**Effects of Tai Chi exercise on depression in older adults: A randomized controlled trial**

Mohammad Fakhari*

**ABSTRACT**

**Introduction:** Depression is a chronic but curable disease that early diagnosis and treatment can lead to a higher life quality. A supplementary treatment such as exercise can reduce depressive symptoms. Tai Chi exercise is easy to learn and easy to do for older adults in nursing homes. This study investigated the effect of Tai Chi exercise on depressive symptoms in elderly residents at Sadeghieh Nursing Home.

**Method & Material:** This is a pre-test, post-test experimental study. Subjects included 62 elderly adults above 60 years of age who were randomly divided into four experimental subgroups and a control group. Participants were older adults who had not been participated any exercise activity during the previous month. The ten step Tai Chi exercise performed three times per week for twelve weeks in experimental groups and a control group doing only their activity of daily living (ADL). The Beck Depression Inventory Second Edition (BDI-II) was used to assess depression.

**Results:** This study shows a statistically significant difference between depression mean scores in the experimental group compared to the control group ($p < 0.01$). After adjustment for the mean older adult’s age, the difference remained significant.

**Conclusion:** This study showed that Tai Chi exercise helps reduce depression in the older adult in residential homes. Social interactions through Tai Chi sessions and a sense of group belongingness may help reduce depression in older adults.

**Key words:** Tai Chi, Complementary Therapies, Older Adult, Depression


**INTRODUCTION**

Alongside improvement of life quality and life expectancy, the population of the elderly is increasing. It is predicted that older adult will mount to 20% of the whole population in the U.S. by 2030. Old age is one of the most vulnerable stages of life. Aging and a sedentary lifestyle make the elderly susceptible to chronic health problems. Depression is a common factor causing disability or death in elderly.

Some older adult lives in a residential home. And residential homes should be well prepared for dealing with problems of this period. Approximately 50% of residents of nursing homes suffer from mild depression. The prevalence of mild depression among the relatively healthy and active elderly is higher than that of severe depression. Now, depression is a curable disease; its early diagnosis and treatment can lead to a higher life quality. Yet, about 55% of the residents of nursing homes have not received any treatment.

A supplementary treatment usually recommended for depression is exercise. It is an efficient and safe treatment for the less active elderly. However, due to weakness and fragility, older adults are not able to do any exercise. A useful and bearable exercise in later life is Tai Chi. The Tai Chi is a mind-body exercise which is both mental and physical effects. Since the Tai Chi exercise does not require any special tool, place, or condition, it could be done with more ease and comfort than other exercises. It has also been more adherence rate in long term practice of the elderly. However, Tai Chi, which is easy to learn and to do for older people, is more favorable with nursing home residents. The previous Meta-analysis showed Tai Chi exercise is effective to reduce depression in the older adult community. Another study showed patients with mild and moderate depression, who cope better with exercise therapy. Previous research has recommended conducting further research on Tai Chi effects on homogeneous groups. There has been very little convincing research on the effectiveness of Tai Chi exercise on residential home older adult depression. This study investigated the effect of Tai Chi exercise on depression in elderly residents at a Nursing Home.

**MATERIALS AND METHODS**

This was a pre-test, post-test experimental study conducted on two groups of older adults. The study population included all residents of Sadeghieh, Isfahan, Iran. This study had not been blinded.
All participants lived in the same condition and the same food menu. The inclusion criteria were old adults above 60 years of age who had not been having any exercise activity during the previous month, given written consent and were declared healthy enough to participate in the study by the residential home physician. While the elderly which absent in 5% of the exercise meetings consecutively or in 10% of meetings alternately were excluded.

**Sampling**

All older adults who gave written consent to participate in the study completed Beck II Inventory, and the qualified subjects were thus selected. In the next step, weight and height measurement was done, and demographic features were recorded. Next, they were examined by the residential home physician and those who were declared healthy enough entered the study. At the end 62 people ready to participate. The subjects were, then, randomly allocated to two groups by the random table. As many as 32 older adults allocated to the experimental group. They divided into four experimental subgroups where they received the intervention (Tai Chi exercise). Thirty older adults allocated in one group, with no special intervention (daily living activities only). In the course of the study, two subjects left the nursing home, and two also died, none of which was due to doing Tai Chi. No exercise injury occurred during the study. Study diagram showed in Figure 1.

**Data Collection**

The Beck Depression Inventory Second Edition (BDI-II), is a valid and reliable tool for determining depression in older adults, with a Cronbach alpha coefficient of about 91 percent was used. It is a 21-item self-report tool to assess the existence and severity of symptoms of depression. Each item consists of 4 self-statements. The statements are assigned values of 0 to 3, with higher scores indicating more severe symptom. On two items (16 and 17) there are seven options to indicate either an increase or decrease of appetite and sleep. All of the 21 items were summed to give a single score for the BDI-II. Beck Depression Inventory completed before the study and at the end of the study.

**Intervention**

Tai Chi exercise performed three times per week for twelve weeks in four experimental groups, while the control group is doing only their activity of daily living (ADL). The ten step Tai Chi exercise recommended by Wolf and colleagues suitable for the elderly adults over 50 had been used. We considered steps 9 and 10 of Tai Chi exercise were difficult to perform for an older adult in a residential home. To reduce the risk of falling or injury, only the qualified subjects (having physical strength and the trainer's approval) were permitted to do steps 9 and 10. Tai Chi exercise sessions were progressively extended so that they took 20-25 minutes at the end of the first month.

**Reliability of the Intervention**

Two experienced trainers cooperated in the study. Subjects in the experimental group were divided into two male and two female groups. In each group, one trainer demonstrated Tai Chi movements while the other went over and guided the subjects, corrected them, and maintained harmony among them.

**Data Analysis**

Descriptive and inferential statistics were used for data analysis. Chi square test was applied for comparing ordinal variables. Independent and paired t-tests used for comparing nominal variables. The significant value was set at p < 0.05. All statistical tests were done through IBM SPSS statistics Version 16.

**RESULTS**

Subjects included 62 elderly adults above 60 years of age who were randomly divided into experimental and control groups. There was no significant difference between the subjects’ gender, the level of education, age, BMI, waist/hip ratio and pretest scores (Table 1). The drop-out rate in the two groups was six subjects. Two male and four female subjects were excluded from the study due to not intend to participate.

Table 2 demonstrated the dependent variable of the study (total score on Beck II Inventory) in the two groups. It indicates that there was a statistically
significant decrease in depression mean scores on the post-test in the experimental group compared to pre-test assessment ($p < 0.001$). However, there was not so significant difference between the scores of the two groups after the intervention.

Table 3 showed no significant difference between two groups before the study, but at the end of the study, depression score in the experimental group was significantly decreased ($p < 0.05$). BDI-II total score revealed participant had mild to moderate depression before this study.

Table 4 tabulates mean differences of the groups before and after the intervention, which showed a statistically significant difference between depression reduction rates in the experimental group compared to the control group ($p < 0.01$).

The one-way ANCOVA test was used to adjust the age of older adult as a covariance on the after intervention BDI-II total score. To examine the assumption of the covariance analysis, there was homogeneity of regression slopes and no interaction between the age, and after intervention, BDI-II total score in the scatter plot and a moderate correlation between them (see Figure 2).

Between-subjects effects in one-way ANOVA test was not significant for this interactive effect ($F = 0.25, p = 0.61$). Also, the Levene's Test of Equality of Error Variances was not significant ($F = 0.04, p = 0.83$). The results of covariance analysis showed a significant difference between the two groups BDI-II total score by adjusting the mean age of older adults (Table 5). There was a slight relationship between the age and the after intervention BDI-II total score, as indicated by a partial eta squared value of 0.31.

A repeated measure ANCOVA was conducted in which group was the fixed factor, age was a covariate, and the before intervention BDI-II scores (time1) and after intervention BDI-II scores (time2) were the repeated factors. There was a significant difference between groups by adjusting for age ($F = 4.04, p = 0.04$, partial eta square $= 0.07$). There was a strong relationship between the age and time, as indicated by a partial eta squared value of 0.34 (Table 6).

### Table 1  Baseline characteristics of participant in experimental and control groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>Experimental group</th>
<th>Control group</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (male %)</td>
<td>51.9%</td>
<td>41.4%</td>
<td>0.605*</td>
</tr>
<tr>
<td>Age (mean ± SD)</td>
<td>69.19 ± 5.48</td>
<td>69.34 ± 5.03</td>
<td>0.910**</td>
</tr>
<tr>
<td>Education (illiterate %)</td>
<td>41.9%</td>
<td>51.6%</td>
<td>0.318***</td>
</tr>
<tr>
<td>Body mass index (mean ± SD)</td>
<td>23.63 ± 3.84</td>
<td>22.57 ± 3.63</td>
<td>0.295**</td>
</tr>
</tbody>
</table>

*Chi square test  
**Student t test  
***Mann-Whitney U test

### Table 2  Compare mean of BDI-II total score in each group before and after intervention

<table>
<thead>
<tr>
<th>BDI-II Total Score</th>
<th>Before Intervention (mean ± SD)</th>
<th>After Intervention (mean ± SD)</th>
<th>Paired t test</th>
<th>df</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>16.18 ± 8.27</td>
<td>13.33 ± 7.09</td>
<td>4.88</td>
<td>26</td>
<td>0.001</td>
</tr>
<tr>
<td>Control group</td>
<td>18.55 ± 9.20</td>
<td>18.10 ± 8.08</td>
<td>1.25</td>
<td>28</td>
<td>0.219</td>
</tr>
</tbody>
</table>

### Table 3  Compare mean of BDI-II total score between two groups before and after intervention

<table>
<thead>
<tr>
<th>BDI-II Total Score</th>
<th>Experimental group(n=27)</th>
<th>Control group(n=29)</th>
<th>T student test</th>
<th>df</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before intervention</td>
<td>16.18± 8.27</td>
<td>18.55 ± 9.20</td>
<td>-1.00</td>
<td>54</td>
<td>0.317</td>
</tr>
<tr>
<td>After intervention</td>
<td>13.33± 7.09</td>
<td>18.10 ± 8.08</td>
<td>2.34</td>
<td>54</td>
<td>0.023</td>
</tr>
</tbody>
</table>

### Table 4  Compare BDI-II total score mean difference between two groups (paired t test)

<table>
<thead>
<tr>
<th>Mean difference</th>
<th>Before Intervention</th>
<th>After Intervention</th>
<th>Paired t test</th>
<th>df</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.85 ± 3.03</td>
<td>0.44 ± 1.91</td>
<td>-3.56</td>
<td>54</td>
<td>0.001</td>
<td></td>
</tr>
</tbody>
</table>

![Figure 2](https://example.com)  
**Figure 2** General distribution and linear relationship between age and post-test depression scores in experimental and control groups
DISCUSSION

This study investigated the effect of Tai Chi on depression in older adults. After adjusting the age of older adults, results indicated that Tai Chi exercises significantly reduce depression scores in the experimental group compared to control group.

Tai Chi exercise has multiple styles with different steps. In this study, we used the ten steps version of Tai Chi in which steps 9 and 10 had been excluded for some participants. Also, other studies used various questionnaires for measurement of depression. We did not find any studies that used the same Tai Chi exercise (with the same style, steps, length, and intensity) and same measurement tool. But our results are consistent with previous studies.15-18

The effectiveness of Tai Chi exercise in decrease depression may not relate to improving the fitness of older adult.19 It may be related to social interaction.17 The residents of a nursing house have constant interactions with each other; group work can increase their interaction and decrease their isolation.20 In group activities, there has also been an inverse relationship between social support and interpersonal conflicts and depression rates.21 Social interactions through Tai Chi sessions and a sense of group belongingness may help reduce depression in older adults. Although control group depression scores didn’t statistically change, but observation of the activities in the experimental group by control group participant may produce a feeling of loneliness and isolation in the control group, that could increase depression.

In order to make sure about similar diet, physical activity, and medication consumption of the participant, researchers remained in close contact with older adult in both groups throughout the study. During these communications, participants shared memories, life experiences (including old age experiences), and their problems. This relationship could also have had a role in depression reduction.22

We haven’t determined types of depression and only rely on BDI scores. Studies have shown seasonal depression is worsened in winter and improve in summer. There is a relation between exposure to sunlight in the warm seasons and intensity of seasonal depression.23 Since this study was conducted in spring, participants could receive more sunlight in April to July that possibly could have decreased depression in older adults with seasonal depression.

Low attrition rate may be related to the type of activity. Adherence to group exercise has also been higher than individual exercise. Compared to those with mild depression, people with moderate depression have displayed stronger adherence to physical exercise. The high turnover rate of residents in the nursing home made difficulties in follow up to BDI test over six months.

Residential home physician permitted healthy older adult to participate in this study. The result of this study could generalize to healthy older adult that can perform exercise. Participants took pain-reliever and sleeping pills from nurses when if necessary. Drug consumption had not been recorded by nurses. Researchers were not able to have any control over that medication consumption. Considering that some of the pain-reliever and sleeping drugs could cause depression and some are anti-depressants, care should be taken to control the effects of drugs in further studies.

To study the effect of Tai Chi on depression in the elderly, further study is necessary. We recommended that medication consumption is monitored, the control and experimental groups are selected from different centers and the effect of Tai Chi on depression reduction be compared with that of group activities.

CONCLUSION

This study showed that Tai Chi exercise helps reduce depression in the older adult in residential homes.
ACKNOWLEDGEMENT

I acknowledged the authorities, staff, exercise trainers, and all the elderly of Sadeghiyeh residential home.

CONFLICT OF INTEREST

The authors declare no conflict of interest in this study.

REFERENCES