

## A HIGH-INTENSITY FUNCTIONAL EXERCISE PROGRAM IS APPLICABLE FOR OLDER PEOPLE WITH COGNITIVE IMPAIRMENT

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**Abstract:** *Maintaining or improving physical functions among older people with cognitive impairment in effective ways is of great importance, since cognitive decline is associated with a decline in physical performance. Training at high intensity has a greater effect than at a lower intensity, but there are few studies evaluating high-intensity training among older people with severe cognitive impairment. However, results from a recent study (the FOPANU Study) among older people dependent in activities of daily living and living in residential care facilities showed that a high-intensity functional weigh-bearing program had positive long-term effects on balance, gait ability and lower-limb strength. The mean score for the Mini-Mental State Examination was 18 (range 10–29) and 52% of the participants had a dementia disease. Regarding the applicability of the exercise program, no statistically significant differences in attendance, intensity or adverse events were observed when participants with dementia were compared with participants without dementia. A main clinical implication of the FOPANU Study is that people with severe cognitive impairment can be offered high-intensity functional exercise programs.*

**Key words:** *Aged, dementia, exercise, frail elderly, residential facilities.*

Maintaining or improving physical functions among older people with cognitive impairment in effective ways is of great importance, since

cognitive decline is associated with a decline in physical performance [1]. Among older people with mild or no cognitive impairment, many studies during the last 10-15 years have shown that physical exercise improves strength, balance, and gait ability [2]. The intensity seems to have a great impact on the result of the training. A recent Cochrane review concluded that strength training at high intensity among older people has a greater effect on strength than strength training at a lower intensity [3]. Unfortunately, there have been few studies evaluating the applicability (e.g. attendance and adverse events) and the effect of high-intensity training among older people with severe cognitive impairment.

Functional weight-bearing exercise programs have been shown to have effects on balance, gait, and lower-limb strength among older people with moderate or no cognitive and physical impairments. This training method also appears to be suitable for frail older people in residential care facilities, including those with severe cognitive impairment, because the exercises are easy to follow and there is no need for specific exercise facilities. In functional weight-bearing training, it is possible to exercise at a high intensity for each participant by exercising with a high load on the lower-limb muscle groups and near the limit of postural stability. In addition, functional exercises which include everyday tasks such as getting up from a chair or climbing chairs, may also create favorable conditions for transferring the improvement in physical functions to the performance in daily living.

In a recent randomized controlled trial using blinded assessors among 191 older people (mean age 85) in nine residential care facilities in Sweden, a high-intensity functional weight-bearing exercise program had positive long-term effects (3 months after the intervention) on balance, gait ability, and lower-limb strength, compared with a control activity [4]. The participants in this study, The Frail Older People – Activity and Nutrition study in Umeå (the FOPANU Study), were dependent in personal activities of daily living (ADL) and a majority had severe cognitive or physical impairments. The mean score for the Mini-Mental State Examination (MMSE) was 18 (range 10–29) and 52% of the participants had a dementia disease according to the DSM-IV criteria. Other common diagnoses among the participants were, for example, depression (61% of the participants), previous stroke (28%), and angina pectoris (28%). Nearly two-thirds of the participants were not able to rise from a chair independently without arm support. All participants had received approval of their participation in the study from their physician. The exercise intervention was based on the High-Intensity Functional Exercise Program (the HIFE Program) which includes lower-limb strength and balance exercises performed in weight-bearing positions (Table). A physical therapist selected exercises for each

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participant according to his or her functional deficits. The control activity included activities performed while sitting, e.g. watching films, reading, singing, and conversation and was expected to be interesting and stimulating for older people including those with severe cognitive impairment. The exercise and the control activity were performed in groups of 3 to 9 participants supervised by two physical therapists and one occupational therapist, respectively. The participants in both groups were offered in total 29 sessions, which lasted approximately 45 minutes each, over a period of 3 months.

**Table 1**

Collection of Exercises in the High-Intensity Functional Exercise Program (the HIFE Program): Categories and Examples<sup>a</sup>

Category	Name	Examples of Exercises
A	Static <sup>b</sup> and dynamic <sup>c</sup> balance exercises in combination with lower-limb strength exercises	Squat in a parallel or walking stance Step-up on to boxes Forward or side lunge
B	Dynamic balance exercises in walking	Walking over obstacles Walking on a soft surface Walking with numerous turns
C	Static and dynamic balance exercises in standing	Trunk rotation Body weight transfer in a parallel or walking stance Side step and return
D	Lower-limb strength exercises with continuous balance support	Squat in a parallel or walking stance Standing-up from sitting Heel-raise
E	Walking with continuous balance support	Walking in various directions Walking with numerous turns

a. The HIFE Program, including the collection of exercises, can be obtained from the authors. The load in the lower-limb strength exercises can be increased by adjusting the performance of the exercise (eg, by doing deeper squats or doing step-ups onto a higher box) or by using a weighted belt worn around the waist, loaded with a maximum of 12 kg. The difficulty of each balance exercise can be increased, for example, by standing or walking with a narrower base of support or by standing or walking on a more challenging surface. b. Static balance exercises: fixed base of support. c. Dynamic balance exercises: changing base of support. Note: This table is reprinted from Littbrand H et al. "A high-intensity functional weight-bearing exercise program for older people dependent in activities of daily living and living in residential care facilities: Evaluation of the applicability with focus on cognitive function" *Phys Ther* 2006;86:489-98, with permission of the American Physical Therapy Association. This material is copyrighted, and any further reproduction or distribution is prohibited.

The applicability of the exercise intervention used in the FOPANU Study has been evaluated focusing on cognitive function [5]. For participants randomized to the exercise group (n = 91), the attendance rate was in

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median 76%. Lower-limb strength exercises of high intensity (8–12 repetition maximum) were performed in a median of 53% of the attended exercise sessions, and lower-limb strength exercises of medium (13–15 repetition maximum) or high intensity in a median of 92% of the attended exercise sessions. A total of 179 adverse events occurred in 9% (166) of the 1 906 exercise sessions attended, but no adverse event led to a manifest injury or disease. An adverse event was defined as experiencing discomfort during the exercise session that manifested itself or became worse because of the exercises. Examples of adverse events that occurred were muscle pain or soreness, dizziness, and breathlessness. No statistically significant differences in attendance, intensity or adverse events rates were observed when participants with dementia (n = 47) were compared with participants without dementia (n = 44). Furthermore, there were no significant correlations between these measures of applicability and the MMSE score.

A main clinical implication of the FOPANU Study is that people with severe cognitive impairment can be offered high-intensity functional exercise programs performed in small groups. Counteracting the decline in physical function among older people with dementia is important in order that they might achieve more independence in activities of daily living. Forthcoming papers from the FOPANU Study will evaluate the effects of the exercise program on falls and dependency in ADL, as well as investigate whether the effects for people with dementia and people without dementia were similar.

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