Research Paper
The Effect of Short-Term Conditional-Equilibrium Exercises on Balance and Functional Limitations in Aged Women With Frailty Syndrome: A Randomized Controlled Trail

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ABSTRACT

Objectives: Increasing frailty syndrome is one consequence of the aging population. Frailty syndrome can adversely affect the independent life and social activities of the elderly by threatening their balance and mobility. This study aimed to investigate the effect of short-term postural-balance training on balance and functional limitations in elderly women with frailty syndrome.

Methods & Materials: The present clinical trial study was performed on 54 elderly women with frailty syndrome. Participants were randomly selected from one of the daycare centers for the elderly in Shiraz and were divided into two groups intervention (n=27) and control (n=27). For the intervention group, 12 sessions of short-term postural-balance exercises were held. Data were collected using the Fried Frailty Index, berg balance scale (BBS-9), and the survey of activities and fear of falling in the elderly (SAFE) Questionnaire at the beginning of the study and the end of the intervention and analyzed using SPSS software v. 25.

Results: The mean age of participants was 66.77 years, and 94.4% had at least one chronic disease. Following the intervention, there was a significant improvement in the mean scores of frailties such as physical activity, walk time, balance, and motor limitation of the elderly in the intervention group. In contrast, the intervention could not significantly affect other frailty indicators, i.e., unwanted weight loss, exhaustion, and grip strength in the intervention group

Conclusion: Postural-balance exercises significantly improve the physical characteristics of malnutrition and motor and functional limitations in daily life activities in the elderly.

Keywords: Frail elderly, Frailty syndrome, Falling, Mobility limitation, Exercise

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Extended Abstract

Introduction

Frailty syndrome is one of the syndromes that is receiving more attention with the increase in the elderly population [2]. This syndrome is characterized by physical complications such as weakness, fatigue, decreased energy, physical activity, and unintentional weight loss, leading to an increased chance of falling. Movement restriction reduces the ability to perform daily life activities and even social interactions among the elderly [3, 4].

Choosing and using appropriate therapeutic interventions can effectively improve the conditions of elderly people with dementia and the consequences of this syndrome [8-10]. One of the exciting interventions in this field is various types of physical activity [11, 12]. Despite the rapid increase in the Iranian elderly population in the future, there is still no accurate information on the prevalence of obesity and appropriate interventions to address it [19].

The current study was conducted to investigate the effectiveness of short-term postural-balance exercises on balance and functional limitations in elderly women with frailty syndrome.

Methods

The current randomized controlled trial (RCT) study was conducted with the participation of 54 elderly women. The sample size was determined based on the difference between two groups of the same size in a similar study, and the samples were selected by a one-stage cluster random sampling method. Examples of entry criteria include being over 55 years old, having at least 3 positive indicators from the Frito-Fried tool, scoring at least 21 on the Berg test, scoring at least 22 on the mobility limitation questionnaire, having no ban on performing sports exercises, and having no severe visual and auditory impairment. The leaving criteria include the withdrawal in case of unwillingness to continue cooperation and the experiencing severe skeletal-muscular injury during the intervention. From the questionnaires of demographic information, Fried Frailty Index, Short Form Berg Balance Scale (9 items), Fear of Falling and Mobility Limitation Questionnaire respectively to collect general and health information, the severity of frailty, balance level, and movement restriction was used to perform activities in the elderly.

The exercise program followed the standard exercise protocol for frailty in the elderly, which includes fall compensation techniques, posture correction, and Otago balance exercises. The exercises were performed under the supervision of an occupational therapist, considering the appropriate intensity and number of repetitions. The intervention was carried out for 6 weeks of 2 sessions of 1-hour training per week and as a group. Before the implementation of the intervention, safe environmental conditions were provided, and the necessary equipment was prepared. Each session’s first and last 15 minutes were devoted to warm-up and cool-down exercises, and the middle 30 minutes were committed to the leading practices. A virtual group in WhatsApp software sends teaching aids materials. People in the control group did not receive any special training. Data were collected immediately after the completion of the intervention.

This research has been approved by the Ethics Committee of Shiraz University of Medical Sciences (No: IR.SUMS.REHAB.REC.1398.03) and registered in the clinical trial system of Iran (IRCT20180514039648N1). An informed consent form was obtained from the participants.

Results

According to the normal distribution of the data, parametric methods were used to analyze the data. According to the findings, 51.8% (28 persons) of the participants in the age group of 60-65 years, 0.50% (27 persons) of the participants were divorced, and 35% (19 persons) were widows. 94.4% of the participants (51 persons) had at least one chronic disease, and 40.7% (22 persons) had a history of chronic disease between 6-10 years. 38.8% (21 persons) of the participants had a secondary education level. 48.1% (26 persons) evaluated their health status as healthy (I have some health problems that I control well).

Examining the situation of the fatigue index in the participants showed that 18.5% of the participants (10 persons) according to the unwanted weight loss index, 74.0% (40 persons) according to the first question of the fatigue index (total effort), “my life is fruitless”, 25.9% (14 persons) according to the second question of fatigue index “I can’t continue anymore”, 25.9% (14 persons) according to the walking speed index, 90.7% (49 persons) according to the index of physical activity, 92.5% (50 persons) were classified according to the index of hand grip strength. Based on Fisher’s exact test results, there was no significant difference between the participants of the intervention group and the control group regarding demographic variables and Fartuity indices.
Table 1. Comparison of fatigue indices, balance status, and movement limitation before and after the intervention in the study groups

| Variables                  | Groups                  | Mean±SD Before Intervention | Mean±SD After Intervention | Sig. (Paired t-test) | Sig. (independent t-test) |
|----------------------------|-------------------------|------------------------------|----------------------------|----------------------|--------------------------|
| Unwanted weight loss       | Intervention (24)       | 0.88±0.33                    | 0.79±0.21                  | 0.491                | 0.556                    |
|                           | Control (21)            | 0.81±0.41                    | 0.95±0.21                  | 0.186                | 0.119                    |
| Sig. (independent t-test)  |                         |                              |                            |                      |                          |
| Mental fatiguea            | Intervention (24)       | 0.46±0.29                    | 0.39±0.18                  | 0.084                | 0.543                    |
|                           | Control (21)            | 0.42±0.22                    | 0.44±0.25                  | 0.327                | 349/0                    |
| Sig. (independent t-test)  |                         |                              |                            |                      |                          |
| Mental fatigueb            | Intervention (24)       | 0.46±0.29                    | 0.39±0.18                  | 0.083                | 0.543                    |
|                           | Control (21)            | 0.42±0.22                    | 0.46±0.29                  | 0.162                | 349/0                    |
| Sig. (independent t-test)  |                         |                              |                            |                      |                          |
| Time to walk               | Intervention (24)       | 0.55±9.17                    | 0.32±7.11                  | <0.001               | 0.144                    |
|                           | Control (21)            | 0.13±8.90                    | 0.19±8.75                  | 0.402                | 0.002                    |
| Sig. (independent t-test)  |                         |                              |                            |                      |                          |
| Physical activity          | Intervention (24)       | 215.25±67.30                 | 260.54±77.44               | <0.001               | 0.144                    |
|                           | Control (21)            | 131.29±61.15                 | 131.33±62.11               | 0.421                | 0.002                    |
| Sig. (independent t-test)  |                         |                              |                            |                      |                          |
| Strength of hand grab      | Intervention (24)       | 13.61±3.49                   | 12.62±3.39                 | <0.101               | 0.421                    |
|                           | Control (21)            | 12.44±3.69                   | 12.58±3.42                 | 0.329                | 0.001                    |
| Sig. (independent t-test)  |                         |                              |                            |                      |                          |
| Balance                    | Intervention (24)       | 30.25±1.42                   | 33.80±0.90                 | <0.001               | 0.335                    |
|                           | Control (21)            | 3.10±1.39                    | 31.10±1.41                 | 0.402                | 0.203                    |
| Sig. (independent t-test)  |                         |                              |                            |                      |                          |
| Strength of hand grab      | Intervention (24)       | 67.00±0.93                   | 46.83±0.91                 | <0.001               | 0.716                    |
|                           | Control (21)            | 67.44±0.78                   | 67.48±0.87                 | 0.407                | 0.001                    |
| Sig. (independent t-test)  |                         |                              |                            |                      |                          |

a The first question of fatigue: All my efforts are fruitless.
b Question 2 fatigue: I can’t go on anymore.
c Three participants were excluded from the study due to not completing the intervention.
d Six participants were excluded from the study due to not completing the post-test questionnaires.
Table 1 compares the sample’s obesity, balance, and mobility indicators. According to the results, at the beginning of the study, there was no significant difference between the intervention group and the control group regarding fatigue, balance status, or movement limitation. After the intervention implementation, the walking speed in the intervention group was significantly lower, and the physical activity was significantly higher than in the control group. Also, although no significant difference was observed in the status of any of the parameters of obesity after the intervention in the control group, in the intervention group, the average scores of walking speed decreased significantly, and physical activity increased significantly (P<0.001). In addition, after the implementation of the intervention in the control group, there was no significant difference in the balance and movement limitations of the elderly; however, in the intervention group, the average score of the elderly’s balance status increased significantly, and the average score of movement restriction significantly decreased (P<0.001).

In addition, the distribution of Bayes factor scores for the response variables showed that the intervention was able to significantly improve physical activity level (t=4.342, Bayes Factor=0.004), walking time (t=3.301, Bayes Factor=0.056), movement limitation (t=77.047, Bayes Factor=0.000) and improve balance (t=10.851, Bayes Factor=0.000) (P<0.0001), but there was no significant effect on mental fatigue (P=0.349) and grip strength (P=0.329).

Discussion

This study aimed to investigate the effect of short-term postural-balance exercises on balance and functional limitations in elderly women with Fertotti syndrome.

According to the results, although the intervention did not significantly affect unintentional weight loss, mental fatigue, and hand grip strength, it improved other indicators of fatigue such as physical activity level, walking speed, increased balance, and reduction of movement limitations among the elderly.

According to the results, although the intervention did not have a significant effect on the components of unintentional weight loss, feeling of mental fatigue, and hand grip strength, it was able to improve other fatigue indicators such as the level of physical activity and walk speed, increasing balance and reducing movement limitations. It was elderly.

The findings of this study were in line with previous studies about the effect of sports programs on improving walking speed and preventing the lack of hand grip strength in the elderly. The reason for the reduction of movement limitation following the implementation of balance exercises was introduced in the study of Aartolahti et al. (2020) to improve balance and in the study of Brahms et al. (2021) to improve the walking speed of the elderly. The elderly in the current study can be attributed to the improvement of the two mentioned components due to the intervention.

Ethical Considerations

Compliance with ethical guidelines

The ethics committee of Shiraz University of Medical Sciences has approved this research with the number IR.SUMS.REHAB.REC.1398.03 and it has been registered in the clinical trial system of Iran with the number IRCT20180514039648N1. An informed consent form was completed for all participants.

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Authors’ contributions

Designing, conducting interviews, collecting data, writing the introduction section Contribution: Forozan Tuan and Mahsa Yarollahi; Methods, statistical analysis, results: Abdolrahim Asadollahi, Ms. Forozan Tuan and Ms. Mehsa Yarollahi; Supervising the process of study, discussion and conclusion: Abdolrahim Asadollahi, Nagin Shiretnagar and Mrs. Forozan Tuan; All authors have also approved the final version.

Conflicts of interest

The authors declared no conflict of interest.

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مقاله پژوهشی
تاثیر تمرینات کوتاه‌مدت و ضمیمه‌تیدی‌های بر تعادل و سالم‌سازی‌های عملکردی در فرتوت: یک
کارآزمایی شاگردان تصادفی

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مقدمه
شماره 17 دوره 1401 بهار، نویسنده مسئول: دکتر عبدالرحیم اسداللهی، دانشگاه علوم پزشکی شیراز، دانشکده بهداشت، گروه ارتقا سلامت و سالمندی.

هدف از این مطالعه، بررسی تأثیر تمرینات کوتاه مدت وضعی‌ـتعادلی بر تعادل و محدودیت‌های عملکردی در زنان سالمند مبتلا به سندرم فرتوتی است.

مواد و روش‌ها
زن سالمند که بر اساس مقیاس فرتوتی فراید مبتلا به سندرم فرتوتی بودند، برای اجرای این مطالعه در مطالعه بر روی دو گروه 37 نفری تقسیم شدند. شرکت کننده‌ها از یکی از مراکز روزانه سالمندان شهر شیراز به صورت تصادفی ساده انتخاب و به دو گروه آزمایش (19 نفر) و کنترل (18 نفر) تقسیم شدند. برای گروه آزمایش و همچنین کنترل، یازده جلسه تمرینات وضعی‌ـتعادلی برگزار شد. داده‌ها با استفاده از شاخص سال‌مردانه فرتوتی فراید در مساحتی با استاندارداً در ابتدای و پایان پیگیری به شکل کلاس‌هایی به شکلی کاملاً یکسان و با استفاده از نرم‌افزار SPSS نسخه 25 و با استفاده از نسخه 16 بطور کاملاً خاص و معنادار، درصد نمرات شاخص‌های فعالیت فیزیکی، تعادل و محدودیت حرکتی زنان سالمند در این دو گروه مقایسه شد.

یافته‌ها
اجرای مداخله در میانگین نمرات شاخص‌های فعالیت فیزیکی و مدت زمان راه‌پیمایی در مقیاس فرتوتی، تعادل و محدودیت حرکتی زنان سالمند در گروه آزمایش بهبود معنادار دیده شد. مداخله نتوانست تأثیر معناداری بر سایر شاخص‌های فرتوتی فراید یعنی کاهش وزن ناخواسته، خستگی روحی و قدرت جنبشی مدت درگیری آبیاری ایجاد کند.

نتیجه‌گیری
تمرینات وضعی‌ـتعادلی باعث بهبود قابل توجه شاخص‌های فیزیکی، تعادل و محدودیت حرکتی در فعالیت‌های روزمره زندگی در سالمندان فرتوت و بهبود سلامت روزمره مبتلایان به فرتوت تأثیر می‌گذارد.

کلیدواژه‌ها
سندرم فرتوتی، تعادل، محدودیت حرکتی، سالمندی، فعالیت فیزیکی، تمرینات وضعی‌ـتعادلی

نمایه‌نامه
"این مطالعه به این ترتیب انجام شده است: تأثیر تمرینات کوتاه مدت وضعی‌ـتعادلی بر تعادل و محدودیت‌های عملکردی در زنان سالمند مبتلا به سندرم فرتوتی..."
کنترل تفاوت معناداری در وضعیت هیچ یک از شاخص‌ها بیشتر از گروه کنترل بود. اگرچه بعد از اجرای مداخله در گروه آزمایش وجود نداشت. بعد از اجرای مداخله در گروه آزمایش، سرعت راه و محدودیت حرکتی در افراد نمونه می‌پردازند. بر اساس نتایج، در از نظر متغیر های جمعیت شناختی و شاخص فرتوتی جمعیت بررسی وضعیت شاخص فرتوتی در افراد شرکت کننده نشان داد. نفر و چند مشکل سلامتی خود را به صورت مستقل و چند متغیر مالی به صورت جمعیتی شناخته شد. درصد از شرکت کنندگان در گروه سنی 10-40 (7، 8، 9) درصد از شرکت کنندگان در گروه سنی 10-40 (7، 8، 9) مناسب برای بررسی برنامه تمرینی مطابق با پروتکل استاندارد ورزش برای سالمندان انجام شد. نتایج برنامه تمرینی مطابق با پروتکل استاندارد ورزش برای سالمندان در مطالعه بیان شده است. 1. Randomized Controlled Trail (RCT) 2. Linda P Fried 3. Berg Balance Scale (BBS) 4. Otago
جمع‌العملیات شناختی فروتنی، وسیله بازدهی و محدودیت حرکتی قبل و بعد از مداخله در گروه‌های مطالعه

| متغیر                     | قیمت ارگونومی (آزمون تی درست) | کاهش سطح معناداری (آزمون تی مستقل) | کاهش میانگین خستگی روحی | کاهش میانگین خستگی روحی | کاهش میانگین خستگی روحی | کاهش میانگین خستگی روحی |
|---------------------------|---------------------------------|-----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| روزه 1                   | 3/64                             | 18/85                             | 3/64                     | 18/85                     | 3/64                     | 18/85                     |
| روزه 2                   | 3/64                             | 18/85                             | 3/64                     | 18/85                     | 3/64                     | 18/85                     |
| روزه 3                   | 3/64                             | 18/85                             | 3/64                     | 18/85                     | 3/64                     | 18/85                     |
| روزه 4                   | 3/64                             | 18/85                             | 3/64                     | 18/85                     | 3/64                     | 18/85                     |
| روزه 5                   | 3/64                             | 18/85                             | 3/64                     | 18/85                     | 3/64                     | 18/85                     |

1. سوال اول خستگی: تمام تلاش من بی‌ثمر است
2. سوال دوم خستگی: دیگر نمی‌توام کار نمایم
3. سوال سوم خستگی: به سختی کار به‌مثابه خستگی می‌پیمایم
4. سوال چهارم خستگی: سختی به‌مثابه خستگی می‌پیمایم
5. سوال پنجم خستگی: به سختی کار به‌مثابه خستگی می‌پیمایم
6. سوال‌های یکم تا پنجم خستگی: به سختی کار به‌مثابه خستگی می‌پیمایم

میانگین خستگی روحی

| متغیر | قیمت ارگونومی (آزمون تی درست) | کاهش سطح معناداری (آزمون تی مستقل) | کاهش میانگین خستگی روحی | کاهش میانگین خستگی روحی | کاهش میانگین خستگی روحی | کاهش میانگین خستگی روحی |
|-------|---------------------------------|-----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| روزه 1 | 3/64                             | 18/85                             | 3/64                     | 18/85                     | 3/64                     | 18/85                     |
| روزه 2 | 3/64                             | 18/85                             | 3/64                     | 18/85                     | 3/64                     | 18/85                     |
| روزه 3 | 3/64                             | 18/85                             | 3/64                     | 18/85                     | 3/64                     | 18/85                     |
| روزه 4 | 3/64                             | 18/85                             | 3/64                     | 18/85                     | 3/64                     | 18/85                     |
| روزه 5 | 3/64                             | 18/85                             | 3/64                     | 18/85                     | 3/64                     | 18/85                     |

*جدول* 4.
هدف از پژوهش حاضر بررسی تأثیر تمرینات کوتاه مدت وضعیت تعادلی بر تعادل و محدودیت‌های عملکردی در زنان مبتلا به سندرم فرتوتی بود. علت از فقدان قدرت چنگش دست شد که تأثیر معناداری بر محدودیت حرکتی (P<0.001) را بهبود بخشید. اما تأثیر معناداری (P<0.001) را توانسته است به طور معناداری سطح فعالیت فیزیکی بزویت، زمان راه رفتن (t=4.32) با بایز فاکتور (Bayes Factor=0.004) و تعادل (t=7.047، Bayes Factor=0.000) را بهبود بخشید. در نتیجه، مداخله اثر معناداری بر مؤلفه از دست دادن وزن به طور ناخواسته، احساس خستگی روحی و قدرت چنگش دست نداشت، اما قادر به بهبود سایر شاخص‌های فیزیکی مانند سطح فعالیت فیزیکی و سرعت راه رفتن و افزایش تعادل و کاهش محدودیت حرکتی بزویت سالمندان بود.

ملاحظات اخلاقی

پیش‌بینی نتایج تاکنون بی‌پایایی می‌تواند باعث اولین‌پاپ یا محدودیت سالمندان در زنان مبتلا به سندرم فرتوتی بود. علت از فقدان قدرت چنگش دست شد که تأثیر معناداری بر محدودیت حرکتی (P<0.001) را بهبود بخشید. اما تأثیر معناداری (P<0.001) را توانسته است به طور معناداری سطح فعالیت فیزیکی بزویت، زمان راه رفتن (t=4.32) با بایز فاکتور (Bayes Factor=0.004) و تعادل (t=7.047، Bayes Factor=0.000) را بهبود بخشید. در نتیجه، مداخله اثر معناداری بر مؤلفه از دست دادن وزن به طور ناخواسته، احساس خستگی روحی و قدرت چنگش دست نداشت، اما قادر به بهبود سایر شاخص‌های فیزیکی مانند سطح فعالیت فیزیکی و سرعت راه رفتن و افزایش تعادل و کاهش محدودیت حرکتی بزویت سالمندان بود.

هر چند که در مطالعه حاضر بر اساس نتایج، مداخله اثر معناداری بر مؤلفه از دست دادن وزن به طور ناخواسته، احساس خستگی روحی و قدرت چنگش دست نداشت، اما قادر به بهبود سایر شاخص‌های فیزیکی مانند سطح فعالیت فیزیکی و سرعت راه رفتن و افزایش تعادل و کاهش محدودیت حرکتی بزویت سالمندان بود.
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