

ORIGINAL RESEARCH

# Construction of Fall Prevention Exercise Training Scheme for Elderly Discharged Patients Using Self-Efficacy Theory Framework

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## ABSTRACT

**Objective** • We conducted this study to help older discharged patients recover better, reduce the risk of falls, and improve quality of life through self-efficacy intervention and the Otago exercise program. The purpose of this study was to address specific challenges in rehabilitation and quality of life in older patients..

**Methods** • 60 elderly patients discharged from January 1 to June 10, 2022, were selected as the study subjects and randomly divided into the experimental group (n = 30) and the controls (n = 30). We studied the impact of a self-efficacy intervention combined with the Otago Exercise Program (OEP) in older discharged patients. We included patients aged 65 and above who understood the study protocol and randomly divided them into two groups: one group received a combined self-efficacy intervention and OEP, and the other group received only OEP treatment. The intervention period is 12 weeks, 3 times a week, 30-45 minutes each time. We focused on the exercise capacity, fall risk, quality of life, and well-being of patients in both groups after the intervention. The aim of the study was to determine whether this combined intervention could improve recovery and quality of life in older discharged patients.

**Results** • Comparison of clinical data between the two groups: there were no differences in gender, age, ethnicity, education, residence, family income, complications, and chronic diseases ( $P > .05$ ). Self-efficacy increased significantly between the two groups after the intervention, but there was no difference before the intervention

( $P > .05$ ). The self-efficacy of the experimental group was higher than that of the control group on days 15, 30, 45, and 60 ( $P < .05$ ). Berg balance scale, TUG, PSMS, IADL, ADL, and total fall risk scores were significantly improved, but there was no difference before intervention ( $P > .05$ ). All indicators of the experimental group were better than those of the control group on days 15, 30, 45, and 60 ( $P < .05$ ). EAQ scores were significantly improved, but there was no difference between the two groups before intervention ( $P > .05$ ). The EAQ of the experimental group was higher than that of the control group on days 15, 30, 45, and 60 ( $P < .05$ ).

**Conclusions** • This study found that a self-efficacy-based intervention combined with the Otago Exercise Program (OEP) was of value to older discharged patients. This comprehensive intervention approach can improve patients' self-efficacy, balance, walking speed, daily functioning, reduce fall risk, and improve quality of life. For healthcare providers and institutions, this means that this approach could be considered to improve the care of older discharged patients. By enhancing patients' self-efficacy and physical function, it can promote better recovery and independent living, reduce the risk of readmissions, and thus reduce the burden on the healthcare system. This study provides important practical guidance for improving the recovery and quality of life of older discharged patients. (*Altern Ther Health Med.* [E-pub ahead of print.]

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## INTRODUCTION

Our study aimed to evaluate the impact of a self-efficacy-based intervention combined with the OEP on reducing the risk of falls and improving the quality of life in elderly discharged patients. Falls are sudden, involuntary, unintentional postural changes, falling on the ground or lower plane.<sup>1,2</sup> According to the Seventh National Bureau of Statistics census data, the total elderly population aged 60 years and above in mainland China in 2020 was 264 million, accounting for 18.7% of the total population.<sup>3</sup>

The health of the elderly is a problem that must be faced, and such populations are susceptible to various chronic diseases that are characterized by insidious onset, long duration of disease, many types of disease, and complex conditions.<sup>4-6</sup> Long-term distress from chronic diseases and repeated hospital admissions have a greater impact on the psychophysiology of elderly patients, and the discomfort symptoms caused by chronic diseases often have physical weakness and unstable key functions, which increase the risk of falls in the elderly.<sup>7,8</sup> Falls are a prevalent problem in the elderly worldwide, and according to the WHO, 28%-35% of the elderly ( $\geq 65$  years) worldwide experience falls yearly. The risk of falls gradually increases with age, and injuries caused by falls are the second leading cause of accidental or unintentional injury deaths around the world, with the elderly over 65 accounting for the largest proportion of fatal falls.<sup>9-11</sup> According to the latest Chinese health statistics, falls among the elderly have become an extremely serious problem. Shockingly, more than 20 million elderly Chinese suffer injuries due to falls every year, and about 1.5 million of them require hospitalization. These figures are not only alarming but also place a huge burden on health systems and families. In this context, our study aimed to explore an effective intervention to reduce falls and improve quality of life in older adults. In China, the annual incidence of non-fatal falls in the elderly ( $\geq 65$  years) is 37.5%, accounting for 2/3 of all non-fatal injuries.<sup>12</sup> Falls rank fourth among the causes of accidental injury deaths, and with increasing age, the mortality rate of falls rises dramatically, with associated costs as high as 60 billion to 80 billion RMB, bringing a serious burden on individuals, families, and society.<sup>13</sup>

Aging and decreased balance ability, lower limb muscle strength, and diminished vision are the most important causes of falls in older adults.<sup>14-16</sup> Elderly patients are at a higher risk of falls due to functional disability caused by their disease after discharge, which not only affects the quality of life of patients but also increases the risk of readmission, while the adverse consequences caused by falls place a greater burden on patients' families and caregivers.<sup>17,18</sup> A large number of studies and clinical practices have proven that OEP has significant benefits in preventing falls in the elderly. A study published in the *New England Journal of Medicine* found that older adults who participated in OEP had a 35% reduction in falls and a reduced risk of serious injury after a fall. In addition, OEP has been listed as a recommended fall intervention program for the elderly by the World Health Organization (WHO), further confirming its effectiveness. Therefore, fall interventions for elderly patients after discharge significantly reduce health care resource investment and the burden of social and family healthcare expenditures. It has been shown that regular home exercise can reduce the risk rate of falls and reduce fall damage to some extent through effective home rehabilitation nursing interventions.<sup>19-21</sup> The Otago exercise program (OEP), as an exercise program that aims to prevent falls in the elderly, individualized and progressive muscle strength and balance exercises performed at home can effectively reduce the occurrence of falls.<sup>22</sup> Developed in the 1990s, OEP is an

individualized exercise program performed at home for the purpose of preventing falls in older adults.<sup>23</sup> The OEP program is divided into 2 parts.<sup>11</sup> The first part includes 5 warm-up exercises, muscle strength training, balance strength training. The second part is walking exercise. The project was conducted in four randomized controlled trials involving a total of 9 towns and 1,016 elderly people aged 65 to 97 years, confirming that OEP can reduce the incidence of falls and fall injuries in the elderly and form a system. To maintain the effectiveness of a home exercise program, older adults should continue these exercises as long as possible. However, older adults' adherence to exercise interventions has declined over time.<sup>24</sup> The decrease of exercise compliance is related to many factors, such as psychological cognition, behavioral ability, lack of planning, lack of autonomous motivation, and lack of professional guidance of medical institutions. How to effectively control these factors is essential.

Albert Bandura, a psychologist at Stanford University in the 1970s, first proposed self-efficacy theory.<sup>25</sup> The concept is confidence or belief in one's ability to achieve domain-specific behavioral goals, and it is based on an assessment of all individual resources, including ability, experience, training, past performance, and information about the task. Self-efficacy theory is crucial in this context. It states that the key to adhering to an exercise program in older discharged patients is increasing their confidence in successfully performing exercises. Research shows that increasing self-efficacy can enhance patients' adherence to exercise programs because they believe they can succeed. This confidence can be improved through positive feedback, actionable goal setting, and support. In this study, we designed interventions based on self-efficacy theory, aiming to enhance patients' confidence to more actively participate in and adhere to OEP, reduce the risk of falls, and improve quality of life. Researchers have applied it to home management of chronic diseases and disease rehabilitation exercises to achieve good results.<sup>26,27</sup> Self-efficacy for the rehabilitation of patients is not only manifested in affecting the power and persistence of rehabilitation training but also manifested in the ability to make patients build confidence and stimulate the subjective initiative of patients to actively cope with emergencies. Intervention with self-efficacy theory can increase elderly patients' willingness to achieve daily independence, restore physical mobility and reduce the risk of falls.<sup>28</sup>

The aim was to screen some elderly patients with a high risk of falls, based on self-efficacy theory combined with OEP to build a home exercise program suitable for elderly patients with discharge in order to promote the effective implementation of home exercise, improve patient balance ability, reduce the occurrence of falls, and improve the daily activities in family life.

## MATERIALS AND METHODS

### Study subjects

60 elderly patients who were discharged from Jiaying Second Hospital from January 1 to June 10, 2022, were selected and screened as high-risk patients by the Chinese

**Table 1.** Specific steps of OEP

Training content	Specific method	Difficulty level			
		1	2	3	4
<b>Muscle strength exercise</b>					
Knee extension, knee flexion, hip abduction	Each movement was repeated 10 times, and weight-bearing sandbags were worn during training to train endurance				
Ankle dorsiflexion	Repeating 10 times, and repeating one group	With support	Without support		
Ankle plantar flexion	Repeating 10 times, and repeating one group	With support	Without support		
<b>Balance training</b>					
Knee flexion training	10 repetitions	With support	Without support; Repeating one group with support	Repeating one group without support	Repeating three groups without support
Backstepping training	Take 10 steps and repeat 4 groups		With support		Without support
Direction-changed walking	8-shaped curve, 2 times		With support	Without support	
Side walking	Take 10 steps and repeat 4 groups		With support	Without support	
Tandem standing	10 seconds	With support	Without support		
Tandem walking	Take 10 steps and repeat one			With support	Without support
Heel walking	Take 10 steps and repeat 4 groups			With support	Without support
Tip walking	Take 10 steps and repeat 4 groups			With support	Without support
Sitting and standing training	Need or do not need hand support	Standing 5 times, both hands support	Standing 5 times with hand support or standing 10 times with both hands support	Standing 10 times without support or standing 10 times with hand support, repeating one time	Standing 10 times without support, repeating one time

version of the *Home Fall Risk Screening Scale*. Inclusion criteria: 1.patients aged  $\geq 65$  years old; 2.patients with stable vital signs and clear consciousness; 3.patients without obvious cognitive impairment; permanent residents of Jiaxing City. Exclusion criteria: 1.long-term bed rest; 2.patients combined with aphasia, severe hearing impairment, and other diseases; 3.patients suffering from severe diseases (such as severe heart failure, severe coronary heart disease, severe osteoarthritis), resulting in inability to perform exercise and tests; 4.patients participating in other professional rehabilitation training of exercise capacity. Criteria for dropout: patients who developed serious adverse reactions during the trial; patients who withdrew, were lost to follow-up, or died due to various reasons. Ethical approval was obtained from the Jiaxing Second Hospital Clinical Research Ethics Board. All participants provided written informed consent. This study was approved by the Ethics Committee of Jiaxing Second Hospital, and all research procedures strictly followed ethical guidelines. We ensured that patients' privacy and rights were fully protected and conducted research in strict compliance with ethical review requirements.

**Construction of exercise training scheme (ETS)**

Self-efficacy management training program: (1) Increasing direct experience; behavioral goals were set according to the purpose, and a behavioral contract was signed with patients. The patient's daily OEP was included. According to the difference of each patient at discharge, the stage goal was set, the completion of the patient's goal was regularly checked, affirmation and encouragement were given to the completer, and the reasons were analyzed with the non-completer to encourage them to overcome the difficulties to complete the goal. (2) Increasing substitution experience; regularly organizing patient fraternity meetings in the outpatient clinic every three months, in addition to organizing communication and interaction among patients, home prevention of falls, Otago exercise precautions, and other knowledge, the focus was to contact some patients with better self-management ability in home Otago exercise to share their successful experience, exchange self-care experience with each other, and

experience in preventing complications. Patients communicated and discussed with each other. Successful experiences can enhance individuals' expectations of their behavioral control and thereby enhance their self-efficacy. (3) Giving guidance and incentives; within half a year after discharge, talking to the patients once or twice a month, with sincere attitude, patience to motivate the patients and help them build self-confidence. Suggestions and timely guidance were given, and the good behaviors established were strengthened. (4) Social and psychological support. The nursing model of family members' participation was adopted; family members and their friends were encouraged to participate in the daily rehabilitation exercise of patients so that patients felt the warmth from family and society and their self-confidence was improved. Nursing staff must timely grasp the psychological condition of patients and answer patient questions. The research group consisted of professional psychologists and researchers to form a psychological support group to explain psychological knowledge to patients and their families and help them build confidence.

**OEP.** The specific implementation of OEP includes a structured walking program, progressive lower limb strengthening, balance training, and increased difficulty. Each patient was given a training program booklet (for guiding training) and a weight-bearing sandbag (for strength training) for the ankle. Training is divided into strength training: knee extension, knee flexion, hip abduction under weight-bearing (sandbag); ankle dorsiflexion, ankle plantar flexion training. Balance training: knee flexion standing, direction-changed walking, side walking, tandem standing, tandem walking, heel walking, tip walking, sitting and standing training (Table 1). Professional rehabilitation therapists shot Otago exercise videos.

The self-efficacy management training program in the study was integrated with the Otago Exercise Program (OEP). Participants performed supervised OEP training three times per week for approximately 60 minutes each time for 12 weeks. Each training session includes consistent balance exercises, strength exercises and aerobic exercises to improve muscle strength, flexibility and balance. During

training, participants are gradually acclimated to higher exercise intensities and durations to ensure their bodies gradually adapt to the exercise.

### Intervention program

60 patients were randomly divided into the experimental group ( $n = 30$ ) and the controls ( $n = 30$ ). During hospitalization, the nurses educated patients in the controls on the precautions related to home fall prevention. Cloud follow-up was given to push the relevant video, and the patients were given telephone follow-up after discharge. Patients in the experimental group received OEP in addition to routine measures. The project implementer will conduct video guidance on Otago exercise in a few weeks 1, 2, 4, and 8, followed by monthly telephone follow-up for 6 months. Phone numbers of training instructors were written in booklets for patients. This training program required patients to train at least three times a week.

### Scales

**The self-efficacy scale:** the general self-efficacy scale (GSES) developed by Schwarzer et al<sup>29</sup> consists of 10 items scored on a 4-point Likert scale with 1 point for “not at all correct”, 2 points for “almost correct”, 3 points for “mostly correct”, and 4 points for “completely correct”. Higher scores were associated with higher levels of self-efficacy. Total score ranges from 10 to 40. In this study, the self-efficacy scale was used to measure participants’ level of confidence in completing the OEP exercise program. This is because there is a close relationship between self-efficacy and exercise persistence, with individuals with high self-efficacy more likely to adhere to an exercise plan.

**Berg balance scale:** The BBS is a tool suggested by Berg<sup>30</sup> for evaluating balance in older adults. The test involves the execution of 14 tests of gradually increasing difficulty. In each one, the subject is asked to maintain a position for a specific time or conduct specific tasks. Each of the 14 tests on the list is graded according to the balancing ability of the examinee from zero to four points, and the total point is 56. The total score finally reflects the overall balance ability of the subject. The higher the score, the better the balance ability. Participants’ balance ability was assessed using the Berg Balance Scale. This is because fall risk in older adults is often associated with balance problems, and the Berg Balance Scale is a widely used tool to assess and monitor changes in balance ability.

**TUG test (timed up-and-go test).** The TUG test is a performance-based measure of functional mobility that was initially developed to identify mobility and dynamic balance impairments in older adults.<sup>31</sup> The score of the test is the time it takes for the participant to perform the following sequence: get up from a chair, walk to a specific point (3 meters), redirect themselves 180°, return to the chair at a walking pace and, finally, sit down. A total of 5 points, the lower the score, is better. In this study, the TUG test was used to assess participants’ functional mobility to better understand their daily living abilities.

**Activity of daily living scale (ADL).** The ADL scale was developed by American scholars Lawton and Brody<sup>24</sup> in 1969 and divided into two parts with a total of 14 items. Physical self-maintenance scale (PSMS) includes walking, eating, dressing, combing, bathing, and toileting, with a total of 6 items; Instrumental activities of daily living (IADL) include riding a bus, taking medicine, preparing meals, doing housework, washing clothes, shopping, calling, and financial management, with a total of 8 items. The scale has been widely used in the elderly population in China as recommended by WHO, with good reliability and validity, and the Cronbach’s  $\alpha$  coefficient of this scale was 0.887. The evaluation results can be analyzed according to the total, subscale, and single-item scores. A total less than 16 was completely normal, and greater than 16 indicates it had varying degrees of functional decline, with a maximum of 64 points. A single score of 1 was normal, and 2 to 4 was decreased function. Where there are two or more items  $\geq 3$ , or a total score  $\geq 22$ , it is a significant impairment of function. These scales were used to assess participants’ ability to care for themselves in daily life and physical functioning. These aspects are important in assessing the overall quality of life of older discharged patients, as they relate to their ability to live independently and participate in social activities.

**Morse fall scale (MFS).** This scale was developed in 1989 by Professor Janice Morse in the United States and consists of six items, which are a history of falls in the past three months, more than one medical diagnosis, the use of walking aids, intravenous fluids or the use of heparin locks, gait, and cognitive status. The scale is a total of 125 points, with higher scores indicating a greater risk of falls. Scores greater than 45 were classified as high risk of falls, 25 to 45 as intermediate risk, and less than 25 as low risk. We used the Fall Risk Assessment Scale to measure participants’ fall risk factors. This includes whether you have had a fall in the past three months, whether you have multiple medical diagnoses, whether you use assistive walking aids, etc.

**Exercise adherence questionnaire (EAQ).** There are 14 items, and the item scoring method is as follows: the sum of the scores of each item is the total score, and the score range is 14-56 points. The higher the total score, the higher the compliance level of functional exercise of the subjects. We used the Happiness Questionnaire to assess participants’ happiness and life satisfaction. This helps us understand whether the intervention has had a positive impact on their overall well-being.

### Outcome measures

Patients’ sex (male/female), age (55-65 years/66-75 years/> 76 years), ethnicity (the Han nationality, ethnic minority), education level (junior high school and below/senior high school and specialty/undergraduate and above), and residence (living alone, living with spouse, and nanny care) were collected. Self-efficacy, Berg balance scale, TUG, ADL, MFS, and EAQ scores were recorded before and after intervention (15, 30, 45, and 60 days).

### Statistical analysis

Data were collected by professionally trained double-blind researchers using validated scales and testing instruments. Data are collected at multiple points in time, carefully processed and statistically analyzed to ensure accuracy and trustworthiness. The data were analyzed by Statistic Package for Social Science (SPSS) 19.0 software, the measurement data were expressed as mean ± standard deviation, and the enumeration data were expressed as percentage (%). One-way analysis of variance was used for pairwise comparisons. Differences were statistically significant at  $P < .05$ . The methods were chosen based on the type of data and the nature of the research question to ensure a comprehensive assessment of the impact of a self-efficacy intervention versus an exercise program in older discharged patients. For missing data, we adopted appropriate methods, such as imputation or exclusion, to minimize the impact on the analysis results and maintain the integrity and accuracy of the data.

## RESULTS

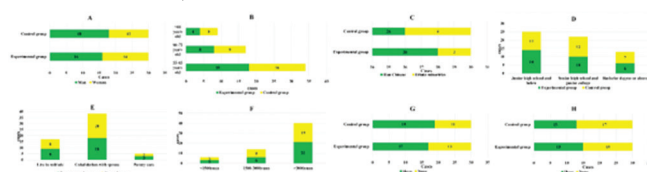
### Comparison of clinical data between the two groups

Figure 1 compares the clinical data of two groups: the experimental group ( $n = 30$ ) included 16 men and 14 women, and the control group ( $n = 30$ ) included 18 men and 12 women. Age distribution: In the experimental group, 18 people were 55-65 years old, 8 people were 66-75 years old, and 4 people were > 76 years old; in the control group, 16 people were 55-65 years old, 9 people were 66-75 years old, and 5 people were > 76 years old. Ethnic groups: 28 Han Chinese and 2 ethnic minorities in the experimental group, 26 Han Chinese and 4 ethnic minorities in the control group. Educational level: In the experimental group, 14 were in junior high school and below, 10 in high school and junior college, and 6 in bachelor's degree and above; in the control group, 11 were in junior high school and below, 12 in high school and junior college, and 7 in bachelor's degree and above. Living: 9 in the experimental group lived alone, 18 with spouses, and 3 nannies; 8 in the control group lived alone, 20 with spouses, and 2 nannies. Household income: experimental group 3<1500 yuan, 6 1500-3000 yuan, 21>3000 yuan; control group 3<1500 yuan, 8 1500-3000 yuan, 19>3000 yuan. Complications: 17 in the experimental group and 13 in the control group had none; 19 and 11 in the control group had none. Chronic diseases: 15 in the experimental group had it and 15 did not; in the control group 13 had it and 17 did not have it. There were no significant differences between the two groups in terms of gender, age, ethnicity, education, residence, family income, complications and chronic diseases ( $P > .05$ ).

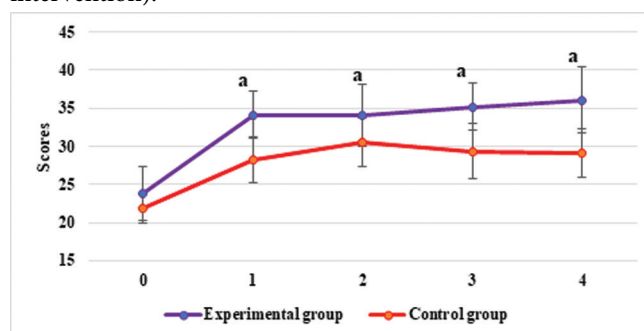
### Comparison of self-efficacy scale scores before and after intervention

As shown in Figure 2, the self-efficacy scale scores of the two groups were significantly increased after the intervention, and the self-efficacy scale scores of the experimental group were not significantly different from those of the controls

**Figure 1.** Comparison of clinical data between the two groups. (A is gender; B is age; C is ethnicity; D is education level; E is living situation; F is per capita household income; G is whether there are complications; H is whether there are chronic diseases)

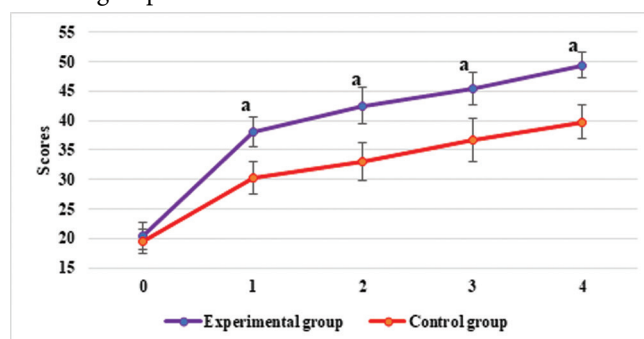


**Figure 2.** Comparison of self-efficacy scale scores between the two groups. (0-4: 15, 30, 45, and 60 days before and after intervention).



<sup>a</sup>indicates that there is statistically significant difference between the experimental group and the controls ( $P < .05$ ).

**Figure 3.** Comparison of Berg balance scale scores between the two groups.

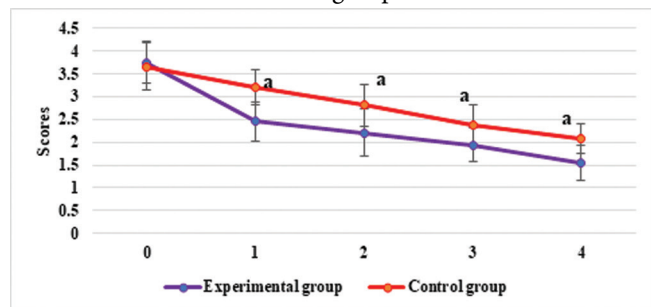


before the intervention ( $P > .05$ ); the self-efficacy scale scores of the experimental group were always higher than those of the controls at 15, 30, 45, and 60 days after the intervention ( $P < .05$ ).

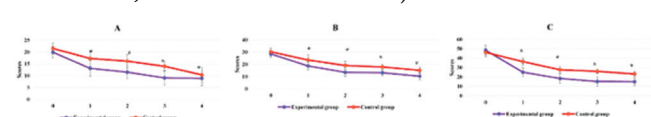
### Comparison of Berg balance scale scores before and after intervention

The Berg balance scale scores of the two groups were significantly increased after the intervention, and those were not significantly different in the experimental group from in the controls before the intervention ( $P > .05$ ); the Berg balance scale scores of the experimental group were always higher than those of the controls at 15, 30, 45, and 60 days after the intervention ( $P < .05$ ) (Figure 3).

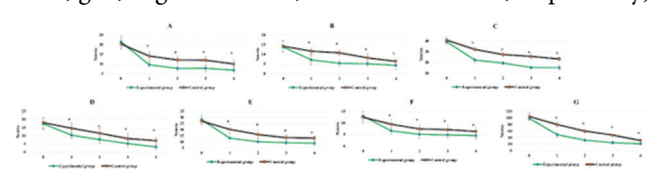
**Figure 4.** Comparison of TUG scores before and after intervention between the two groups.



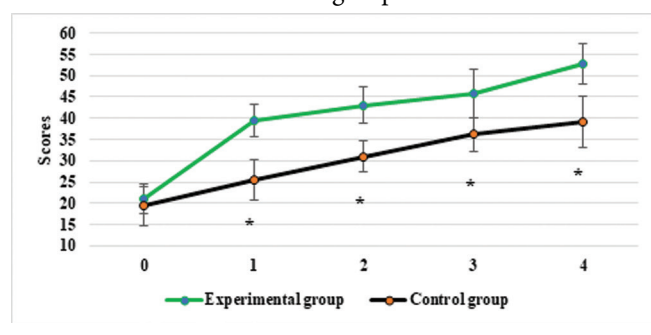
**Figure 5.** Comparison of ADL scores before and after intervention between the two groups. (A is PSMS score; B is IADL score; C is total score of scales).



**Figure 6.** Comparison of fall risk scores before and after intervention between the two groups. (A-G = history of falls in the past three months, more than one medical diagnosis, use of walking aids, intravenous infusion or use of heparin locks, gait, cognitive status, total fall risk score, respectively)



**Figure 7.** Comparison of EAQ scores before and after intervention between the two groups.



**Comparison of TUG scores before and after intervention**

The TUG scores of the two groups were significantly reduced after the intervention, and the TUG scores of the experimental group were not obviously different from those of the controls before the intervention ( $P > .05$ ); the TUG scores of the experimental group were always lower than those of the controls at 15, 30, 45, and 60 days after the intervention ( $P < .05$ ) (Figure 4).

**Scoring comparison**

The PSMS, IADL, and ADL scores of the two groups were significantly decreased after the intervention, and the

PSMS, IADL, and ADL scores of the experimental group were not significantly different from those of the controls before the intervention ( $P > .05$ ); the PSMS, IADL, and ADL scores of the experimental group were always lower than those of the controls at 15, 30, 45, and 60 days after the intervention ( $P < .05$ ) (Figure 5).

**Comparison of fall risk scores before and after intervention**

The history of falls in the past three months, more than one medical diagnosis, the use of walking aids, intravenous infusion or the use of heparin locks, gait, cognitive status, and the total score of fall risk in the two groups were significantly reduced after the intervention, and those were not significantly different in the experimental group from in the controls before the intervention ( $P > .05$ ); the above were always lower in the experimental group than in the controls at 15, 30, 45, and 60 days after the intervention ( $P < .05$ ) (Figure 6).

**Comparison of EAQ score before and after intervention**

The EAQ scores of the two groups were significantly increased after the intervention, and the EAQ score of the experimental group was not significantly different from that of the controls before the intervention ( $P > .05$ ); the EAQ score of the experimental group was always higher than that of the controls at 15, 30, 45, and 60 days after the intervention ( $P < .05$ ) (Figure 7). While we have already observed differences in scores before and after the intervention, let us think more deeply about the clinical relevance of these changes. Changes in these scores may significantly reduce fall risk and improve patients' quality of life and overall health. Increased self-efficacy and balance, as well as improved performance of daily tasks, help patients live more independently and reduce the need for medical services.

**DISCUSSION**

Our findings are critical for improving the care of older discharged patients. Healthcare professionals can use self-efficacy based interventions (ETS) combined with the Otago Exercise Program (OEP) to reduce the risk of falls. Additionally, incorporating these approaches into routine care can improve patients' confidence, reduce their risk of falls, and extend their time living independently. Our study therefore provides valuable insights into improving the care of older discharged patients, particularly by highlighting the potential benefits of self-efficacy-based interventions.

Falls are one of several major factors in the death of older adults. According to domestic and foreign studies, the incidence of falls in the elderly ranges from 15 to 40% each year, and its probability increases with age.<sup>32,33</sup> It is reported that 30% of people over the age of 65 experience a fall annually, while the percentage is 50% for adults over 80.<sup>34</sup> Elderly people will cause a serious injury every ten falls, including fractures, head bleeding, head trauma, subdural bleeding, etc., and some elderly people will start limiting their self-activity and gradually lose the ability to move independently because they are afraid

of falling again, which not only causes the burden on their families, but also makes the physical function of the elderly age more rapidly, so attention should be paid to the prevention of falls in elderly patients in daily life.<sup>35</sup> 60 discharged elderly patients were randomly divided into the experimental and control groups. During hospitalization, the nurses educated patients in the controls on the precautions related to home fall prevention, gave relevant videos for cloud follow-up, and gave telephone follow-up after discharge. Patients in the experimental group underwent self-efficacy-based ETS combined with OEP. From the clinical data, there was no significant difference in gender, age, ethnicity, education level, residence, per capita family income, complications, and chronic diseases between the two groups ( $P > .05$ ), which provided feasibility for subsequent studies.

Based on our study, the following practical recommendations are provided to healthcare providers and policymakers to improve healthcare systems and rehabilitation programs to reduce the risk of falls in older discharged patients: Self-efficacy-based intervention programs can be implemented that incorporate self-efficacy training programs (ETS) is combined with the Otago Exercise Program (OEP) to improve elderly patients' self-confidence and encourage them to better adhere to their exercise programs. This can be achieved by providing support, training and resources. At the same time, a personalized care plan is developed, taking into account the age, gender, cultural background, education level, family support and other factors of elderly patients to improve the acceptability and effectiveness of the plan. Healthcare providers should regularly assess older patients for fall risk and perform ongoing monitoring. Additionally, provide education and training on fall prevention, including proper exercise techniques, home safety measures and how to respond to emergencies. Work with community organizations to establish social and exercise activities that support older adults, while using a collaborative multidisciplinary approach including doctors, nurses, physical therapists, social workers and more to provide comprehensive care and support. Finally, establish a system to track and report fall events and risk factors for further research and improvement of fall prevention strategies. These comprehensive recommendations are expected to improve the care of older discharged patients, reduce the risk of falls, and improve their quality of life and well-being.

Self-efficacy refers to a person's ability to engage in a certain behavior in a specific scenario and achieve the desired outcome, and it largely refers to the individual's feelings about self-related abilities.<sup>36</sup> It was found that the self-efficacy scale scores of patients in the experimental group were always higher than those in the controls at 15, 30, 45, and 60 days after intervention ( $P < .05$ ), which indicated that ETS based on self-efficacy combined with OEP could effectively improve the patient's own potential and promote the improvement of patients' psychological cognition and behavior. The Berg balance scale scores of patients in the experimental group were always higher than those in the controls at 15, 30, 45, and 60 days after intervention ( $P < .05$ ).

Higher scores mean better balance. Therefore, this result suggests that ETS based on self-efficacy combined with OEP can effectively improve the physical balance ability of discharged elderly patients and reduce the risk of falls at home, which suggests that the training of limb function and exercise of balance ability of patients should be strengthened (Simning, et al. 2020).<sup>37</sup> The PSMS, IADL scores and ADL total scores of patients in the experimental group were always lower than those in the controls at 15, 30, 45, and 60 days after intervention ( $P < .05$ ), which was consistent with the results of,<sup>38</sup> indicating that ETS based on self-efficacy combined with OEP can effectively improve the quality of life of discharged elderly patients. A history of falls in the past three months, more than one medical diagnosis, use of walking aids, intravenous infusion or use of heparin locks, gait, cognitive status, and total fall risk scores of patients in the experimental group were always lower than those in the controls at 15, 30, 45, and 60 days after intervention, while EAQ score in the experimental group was always higher than those in the controls ( $P < .05$ ). The results showed that the ETS based on self-efficacy theory combined with OEP can understand the physical and psychological dynamics of patients, perform targeted home functional exercise guidance and psychological counseling, encourage patients with positive language, help to relieve mood and stress, change the cognition and attitude of the patients, improve the ADL and functional exercise compliance of patients, and reduce the risk of home falls through the intervention of rehabilitation personnel.<sup>39</sup>

We acknowledge some limitations of this study. First, the sample size of this study was relatively small, including only older discharged patients from a specific geographic area. This may limit the external generalizability of the study results. Second, our study design was single-blind, but subjects may have known whether they received the intervention, which may have introduced some subjective bias. Furthermore, although we observed significant improvements in self-efficacy scores and other outcomes in the intervention group, the clinical significance of these changes requires more in-depth research to determine.

This study highlights the potential of a self-efficacy-based intervention with OEP to reduce fall risk and improve quality of life in older discharged patients. By improving patients' physical balance and self-efficacy, our research provides new insights into aged care and fall prevention. This helps healthcare decision-makers and professionals better utilize these interventions to improve patient outcomes, enhance their quality of life, and reduce healthcare costs, thereby providing a valuable contribution to the development of the geriatric care field.

Future research could examine how self-efficacy-based interventions can be combined with OEP in different healthcare settings to optimize the care and recovery of older discharged patients. Future research could focus on long-term effects, personalized interventions, and the impact of social support on well-being. At the same time, exploring the relationship between self-efficacy-based interventions and mental health, technical support, multidimensional well-being, and chronic diseases will help improve the well-being of elderly patients.

## CONCLUSION

In summary, our study demonstrates that ETS based on self-efficacy theory combined with OEP effectively enhances the physical balance ability of discharged elderly patients, improves functional exercise compliance and activities of daily living (ADL), and reduces the risk of home falls. Long-Term Effects: You rightly mention that your study had a limited follow-up period of 2 months. However, it might be beneficial to briefly discuss the potential implications of these short-term effects. For example, mention that while the study showed positive results in the short term, the long-term impact of the intervention remains to be explored in future research. While the study showed positive results in the short term, the long-term impact of the intervention remains to be explored in future research. It was found that ETS based on self-efficacy theory combined with OEP could effectively improve the physical balance ability of discharged elderly patients, improve functional exercise compliance and ADL, and reduce the risk of home falls. However, there are still some problems to be improved. Because we were limited to a 2 months follow-up, we cannot provide a clear picture of the long-term effects of the OEP. More relevant research with longer follow-ups is needed in the future to determine the long-term effects of similar programs. Only 60 discharged elderly patients were included, and all originated from the same hospital, which may cause some deviations in the results. The sample size and conducting multi-center studies could help validate these findings across a broader population. Therefore, the patient sample size will be increased in the subsequent study, and the ETS based on self-efficacy combined with OEP will be applied in more nursing interventions for the elderly. Future studies should investigate the long-term effects of similar programs, exploring the impact of individual patient characteristics, and considering larger and more diverse study populations. In conclusion, the present results provide a reference for the design of home fall prevention programs for discharged elderly patients.

## CONFLICT OF INTEREST

The authors have no potential conflicts of interest to report relevant to this article.

## AUTHOR CONTRIBUTIONS

HC and FP designed the study and performed the experiments. HC and MS collected the data, FP and MS analyzed the data, HC and FP prepared the manuscript. All authors read and approved the final manuscript.

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