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Comparison of Dual Task Performance in Young Adults, Middle Aged Adults and Geriatric Population

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Abstract: ***Introduction*: Dual-task performance is defined as simultaneous execution of primary and a secondary task. The dual task performance is associated with functionality and it becomes more complex with age. The purpose of the study was to compare dual task performance of various age groups. *Method*: Forty-five individuals were divided in three groups depending upon their age. Group A consisted of individuals of 20-40 years, group B consisted of 41-65 years and group C consisted of adults 65 years and above. Individuals having cognitive decline and known case of Alzheimer's stroke or Parkinsonism or those with visual impairment were excluded from the study. Each individual was made to walk for 3 minutes. Their speed was calculated. They were then made to walk again for 3 minutes at self-selected speed and questions were asked while they were walking the second time. The difference in their speeds of the two sessions was calculated. *Results*: The mean difference in speed while walking and dual tasking in Group A was 0.15+0.14 m/s, Group B was 0.17+0.33 m/s for Group C was 0.37+0.07 m/s. Using Kruskal Wallis test there was significant difference (Kw= 8.87, p= 0.012) in speed of walking while single task and dual tasking between the three groups. Post hoc analysis showed difference between groups A and C and A and B to be significant (p=0.019, 0.03 respectively) *Conclusion*: There is difference in ability to perform dual tasks between young adults, middle aged adults and older adults.***

Keywords: Dual task, young adults, geriatrics, falls

1. Introduction

Dual-task performance is defined as simultaneous execution of primary and a secondary task. Dual task performance is common in everyday lives of individuals of all age groups.In healthy persons, dual tasks have been shown to affect walking performance Falling in the elderly represents a major public healthissue due to a high prevalence.It has been reported in other studies that one in three community-dwelling persons over 65 years of age fall at least once a year and more 50% olderadults aged over 80 years' experience falls.[2] Age-associated changes in gait characteristics, such as lower walking speed , reduced step length and increased step time have been found[2,3]. A more conscious gait pattern, however, may require more cognitive control and result in an attention demanding form of locomotion. Walking requires more cognitive control and becomes less automated. Hence old aged people become more prone to be influenced by concurrent (cognitive) dual tasks. As with aging or in pathologic conditions, the gait changes in response to dual tasking have a destabilizing effect on the gait pattern.[3,4]Many falls in balance-impaired older individuals do not typically occur during normal walking conditions, but rather when they are walking and simultaneously performing a secondary task such as talking.Gait and balance disorders are suggested to better predict imminent falls than risk factors in other domains such as impaired vision and medication 4Therefore, the objective quantification of gait and balance disorders to detect persons who have high risk of falls is of utmost importance especially in geriatric. Fall risk assessment is the firststep towards efficient fall prevention strategies [3]. When assessing the risk of fall, not only intrinsic (subject related)but also extrinsic (environment-related) and behavioural (activity-related) factors need to be considered[4]. Unfortunately, multifactorial falling risk assessmentis often complex and rather time-consuming andtherefore not easy to systematically implement in clinicalroutine [2,3,4], Recently, Beauchet et al. showed that faster countingwhile walking was strongly associated with the occurrenceof a first fall, suggesting that a better performancein an additional backward counting task whilewalking might represent a new, efficient way to predictfalls among older adults. No dual-task-related gait changeswere reported in this study. It has been shown thatbackward counting interferes with gait and more particularly with gait stability[5].

With increasing age, the change in gait pattern as explained above occur because of various reasons which arelikely multifactorial and include deficits in physiologicfunction such as impaired joint range of motion and muscleperformance and deficits in neuropsychological orcognitive status that may exacerbate the effects ofimpaired physiologic capacity [8]. Several studies haveexamined age-related changes in gait stability over thepast decade [9,11]. There has been found that there is profound increase in gait variability while dual tasking as compared to younger adults.Gait variability observed in the dual task walking condition characterizes impaired execution of gait that reflects gait instability and indicates that cognitively challenging tasks performed while walking may place older persons at greater risks of falls.[12]As there have been deficient studies performed on Indian population comparing the dual task performance of three age groups, this study was done to compare the dual task performance in different age groups.

2. Methodology

Anobservational Analytical study was conducted using purposive sampling was. The sourcefor the sample for the subjects who were young adults were from SBB college of physiotherapy, middle aged and older adults were from Physiotherapy dept. of VS general hospital, housing society of Ahmedabad and old age home of Ahmedabad. Sample size was 45. Adults who were able to walk independently without the use of any external aid were included in the study. Any subject withcognitivedecline or is a known case ofAlzheimer's disease, Stroke, Parkinsonismwere not included in the study. Any individual withvisual impairment were excluded from the study.Forty-five individuals were divided in three groups depending upon their age.Group A consisted of individuals of 20-40 years, group B consisted of 40-65 years and group C consisted of adults 65 years and above.Subjects were instructed to walk at self-selected speeds across a 10-meter walkway for 3 minutes and the distance they covered was measured.In the dual-task condition, participants responded to various questions while walking and the speed was noted. The difference in their speeds of the two sessions was calculated. Level of significance was kept at 5%.

3. Results

The mean age of Group A was 22.8 ±1.56 years Group B was 50.5 ±5.25 years and group C was 74.3±6.05 years. Krushal Wallis test was applied to test speed difference between the groups.

Table 1: Comparison of mean speed of each group during single task and dual task

Groups	Speed during single task m/s	Speed during dual task m/s	Mean difference of speed	Kw Value	P value
A	0.86± 0.08	0.59±0.08	0.15+0.14	8.87	0.01
B	0.75±0.07	0.68±0.11	0.17+0.33		
C	0.51±0.11	0.37±0.12	0.37+0.07		

P value is 0.01. Post hoc analysis showed difference between groups And B (p= 0.002), B and C p=(0.01) and A and C (p=0.03) to be significant.

4. Discussion

In the present study significant difference was found in dual task performance between the younger adults and middle-aged group as well as between middle age group and geriatric population and between young adults and geriatric population. This result was similar to the study by Vaportzis et al [1] which concluded that older adults were significantly slower in dual task conditions compared to younger adults.The reason could be that under dual task demands, older adults adopt different strategies than younger adults, and these depend on both complexity and difficulty level of the cognitive tasks. The differential pattern of performance across the lifespan affects both processing speed and processing accuracy.[3,4].Van Lersel et al found that in fit older adults, cognitive dual-tasks influence balance control during walking directly as well as indirectly through reduction of gait speed, and that reduced gait velocity can be a strategy with which to maintain balance in more difficult circumstances. [13]Studies have shown that young adults significantly reduce their gait speed when texting while walking.[13]That study shows that young adults do not spontaneously modify their texting and walking behaviour with environment.For older adults, daily living activities, in which several simultaneous activities need to be appropriately combined, can turn into complex multitask situations and, thus, increase the risk of falling. [13]

Dual tasking increases safety risks for young adults and geriatric population both.Though for older adults it has been reported that older adults in a dual task condition tend to adopt the walking-first strategy even when they were instructed to primarily attend to a secondary motor task while walking.[14]Shmuel et al reported dual tasking destabilizes the gait of idiopathic elderly fallers in comparison to younger adults and elderly non-fallers. This could be mediated by decline in executive function. It refers to cognitive processes that orchestrate goal-directed activities and allocate attention among competing tasks and has been defined as the complex process by which an individual goes about performing a novel problem-solving task from its inception to its completion.[15] In contrast to the present study a study comparing middle aged and older adults showed age had low correlation with dual task performance while cognition level and attention played major role.[16]

Limitation of the present study is that it did not assess speed difference of fallers. But as it has already been established that rate of falls is more while dual tasking, effect of dual task training on falls and the improvement can be done in future.

5. Conclusion

Dual task training may be essential in middle aged and geriatric population because as shown dual tasking performance is different between young adults and middle aged adults , middle aged adults and geriatric population, young adults and geriatric population.

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