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Influence of instructions regarding task prioritization on performance while doing time up and go - cognitive task in elderly: - A quasi-experimental study

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ABSTRACT

Aim and objective: - The study was design to find the influence of task prioritization instructions on performance while doing Time Up and Go - Cognitive in the elderly and to compare the performance of the elderly for dual-task (TUG-C) in three different situation of task prioritization. i.e. no priority, motor priority and cognitive priority.

Methods: Ethical clearance was taken from the ethical committee. TUG-C test was chosen for dual task. Participants were asked to perform single task (motor and cognitive) first and then dual task with priority instruction based on chit method. Time taken to complete the test and the accuracy of the secondary task was calculated in percentage. Statistical analysis was done.

Conclusion: Elderlies were able to prioritize on the motor task and enhance performance in motor priority condition with priority instruction but no difference was seen in cognitive performance with priority instructions.

Keywords: Dual-task, Prioritization, Instructions.

INTRODUCTION

Aging is a progressive, physiological, and dynamic process that is accompanied by functional, morphological, biochemical, and psychological changes. Being the second-most populous country in the world, India shows a sharp increase in the elderly population[(1).] Walking is a complex task that requires the integration of multiple sensory information. Our everyday life consists of numerous situations in which walking must be integrated with other activities, such as watching out for vehicular traffic or using a mobile phone. This concurrence of locomotion with another activity is termed as dual-tasking[(2,3).] Age-related changes affect motor functions leading to decrease in walking speed and stride length, and increase in lateral sway and stride time[(4,5).] "Cognitive capacity", is the background capacity and play an important role in performing that task effectively[(6).] Several studies have shown that, gait in older adults is not simply an automatic process but is influenced by cognitive or motor capacity[(7,8).] Relationship between these two depends on the domains of the dual task component. Gait in a dual-task is a multidimensional task[(9).] Thus, an individual needs intact cognition and motor ability to do such a task effectively[(10).] The ability of the individual to perform dual tasks depends on the prioritization of the task and availability of the resource. Two tasks are said to interfere when simultaneous task execution results in decreased performance on one or both tasks[(11).] Task interference can be understood by various theories of dual task. Task interference is also a convenient construct to investigate preferences in task prioritization because when there is task interference person has to prioritize a single task for better performance[(11).]

Analysing such interference pattern can help us to understand priority or attention allotted to physical or cognitive component, while doing the two tasks together. This information when gained will be helpful for the assessment and treatment of elderly in dual task situation. As, motor and cognitive resources are limited in elderly, dual-task skills also can be affected [7,11]. According to a few studies, the elderly prioritize postural tasks (posture first strategy) as a means of fall prevention[12,13], whereas other studies suggest that, they follow the cognitive first strategy[9]. Thus, there is a need to explore this area. This information, if known, can help in training and fall prevention strategy development in elderly. Thus, this study was done with objective to understand any change in prioritization with instruction and will also help to resolve the conflict between the different studies.

Aim and objective of the study was to find the influence of task prioritization instructions on performance while doing Time Up and Go - Cognitive in the elderly and to compare the performance of the elderly for dual-task (TUG-C) in three different situation of task prioritization. These were first without any instructions (no priority), second with instruction to concentrate on the motor task (motor priority) and third with instruction to concentrate on the cognitive task (cognitive priority).

Materials and methods.

Institutional ethics committee clearance was taken. A pilot study was performed mean and SD was calculated from it. The estimated sample size was 115by using formula: - $(Z\alpha/2 + Z\beta/2)^2 (SD1^2 + SD2^2) / (Mean1 – Mean2)^2$. ($\propto = 0.01$, $\beta = 0.10$), SD1 = 2.13 and SD2 = 2.98. Elderly with no depression (GDS 0-9) and able to walk 20 meters without walking aid was asked to sign written informed consent for participation. Those having a neurological condition, pain (VAS >4), peripheral vascular disease, orthopaedic conditions, vestibular processing insufficiency, and on pharmaceutical agents like antidepressants, etc which affect cognition or alertness were excluded. Any fall or injury during assessment was the withdrawal criteria.

TUG- Cognitive test was chosen (Individuals get up from the chair, walk 3 meters as quickly and safely as possible, cross a line marked on the floor, turn around, walk back, and sit down. Along with that they are supposed to subtract a random number by 3. Time taken to complete the test noted in seconds and accuracy of the subtraction task was calculated in percentage. Participants were asked to perform the single task of both cognitive and motor domain first and then was followed by dual task without and with prioritization instruction on cognitive and motor domain respectively. This sequence was decided by chit method, prior practice was given for the task with an adequate rest period in between as per the subject's preference.

METHODS

Ethical clearance was taken from the ethical committee. TUG-C test was chosen for dual task. Participants were asked to perform single task (motor and cognitive) first and then dual task with priority instruction based on chit method. Time taken to complete the test and the accuracy of the secondary task was calculated in percentage. Statistical analysis was done.

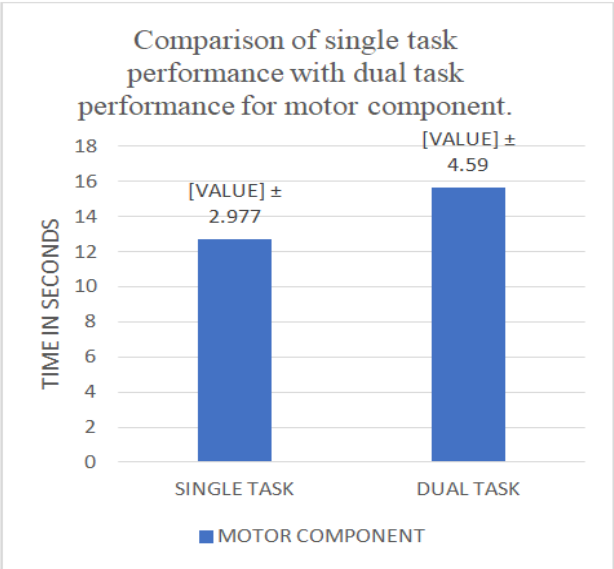
RESULTS

Table 1: Demographic data

Age (years)	**No of participants.**
60 - 74	91
75 – 89	23
Gender	
Male	56
Female	59

Table 2: Comparison of single task performance with dual task performance for motor and cognitive component.

	MOTOR COMPONENT		**COGNITIVE COMPONENT**	
	SINGLE TASK	**DUAL TASK**	**SINGLE TASK**	**DUAL TASK**
MEAN	12.70 sec	15.65 sec	94.0 %	91.31 %
SD	2.977 sec	4.59 sec	11.13 %	15.12 %
P VALUE	<0.0001		0.1263	



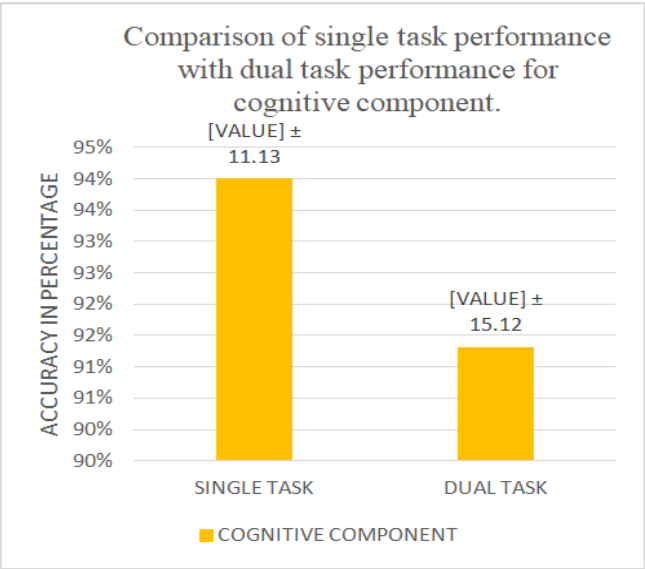
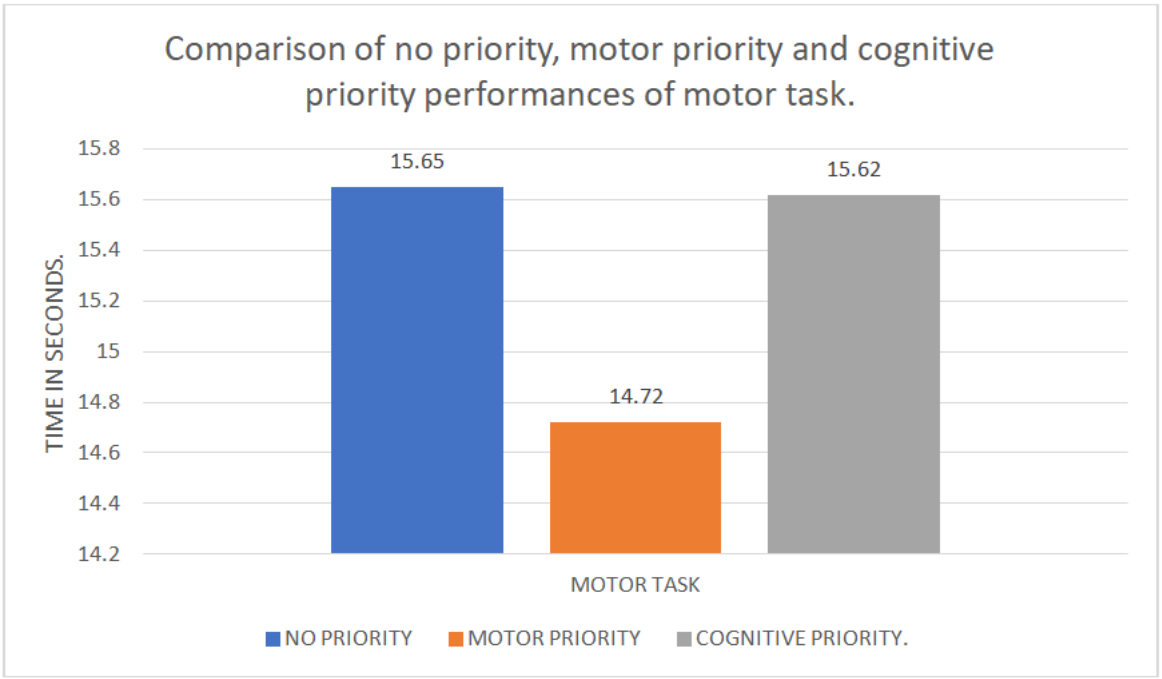


Table 3: Values of no priority, motor priority and cognitive priority performances

	MOTOR COMPONENT		COGNITIVE COMPONENT	
	MEAN (SEC)	SD	MEAN (%)	SD
NO PRIORITY	15.65	4.59	91.31	15.124
COGNITIVE PRIORITY	15.62	4.863	93.88	11.812
MOTOR PRIORITY	14.72	4.12	89.67	15.893

Statistical analysis: Kruskal Wallis test.



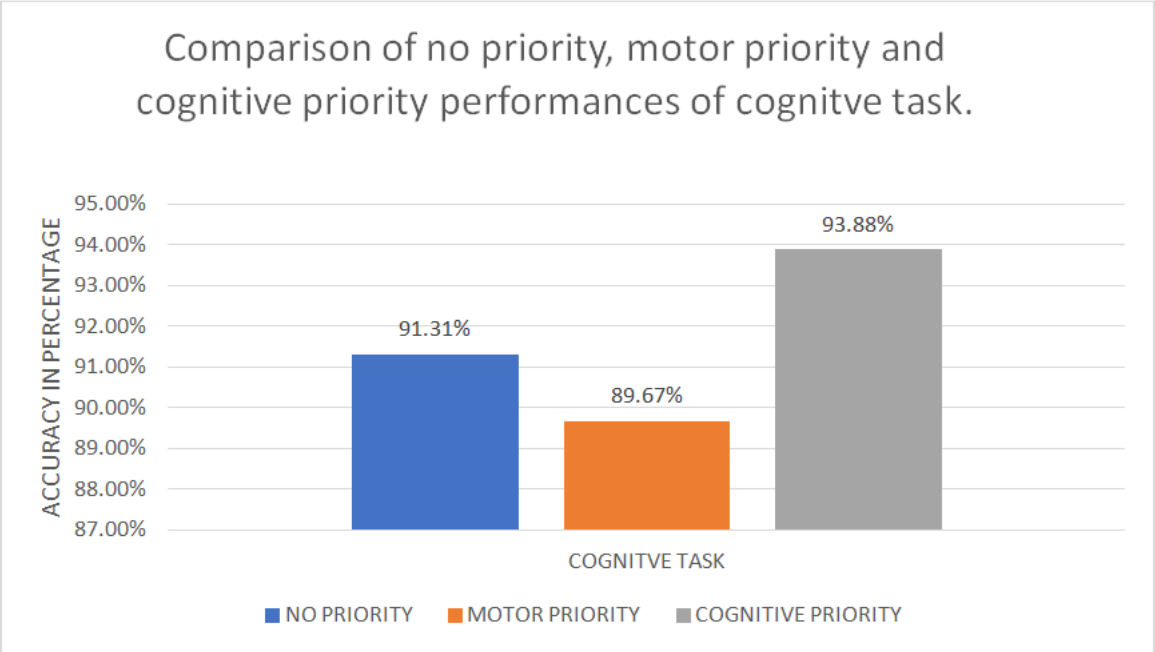


Table 4: Comparison of no priority, motor priority and cognitive priority performances

Motor task comparison. Dual-task cost (p = 0.0224) considered significant		
	p- value	**Inference**
No priority V/s cognitive priority	> 0.05	Not Significant
No priority V/S motor priority	<0.05	Significant
Cognitive priority v/s motor priority	>0.05	Not significant
Cognitive task comparison. Dual-task cost cognitive (p = 0.1191) considered not significant.		
	p- value	**Inference**
No priority V/s cognitive priority	> 0.05	Not Significant
No priority V/S motor priority	> 0.05	Not Significant
Cognitive priority v/s motor priority	> 0.05	Not Significant

DISCUSSION

Participants of this study demonstrated significant decline in motor component while performing with TUG- cognitive task. These observed results are consistent with the previous results seen by Olivier Beauchet et al that there is a decrease in performance while dual tasking[14]. Other studies also report the same i.e. performance of the task where attention is required, have a decremental effect on gait[15]. There was no difference in the cognitive component performance in DT when compared with ST.

Participants showed significant difference in the performance of motor component when no priority and motor priority condition were compared (P value < 0.05) of TUG-C. Thus, suggesting that the elderly could follow the instructions of prioritization on motor task and modify their performance. Probable reasons for a significant difference in the motor task performance can be that participants have used posture first strategy motor task would have been found more difficult. Hence, they adopted this strategy to maintain balance [16]. Motor task performance would have given them pleasure. Hence, would have led to prioritization of motor task [16,17]. According to positive effect of bottle neck participants might have concentrated more on motor task. Thus, information of motor task would have been processed first from the bottle neck also participants might have felt cognitive task to be easy. Hence, they allocated all the attention and resource to motor task[18]. Motor component of TUG in commonly practiced daily. Thus, reducing the time required to process the information of the task[19] Understanding of the instructions also play a major role participants might have perceived that instruction of motor prioritization is more important to finish the task than cognitive component[20]. As patient had successfully prioritized the motor component the resources for cognitive component reduced also the instruction to maintain prioritization n is a cognitively demanding activity. Thus, requiring more cognitive resources[17]. Hence, there was reduction in the performance but was insignificant.

When no priority condition and cognitive priority dual-task no statistically significant difference was observed in the performance of motor as well as cognitive components the reasons can be reduced mental flexibility. Different studies have claimed that cognitive flexibility is reduced in elderly and affect the prioritization[20,21]. As with aging mental flexibility is reduced. Thus, prioritization of task is also affected. Attention allocation index: - Index is to measure the flexibility of allocation of attention to the task in dual task condition. In elderly this index is affected. Thus, they cannot allocate more attention to cognitive task[21]. All the participant were well educated. Thus, they might have felt cognitive task to be too easy and didn't allocate more attention to it. Higher education may increase cognitive reserve and thereby making the task easier to perform [22].

The limitation of this study was impact of gender, environmental complexities and distractions which can influence dual task performance of an elderly while doing assessment was not considered during study. Also, the difficulty of cognitive task was not same as the number allocated for serial subtraction was randomly allocated.

CONCLUSION

Task prioritization instructions influence performance of the elderly while doing motor task. Elderlies were able to prioritize on the motor task and enhance performance in motor priority condition with priority instruction of motor task. In cognitive priority condition, there was no change in performance suggesting of unsuccessful prioritization towards the cognitive task.

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