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Effectiveness of Cognitive Sensorimotor Exercise in Reducing Fear of Falling Among Older Adults

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Abstract

Fear of falling is a common concern among older adults that can reduce mobility, independence, and quality of life. This study aimed to evaluate the effect of cognitive sensorimotor exercise on fear of falling in older adults. A quasi-experimental study with a one-group pretest-posttest design was conducted among 38 older adults at Panti Sosial Lanjut Usia Geunaseh Sayang, Banda Aceh, Indonesia, selected using purposive sampling. Participants performed cognitive sensorimotor exercise for 30 minutes per session, five times per week for four weeks. Fear of falling was assessed before and after the intervention using the Modified Falls Efficacy

Scale (MFES). Data were analyzed using the Wilcoxon Signed-Rank test. The results showed a significant reduction in fear of falling following the intervention ($p = 0.001$), with a mean rank of 19.50, indicating improved confidence in performing daily activities without fear of falling. Cognitive sensorimotor exercise effectively reduced fear of falling among older adults. These findings suggest that this intervention may serve as a practical and non-pharmacological approach to improving confidence and reducing fear associated with falls in the older adult population.

Keywords: Cognitive Sensorimotor Exercise, Fear of Falling, Older Adults

1. Introduction

The aging process is a universal and inevitable physiological phenomenon characterized by progressive declines in the structural integrity and functional capacity of cells, tissues, and organ systems. Advancing age is associated with deterioration in sensory processing, cognitive function, and neuromuscular coordination, all of which contribute to reduced physical function and increased vulnerability to adverse health outcomes ^[1, 2]. Among the most common psychological consequences experienced by older adults is fear of falling, a condition that extends beyond the risk of actual falls and substantially limits mobility, independence, and quality of life ^[3, 4].

According to the World Health Organization (WHO), global population aging is accelerating rapidly. By 2030, one in six people worldwide will be aged 60 years or older, reaching approximately 1.4 billion individuals ^[5]. Indonesia is also experiencing this demographic transition, with older adults accounting for approximately 12% of the total population in 2024. In Aceh Province, older adults represented 9.01% of the population in 2024, with most belonging to the young-old age group (60–69 years) ^[6]. This demographic shift is accompanied by an increasing prevalence of age-related functional decline and a growing number of older adults experiencing fear of falling, which has become an important public health concern.

Fear of falling is defined as an ongoing concern about falling that causes individuals to avoid activities they remain physically capable of performing ^[7]. It may develop not only after experiencing a fall but also among older adults without a previous fall history. Persistent fear of falling often results in reduced participation in daily activities, decreased social engagement, loss of confidence, and diminished quality of life ^[8]. Furthermore, activity avoidance associated with fear of falling may contribute to physical deconditioning, increased dependence, and a greater likelihood of future falls, creating a cycle that further compromises healthy aging ^[9, 10].

Cognitive Sensorimotor Exercise (CSE) has emerged as a promising intervention that integrates cognitive processing with sensorimotor activities to enhance movement control and functional performance ^[11]. Through proprioceptive stimulation, tactile discrimination, spatial orientation, and cognitive engagement, CSE aims to improve sensory integration and motor planning by promoting cortical neuroplasticity ^[11, 12]. These mechanisms may also enhance older adults' confidence in

performing daily activities, thereby reducing fear of falling. Despite the growing interest in CSE, evidence regarding its effectiveness in reducing fear of falling among community-dwelling and institutionalized older adults remains limited, particularly in Indonesia.

Preliminary observations conducted at Panti Sosial Lanjut Usia Geunaseh Sayang, Banda Aceh, indicated that exercise programs for older adults remain predominantly conventional and focus mainly on maintaining general physical activity. Many residents continue to express concerns about falling during routine daily activities, leading to reduced confidence and avoidance of movement. To address this gap, this study aimed to evaluate the effect of a four-week Cognitive Sensorimotor Exercise program on fear of falling among older adults residing at Panti Sosial Lanjut Usia Geunaseh Sayang, Banda Aceh.

2. Methods

This study employed a quasi-experimental design using a one-group pretest–posttest approach. In the absence of a control group, the intervention effect was determined by comparing participants' outcomes before and after the implementation of the intervention. The research was conducted at Panti Sosial Lanjut Usia Geunaseh Sayang, Banda Aceh, Aceh Province, Indonesia. Data collection and the Cognitive Sensorimotor Exercise intervention were systematically implemented over a four-week period, from March 30 to April 27, 2026.

3. Results

A total of 38 older adults were enrolled in this study. As shown in Table 1, the mean age was 67.18 ± 4.85 years, with most participants aged 60–74 years (60.5%, $n = 23$). Males accounted for 55.3% ($n = 21$), and most participants had completed high school (60.5%, $n = 23$). All participants were Muslim. Hypertension was the most common comorbidity (71.1%, $n = 27$), followed by diabetes mellitus (28.9%, $n = 11$). Most participants reported no pain (78.9%, $n = 30$) and minimal or no anxiety (71.1%, $n = 27$).

Table 1: Sociodemographic and Clinical Characteristics of Older Adults ($n = 38$)

Characteristics	Frequency (%)
All	38 (100)
Age (years), Mean $\pm$ SD	67,18 $\pm$ 4,854
Age Group	
60 – 74 years	23 (60,5)
75 – 84 years	15 (39,5)
Sex	
Male	21 (55,3)
Famale	17 (44,7)
Educational Level	
Elementary School	6 (15,8)
Junior High School	9 (23,7)
Senior High School	23 (60,5)
Religion	
Islam	38 (100)
Medical History	
Hipertnsion	27 (71,1)
Diabetes Melitus	11 (28,9)
Pain Status	
No Pain	30 (78,9)
Midle Pain	8 (21,1)
Anxiety Level	
Minimal/ No Anxiety	27 (71,1)
Midle Anxiety	11 (28,9)

The Wilcoxon signed-rank test demonstrated a significant reduction in fear of falling following the Cognitive Sensorimotor Exercise intervention among the 38 participants ($z = -5.387$, $p < 0.001$), with a very large effect size ($r = 0.874$). These findings indicate that the intervention was highly effective in reducing fear of falling, demonstrating both statistical significance and substantial clinical relevance.

Table 2: Changes in Spasticity, Lower Extremity Strength, Balance, and Fear of Falling Following the Intervention ($n=38$)

Variable	Wilcoxon <i>Signed-Rank</i>			
	n	Z	Effect Size	p
<i>Fear of Falling</i>	38	-5,387	0,874	0,001

4. Discussion

Ear of falling is one of the most prevalent psychological concerns among older adults and is associated with reduced participation in daily activities, loss of independence, social isolation, and decreased quality of life. The present study demonstrated that Cognitive Sensorimotor Exercise (CSE) significantly reduced fear of falling among older adults after four weeks of intervention. The large effect size observed indicates that CSE is an effective intervention for improving older adults' confidence in performing everyday activities without excessive concern about falling.

Before the intervention, participants demonstrated high levels of fear of falling, indicating considerable concern regarding the possibility of falling during routine activities. This finding is consistent with previous studies showing that older adults frequently experience fear of falling regardless of whether they have previously experienced a fall. Such fear often leads to activity avoidance, reduced social participation, and diminished self-confidence in mobility [13]. Following the intervention, fear of falling decreased significantly. This finding is consistent with Sedaghati *et al.*, who reported that functional sensorimotor training significantly reduced fall-related concerns among older adults [14, 15]. Likewise, Zhang *et al.* concluded in their systematic review that task-oriented exercise interventions effectively reduce fear of falling by improving individuals' confidence in performing daily functional tasks [24]. These studies suggest that repeated engagement in meaningful sensorimotor activities enables older adults to perceive movement as safer and more controllable, thereby reducing anxiety related to falling.

The beneficial effect of CSE on fear of falling may be explained by its emphasis on active cognitive involvement during movement. Unlike conventional exercise programs that primarily focus on repetitive physical movement, Cognitive Sensorimotor Exercise requires participants to consciously process sensory information, recognize body position, discriminate tactile stimuli, and solve movement-related tasks while performing functional activities. This active cognitive engagement enhances body awareness and promotes a greater sense of control during movement. As older adults become more aware of their body position and movement capabilities, they develop greater confidence in carrying out everyday activities, which may reduce excessive concern about falling.

Another possible explanation is that CSE provides repeated successful movement experiences in a structured and safe environment. Through gradual exposure to progressively

challenging sensorimotor tasks, participants gain confidence in their ability to complete movements successfully. According to Bandura's self-efficacy theory, repeated mastery experiences are the strongest source of self-confidence. Therefore, successfully performing cognitive-sensorimotor tasks throughout the intervention may strengthen movement self-efficacy and reduce fear associated with potential falls.

The present findings are further supported by studies investigating cognitive-motor interventions in older adults. Aragão-Santos *et al.* demonstrated that incorporating cognitive demands into functional exercise programs improved functional confidence among older women [16]. Similarly, Nascimento *et al.* reported that physical-cognitive training enhanced participants' confidence in performing everyday activities, contributing to lower levels of fear related to falling [17]. Vasu *et al.* also highlighted that interventions integrating cognitive and physical components produce meaningful psychological benefits, including increased confidence and reduced fear of falling among older adults [18].

Overall, the findings of the present study suggest that Cognitive Sensorimotor Exercise is an effective intervention for reducing fear of falling among older adults. By integrating cognitive processing with sensorimotor activities, CSE promotes body awareness, movement confidence, and self-efficacy, enabling older adults to perform daily activities with greater confidence and less fear of falling. These findings support the incorporation of Cognitive Sensorimotor Exercise into geriatric rehabilitation and fall prevention programs, particularly for addressing the psychological aspects of fall risk in addition to physical function.

5. Conclusions

The study concluded that Cognitive Sensorimotor Exercise (CSE) significantly reduced fear of falling among older adults. These findings suggest that CSE is an effective intervention for increasing movement confidence and reducing fall-related concerns, thereby supporting healthy aging and maintaining functional independence.

6. References

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