Original Article

Determination of Agility in Elderly using Assistive Device by 8 Foot Up and Go Test

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Abstract

Background: With increasing age agility starts declining. Use of an assistive device hopefully aids in improving balance, agility, and confidence. There are fewer studies of objective quantification of agility with the use of the assistive device. This study aims to determine the agility in elderly using an assistive device by 8 foot up and go test.

Methods: A comparative, experimental study was done on 60 Healthy adults of age 75 to 85 years. Subjects were asked to perform 8 foot up and go agility test initially without assistive device and then with an assistive device. The time in seconds was noted respectively. The mean of the two trials each was calculated. The data were analyzed using the paired t-test.

Results: There was a statistically significant difference in mean agility score on 8 foot up and go test between subjects without an assistive device (12.33 ± 3.21 seconds) and with an assistive device (13.33 ± 3.39 seconds). Subjects when given assistive device took a longer time to complete the 8 foot up and go agility test than they required for completing it without an assistive device.

Conclusion: There was a significant decrease in agility in elderly using an assistive device as shown by the increase in time taken to complete the 8 foot up and go agility test. There is a need for cautious clinical prescription practice for mobility aids.

Keywords: Agility, Assistive device, 8 foot up and go test, Ageing.

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Introduction

Ageing progressively impairs sight, vestibular input, and somatosensory information, which results in a reduction of environmental perception and precision of movements. On the other hand, ageing also impairs functioning by reducing the number of muscle and nerve fibres, which bring a reduction in muscle strength and power.[1] Ageing is a dynamic, progressive, physiological process accompanied by morphological and functional changes[2]. For these reasons, individuals who are beyond 50 years old may start to experience manifestations of imbalance and body instability. Therefore, simple activities like standing up or rising from a chair may become limited or even dangerous, because they are dependent on both gait and balance[3]. Moreover, the ageing process tends to reduce physical fitness (strength, endurance, agility and flexibility) and results in difficulties in daily life activities and normal functioning of the elderly.[4] Because of this process, the elderly are more prone to the risk of fall due to lack of agility, negligence towards the use of assistive device, social stigma etc.

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Functional mobility, loosely defined as the ability to access one's environment, is considered a significant contributor to maintaining the quality of life at any age.[5] Much of the loss in functional mobility leading to increased disability and falls can be preventable or at less treatable through early detection and targeted interventions.[6] The functional ability can be improved with the use of portable devices, such as crutches, canes and walkers (assistive devices, mobility aid). Mobility aids have a direct physical and psychologic effect on the health of users. Mobility aids can increase older adults' confidence and feelings of safety, which, in turn, can raise their levels of activity and independence. Such mobility aids are often required by older adults or by people with various clinical conditions so that they can move about independently and maintain their balance. Also, these aids can help reduce lower-limb loading and thereby alleviate joint pain or compensate for weakness or injury[7]. There is need to find out the effectiveness of assistive device on agility in elderly individuals.

Agility is the ability to change the body's position efficiently and requires the integration of isolated movement skills using a combination of balance, coordination, speed, reflexes, strength and endurance. There are many agility tests like Timed Up and Go test, AAPHERD functional fitness test, ten-step test etc. Eight foot up and go test is an objective tool for assessing agility in the older population, and fewer data are available on this test.

8 foot up and go (Rikli and Jones) is a composite measure involving power, agility, speed and dynamic balance (an integration of neuro-muscular system). This test is part of the Senior Fitness Test protocol. It is modified version of TUG (3m/9.84 foot).[6] In order to increase the feasibility of administrating the test in a home setting, Rikli and Jones reduced the overall distance required to perform the test to 8 ft (2.44 m).This shorter version of the test requires participants to rise from a chair, walk 8 ft to and around a cone, walk back, and sit down in shortest possible time.[6]

This study aims to determine the agility using an assistive device in elderly by 8 foot up and go test.

Materials and Methods

Sample Selection: Sixty participants were selected between the age group 75 to 85 years for comparative, experimental study. Inclusion criteria were individuals using corrective glasses, using hearing aids and those willing to participate. Exclusion criteria were any recent trauma and musculoskeletal problems or any continuous pain in upper limb, lower limb, spine, individuals with neurological conditions, uncontrolled cardiovascular conditions, any sensory abnormalities, psychological problems, any vestibular dysfunction, recent surgeries of lower limb, spine, already using an assistive device, or already undergoing physiotherapy treatment. The Institutional Ethical Review Board approved the study. Informed written consent was obtained from all subjects who participated in the study.

The procedure of 8 foot up and go

Demonstration of 8 foot up and go test was shown, and two trials were given to the subject.

A chair was placed at the starting point. From there 8 foot (2.44 m) distance was marked with the help of a measuring tape. At the end of this distance, a cone was placed.

Part-1: Subject in sitting, hands resting on the knees and feet flat on the ground. He gets up from the chair, walks as quickly as possible (no running) 8 feet to and around the cone and return to the chair in shortest possible time. Time begins with a verbal sign "go" and ends when the individual's buttock touches the chair.

Time (seconds) was noted. 2-3 minutes rest pause was given. Again, the subject was asked to perform the same test.

Part 2- A tripod (adjustable tripods according to the height of the subjects) was given to the individual in hand. Again, he was instructed to perform the test with the assistive device (tripod) and walk with the support of the tripod. Time (seconds) was noted. Again the subject performed the second trial with the assistive device.

Part 3- Mean of the two timings, without and with the assistive device (tripod) was calculated.

Statistical Analysis: Mean of the time noted for 8 foot up and go test with and without assistive device was used for statistical analysis. The data was initially tested for normal distribution using the one sample Kolmogorov Smirnov test for Normality. Since the data were normally distributed, the parametric test was used. The comparison in the mean of time (seconds) taken to complete agility test with and without assistive device was analyzed using paired t-test.

Results

The result of paired t-test shows that there was a significant difference in time taken for

performing agility test between assistive and without an assistive device ($p<0.05$). Table 1 shows the difference in mean and standard deviation of time (seconds) taken for performing 8 foot up and go with and without an assistive device. It was seen that mean ± SD without assistive device was (12.33 ± 3.21) seconds and with the assistive device was (13.33 ± 3.39) seconds in 60 subjects. Effect Size as proposed by Cohen (1988), is an important tool in reporting and interpreting effectiveness of a study. Effect Size (ES), is estimated by the difference in means between the two groups divided by the standard deviation of the control group. It is the measure of the strength of the phenomenon, i.e. the relationship between the two variables. It quantifies the size of the difference between two groups, and may, therefore, be said to be a true measure of the significance of the difference, i.e. agility without assistive device and with an assistive device.

Table 1: Comparison of mean and standard deviation between agility without and with an assistive device.

Agility	Mean (seconds)	Std. deviation	Significance
Without Assistive Device	12.33	3.21	0.0002
With Assistive device	13.33	3.39	

*$p<0.05$

As seen in Table 2, after calculating effect size from the readings, our study falls in a group of moderate clinical significance (0.31).

Table 2: Calculation of effect size using Cohen's formula

Time (sec)	Without assistive device	With assistive device
Mean	12.33	13.33
Difference in mean	1.00	
Standard deviation	3.21	
Effect size	0.31	
Significance	Moderate	

Discussion

Determination of Agility in healthy elderly subjects between the age group 75 to 85 years showed that there was a significant increase in time taken to complete the 8 foot up and go agility test using the assistive device. Clinical benefits of assistive devices such as to improve mobility, help to maintain balance while performing activities of daily living, for prevention of falls, compensate for muscle weakness, increase confidence and feeling of safety in healthy individuals and individuals with musculoskeletal and neurological disorders have been reported.[8] Nascimento LR et al. concluded that provision of single tip cane might help in improving the walking speed of slow and intermediate walkers after stroke[9]. But our study showed that healthy elderly subjects with assistive device took a longer time to complete the 8 foot up and go agility test.

The probable reason could be that assistive device might have caused hindrance or obstacle to the normal accustomed walking speed of elderly individuals. Sara, M. Bradley hypothesized that the act of lifting and advancing the assistive device causes destabilization of biomechanical forces and balance, thus disrupting the attention towards controlling the device. In our study, the sudden addition of assistive device for normal accustomed activity i.e. walking might have caused destabilization of biomechanical forces, disturbance in attention and balance, thus causing an increase in time taken to complete the agility test.[8] The other reasons contributed to the increased time to complete the agility test could be incorrect cane height, placement of cane on improper hand, inability to maintain proper reciprocal gait pattern and improper posture during ambulation as explained by Hao Liu et al.[10]

Chen et al., in his study of 20 stroke patients discussed that people with hemiplegic stroke who walk with a cane have relatively slower velocities, shorter stride lengths, lesser cadence and longer stride time. The average walking speed was 15.5 cm/sec but in normal subjects was 106 cm/sec, 73 cm/sec in unassisted people with hemiplegic stroke and 55 to 60 cm/sec in people with orthopaedic problems with cane assistance.[11] Again, Anne Cook in her study showed that Timed Up and Go test with no assistive device was 9.0 secs (range 6.4-13.4 seconds) and that time taken to complete Timed Up and Go test with a cane was 18.1 seconds (range 14.6 – 22.3 seconds).[12]

M Pine et al. also concluded that older people who deny any difficulty in walking but still use cane are at a greater risk of developing difficulty in walking and other new mobility problems compared to those who do not use a cane while walking.[13]

Clinical observation and empirical evidence indicated a high prevalence of disuse and abandonment of mobility aids among older adults. Surveys indicated that almost half of the reported

problems associated with the use of cane or walker fall under the category of difficulty and/or risky to use. Such a high rate of disuse and/or dissatisfaction raises questions about the device effectiveness.[14]

The relation between mobility aid use and risk of fall is less clear. Several studies have found that use of mobility aid is a prospective predictor of falls, increased risk of fall in older adults or associated with falls and related injuries. Although some have suggested that use of mobility aids may simply be an indicator of balance impairment, functional decline and/or falling risk.[14]

Conversely, others have argued that use of assistive devices may increase the risk of fall by causing tripping or by disrupting balance control through other mechanisms. (eg. by competing for attentional demands). Recent studies have characterized the demands associated with mobility aids and have identified situations in which these mobility aids can potentially jeopardize stability.[14]

Ultimately, we anticipate that such research may lead to cautious clinical prescription practices, improved guidelines for mobility aid safety, and improved designs for safer and more effective mobility aid devices.[14]

Conclusion

There was a significant decrease in agility as shown by the increased time taken to complete the 8 foot up and go agility test in healthy elderly subjects using an assistive device. There is a need for cautious clinical prescription practice for mobility aids.

Conflicts of interest: None

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