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Effect of functional task training versus resistance training in improving activities of daily living performance in Indian community-dwelling older adults

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Abstract

Introduction. There is little certainty about the effect of different exercise programs on the performance of activities of daily living (ADL). The purpose of this study was to compare the impact of functional task training (FTT) and resistance training (RT) on improving ADL performance in Indian community-dwelling older adults.
Methods. The single-blinded comparative experimental study involved 100 community-dwelling older adults aged 65 years and above. The subjects were randomly assigned to either the FTT group or the RT group. The FTT group (n = 50) performed functional task exercises associated with functional performance and the RT group (n = 50) performed resistance exercises focusing mainly on muscle performance. Exercises were practised in 1-hour sessions, 3 times a week, for 12 weeks. ADL performance of the participants was assessed at baseline and 12 weeks by using the Groningen Activity Restriction Scale.
Results. In both groups, the Wilcoxon signed-rank test revealed a significant difference between median pre-intervention ranks and median post-intervention ranks, indicating a significant improvement in ADL performance in both groups ($p < 0.05$). However, the Mann-Whitney U test demonstrated that the improvement in ADL performance in the FTT group was significantly greater than that in the RT group ($p < 0.05$).
Conclusions. Although both groups significantly enhanced their ADL performance, the improvement achieved by the FTT group was significantly greater than that in the RT group.
Key words: functional task training, resistance training, activities of daily living, older adults

Introduction

Ageing is associated with a decline in functional capacity, which can be defined as the potential of elderly people to decide and act independently in their daily living [1]. Loss of functional capacity ultimately leads to loss of independence, institutionalization, and increased morbidity and mortality [2, 3]. The extent to which older people live independently in the community depends on their capability to execute activities of daily living (ADL) [4]. The ability to perform ADL is thus becoming increasingly important to older people for independent living. There are 2 ADL domains: basic ADL and instrumental ADL. Basic ADL include bathing, getting dressed, eating, drinking, toileting, and walking about the house. Instrumental ADL involve more complex activities within the house, e.g., washing the dishes, cleaning, or preparing meals, as well as outdoor activities, e.g., walking outside the house, shopping, and gardening [5].

The loss of independence results in a decrease in quality of life and is the most distressing aspect of ageing for many older adults. Understanding the factors that cause the decline in independence is necessary for designing successful interventions. The decline is associated with the ageing process, as well as sedentary lifestyle and disease [6]. The working capacity of sedentary individuals has been shown to decrease by 30% between the ages of 30 and 70 years, with half of this decrease being due to disuse and the other half due to ageing [7]. Asymmetric posture and gait and balance problems arising from weakness in the lower extremities may also be accountable for a reduced ability to perform ADL [6].

There is no transparency on the effects of exercise programs on the performance of daily tasks [8–11]. A reason for this may be that the exercise interventions often aim to enhance functional task performance by improving muscle strength, flexibility, or balance. Although resistance exercises are effective in increasing muscle strength in older adults [12], it is not clear whether they are effective in reducing late-life disability in ADL [13]. Moreover, the effects of strength training are limited and poorly translate into enhancement in ADL in older adults. The principle of specificity states that the training should be relevant and appropriate to the activities for which the individual is training in order to generate the desired effect [14]. Therefore, exercise training should be relevant to and mimic the performance of daily tasks so that significant effects are produced. Resistance exercises generally consist of structured, repetitive movements and are very distinct in nature from task-oriented ADL. Functional task training (FTT) involves exercises that are similar to the daily activities performed in day-to-day life. Therefore, this study was determined to compare the effectiveness of FTT and resistance training (RT) in improving ADL performance in community-dwelling older people.

Subjects and methods

Study design and participants

A single-blinded comparative experimental study was performed to evaluate the effectiveness of FTT against RT in improving ADL performance in community-dwelling older

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adults. The study population consisted of 100 community-dwelling older adults recruited from recreational parks and religious places.

Included were both male and female subjects aged 65 years and above who were apparently healthy, physically independent (able to walk with or without an assistive device and without the assistance of another person), without cognitive impairment (Mini-Mental State Examination score of ≥ 24), and able to lift 1.5 kg weight from the floor and stand up.

The exclusion criteria were as follows: neurological disease, uncontrolled low or high blood pressure, uncontrolled cardiovascular or respiratory condition, musculoskeletal diseases or surgeries, taking any kind of medication that could affect balance (i.e., sedatives, anticholinergics, or antipsychotic drugs), as well as active participation in an exercise program.

Of 348 individuals, 100 were included in the study (Figure 1). The participants were randomly assigned to either the FTT group or the RT group by using cards in unmarked envelopes by an independent researcher. The FTT group performed functional task exercises that were associated with functional performance, while the RT group practised resistance exercises which mainly focused on muscle performance. The exercise training was conducted in the Geriatric Physiotherapy Unit of the YCR hospital, Latur, in 1-hour sessions, 3 times a week, for 12 weeks. The sessions were divided into a 10-minute warm-up period, consisting of aerobic exercises; a 40-minute core exercise period; and a 10-minute cool-down period, consisting of flexibility exercises for the limbs and trunk. Exercise intensity in both programs was based on the Borg Rating of Perceived Exertion (Borg CR10) scale [15]. The maximum intensity used was 5, i.e., the 'severe' level of exertion. The participants were asked to report any discomfort immediately. If they rated an exercise 'slight' or 'moderate,' they were instructed to increase the load by raising weight, the number of repetitions, duration, or speed of exercise up to the level where the exercise was rated 'severe'.

Exercise interventions

Functional task training program

1. Stepping on and off a bench.
2. Sit to stand from a chair while holding an object.
3. Stopping on commands while walking.
4. Walking through a curved path.
5. Walking and turning right/left/back.
6. Picking an object from the floor and placing it on a shelf.
7. Walking while passing an object from hand to hand.
8. Walking and avoiding obstacles while listening to music.
9. Walking up and down a ramp while carrying a weighted box.
10. Climbing up and down stairs while carrying a weighted box.
11. Walking and avoiding obstacles while carrying a glass of water on a tray.
12. Walking and passing through a raised surface carrying a glass of water on a tray.

The exercises were progressively increased in the complexity and variability, as the participants gradually became familiar with them. Each of the above exercises was performed for 1 minute. Progressions included an increase in weight (of the box, tray, ball, etc.), duration, or speed of exercise.

Resistance training program

1. Four-way straight leg raises: ankle weights were used to provide resistance.

2. Seated knee extension exercises: these were performed on a quadriceps table.

3. Raising the body up as high as possible on the toes to strengthen plantar flexors.

4. Wall slides: introduced additional weight to bodyweight by holding a dumbbell close to the chest with both hands; alternatively, dumbbells were held in each hand at the sides or over the tops of shoulders flexing elbows.

5. Step-up exercises – forward and lateral: introduced additional weight to bodyweight step-up by holding dumbbells in each hand at the sides or over the tops of shoulders flexing elbows.

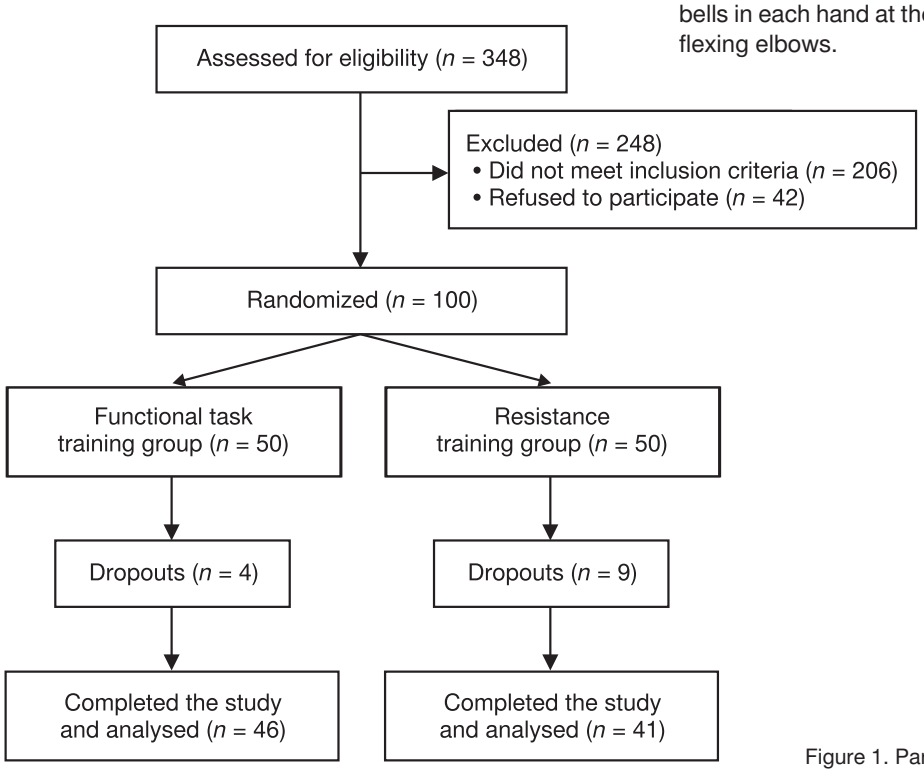

Figure 1. Participants' flow through the trial

Each of the above exercises was performed in 3 sets of 8 repetitions. Minimum weight of 0.5 kg was used where applicable. Progressions included an increase in weight or repetition number and were based on the subject's tolerance, i.e., up to the level of 'severe' on the Borg CR10 scale.

Outcome measure

ADL performance was assessed at baseline and 12 weeks with the Groningen Activity Restriction Scale (GARS). It is a valid and reliable measure for evaluating ADL and instrumental ADL [16]. The scale consists of 18 items: 11 referring to ADL and 7 to instrumental ADL. There are 4 response categories for each item. The minimum score is 18, indicating absence of disability, and the maximum score is 72, indicating that a person is highly disabled (the lower the score, the better the ADL performance). In each question, the individual is asked whether they are able to perform the activity at this moment. The intention is not to assess if the respondent actually performs the activities, but if they can do them if necessary. All the questions refer only to the current disability (within the previous 7 days).

Statistical analysis

The general characteristics of the study groups were compared with an unpaired *t*-test and chi-square test. As the data did not follow normal distribution, the Mann-Whitney *U* test was used to compare the baseline data of the variable (GARS score). For post-intervention analysis, the Wilcoxon signed-rank test and Mann-Whitney *U* test were performed to find out the significance of within-group and between-group differences, respectively. Results were considered statistically significant when 2-tailed *p*-values were smaller than 0.05. The GraphPad Prism 8.3 software was used to perform all analyses.

Ethical approval

The research related to human use has complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the Ethics Committee of the Maharashtra Institute of Physiotherapy, Latur (letter No.: REC/26/2020), and by the Department Research Committee of MV Global University, Jaipur, India (reg. No.: MVGU13PB1PT8).

Informed consent

Informed consent has been obtained from all individuals included in this study.

Results

Of the 100 eligible participants included in the study, 87 completed the program: 46 in the FTT group and 41 in the RT group. No significant differences in age, weight, height, or body mass index were found at the baseline assessment between the 2 groups (Table 1).

Table 2 presents the obtained GARS scores. In the FTT group, the Wilcoxon signed-rank test indicated that the median post-intervention ranks (median = 28) were significantly lower than the median pre-intervention ranks (median = 32.5) ($Z = -5.90$, $p < 0.00001$). In the RT group, the Wilcoxon signed-rank test also indicated that the median post-intervention ranks (median = 29) were significantly lower than the median pre-intervention ranks (median = 30) ($Z = -4.78$, $p < 0.00001$). Thus, both groups improved significantly after the 12 weeks of intervention.

Table 1. Baseline characteristics of the participants

Parameters	Group		*p*
	FTT (*n* = 46) (mean ± *SD*)	RT (*n* = 41) (mean ± *SD*)	
Age (years)	73.41 ± 4.24	72.76 ± 4.16	0.468*
Male gender (*n*)	25	22	0.948†
Female gender (*n*)	21	19	
Height (m)	162.15 ± 7.59	164.24 ± 8.67	0.233*
Weight (kg)	62.57 ± 8.91	62.54 ± 8.55	0.987*
BMI (kg/m^2)	23.71 ± 2.35	23.14 ± 2.27	0.250*
GARS score	32.57 ± 4.61	31.73 ± 4.20	0.395§

FTT – functional task training, RT – resistance training, BMI – body mass index, GARS – Groningen Activity Restriction Scale
* unpaired *t*-test, † chi-square test, § Mann-Whitney *U* test

Table 2. Pre- and post-intervention Groningen Activity Restriction Scale scores

Group	Median		Mean ± *SD*		*Z**	*p**
	Pre	Post	Pre	Post		
FTT	32.5	28	32.57 ± 4.61	28.61 ± 4.56	–5.90	< 0.00001
RT	30	29	31.73 ± 4.20	30.59 ± 4.49	–4.78	< 0.00001

FTT – functional task training, RT – resistance training
* Wilcoxon signed-rank test

Table 3. Comparison of post-intervention GARS scores between the groups

Parameter	FTT group (*n* = 46)		RT group (*n* = 41)		*Z**	*p**
	Median	Mean ± *SD*	Median	Mean ± *SD*		
GARS	28	28.61 ± 4.56	29	30.59 ± 4.49	–2.07	0.038

FTT – functional task training, RT – resistance training, GARS – Groningen Activity Restriction Scale
* Mann-Whitney *U* test

However, between-group analysis performed by the Mann-Whitney *U* test revealed that the improvement in ADL performance was significantly greater in the FTT group (median = 28) than in the RT group (median = 29) ($Z = -2.07$, $p < 0.05$) (Table 3).

Discussion

Participation in a regular exercise program is considered to be an effective strategy to reduce or prevent functional decline with ageing. However, there is little certainty about the impact of exercise programs on the performance of ADL. Resistance strength training is the type of exercise mostly used in trials among older adults, but an increase in strength alone may not be beneficial in producing positive effects on ADL. On that account, an FTT program was utilized in this study to evaluate its influence on ADL. Consequently, this training was proved to be effective and the performance of ADL improved significantly in the group treated with the FTT program. Although it was hypothesized that RT alone would not be effective and despite previous reports that RT was not an effective intervention for elderly population [17], the group that performed RT in this study also improved significantly. The reason may be that the participants were appar-

ently healthy, did not have any major health issues, and were able to perform resistance exercises without much difficulty. A recent meta-analysis also implied that RT was an effective means for improving functional ability in older adults [18]. However, the group that performed FTT advanced significantly better than the group that practised RT in our study.

Effects of functional training and resistance exercises were also compared in other clinical trials. The results of our study corroborate a previous study in which functional task exercises turned out more effective than resistance exercises at improving daily activity performance in healthy elderly women [19]. On the contrary, a randomized control trial reported that neither strength training nor functional training of moderate intensity was an effective intervention for older adults. Moreover, most participants were afraid to exercise at moderate intensity, which was associated with pain in some individuals and difficulties in compliance with the strength training protocol [20]. Likewise, interventions of strength training induced some adverse events, such as muscle and joint pain, in previous studies and literature reviews [21–23]. Even in our study, some participants from the RT group reported joint and muscle pain, which was the main reason for more dropouts from this group (paper submitted for publication elsewhere). It was also found that the effects of resistance exercises on functional activities of older adults were contradictory [13, 24]. The muscle strength gained by RT in older adults may not last overtime [25].

A functional training program can alter markers of physical frailty in frail adults as well. Functional independence (Barthel Index score) was significantly improved in frail community-dwelling adults who received a functional circuit training program [26]. But this did not happen with the frail older adults who were prescribed group exercises in another study [27]. ADL performance did not show significant improvement, possibly because of the type of exercises that were administrated to the frail older adults. It was recommended in the study that an individual exercise program might therefore be more beneficial for frail older adults [27]. A recent pilot study reported that functional task exercises were effective in improving memory and functional status of older adults with mild cognitive impairment [28]. Mulder [29] stated that these exercises involved an interplay of cognitive, perceptual, and motor functions. The exercise program for older people should be feasible and well tolerated, with no side effects. A previous study suggested that the applied functional task exercise program was feasible and the training compliance was also high [30].

In past research, it was found that the effect of functional task training was preserved for a longer time than the gain achieved with RT [19]. In view of this, it is believed that FTT can generate long-lasting effects, improve older people's functional capacity, and, thus, ease the performance of ADL. When addressing disability in the elderly, additional evidence also suggests that FTT may be more effective than RT in preventing functional decline by decreasing activity limitations and participation restrictions [31].

The specificity of training principle was also supported by a systemic review: the best gains in ADL performance can be achieved when the training closely mimics the performance. Therefore, functional training can be considered a better option than RT alone if the aim is to improve ADL performance in older adults [32]. The present study results confirm that FTT is superior to RT. The reason could be that the functional task exercises look a lot like the usual daily activities; as a result, one does not feel any difficulty while learning these activities and can put them into practice in daily life tasks. Conversely, resistance exercises do not suit daily life situations, and so one may not consider continuing them in their leisure time. Thus, an intervention consisting of functional training would yield enhanced results as compared with other forms of training when administered to older people.

Limitations

There are two major limitations in this study that could be addressed in future research. First, only one outcome measure was used, which is a self-reported measure to evaluate ADL performance. Second, the study lacks trial follow-up.

Clinical implications

As functional task exercises are closely associated with the performance of daily tasks, incorporation of FTT in exercise interventions would be beneficial to older adults to enhance functionality and independence.

Conclusions

Although ADL performance of both groups enhanced significantly after the intervention, the improvement achieved by the FTT group was significantly greater than that in the RT group.

Disclosure statement

No author has any financial interest or received any financial benefit from this research.

Conflict of interest

The authors state no conflict of interest.

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