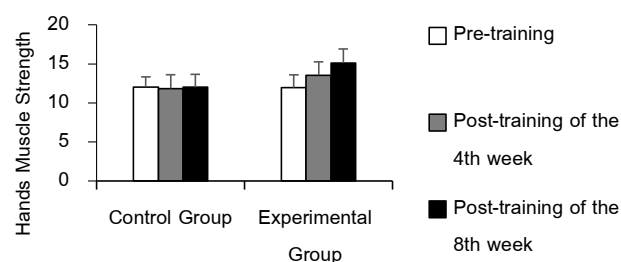


Fig. 3. Comparative of the average arm muscle strength before training. After the 4th week of training and after the 8th week of the control group and the experimental group ($p < 0.05^*$).

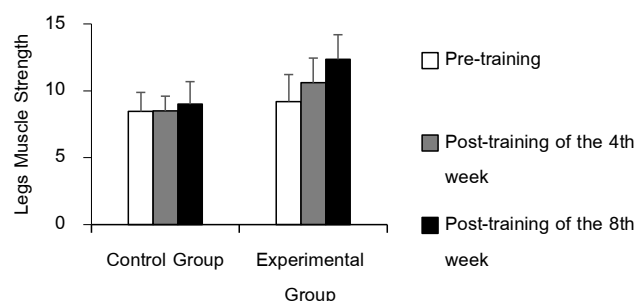


Fig. 4. Comparative results of the average leg muscle strength before training. After the 4th week of training and after the 8th week of the control group and the experimental group ($p < 0.05^*$).

after the 8th week of the control group and the experimental group. Mean $\pm$ Standard Deviation. The mean difference was statistically significant between the groups, $p < 0.05^*$. The mean was statistically different within the group, $p < 0.05^*$.

Figure 4 show the comparative results of the average leg muscle strength before training. After the 4th week of training and after the 8th week of the control group and the experimental group. Mean $\pm$ Standard Deviation. The mean difference was statistically significant between the groups, $p < 0.05^*$. The mean was statistically different within the group, $p < 0.05^*$.

Discussion

This study demonstrated that the balance, hand muscle strength, leg muscle strength before training was no different. After the 4th and 8th weeks of training, participants in the TCR group showed balance, hand muscle strength, and strength, and leg muscle strength was significantly improved compared to the control group. Which could be attributed to the Tai Chi and resistance band training (TCR). In this study, including helping to relax and good mental health. This is consistent with the study by Nontakhod et al. (2022) the training of physical activity with Qi Gong and Ruesi Dadton (RSD) in conjunction with massage can increase balance. Arm and leg muscle strength. It was consistent with Nontakhod et al. (2021) who found that the physical activities such as Qigong, Yoga and stretching could have a positive impact on health. That is the person would have 1) good health including good balance, flexibility, improved breath, reduced arches; 2) good health; 3) more socialization and 4) better concentration. It was consistent with Chen et al. (2012) stated about the study of Tai Chi training in elderly with visual impairment. It was found that the elderly were able to stabilize more. Make the elderly not fall easily It can help improve balance in older people. Another study on physical activities to elderly that found qigong training combined with yoga had a positive effect on the health of the elderly. Improve the overall physical, mental, social and intellectual health of the elderly. and reduce the fear of falling due to strong legs and good balance (Saetae et al., 2018) Consistent with Thaiprasert et al., (2019) said that Yoga training and nine square tables made the elderly healthy, physically, mentally. Socially, and memory, the fear was reduced due to having a good balance. The favorable effects of Qigong training on strengths are consistent with previous studies demonstrating significant improvements of knee extension strength after Tai chi training in elderly subjects (Christou et al., 2003; Lan et al., 2000; Song et al., 2014; Wolfson et al., 1996; Klarod et al., 2020). In terms of muscle strength, participants in the TCR group Meanwhile tai chi and resistance band training (TCR) from this training. The use of elastic bands to provide resistance during exercise for older adults, is considered safe and practical (Hofmann et al., 2016; Rahim et al., 2021). The effectiveness of elastic bands in resistance training was proven to lead to a significant improvement in lower limb function, especially leg strength (Motalebi et al., 2018). This is consistent with the study by Minjoon et al., (2022) said that an elongation band (EB) is used to improve the physical strength of older adults. In conclusion, EB exercises increased upper limb muscle strength, shoulder joint range of motion, and grip strength in older adults. It was consistent with Krabuanrat and Supaporn (2014) said that the exercise with the resistance band with nine square and stretching activities (RMS) improved good health. In addition, physical activities from tai chi, chiqong and yoga

can help seniors gain strength and balance. can adjust the balance and reduce the fear of falling (Kim et al., 2014; Saetae & Supaporn. 2016). Including sensation of physical and psychological relaxation (Miller & Taylor-Piliac, 2014; Zhao et al., 2017; Lida et al., 2018).

Conclusions

Tai Chi and resistance band training (TCR) application and combination forms of physical activity, to development balance hands muscle strength and legs muscle strength, this makes the elderly have better health than Tai Chi Training alone. Tai Chi and resistance band training is considered as an alternative activity suitable for physical conditions for the elderly to have good health and physical fitness.

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Human research ethics

The research had been approved by the committee for the research ethics of Buriram Rajabhat University. The certificate issued was BRU: -rdi002-002/2564.

Conflict of interest

The author declares that there is no conflict of interest.

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ВПЛИВ ЗАНЯТЬ ТАЙЦЗИ ТА ТРЕНУВАНЬ З ЕСПАНДЕРОМ НА РІВНОВАГУ ТА СИЛУ ЛЮДЕЙ ПОХИЛОГО ВІКУ

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 7 с., 2 табл., 4 рис., 51 джерело.

Мета дослідження. Дослідження мало на меті вивчити вплив занять тайцзи та тренувань з еспандером на рівновагу та силу літніх людей.

Матеріали та методи. Учасниками дослідження були 40 літніх жінок віком від 62 до 76 років. Вони були відібрані шляхом систематичної випадкової вибірки за критерієм оцінки рівноваги. Їх розділили на дві рівні групи по 20 осіб у кожній, а саме: експериментальну групу з тайцзи та тренуваннями з еспандером (TCR) тренували протягом 8 тижнів, 3 дні на тиждень по 60 хвилин кожного дня, а контрольну групу (С) не тренували. Учасниці згодилися підписати форми згоди на участь у цьому дослідженні. Кількісні дані збирали шляхом вимірювання рівноваги, сили м'язів рук і м'язів ніг. Якісні дані збирали шляхом інтерв'ю та спостереження за учасницями.

Результати. Дослідження показало, що (1) рівновага, сила м'язів рук і м'язів ніг не відрізнялися до тренування. Після тренування тайцзи та тренування з еспандером (TCR) на 4-му та 8-му тижнях експериментальна група мала середнє значення рівноваги, сили м'язів рук та сили м'язів ніг краще, ніж перед тренуванням, і відмінності між експериментальною та контрольною групами були статистично значущими ($p < 0,05$). (2) Експериментальна група мала рівновагу, силу, гарну гнучкість, розслаблене тіло та гарне психічне здоров'я.

Висновки. Що стосується користі для фізичної форми, заняття тайцзи та тренування з еспандером (TCR) і комбіновані вправи покращують рівновагу, силу м'язів рук і м'язів ніг. Завдяки цьому люди похилого віку мають міцне здоров'я та гарну фізичну форму.

Ключові слова: тайцзи, тренування з еспандером, рівновага, сила, люди похилого віку.

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