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Effect of the Eight-week Tai Chi Exercise on Knee Flexibility, Lower Limb Muscle Control, Fall Risk Prevention and Self-efficacy of Elderly Males in Severe Cold Areas

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Abstract: *Objectives: This study aims to investigate and discuss on the effects of Tai Chi exercise on knee flexibility, lower limb muscle control, fall risk prevention and self-efficacy for elderly males living in severe cold areas .Methods: In the experiments, 36 healthy elderly males, who were aged between 65 to 70 and from Kuancheng District, Changchun City, Jilin Province, Northeast China, were selected and randomly divided into experimental group and control group:during the eight-week experiment, subjects in the experimental group exercised Tai Chi, with 4 times a week, and duration of 45 minutes for one section. The researcher evaluated subjects' knee flexibility, lower limb muscle control, fall risk prevention, and self-efficacy before and after 8 weeks of Tai Chi exercise intervention. Also, Five Times Sit to Stand Test, 6-min Walk Test and Romberg's Test were launched for the subjects. In addition, to assess self-efficacy of all subjects, the researcher adopted General Self-efficacy Scale (GSES) and Time-based Performance Efficacy Scale.Results: Through experimental data analysis achieved by Two-way Repeated-measures ANOVA and Matched Samples T-test, it was figured that thanks to 8-week exercise intervention, subjects in Tai Chi group got significantly enhanced in terms of knee flexibility, muscles of lower limb control and dynamic balance, with strengthened GSES scores.Conclusion: The 8-week Tai Chi exercise possessed functions of effectively improving the knee joint flexibility and lower limb muscle control of the elderly males in severe cold areas, strengthening their self-efficacy, as well as preventing and controlling the fall risks.*

Keywords: *Tai Chi Exercise, Severe Cold Areas, Elderly Males, Knee Joint, Fall Risks, Self-efficacy*

1. Introduction

In 2010, the proportion of elderly people aged 65 and over in Northeast China was 6.6%, of which the figure in Liaoning Province was 7.88%, higher than 6.1%, the proportion of China in the same period. Hence, it could be uttered that compared with the national situation, the population aging is serious in Northeast China. As for 2020, the number of the elderly population in Northeast China further increased, with the proportion of the group aged 65 and above reaching 9.12%, 0.2 percentage higher than that of the national elderly population in the same period. Among the figures, the proportion of the elderly population in Liaoning Province was 10.3%, and the growth rate of the elderly population in Jilin Province and Liaoning Province already exceeded the figure on national level in the same period; this means that the population aging development in the Three Provinces in Northeast China became rapid (Table 1) [1]. In addition, what is worth mentioning is the increasingly severe and rapid population aging among urban population in Northeast China. It is revealed from the Table 2 that from population aging in cities, towns and villages, the growth rate of the proportion of the elderly population aged 65 and over in cities and towns in such three provinces was higher than the figure of national average level, while that in rural areas was slightly lower; this showed that population aging in urban areas in Northeast China grew faster, and this had certain connection with the lower birth rate and the higher level of urbanization in these provinces[2].

Population aging has become a serious social problem globally. Also, from the male elderly people, the decrease of lower limb strength, especially knee joint strength, as well as the deterioration of mental health, have become major risks that damage the physical health of such group in recent years. According to WHO's statistics, the incidence of falling occurred among the senior citizens is in an upward trend on a year base. Each year, nearly 500,000 people worldwide are seriously injured by falling, and approximately 300,000 lose their lives. Among them, the proportion of the population

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under the age of 60 is 25.2%, while the figure of the same group over the age of 65 is 45.2%; more than half of the people who die from falling are the elderly [3]. Lower limb muscle strength acts one of the decisive factors in maintaining the balance of human bodies. The research of Yan Li et al. (2018) pointed out that in the age of 20 to 30, the human muscles control strength and level were at their peak[4]. The strength remains stable until 40, and after 45, such two indicators come to decline. According to the study of Zhong, D (2020), with the aging of human bodies, flexibility and muscle strength of the knee joint are also declining on a year's base, and the decline of the knee flexor muscle strength of elderly female people is more serious than that of the males[5]. In a study on the lower limb muscle strength and knee flexibility of the elderly people in the community, it was found that both lower limb muscle strength and knee flexibility declined with age [6].

Table 1: Proportion of Population Aged 65 and Over in China and the Three Provinces of Northeast China in 2010 and 2020 (Unit: %)

Year	2010				2020			
Area / Ratio	Country	City	Town	Rural Area	Country	City	Town	Rural Area
Countrywide	7.10	6.67	5.99	7.50	8.92	7.68	7.98	10.06
Liaoning	7.88	8.22	6.86	7.80	10.31	10.50	9.43	10.33
Jilin	6.04	6.31	5.88	5.91	8.38	9.05	8.64	7.77
Heilongjiang	5.56	6.30	5.51	5.04	8.28	9.40	8.65	7.19
Northeast China	6.61	7.18	6.03	6.32	9.12	9.85	8.89	8.47

Table 2: The elderly dependency ratio of the population of the three northeastern provinces and the whole country in 2010 and 2020 (unit: %)

Year	2010				2020			
Area / Ratio	Country	City	Town	Rural Area	Country	City	Town	Rural Area
Countrywide	10.15	8.69	8.28	11.20	11.98	9.59	10.62	14.21
Liaoning	10.59	10.65	9.20	10.87	13.17	13.13	12.03	13.60
Jilin	8.05	8.11	7.78	8.10	10.53	11.18	10.86	9.88
Heilongjiang	7.36	8.12	7.27	6.82	10.38	11.61	10.92	9.11
Northeast China	8.82	9.27	8.00	8.67	11.52	12.23	11.24	10.89

Another study reveals that the weakened control of lower limb muscle strength is an important factor leading to falling of the elderly people, since the deteriorated control of the lower limb muscles resulted in a decline in the body balance. Furthermore, elderly males are more likely to fall due to decreased quadriceps muscle strength and weakened ligaments and tendons around the lower limb joints, which is also harmful to balance [7]. Cetin, S.Y, et al. (2020) suggests that decreased knee flexibility, and weakened muscle control of ankle dorsiflexors other areas in bodies increase the risk of fall in senior citizens[8]. While physical aging leads to physical decline and other diseases, the mental health of the elderly cannot be overlooked as well: in 2020 just the incidence of falls among the population over the age of 65 in Northeast China was 44.53%. Take Changchun City (the captial of Jilin Province) as an example, the severe cold and strong winds make the chances for local elderly to exercise significantly lower than that at national average level. Meanwhile, after a fall, the vast majority of the elderly people tended to reduce exercise and related physical activities to prevent them from falling again. Unfortunately, such choice further jeopardized their physical health; and this fear and worry worsened the subjective efficacy of most elderly people, which are prone to trigger mental depression and other negative phenomena [9]. The psychological issues attributed to the decreased subjective well-being and weak self-efficacy are likely to lead to further deterioration of the physical health of the elderly, which deserves high attention [10]. Experiments and the researches by Wang, Z et al. (2020) also showed that there was a causal relationship between long-term psychological stress and cardiovascular disease, acute respiratory disorder and mental disorders. It has been proved by many studies that exercise had positive influences on improving physical and mental health[11]. Nonetheless, due to the cold and windy weather in Changchun City, it is obviously difficult to conduct outdoor aerobic exercise; besides, as for the physical features of elderly males, from exercise intensity, inappropriate high-intensity exercise will instead actually make damage.

As a traditional national sport in China, Tai Chi boasts the features of slow and flexible movements and moderate intensity, which makes it suitable for a sports training program for the elderly people.

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Meanwhile, in recent years, its desirable fitness effects have been confirmed by increasingly number of experimental studies. Tai Chi has a positive effect in terms of improving the balance and stability of the human bodies and enhancing the strength of the knee muscles; its implementation and development are also beneficial for relieving the mental stress of the elderly [12].

2. Methods

2.1 Participants

In this study, 36 elderly males who are physically and mentally healthy and aged between 65 and 70 were randomly selected as subjects in Kuancheng District, Changchun City. The subjects were randomly assigned poor to the experiment, with 18 in the exercise group and the other half in the control group (Table 3). The researcher obtained the subjects' fall histories and disease histories in the past one year before the experiment, and tested their physical and mental conditions 24 hours before the start. The aim was to ensure that the subjects were not influenced by musculoskeletal diseases of the upper and lower limbs or did not have tumor history, and that the subjects meet the requirements and standards of the experiment, which is to say, they were able to follow the simple instructions of the researcher. All subjects were tested in Changchun Normal University.

Table 3: Basic information of the subjects

Variables / Groups	n	Age(yrs)	Height(cm)	Weight(kg)
Exercise Group	18	62.05±5.05	167.89±5.15	70.66±7.12
Control Group	18	61.95±4.12	167.01±6.22	69.95±6.12

2.2 Randomization

The experimental group was trained by teachers who possessed dozens of years of Tai Chi lecturing experience in Changchun Normal University; the training was launched 4 times a week during 9:00 to 9:45 in the morning, with the length of 45 minutes and RPE (subjective exercise intensity perception) controlled at the level of 10-13.

2.3 Experimental Protocol

Considering safety and rationality, and physical fitness of elderly males, this study is expected to conduct relevant research through the following experimental tests:

Test 1: 6-min Walk Test

A 6-minute Walking Test was launched to figure out the control ability of the subjects' lower limb muscles. The subjects were required to walk back and forth in a 50-meter corridor, and the distances accomplished were adopted as the results to evaluate the level of the subjects' lower limb muscles control.

Text 2: Romberg's Test

When it comes to the prevention of fall risk for elderly males, Romberg's Test was launched in this study, whose main method was to measure the dynamic balance ability of subjects to evaluate the risk.

Test 3: Five Times Sit to Stand Test (FTSST)

Five Times Sit to Stand Test possessed the function of testing the flexibility of the subjects' knee joints. Main procedures of the test: the subjects were asked to sit and stand up five times consecutively on the upright chair, and the researcher counted the time took to finish such activities; the test was conducted 3 times, before which the average was taken as the final outcome.

Test 4: General Self-efficacy Scale (GSES)

The subject's self-efficacy was mainly assessed by means of filling in GSES. It consisted of 10 items whose comprehensive grades could assess the subject's self-efficacy.

Test 5: Time-based Performance Efficacy Scale

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The scale was adopted to assess the self-efficacy of elderly males. The principle was mainly to conduct tests by asking the subjects confidence related to completing slow and rhythmic movements of 5 minutes, 10 minutes and 15 minutes. The subjects scored to themselves in the range of 1-10 points; the higher score means better self-confidence in terms of movement completion.

2.4 Procedures

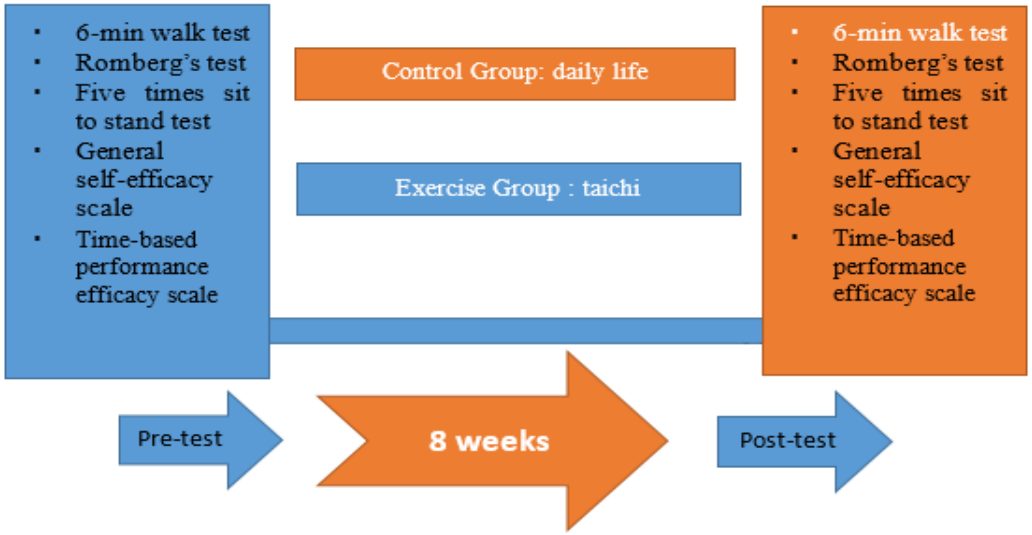

Figure 1: Experimental procedure

3. Measures

3.1 Six-minute Walk Test

This experiment was to test the subject's ability to control the muscles of the lower limbs. In the experiment, a 50-meter-long closed corridor was selected to carry out a 6-minute walk test between the experimental group and the control group. The timer was set to 6 minutes, and the subjects were asked to walk back and forth in the corridor and they were encouraged to continue walking, but pause and rest in the middle were allowed. The researcher reported the time every 1 minute, and when the 6 minutes was over, the researcher told the subjects to stop immediately, and measured the total distance the subjects covered.

3.2 Romberg's Test

Before and after the intervention of Tai Chi exercise, Romberg's Test were carried out to the subjects. The subjects were asked to stand on the yoga mat with bare feet and eyes closed, and stand with their feet one in front of the other (the toes of the rear foot were connected to the heels of the front foot) on the same straight line. After the subject stood firm with their eyes closed, the timing was started; when they moved or shook their bodies shakes, the timing was stopped. For each experiment, the Romberg's Test was conducted 3 times, with the interval two minutes, and the longest time that the subjects kept was taken as the final test result for recording.

3.3 Five Times Sit to Stand Test (FTSST)

Five Times Sit to Stand Test aimed to test the subjects' lower limb joint control ability, which indicated their knee flexibility. During the test, subjects were required to sit with their arms folded in front of their chest and sit in a chair with a backrest but no armrests. The subjects were also asked to keep their backs straight and not in contact with the backrest of the chair. When the researcher announced the start of the timing, the subjects sat and stood up on the chair as fast as possible for 5 times, and the researcher recorded the total time spent in finishing the sitting and standing up. In the procedure, such test was conducted three times in total, and the average time of the three tests was taken as the final score of the subjects. In each interval, a 40-second time for rest should be given to

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each subject. During the test, the researcher should pay attention to oral guidance and instructions to the elderly people, and ensure the stability of the chair to prevent subjects from falling.

3.4 GSES (General Self-efficacy Scale) Test

The researcher used General Self-efficacy Scale to assess the psychological state of the subjects, the results of which reflected the psychological state of the elderly people when they faced with stress. GSES included 10 items, with contents about the assessment of self-confidence, attitudes to and ways of addressing of setbacks and difficulties, and etc. For each item, the rating range was from1 to 4 points, which were filled in by the subjects before and after the experiment.

3.5 Time-based Performance Efficacy Scale Test

Time-based Performance Efficacy Scale Test is also a method to test the elderly males' self-efficacy, which functions together with GSES Test. As for the scale, the subjects were first asked about their confidence in completing a set of 5-minute slow movements successfully and coherently, before rating themselves on a scale from 1-10 points. Then the time of the movement was extended to 10 and 15 minutes, which is to say, the subjects were asked their confidence of completing slow and rhythmic movements of 10 minutes and 15 minutes respectively. The related assessment results of the subjects were recorded in turn as well.

4. Results

Subsequent to Six-minute Walk Test, Romberg's Test, Five Times Sit to Stand Test, GSES Test, and Time-based Performance Efficacy Scale Test, the researcher carried out Two-way Repeated-measures ANOVA and Matched Samples T-test to analyze, obtaining results as follows:

4.1 Six-minute Walk Test

Table 4: Results of two-way ANOVA with repeated measure for the six-minute walk test

Variable		Source	SS	df	RMS	F	p
6-min Walk Test(m)	Between -group	Group	708.134	1	708.134	3.390	0.074
		Error	7103.266	34	208.920		
	Within -group	Time	0.009	1	0.009	0.000	0.989
		T×G	122.201	1	122.201	2.710	0.109
		Error	1532.931	34	45.086		
* p<.05,** p<01 *** p<.001 T × G:time ×group							

Before the 8-week Tai Chi exercise intervention, the average scores of the Tai Chi experimental group and the control group in the 6-min walking test were 383.16±11.21 and 379.49±12.05 respectively (Table 4). There was no significant difference in the test results between the two groups (p >0.05) (Figure 2). However, after the 8-week Tai Chi exercise intervention, the experimental result of Tai Chi group got 385.74±10.01, which was obviously improved compared with the same group 8 weeks ago. The result analysis showed that no significant difference occurred (p>0.05) (Table 5), but the overall test results of the experimental group revealed an upward trend. Compared with the test scores of the control group after 8 weeks, the scores of the experimental group were considerably higher, while the scores of the control group did not achieve obvious change compared with the test results before 8 weeks (p>0.05).

Table 5: Paired t-test results of the six-minute walk test(6-minWT)

Variable	*Group*	*Pre*	*Post*	*t*	*p*
		M±SD	*M±SD*		
min WT(m)	*Exercise Group*	*383.16±11.21*	*385.74±10.01*	*-1.846*	*0.082*
	Control Group	*379.49±12.05*	*376.87±11.70*	*0.926*	*0.231*

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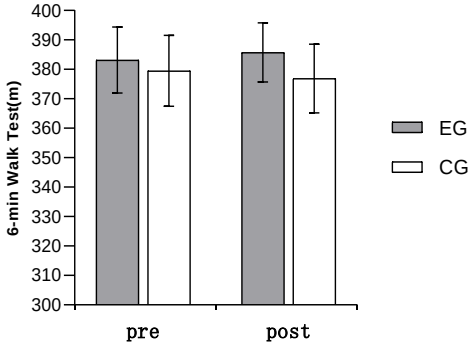

Figure 2: Results of the six-minute walk test(m)

4.2 Romberg's Test

Before and after the Tai Chi exercise intervention, Romberg Test was carried out to the experimental group and the control group respectively, and the horizontal and vertical comparisons were both conducted to confirm the effect of the Tai Chi exercise intervention. The average test score of the experimental group before the 8-week Tai Chi exercise intervention was 6.52 ± 0.97 seconds, and after the 8-week Tai Chi exercise intervention, such figure of the experimental group became 6.99 ± 0.90 seconds (Table 6). The comparison of the results from the two tests showed that the 8-week Tai Chi exercise enormously improved the Romberg Test scores of the experimental group ($p<0.01$) (Figure 3). This indicated that the dynamic balance of the subjects was greatly strengthened. Yet from the vertical comparison of the test results of the control group, in the pre-test the average score of the control group was 6.54±0.98 seconds, which was not significantly different from the horizontal comparison of the average score of the experimental group. The scores of the two groups were quite similar. In the test results after 8 weeks, the average score of the control group was 6.31±0.88 seconds, which was not largely different from the average test results before 8 weeks ($p>0.05$). Also, compared with the test results of the experimental group after 8 weeks, the average test scores of the control group were significantly lower (Table 7).

Table 6: Results of two-way ANOVA with repeated measure for the Romberg's Test

Variable		Source	SS	df	RMS	F	p
Romberg's Test(sec)	Between -group	Group	2.033	1	2.033	1.314	0.260
		Error	52.615	34	1.547		
	Within -group	Time	0.257	1	0.257	1.277	0.266
		T×G	2.240	1	2.240	11.138	0.002**
		Error	6.838	34	0.201		

* p<.05,** p<01 *** p<.001
T × G:time×group

Table 7: Paired T-test Results of the Romberg's Test (RT)

Variable	Group	Pre	Post	t	p
		M±SD	M±SD		
RT(sec)	Exercise Group	6.52±0.97	6.99±0.90	-4.871	0.000***
	Control Group	6.54±0.98	6.31±0.88	1.242	0.231

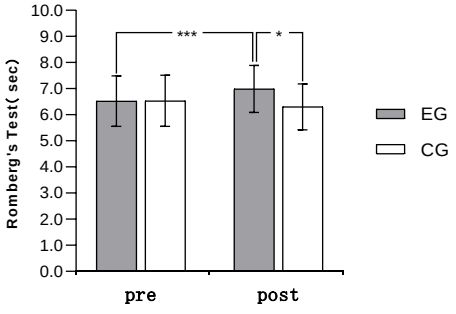

Figure 3: Results of Romberg's Test (sec)

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4.3 Five Times Sit to Stand Test (FTSST)

In order to test the subjects' ability to control the muscles of the lower limbs, the experimental group and the control group were tested under Five Times Sit to Stand Test before and after the exercise intervention. Prior to the 8-week Tai Chi exercise intervention, the average scores of the experimental group and the control group were 16.43±0.69s and 16.66±0.81s respectively, and there was no significant difference between the results of experimental group and the control group ($p>0.05$) (Table 9). After the experimental group experienced Tai Chi training for 8 weeks, with 4 times a week and 45 minutes each time, the average test scores was 14.00±0.72s: compared with the time before the exercise intervention, the test results decreased obviously ($p<0.01$) (Table 8 and Table 9). But the test results of the control group did not change significantly compared with 8 weeks ago, and the test results of the experimental group after 8 weeks of exercise intervention were greatly higher than the figures of the control group (Figure 4).

Table 8: Results of Two-way ANOVA with repeated measure for the FTSST

Variable		Source	SS	df	RMS	F	p
Five Times sit to Stand(sec)	Between -group	Group	41.405	1	41.405	49.069	0.000***
		Error	28.689	34	0.844		
	Within -group	Time	23.576	1	23.576	63.468	0.000***
		T×G	29.645	1	29.645	79.808	0.000***
		Error	12.629	34	0.371		

* p<.05,** p<01 *** p<.001
T ×G:time×group

Table 9: Paired t-test results of the FTSST

Variable	Group	Pre	Post	t	p
		M±SD	M±SD		
FTSST(sec)	Exercise Group	16.43±0.69	14.00±0.72	10.527	0.000***
	Control Group	16.66±0.81	16.80±0.88	-0.811	0.429

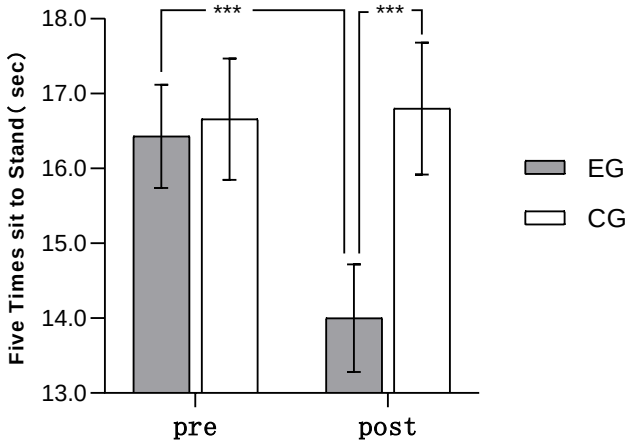

Figure 4: Results of Five Times Sit to Stand Test (sec)

4.4 General Self-efficacy Scale (GSES) Test

As revealed in the horizontal and vertical comparison of the results of the General Self-efficacy Scale (GSES) Test, before the 8-week Tai Chi exercise intervention, the average GSES Test score of the Tai Chi Exercise Group was 28.5±1.54 points; nevertheless, after the 8-weeks Tai Chi exercise intervention, the average score of the Tai Chi Exercise Group became 30.39±1.50 points: The vertical comparison results showed that the overall score of the Tai Chi Exercise Group was significantly strengthened, which was a enormously salient change ($p<0.01$) (Table 10). From the test results of the control group, as for the test results before the exercise intervention, the average score of the control group was 28.56±1.79 points; compared with the experimental group at the same stage, the test results of the two groups were similar ($p>0.05$) (Table 11). After the 8-week Tai Chi intervention experiment, the average score of the control group was 28.22±1.77 points, and no significant change could be found

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when it was compared vertically with the test results (p>0.05) before 8 weeks.Yet compared with the test scores of the experimental group after the 8-week exercise intervention, the scores of the Tai Chi Exercise Group were significantly higher than those of the control group (Figure 5).

Table 10: Results of two-way ANOVA with repeated measure for the GSES Test

Variable		Source	SS	df	RMS	F	p
General Self-Efficacy Scale(scores)	Between -group	Group	20.056	1	20.056	4.024	0.053
		Error	169.444	34	4.984		
	Within -group	Time	10.889	1	10.889	21.921	0.000***
		T×G	22.222	1	22.222	44.737	0.000***
		Error	16.889	34	0.497		

* p<.05,** p<01 *** p<.001
T × G:time×group

Table 11: Paired t-test results of the GSES test

Variable	Group	Pre	Post	t	p
		M±SD	M±SD		
GSES(scores)	Exercise Group	28.5±1.54	30.39±1.50	-9.628	0.000***
	Control Group	28.56±1.79	28.22±1.77	1.243	0.231

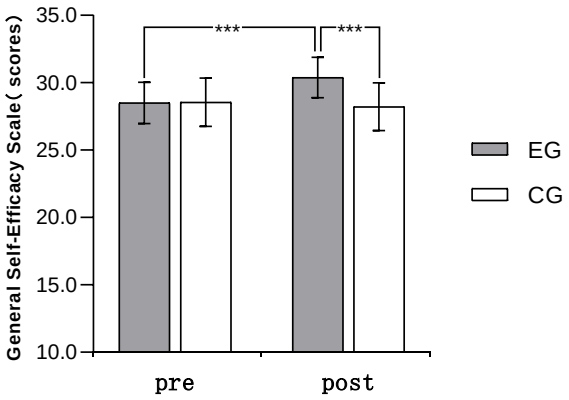

Figure 5: Results of GSES Test

4.5 Time-based Performance Efficacy Scale Test (TPEST)

As for the Time-based Performance Efficacy Scale Test results before the 8-week Tai Chi exercise intervention, the average score of the Tai Chi Exercise Group was 17.83 ± 1.54 points, and that of the control group was 18.61 ± 3.05 points (Table 13). The scores of the two groups were similar, and there was no obvious difference (p>0.05). But after the 8-week Tai Chi exercise intervention, the average score of the Tai Chi Exercise Group got 20.72±1.53 points; Compared with the test score before 8 weeks, the average score of the Exercise Group was significantly improved, and the results showed difference which was authentically obvious. (p<0.01) (Table 12). On the other hand, after 8 weeks, the average score of the control group become 17.61±1.72, which was largely lower than the average score of the experimental group which enjoyed the 8-week Tai Chi exercise intervention; and compared with the average score of the same group before 8 weeks, the average score of the control group was not improved obviously (Figure 6).

Table 12: Results of two-way ANOVA with repeated measure for the Time-based Performance Effectiveness Scale test (TBPES)

Variable		Source	SS	df	RMS	F	p
Time-based Performance Efficacy Scale(scores)	Between -group	Group	24.500	1	24.500	6.785	0.014*
		Error	122.778	34	3.611		
	Within -group	Time	16.056	1	16.056	3.291	0.079
		T×G	68.056	1	68.056	13.948	0.001**
		Error	165.889	34	4.879		

* p<.05,** p<01 *** p<.001
T × G:time×group

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Table 13: Paired t-test results of the the Time-based Performance Effectiveness Scale test (TBPES)

Variable	Group	Pre	Post	t	p
		M±SD	M±SD		
TBPES(scores)	Exercise Group	17.83±1.54	20.72±1.53	-4.337	0.000***
	Control Group	18.61±3.05	17.61±1.72	1.249	0.228

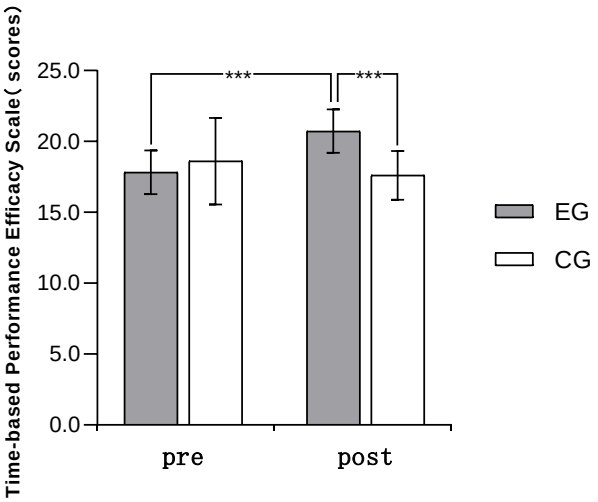

Figure 6: Results of Time-based Performance Effectiveness Scale test

5. Discussion

5.1 The Effect of the 8-week Tai Chi exercise on Lower Limb Muscle Control for the elderly males

The control of muscles of the lower limbs directly determines the dynamic balance of the elderly and their ability to prevent the risk of fall. In this study, the 6-minute walk test was adopted to study the lower limb muscle control of male elderly. From the results of such test, it was revealed that after the 8-week of Tai Chi exercise, although there was no significant change statistically between results of the experimental group after and before the exercise, the subjects did increase their walking distance in the 6-minute walk test. Meanwhile, the test scores of the experimental group after the 8-week exercise intervention were higher than those of the control group. Therefore, this experiment could confirm that the 8-week Tai Chi exercise was able to improve the lower limb muscle control of elderly males.

5.2 The Effect of the 8-week Tai Chi exercise on Knee Flexibility for the elderly males

The flexibility of the knee joint is crucial for maintaining the flexibility, balance and stability of the human body. Yet, the control of muscles of the lower limbs will decline with age, and the flexibility of the knee joint and lower limbs will degenerate. In addition, the decreased flexibility of the knee joint could also lead to the risk of fall and fractures to the elderly people. According to result data, Tai Chi had a significant impact on the improvement of flexibility of the knee joint of the elderly males: the experimental results of Five Times Sit to Stand Test visually showed that the 8-week Tai Chi exercise could enhance their flexibility of the knee joints. Compared with the control group, Tai Chi Exercise Group, after experiencing the 8-week Tai Chi exercise intervention, decreased their time spent in finishing the test by 2 minutes in total. Such decrease revealed that after the 8-week Tai Chi exercise, flexibility of the knee joint of the elderly males got increases and strengthened. Although Tai Chi was featured by moderate intensity and gentle movements, it emphasized the stability of lower body movements, and that this stability should be maintained while the movements of the upper body were changed. Hence, the flexibility of the knee joints of elderly males get optimized during the 8-week exercise.

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5.3 The Effect of the 8-week Tai Chi exercise on Fall Risk Control for the elderly males

Viewing from the vertical comparison of the Romberg's Test results, the test results of the experimental group after the 8-week Tai Chi exercise intervention were improved by about 0.5 seconds, which meant that the stability of the subjects' lower limbs and their overall dynamic balance got increases significantly. On the contrary, the results of the control group showed that there was no significant change in the scores of Romberg' Test, and compared horizontally with the results of experimental group after 8 weeks, the figure of the control group were largely lower. Such result showed that the 8-weeks Tai Chi exercise intervention could effectively improve the dynamic balance of the male elderly and reduce the fall risk.

5.4 The Effect of the 8-week Tai Chi exercise on Self-efficacy for the elderly males

As an important indicator to reflect the psychological and mental health of the elderly people, self-efficacy represents the confidence for their own state. The elderly people with low self-efficacy are prone to mental and physical diseases. Through GSES text and Time-based Performance Efficacy Scale the researcher conducted comprehensive assessment on the subjects' self-efficacy. The experimental results showed that the subjects' scores of GSES and Time-based Performance Efficacy Scale scores were significantly improved compared with those before the 8-week Tai Chi exercise intervention. The results of the both two experiments indicated that Tai Chi could enhance the self-confidence of male elderly in their daily life and other aspects, and that the intervention of Tai Chi exercise was actually conducive for subjects' self-efficacy.

6. Conclusion

The 8-week Tai Chi exercise training could exert obvious positive influences on the flexibility of knee joints of the elderly males living in severe cold areas. Also, at the same time, the training achieved positive changes for the lower limb muscles control to this group, but there was no significant difference in the experimental results before and after the intervention. Additionally, the 8-week Tai Chi exercise enormously improved the dynamic balance of the subjects, which indicated such exercise was also useful to prevent fall risk. Moreover, the 8-week Tai Chi exercise largely strengthened the self-efficacy of the elderly males, which is beneficial for their mental and psychological health.

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