



THE EFFECT OF BALANCE EXERCISES AND MOZART MUSIC THERAPY ON ELDERLY ANXIETY AND BALANCE

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ABSTRACT

Many elderly individuals deal with anxiety about their declining bodies and fears of social isolation. Such changes can contribute to a decline in the quality of life in multiple dimensions. The study incorporated 12 balance exercises to enhance one's balance and decrease the risk of falls. To address anxiety, the research utilized Mozart's classical music therapy. Music has the ability to heal and restore the body, mentally and physically, and stimulate the production of calming endorphins. The study's aim was to evaluate the effect of 12 balance exercises and Mozart classical music therapy to elders in determining the risk of falling and the level of anxiety. Quasi-experimental 2 groups, control and treatment. The sample was 28 elders. The control group, consisting of 14 people, only received the music therapy, while the treatment group of 14 people received 12 balance exercises along with Mozart music therapy. The intervention was carried out 2 sessions/week for 4 weeks. Data were collected using valid and reliable instruments; the Berg Balance Scale (BBS: $r = 0.98$; $\alpha = 0.97$) was used to measure the risk of falling and the Hamilton Anxiety Rating Scale (HARS: $r = 0.81$; $\alpha = 0.92$) was used to measure anxiety. Paired t-tests and independent t-tests were used to analyze data and assess pre-post changes and differences within and between groups. The treatment group showed significant improvements in BBS score ($p < 0.001$) and a significant reduction in HARS scores ($p < 0.001$) in contrast to the control group. In conclusion, 12 Balance Exercises and Mozart music therapy improved balance and reduced anxiety in elderly people.

Keywords: anxiety; balance exercise; elderly; fall risk; mozart; music therapy

How to Cite (in APA Style)

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INTRODUCTION

The increase in life expectancy in Indonesia has led to a significant increase in the number of elderly people. According to data from the Central Statistics Agency (BPS, 2024), the number of elderly people in Indonesia has reached more than 11% of the total population and is projected to increase to 19.6% by 2045. This phenomenon has consequences for increasing health problems related to aging, including impaired balance and an increased risk of falls. The decline in physiological function that occurs due to aging can impact an individual's ability to carry out activities independently and reduce quality of life (Oueslati et al., 2025; WHO, 2022).

Physiologically, the aging process is characterized by degenerative changes in the musculoskeletal, nervous, and sensory systems. Decreased muscle strength, joint flexibility, and neuromuscular responses are the main factors causing postural balance disorders in the elderly (Lesinski et al., 2015; Sherrington et al., 2019). Balance is the ability to maintain body position against the force of gravity, both when stationary (static balance) and moving (dynamic balance). This function is controlled by the integration of three main systems: the visual, vestibular, and somatosensory systems, which coordinate through a control center in the brain (Kisner & Colby, 2017; Murtiyani & Suidah, 2019). When one of these systems is impaired due to degeneration, the body's ability to maintain stability decreases, making older adults more susceptible to falls (Teixeira et al., 2019).

The risk of falls in older adults is influenced not only by physical factors but also by psychological

factors such as anxiety and fear of falling. Anxiety is an emotional response characterized by increased sympathetic nervous system activity, such as increased heart rate, muscle tension, and impaired concentration (Goodarzi et al., 2024; Putri et al., 2020; Tandirerung et al., 2023). Anxiety in older adults often arises from changes in social roles, loss of physical abilities, or chronic illnesses. Research shows that anxiety can impair motor coordination and reduce postural ability because muscles become more tense and the body's response to changes in position becomes unstable (Asri & Sari, 2024; Nugraha, 2009). Therefore, balance management in the elderly should include interventions that address both physical and psychological aspects simultaneously (Oueslati et al., 2025).

One form of physiotherapy intervention that has been proven effective in improving balance in the elderly is the 12 Balance Exercises. This program consists of twelve types of progressive balance exercises designed to stimulate static balance, dynamic balance, and functional mobility (Mutnawasitoh et al., 2022; Suadnyana et al., 2018). The movements in this exercise include activities such as side-stepping, heel-to-toe walking, tandem stance, and single-leg standing, which target lower extremity muscle strength, coordination, and core stability. Regular exercise can improve proprioception and the body's neuromuscular response to external disturbances, thereby improving postural control and reducing the risk of falls (Vafaeenasab et al., 2019). Furthermore, structured physical exercise also contributes to improved cardiovascular and general fitness, positively impacting older adults' self-confidence in their daily activities.

However, physical exercise in older adults often faces challenges, particularly in terms of motivation and anxiety levels. Elderly individuals with high levels of anxiety tend to lack focus and easily lose their balance during exercise (Listyarini & Alvita, 2018). To address this, a multimodal approach can be used, one of which is combining physical exercise with classical music therapy, specifically music by Wolfgang Amadeus Mozart. Mozart's classical music is known for its steady rhythmic tempo (60–80 beats per minute) with calming harmonic patterns (Saparia et al., 2024). Previous research has shown that classical music can reduce sympathetic activity and increase parasympathetic activity by stimulating the limbic system in the brain, which regulates emotions and relaxation. This effect induces a sense of calm, reduces anxiety, and improves focus and concentration during physical exercise (Bradt et al., 2016; Witte et al., 2020).

Neurophysiologically, Mozart's classical music therapy can increase alpha brain wave activity, which is associated with optimal relaxation and alertness (Lu et al., 2021; Pauwels et al., 2014). This alpha wave activation plays a role in enhancing cognitive abilities and motor focus, thereby improving motor coordination. Music also affects the autonomic nervous system by reducing levels of stress hormones like cortisol and increasing the release of endorphins and dopamine, which induce feelings of comfort and calm (Ma & Ma, 2023). Thus, music therapy not only impacts psychological aspects but also supports the efficiency of the motor-nervous system during activity.

The combination of 12 Balance Exercises and Mozart's classical music therapy is a comprehensive physiotherapy intervention strategy because it simultaneously engages both physical and psychological aspects. Physical exercise improves neuromuscular function and proprioception, while music plays a role in reducing anxiety and increasing comfort during exercise. This approach aligns with the principles of the biopsychosocial model of physiotherapy, which explains that human movement function is the result of the interaction between biological factors (muscles, nerves, sensory systems), psychological factors (motivation, emotions, anxiety), and social factors (environmental support) (Vafaeenasab et al., 2019). Through this integrative approach, it is hoped that a more optimal balance and a significant reduction in anxiety in the elderly will be achieved.

Several studies support this combined approach. Suadnyana et al. (2018) and Mutnawasitoh et al. (2022) reported that the 12 Balance Exercises significantly improved Berg Balance Scale (BBS)

scores in elderly people after six weeks of training. Meanwhile, research by Nnode et al. (2018) and Asri & Sari (2024) demonstrated that classical music therapy effectively reduced anxiety levels and improved sleep quality in elderly people. These findings are supported by Ma & Ma (2023), who explained that Mozart's music can increase emotional stability and improve sensorimotor coordination.

However, research specifically combining these two methods, especially in Indonesia, is still limited. The novelty of this study lies in the combination of 12 Balance Exercises with Mozart's classical music therapy, applied simultaneously to improve physical and psychological aspects in older adults within a community setting. This holistic approach applies the biopsychosocial model to physiotherapy practice with a simple, inexpensive, and easy-to-implement method. Based on this theoretical explanation, this study was conducted to analyze the effect of the combination of the 12 Balance Exercises and Mozart's classical music therapy on dynamic balance and anxiety levels in elderly people.

METHOD

This study used a quasi-experimental design with a pretest–posttest control group design. The objective was to determine the effect of a combination of 12 Balance Exercises and Mozart classical music therapy on dynamic balance and anxiety levels in the elderly. The study was conducted at the Elderly Community Health Post (Posyandu Lansia) within the Cilacap Community Health Center (Puskesmas) from April to June 2025.

The study population consisted of all elderly people who actively participated in Posyandu activities in the area. The sample was drawn using a purposive sampling technique based on predetermined inclusion and exclusion criteria. Inclusion criteria included elderly aged 60–68 years, able to stand and walk without assistive devices, at moderate risk of falls with a Berg Balance Scale (BBS) score of 21–40, mild to moderate anxiety with a Hamilton Anxiety Rating Scale (HARS) score of 14–28, and willingness to participate in a four-week exercise program. Exclusion criteria included the elderly with severe visual or hearing impairment, neurological diseases such as stroke, Parkinson's disease, or dementia, and those taking sedatives or antianxiety medications during the study. The total sample size was 28 people, consisting of 14 in the treatment group and 14 in the control group.

Data analysis included the dynamic balance assessment using the Berg Balance Scale (BBS) and the anxiety assessment using the Hamilton Anxiety Rating Scale (HARS). Each of the 14 items in the BBS is scored from 0 to 4, allowing a maximum score of 56, where the higher the score, the higher the balance ability. Among older adults, the BBS has been shown to have very high and excellent internal reliabilities and is very valid for balance assessment (Berg, 2016). HARS also consists of 14 statements, each scored from 0 to 4. Total scores on this instrument are also higher with higher anxiety. This instrument also has strong internal reliability and good interrater reliability and is thus valid and reliable for anxiety symptom assessment (Eljora et al., 2018). The study lasted four weeks, with practice sessions twice weekly lasting 30–40 minutes. Before the intervention began, all participants were informed of the research procedures, benefits, and potential risks, and then signed an informed consent form. The initial phase of the study began with baseline data collection (pretest) using the BBS and HARS instruments.

The treatment group received a combination of 12 Balance Exercises and Mozart classical music therapy. Each practice session took place in a quiet room with a controlled temperature (25–27°C). The training structure consisted of: Warm-up (5 minutes): leg muscle stretching and light breathing exercises; Core training (25 minutes): 12 progressive balance movements: side stepping, heel-to-toe walking, tandem stance, single-leg standing, mini squats, sit-to-stand, arm-reach balance, turning movements, weight shifting, step-up-down, standing on foam, and balancing with eyes closed; and Cool-down (5–10 minutes): relaxation and deep breathing exercises while listening to Mozart.

Classical music was played throughout the training session using speakers at moderate volume to promote relaxation and focus during the exercise. Meanwhile, the control group received music therapy of the same duration and frequency, without any specific balance training intervention.

After four weeks, a post-test was conducted to measure changes in balance and anxiety scores using the same instruments. Pre- and post-test data from both groups were then analyzed using SPSS software. Data analysis used normality (Shapiro-Wilk) and homogeneity (Levene) tests. Paired t-tests were used for pre-post changes within groups; independent t-tests for comparisons between groups. Significance $\alpha = 0.05$.

RESULT

This study involved 28 elderly respondents aged 60–68 years, consisting of 20 women (71.4%) and 8 men (28.6%). All respondents met the inclusion criteria, namely a moderate fall risk based on a Berg Balance Scale score of 21–40 and a mild anxiety level based on a Hamilton Anxiety Rating Scale score of >7 (HARS). The average Body Mass Index (BMI) of the respondents was $21.37 \pm 0.70 \text{ kg/m}^2$, indicating that most respondents were in the normal nutritional status category.

Table 1.
Respondent characteristics

Variable	Category	N	Percentage (%)
Gender	Male	8	28.6
	Female	20	71.4
Group	Treatment	14	50.0
	Control	14	50.0
Body Mass Index (kg/m^2)	Mean $\pm$ SD	21.37 ± 0.70	-

Descriptive results indicate an increase in Berg Balance Scale (BBS) scores and a decrease in Hamilton Anxiety Rating Scale (HARS) scores after the intervention in the treatment group.

Table 2.
Descriptive Statistics of Pre- and Post-Scores in Both Groups

Variable	Group	N	Mean Pre	Mean Post	Difference (Δ)	SD
BBS	Treatment	14	38.96	44.86	+5.90	3.21
HARS	Treatment	14	18.46	12.57	-5.89	2.13
BBS	Control	14	38.96	38.96	0.00	2.43
HARS	Control	14	18.46	14.53	-3.93	3.08

Before conducting the hypothesis test, the data were tested for normality and homogeneity. The Shapiro–Wilk test showed a p-value > 0.05 , indicating that the data were normally distributed. The Levene's test also showed a p-value > 0.05 , indicating that the variance between groups was homogeneous. Thus, the data met the assumptions for the parametric test (t-test).

Table 3.
Paired Sample t-Test Results

Variable	Group	Mean Difference (Δ)	T	Df	Sig. (p)	Description
BBS	Treatment	5.90	-68.41	13	0.000	Significant
HARS	Treatment	-5.89	38.16	13	0.000	Significant
BBS	Control	0.00	-	13	0.532	Not Significant
HARS	Control	-3.93	55.00	13	0.064	Not Significant

Table 4.
Independent t-Test Results Between Groups

Variable	Mean Δ Treatment	Mean Δ Control	Mean Difference	t	df	Sig. (p)	Description
Δ BBS	5.90	0.00	3.79	33.27	26	0.000	Significant
Δ HARS	-5.89	-3.93	-3.93	18.03	26	0.000	Significant

Based on the table above, the results show a significant difference between the treatment and control groups for both changes in balance (Δ BBS) and anxiety (Δ HARS). This indicates that the combination of 12 Balance Exercises and Mozart classical music therapy is more effective than no intervention.

DISCUSSION

The results of this study showed a significant increase in Berg Balance Scale (BBS) scores and a significant decrease in Hamilton Anxiety Rating Scale (HARS) scores after the combined intervention of 12 Balance Exercises and Mozart classical music therapy. The treatment group experienced an improvement in balance from an average of 39.0 to 44.9, while the control group showed no significant change. Similarly, anxiety levels in the treatment group decreased from an average of 18.5 to 12.6, while the control group only decreased slightly from 18.5 to 14.5. These results indicate that the combination of balance training and classical music is effective in improving functional ability and reducing anxiety in older adults.

Balance Training and Neurophysiological Mechanisms

Body balance is the result of complex coordination between the vestibular, proprioceptive, visual, and musculoskeletal systems (Melinda et al., 2024). In older adults, decreased sensorimotor function and muscle strength lead to impaired postural stability and increase the risk of falls (Horak, 2006). Balance exercise is a form of neuromotor training aimed at improving postural control through stimulating neuromuscular adaptation. Movements such as tandem stance, heel-to-toe walking, and single-leg standing improve proprioceptive abilities and strengthen the body's main supporting muscles, particularly the lower leg muscles and core muscles (core stability) (Mutnawasitoh et al., 2022).

Physiologically, balance training increases the activation of type I muscle fibers, which play a role in long-term stability, and improves coordination between agonist and antagonist muscles (Granacher et al., 2013). Furthermore, repeated practice can strengthen neural pathways in the motor cortex, cerebellum, and basal ganglia, which are responsible for fine motor control and dynamic stability (Magrinelli et al., 2016; Zemková & Kováčiková, 2023). This improved nervous system function will improve the body's ability to adapt to changes in position, thereby minimizing the risk of losing balance. Balance training also contributes to improved sensory integration. Elderly people often experience a decreased ability to integrate information from the vestibular, visual, and proprioceptive systems. Through structured exercises such as the 12 Balance Exercises, sensory integration skills can be improved by training the brain to re-prioritize the most relevant sensory information sources to body position (Peterka et al., 2018).

Effects of Mozart's Classical Music on the Nervous System and Psychology

Beyond physical exercise, Mozart's classical music plays a significant role in the psychological and physiological aspects of participants. Several studies have shown that listening to Mozart's music, particularly the Sonata for Two Pianos in D Major (K. 448), can stimulate increased alpha wave activity in the brain, which is associated with relaxation and increased concentration (Jaušovec et al., 2006). This effect, known as the Mozart Effect, is characterized by improved cognitive and emotional function after listening to music with a harmonic structure and stable tempo (Rauscher, 2006).

Neurophysiologically, music with a tempo of 60–80 bpm, such as Mozart's K. 448, influences the limbic system, particularly the amygdala and hippocampus, which play a role in regulating emotions and memory. Harmonious music lowers levels of stress hormones like cortisol and increases dopamine and serotonin levels, contributing to feelings of calm and increased motivation (Koelsch, 2014). Thus, music can improve mood and reduce anxiety, especially in older adults who often experience emotional changes due to aging.

The combination of physical exercise and classical music creates a synergistic effect on brain function. Music can enhance motor learning through rhythmic synchronization between the auditory and motor systems. When music with a steady tempo is used as a background for

exercise, the brain adapts the body's movement rhythm to the music, resulting in more efficient motor coordination (Thaut et al., 2015). This phenomenon, known as rhythmic auditory stimulation (RAS), has been shown to be effective in improving movement patterns, stability, and gait rhythm in both patients with neurological disorders and healthy older adults.

The Relationship Between Balance and Anxiety

Balance and anxiety have a mutually influential relationship. Elderly people with balance disorders often experience a fear of falling, which increases anxiety and ultimately worsens motor function (Hu et al., 2024; MacKay et al., 2021; Rani et al., 2023). This condition creates a negative cycle of physical and psychological disorders. A combined physical exercise and music intervention, as in this study, can break this cycle through two main mechanisms: increased self-confidence due to improved physical abilities and reduced physiological stress due to the relaxing effects of music. Mozart's classical music with its steady rhythm also stimulates the parasympathetic nervous system, which is responsible for the relaxation response (rest and digest). Activation of this system lowers heart rate, blood pressure, and respiratory rate, thus enhancing the relaxation effect during exercise (Bernardi et al., 2006). As a result, older adults are better able to enjoy exercise without undue strain and obtain optimal physical and psychological benefits.

Comparison with Previous Research

The results of this study align with the findings of Wei et al. (2023) who showed that 4 weeks of structured balance training significantly improved BBS scores in community-dwelling older adults. Meanwhile, research by Pauwels et al. (2014) reported that Mozart's classical music reduced anxiety levels in pre-operative patients through a mechanism that reduced plasma cortisol levels. Similar findings were also reported by (Witte et al. (2020) who found that the combination of neuromotor training and relaxation music resulted in simultaneous improvements in cognitive function and postural stability in an older population. Several studies also support these results. Integrating physical exercise with psychological approaches such as music therapy is an effective strategy for improving the holistic well-being of older adults. This multimodal approach reinforces the biopsychosocial model concept in physiotherapy rehabilitation, where health is viewed not only from a physical perspective but also from a mental and social perspective (De Nys et al., 2024; Li et al., 2022; Satoh et al., 2014).

Clinical Implications

These findings have important implications for community physiotherapy practice. Exercise programs that combine physical and psychological aspects have been shown to be more effective than single interventions. Twelve Balance Exercises combined with Mozart's music can be an alternative exercise program for older adults at moderate risk of falling. This program is relatively easy to implement in primary healthcare facilities or elderly health posts (posyandu) because it does not require sophisticated equipment and can be performed in groups, thus strengthening the social and motivational aspects of participants.

Furthermore, the results of this study provide a scientific basis for the development of music-based physiotherapy interventions, which are currently being widely used in various countries to treat movement and emotional disorders in older adults, Parkinson's patients, and post-stroke patients. Considering the significant results obtained, this method can be recommended as part of a fall prevention and stress management program in the elderly population.

Research Limitations and Recommendations

This study has several limitations that require attention. First, the sample size was relatively small and was conducted in a single location, so the generalizability of the results is limited. Second, the intervention duration was only four weeks; the long-term effects of the combination of

exercise and music are unknown. Third, physiological measurements such as stress hormone levels or brainwave activity were not conducted to support the described neurophysiological mechanisms. For future research, it is recommended to involve a larger sample size, extend the intervention duration to 8–12 weeks, and include objective measurements such as electromyography (EMG) or electroencephalography (EEG) to determine the synergistic effects of exercise and music on motor and cognitive neural activity.

CONCLUSION

The combination of 12 Balance Exercises and Mozart classical music therapy has been shown to be effective in improving dynamic balance and reducing anxiety levels in older adults. This intervention resulted in a significant increase in Berg Balance Scale (BBS) scores and a significant decrease in Hamilton Anxiety Rating Scale (HARS) scores, with a very large effect size. This approach works through neuromuscular adaptation and psychological relaxation mechanisms, thereby improving postural control and reducing sympathetic nervous system activity. The combination of physical exercise and music can be recommended as a community-based, non-pharmacological physiotherapy intervention to improve balance function and emotional well-being in older adults.

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