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Comparative Effect of Balance Rhythm Dance and Aerobics on Motor Function Rehabilitation in Elderly Women

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Abstract: *Objective:* To investigate the effect of a self-developed balance rhythm dance program on the rehabilitation of motor function and the reduction of fall risk in elderly women with diminished balance function. *Methods:* Fifty elderly women with reduced balance function, admitted to the Qingbar Elderly Care Center of Chongqing Medical University from December 2022 to December 2023, were randomly selected and divided into two groups. The aerobic exercise group (25 patients) received traditional treatment and rehabilitation nursing, while the balance rhythm dance intervention group (25 patients) received the balance rhythm dance intervention in addition to traditional treatment and rehabilitation nursing. The Unified Parkinson's Disease Rating Scale (UPDRS) and Berg Balance Scale (BBS) were used as evaluation indicators to compare the intervention effects between the two groups. *Results:* The data revealed that the balance rhythm dance intervention significantly improved the motor ability and balance function of elderly women in the intervention group ($P < 0.01$), with statistically significant differences observed. *Conclusion:* The balance rhythm dance program plays a critical role in promoting the rehabilitation of motor function and balance ability in elderly women, effectively enhancing their quality of life.

Keywords: Balance rhythm dance; Fall risk; Eldery women; Motor function

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1. Introduction

With the acceleration of population aging, China has entered the era of an aging society. Pelvic fractures, often

referred to as the "last fracture of life," have become increasingly prevalent, significantly increasing family burdens and government medical expenditures. Statistics indicate that at least 25 million falls occur annually among approximately 20 million elderly individuals in China, with elderly women being particularly vulnerable. Due to physiological changes such as declining estrogen levels, reduced musculoskeletal mass, and slower neural responses, their balance function is markedly impaired.

In light of this situation and elderly women's preference for aesthetically appealing exercise routines, the First Affiliated Hospital of Chongqing Medical University, in collaboration with the Qingbar Elderly Care Center and health experts from Chongqing Vocational Nursing College, developed the balance rhythm dance program. This innovative rehabilitation method fills a gap in the current market by integrating proven rehabilitation training systems such as SMT and Otago, both domestically and internationally, to create practical, aesthetic, simple, and cost-effective home-based rehabilitation solutions.

The balance rhythm dance program, specifically designed for individuals with reduced balance function, employs scientifically designed dance movements to enhance coordination and balance. The ultimate aim is to improve the quality of life of elderly individuals. This study explores the effects of balance rhythm dance as an intervention for the rehabilitation of motor function in elderly women with diminished balance function, providing a scientific basis and reference for clinical rehabilitation practices [1-3].

2. Materials and methods

2.1. General information

This study randomly selected 50 elderly women with reduced balance function who were admitted to the Qingbar Elderly Care Center of Chongqing Medical University between December 2022 and December 2023.

Inclusion criteria: (1) Active elderly individuals aged 60–70 years (no major illnesses within the past year or in the stable stage of chronic disease); (2) Inability to walk independently; (3) Presence of balance disorders; (4) Clear mind, normal cognitive function, and normal or corrected vision.

Exclusion criteria: (1) Moderate or severe lower back pain (Oswestry Low Back Pain Questionnaire score ≥ 21); (2) Cognitive impairment (Mini-Mental State Examination [MMSE] score < 17); (3) Severe muscle, bone, and joint diseases or deformities, severe osteoporosis, or walking distance < 300 meters; (4) Current engagement in balance training activities (e.g., Tai Chi or pilates).

2.2. Methods

Fifty elderly women with reduced balance function were randomly divided into two groups: the aerobics group and the rhythm dance group. Each group participated in a 30-minute session once a day, five times a week, for six weeks.

2.2.1. Aerobics group

This group consisted of 25 elderly women with reduced balance function. In addition to conventional medical treatment and health education, participants received standard aerobic exercise training commonly employed in local nursing homes in Chongqing [4-7]. The specific exercises included:

(1) Head movement: Use the head as a pen tip to "write" in the air, then draw circles clockwise and counterclockwise for approximately 2 minutes.

(2) Chest expansion: Stand with slightly bent knees, extend the arms forward through the chest, then straighten the knees while swinging the arms sideways. Repeat five cycles.
(3) Cross swings: Drop both arms, cross the palms near the abdomen, and open and close the arms. Repeat 5–8 times.
(4) Circular palm movements: Position the palms about 10 cm apart and move them in clockwise and counterclockwise circles near the navel. Perform 20 laps in each direction.
(5) Lunges with chest expansion: Perform standing lunges while extending and folding the arms, coordinating upper and lower limb movements. Alternate legs and repeat 10 cycles.
(6) Relaxation: Take deep breaths and shake the limbs to relax.

2.2.2. Rhythm dance group

This group included 25 elderly women with reduced balance function. In addition to conventional medical treatment, health education, and routine rehabilitation training, participants performed balance rhythm dance exercises. These exercises were accompanied by a cheerful rhythm and guided by an augmented reality (AR) training system that provided feedback and correction [8-10]. The training methods were as follows:

(1) Warm-up stage:
   (a) Head movement: Stand straight, look ahead, and turn the head to the right and left as far as possible. Repeat 3–5 times in each direction.
   (b) Neck movement: Adduct the chin while keeping the neck stable and upright. Repeat 3–5 times.
   (c) Lateral walking: Walk four steps to the right and left while keeping the body facing forward. Repeat on both sides.
   (d) Leg lifts and heel raises: Perform tiptoe movements and heel raises.
(2) Balance dance stage:
   (a) Figure-of-eight walking: Walk back and forth in a figure-of-eight pattern, alternating clockwise and counterclockwise. Repeat two cycles.
   (b) Toe walking: Walk on the toes for 10 steps, then lower the heels and turn around. Repeat 2–3 times.
   (c) Trunk rotation: Rotate the upper body to the right and left while keeping the hips stable. Repeat 2–3 cycles in each direction.
(3) Relaxation stage with a balance ball:
   (a) Knee joint stretch: Sit on a chair, extend one leg, and lean the upper body toward the thigh. Alternate legs.
   (b) Trunk movement: Hold the balance ball and move it around the body in the largest possible range. Repeat 2–3 times.

2.3. Evaluation indicators

(1) Unified Parkinson's Disease Rating Scale (UPDRS): The UPDRS is a clinical tool for assessing symptoms of Parkinson's disease, particularly motor balance disorders. It evaluates daily living activities, behavior and emotion, mental state, motor function, and treatment complications. Higher scores indicate more severe disease and greater mobility impairment [11].
(2) Berg Balance Scale (BBS): The BBS is a specialized scale for assessing balance function. It evaluates walking, standing, and turning balance. Higher scores indicate better balance performance [12].

2.4. Statistical analysis

Statistical analysis was performed using SPSS 24.0. Measurement data were expressed as mean ± standard deviation (SD). Data normality was tested using the Shapiro-Wilk test, and the *F*-test was applied for variance homogeneity. For normally distributed data, the paired *t*-test was used for within-group comparisons, while the chi-squared test and Wilcoxon signed-rank test were used for non-normally distributed data. Two-factor repeated measures analysis of variance was employed for between-group comparisons. Pearson correlation analysis was conducted for normally distributed variables, and Spearman's test was applied for non-normally distributed variables. Linear regression analysis was used to further explore variable correlations. Statistical significance was set at $P < 0.05$.

3. Results

3.1. Changes in UPDRS total scores

Table 1 shows that the total UPDRS scores of the patients in both the aerobics group and the rhythm dance group before the intervention were relatively similar, showing no significant difference. After six weeks of intervention, the UPDRS scores in both groups decreased. However, the decrease in the rhythm dance group was statistically significant (P = 0.001), indicating a notable improvement in motor function.

Table 1. Comparison of UPDRS total scores between the two groups before and after intervention

Group	Before intervention	After intervention	Difference significance test (*P* value)
Aerobics group	45.6 ± 10.2	42.8 ± 9.5	0.08 (Not significant)
Rhythm dance group	46.1 ± 9.8	38.5 ± 8.7	0.001 (**)

3.2. Changes in BBS scores

The baseline BBS scores were similar in both groups before the intervention, with no significant differences. After six weeks of intervention, the BBS scores in the aerobics group increased slightly but did not reach statistical significance. In contrast, the rhythm dance group exhibited a significant improvement, with an average increase of nearly 7 points, resulting in a statistically significant difference ($P = 0.001$), as shown in **Table 2**.

Table 2. Comparison of BBS scores between the two groups before and after intervention

Group	Before intervention	After intervention	Difference significance test (*P* value)
Aerobics group	42.3 ± 7.6	44.1 ± 7.2	0.15 (Not significant)
Rhythm dance group	41.8 ± 7.9	48.6 ± 6.8	0.001 (**)

3.3. Changes in other evaluation indicators

The baseline scores for quality of life, gait analysis, and muscle strength testing were similar in both groups before the intervention, indicating homogeneity at baseline. After the intervention, the rhythm dance group demonstrated more pronounced improvements in all three indicators. The changes in gait analysis and muscle strength testing in the rhythm dance group were statistically significant ($P < 0.01$), highlighting the effectiveness of the intervention (**Table 3**).

Table 3. Comparison of other evaluation indicators between the two groups before and after intervention

Evaluation indicator	Group	Before intervention	After intervention	Difference significance test (*P* value)
Quality of life questionnaire scores	Aerobics group	65.2 ± 12.4	67.1 ± 11.9	0.20 (Not significant)
	Rhythm dance group	64.8 ± 12.7	72.3 ± 11.5	0.01 (*)
Gait analysis (step length/m)	Aerobics group	2.3 ± 0.5	2.4 ± 0.4	0.30 (Not significant)
	Rhythm dance group	2.2 ± 0.6	2.7 ± 0.5	0.005 (**)
Muscle strength testing (kg)	Aerobics group	4.1 ± 1.0	4.3 ± 0.9	0.10 (Not significant)
	Rhythm dance group	4.0 ± 1.1	4.8 ± 1.0	0.001 (**)

4. Discussion

4.1. Balanced rhythmic dance can significantly improve overall motor function

After six weeks of rehabilitation nursing intervention, the UPDRS scores in the aerobics group did not show significant changes. In contrast, the UPDRS scores in the rhythmic dance group decreased significantly compared to pre-intervention scores, indicating a pronounced effect of the intervention. The balance rhythm dance significantly improved activities of daily living, behavior and emotion, mental state, motor examination, and treatment complications in elderly women with reduced balance function. This improvement in various domains led to a notable enhancement in overall motor function [13].

4.2. Balanced rhythmic dance effectively improves balance function

Balance dysfunction substantially impacts patients' ability to perform activities of daily living [14]. The study revealed that BBS scores in elderly women significantly increased following the intervention of balance rhythm dance. These improvements were notably greater compared to the aerobic exercise group, highlighting the advantages of the rhythmic dance intervention. The findings demonstrate that balance rhythm dance can effectively enhance the balance function of elderly women, facilitating daily activities, reducing the risk of falls, and promoting a healthier lifestyle [15].

4.3. Conclusion and limitations

In conclusion, balance rhythm dance has a significant positive effect on motor function rehabilitation in elderly women with reduced balance function. It aids in improving balance function, lowering the risk of falls, alleviating the fear of falling, and enhancing self-care abilities and quality of life.

However, this study has several limitations. The sample size was relatively small, which may affect the reliability and generalizability of the findings. Additionally, the short intervention duration limited the observation of the long-term effects of the balance rhythm dance. Furthermore, variations among patients that could influence the outcomes were not fully accounted for. Future studies should aim to address these limitations by increasing sample sizes, extending intervention durations, and conducting more detailed analyses to explore and innovate in this field.

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Disclosure statement

The authors declare no conflict of interest.

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