



## Feature Article

## Neuromotor training in older women living in long-term care setting: A pilot study



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## ABSTRACT

This pilot study identified the effect and the feasibility of neuromotor training in a group of ageing women living in a long-term care setting. Thirty-five older women (mean age, 84.18 years; SD = 5.92 years) participated in the study. Twenty women were in the intervention group, and 15 women were in the control group. Data on mobility, activities of daily living (ADL) and fear of falling were collected before and after the 16-week training period. The neuromotor training program was based on concepts from motor control and motor learning. All participants completed the training program, and no adverse events occurred. The intervention group showed steady and significant improvements in mobility, ADL and fear of falling after the intervention, but the control group did not exhibit significant changes. Moreover, mediation analysis demonstrated the role of mobility as a mediator between participation in physical training and fear of falling.

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Physical function deteriorates in advancing age because disease progression and impaired physical fitness<sup>1</sup> (e.g., musculoskeletal function, cardiovascular function and balance) impact a person's functional abilities<sup>2</sup> and activities of daily living (ADL),<sup>3</sup> such as walking, stair climbing and rising from a chair,<sup>4</sup> which increases the risk of mobility decline. Mobility, which is defined as the ability to move independently in the environment,<sup>3</sup> is often the first symptom of the inability to perform ADL, which may lead to a requirement for assistance and an increased risk of falling and disability.<sup>5</sup> Mobility impairments may also result in an increased fear of falling, which may contribute to a decrease in the quality of life and independence, with a greater likelihood for admittance to a long-term care setting<sup>6</sup> and a significant need of health and social care.<sup>7–9</sup>

Engaging in a physical training program is one of the first steps to avoid mobility impairments, functional decline and fear of falling.<sup>8</sup> Physical training contributes to 'successful' ageing,<sup>10</sup> especially in particularly vulnerable individuals, such as people living in long-term care settings. Previous literature<sup>2,7,11–13</sup> suggests that

physical training programs, including progressive resistance, balance and functional training, improve mobility, ADL and the general quality of life in older adults living in long-term care settings.<sup>14–19</sup>

Different types of physical training programs were developed to examine the effect of training on mobility, ADL and fear of falling in long-term care settings. Gusi and colleagues<sup>8</sup> examined the effect of balance training with visual feedback and demonstrated a reduction in the fear of falling and an improvement in dynamic balance and isometric strength. Similar positive trends were observed using Tai Chi training<sup>20</sup> and an exercise program based on video game systems.<sup>21</sup> Schoenfelder and colleagues<sup>22</sup> used an ankle-strengthening and walking program and found that 3 months of supervised exercise exerted a positive effect on balance and fear of falling. Moreover, Baum and colleagues<sup>23</sup> found significant improvements in mobility during a strength training program.

Some recent studies<sup>24–27</sup> focussed on a physical training program based on motor learning, and the results showed greater improvements in mobility compared to an endurance training program.<sup>24</sup> The motor learning exercise required a goal-oriented repetitive practice exercise<sup>25</sup> to learn/re-learn motor control in ADL.<sup>24</sup> Despite these positive findings, a majority of evidence-based research studies were conducted in people with neurological problems<sup>28,29</sup> and community-dwelling older people with mobility

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limitations<sup>27</sup> or impairments,<sup>24</sup> but little evidence focused on older adults living in the long-term care settings. Taken together, these findings support the idea that older adults living in long-term care settings might improve their functional performance through an effective physical training program despite their advanced age, mobility impairment and general functional decline.<sup>16</sup>

Therefore, our pilot study was based on physical neuromotor training using a cognitive neuroscientific approach to motor control. This approach implies that several cognitive processes, such as working memory and executive functions, and motor control processes can be distinguished during the preparation and execution of functional motor tasks, such as the processing of motor task-related information, action planning and initiation.<sup>30,31</sup> Our training was directed at stimulation of the proprioceptive, vestibular and visual systems, so that older adults would learn to integrate sensory information into adequate motor responses. Moreover, the training was designed to increase motor competence by teaching functional motor skills, such as balance, coordination and gait, and also the necessary skills for moving independently in the environment and related mobility functions.<sup>3</sup> We hypothesized that this particular physical intervention would benefit older adults and be specifically useful in older adults living in long-term care settings.

This pilot study investigated the direct and indirect effects of physical intervention based on neuromotor training in mobility, basic ADL and fear of falling and the feasibility of this training in a group of women living in a long-term care setting. The secondary aim was to assess the effects of engagement in physical training on the fear of falling through the related changes in mobility.

## Design and methods

The pilot study included two groups, one intervention and one control group. The focus of the study was to determine the effects of

training on mobility, ADL and fear of falling. The intervention group participated in the training twice weekly for 16 weeks, whereas the control group received routine residential/medical care, went about their lives as usual. All participants were assessed before and after the 16-week training period. The study was conducted from January to June 2013 in Turin, Italy.

## Participants

Study participants were recruited from a private long-term care facility linked to the Public Health Service of Turin. The care facility accommodated 249 older adults. Participants were included if they were female, aged >75 years and able to give informed consent. Participants were excluded from participation if they were unable to walk 6 m independently with or without a walking aid and if their cognition, as judged by the psychologist of the residential care facility, was so impaired that they would not be able to process the information provided during the testing and training sessions.<sup>32</sup> In addition, the medical practitioner of each participant judged whether there was a medical contraindication for participation. Individuals were not enrolled in the study if they had certain medical conditions, such as an acute disease (e.g., myocardial infarction) or a chronic disease (e.g., Parkinson's disease), a major motor deficit (e.g., orthopedic impairment), a severe psychiatric disorder or a clinical diagnosis of depression or anxiety at the time of the evaluation.

Participants were informed that their participation in the study was voluntary and confidential. Participants gave their informed written consent to participate in the study in accordance with the local medical ethics committee and in compliance with the ethical standards provided in the 1964 Declaration of Helsinki. Fig. 1 summarizes the recruitment process of the study population. Participants were assigned to the control or intervention groups based

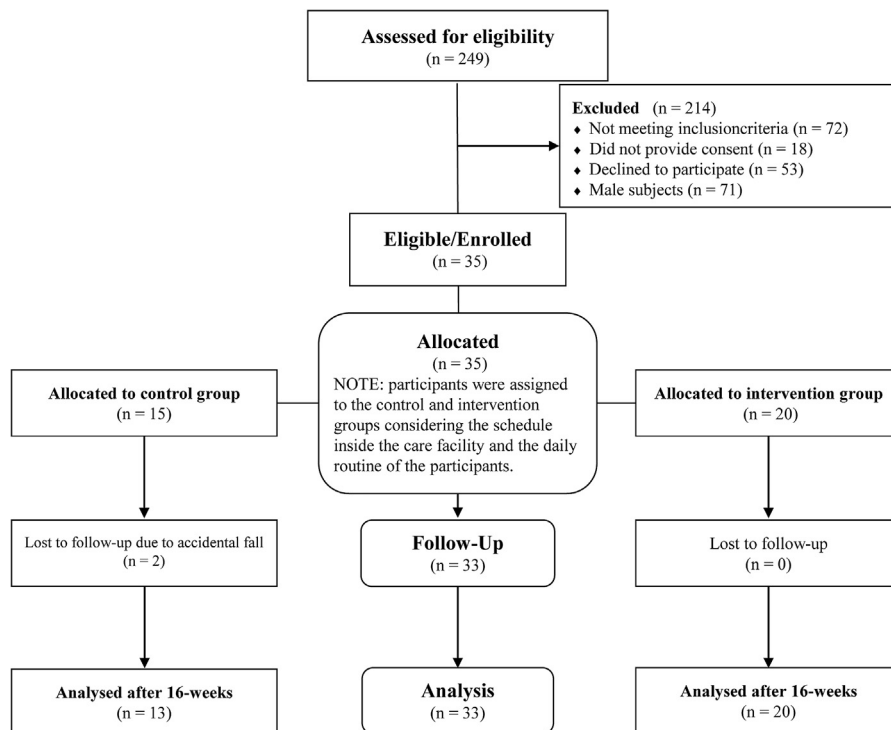


Fig. 1. Recruitment process and attendance information of the study population.

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