



Original Research Article

A Descriptive Correlational Study: Dual Task Performance and Physical Activity among Young Adults, Middle Age, Adults and Geriatric Population of India

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Abstract

Background: Dual tasking is the ability to execute two tasks simultaneously. It is necessary and commonly used by human beings in the performance of various activities of daily living. Physical activity is defined as any voluntary bodily movement produced by skeletal muscle that requires energy expenditure. Physical activity encompasses all activities, at any intensity, performed during any time of day or night. It includes exercise and incidental activity integrated into daily activity. **Aims:** Compare the dual-task performance in young adults, middle aged adults and geriatric population and to correlate the dual-task performance with physical activity **Method:** Sixty individuals who fulfilled inclusion criteria were divided into three age groups that is young, middle and geriatric. Initial screening was done using IPAQ. Followed by this each individual was asked to perform TUG, TUG DT motor and TUG DT cognitive. **Result:** The result of the study revealed that majority of the population are classified under low level of physical activity with the mean score of 639.5 MET, and according to dual task performance the time taken by geriatric was higher compare to middle and young age population. **Conclusion:** The study concluded that physical activity level was found higher in young age than middle age and geriatric population. There is significant difference in dual task performance between young, middle and geriatric population.

Keywords: Physical activity, time up and go test (TUG), Time up and go dual task, motor and cognitive

INTRODUCTION

Dual tasking is the ability to execute two tasks simultaneously. It is necessary and commonly used by human beings in the performance of various activities of daily living. This capability represents an evolutionary advantage, since it allows the individual to perform various activities concurrently, with lower neural activation, using less than with doing the same tasks separately. The loss that one - or both - suffers is called dual task interference. Its presence creates disadvantages and may lead to the risk of bodily injury when one of them requires close postural control or screening of environmental risks.^[1]

Three theoretical models were developed in order to explain the dual task interference. The capacity theory - or theory of sharing resources (the capacity model), is based on the assumption that the attention resources are limited, leading to loss in the execution of one or two tasks when the processing capacity is exceeded. The crossed communication theory (the cross-talk model) explains that similar tasks use the same routes, thereby reducing the risk of dual task interference. Finally, the bottleneck theory (the bottleneck model), in contrast to the previous theory, says that similar tasks are competing for the same processing routes, generating loss in performing one or both tasks.

Depending on the type of activities performed, the dual task can be motor, cognitive, or motor-cognitive. A rehabilitation strategy increasingly used is the dual task training, which seeks to facilitate, by means of conducting concurrent functional activities, the allocation of attention resources, thus decreasing the dual task interference.

The executive functions, especially the divided attention, verified by the completion of concurrent tasks, have raised the interest in both observational studies as well as in intervention studies. This indicates that the performance in dual

tasking can be an important item in both the evaluative approach as well as in the physiotherapeutic intervention. The present study will approach the use of dual taking exclusively as an intervention strategy.

Physical activity is defined as any voluntary bodily movement produced by skeletal muscle that requires energy expenditure. Physical activity encompasses all activities, at any intensity, performed during any time of day or night. It includes exercise and incidental activity integrated into daily activity. This integrated activity may not be planned, structured, repetitive or purposeful for the improvement of fitness, and may include activities such as walking to the local shop, cleaning, working, active transport etc. Lack of physical activity is associated with a range of negative health outcomes whereas increased physical activity can improve physical as well as mental health. Physical activity increases energy expenditure and is a key regulator in controlling body weight.^[2]

Physical activity can be at any intensity, from a simple twitch of a muscle, to an all-out sprint. For practicality, physical activity can be viewed as a continuum from sedentary behaviour to vigorous intensity activity. Intensities are broadly categorized according to energy expenditure using a standard measure of intensity, metabolic equivalents (METs). The broad categories are sedentary behaviour, light activity, moderate activity and vigorous activity.

World health organization has recommended different levels of physical activity including sleep and sedentary behaviour for various age groups they are as follows:^[3]

Children and Adolescents age: 5–17 years

1. Children and youth aged 5–17 should accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily.
2. Amounts of physical activity greater than 60 minutes provide additional health benefits.
3. Most of the daily physical activity should be aerobic. Vigorous-intensity activities should be incorporated, including those that strengthen muscle and bone, at least 3 times per week

Adults age:-18–30 years

1. Adults aged 18–30 should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 100 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous- intensity activity.
2. Aerobic activity should be performed in bouts of at least 10 minutes duration.
3. For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous- intensity activity.
4. Muscle-strengthening activities should be done involving major muscle groups on 2 or more days a week.

Adults aged: 31- 55 years

1. Adults aged 31 to 55 years should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity.
2. Aerobic activity should be performed in bouts of at least 10 minutes 2 days a week.
3. For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 150 minutes per week, or engage in 70 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate-and vigorous- intensity activity.
4. Muscle -strengthening activities should be done involving major muscle groups, on 1 or more days a week.

Adults aged: 56+ years

1. Adults aged 56 years and above should do at least 75 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 40 minutes of vigorous-intensity activity
2. Adults of this age group, with poor mobility, should perform physical activity to enhance balance and prevent falls on 3 or more days per week.
3. Muscle-strengthening activities should be done involving major muscle groups, on 2 or more days a week.
4. When adults of this age group cannot do the recommended amounts of physical activity due to health conditions, they should be as physically active as their abilities and conditions allow.

Sixty individuals were included in the study that fulfilled the inclusion and exclusion criteria. These individuals were divided in three groups based on their age. Group A consisted of individuals from 18 to 30 years of age that is young adults, Group B consisted of individuals aged between 31 to 55 years that is middle aged population and Group C consisted of 56 above year that is geriatric population.

A brief explanation was given to each individual about the objective of study and about the procedure to be conducted. Voluntary signed consent was taken from each individual. Before proceeding for the data collection each individual was given a brief demonstration of the task to be performed.

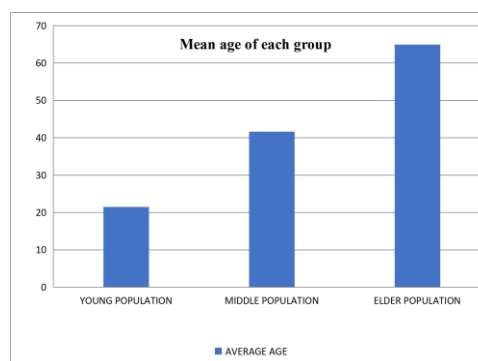
Initial screening was done of each individual by using International Physical Assessment Questionnaire (IPAQ). According to that individuals were sub categorised into inactive, moderately active and vigorously active calculated. Followed by this, each participant was asked to performed Time Up and Go test (TUG). In this each individual is asked to stand up from a chair walk up to 3 meter till the mark and back to the chair, after completion of task time was noted .Then an individual was allotted 10seconds of rest time.

Followed by the that, each individual was asked to perform Timed up and go dual task (TUG DT) it was categorized into 1) TUG DT motor and 2)TUG- DT cognitive. In TUG DT motor, each individual was asked to perform Timed Up and Go test holding a glass full of water and were advised not to allow water to drop out, the task time was noted. Followed by 10 seconds of rest, individuals were asked to perform TUG DT cognitive in which they have to perform TUG, while uttering the reverse sequence of the number and at the end task completion time was noted.

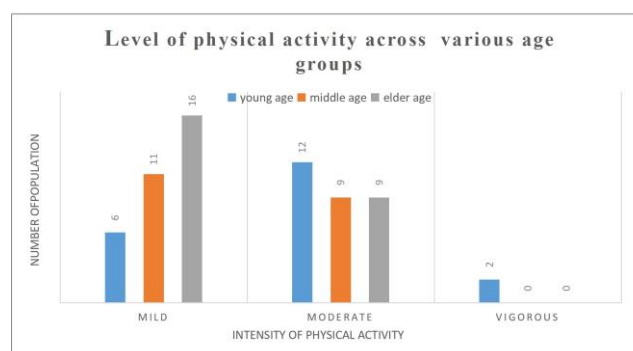
Followed by this the difference in time taken for each task and difference between the performances was calculated and result was analyzed.

RESULT

In current study 60 participants were screened. The mean age for young population was 21 ± 1.5 years, for middle age 41 ± 3.8 years and for geriatric 64 ± 5.1 years.

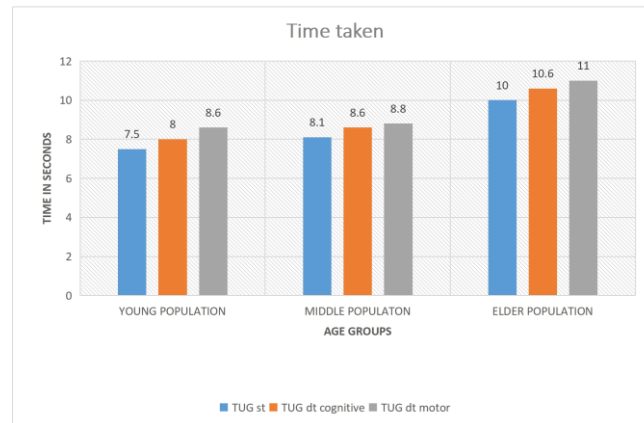


Graph-1: Mean age of young, middle and old age group



Graph-2: Level of physical activity across the population

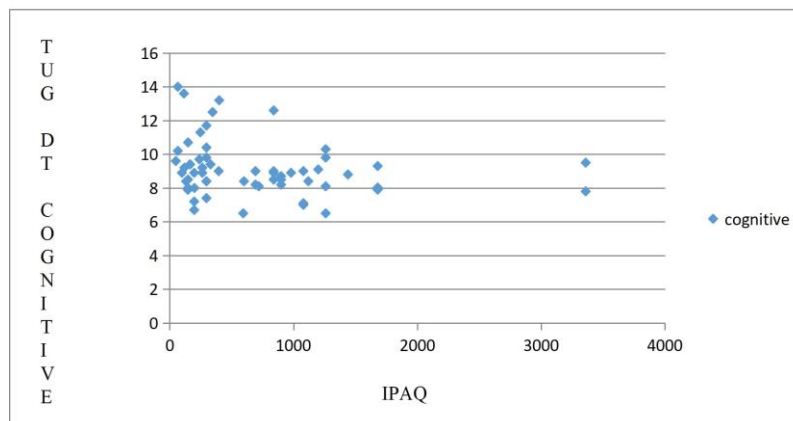
The IPAQ short score revealed that the population screened had low level of physical activity with mean score MET 693.5



Graph-3: Time taken during Dual Tasking

The time taken to perform TUG, TUG DT motor and TUG DT cognitive by various age groups population is shown in the graph above.

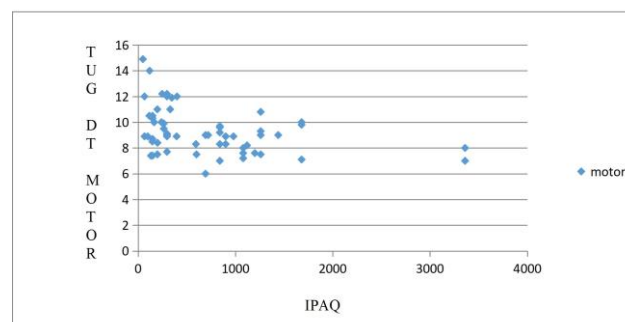
The co relation of TUG DT with IPAQ scores cognitive among various age groups is shown in the graph below.



Graph-4: TUG- DT cognitive of various age groups.

There is statistical significant but weak negative correlation [$r = -0.262$, $p < 0.5$] between IPAQ score scale and TUG - DT cognitive.

The co relation of TUG DT with IPAQ scores motor among various age groups is shown in the graph below.



Graph-5: TUG DT motor of various age groups.

There is difference in time taken during performance of single task and motor TUG -DT but there is no significant statistical no correlation [$r = 0.024$, $p > 0.5$] between IPAQ score and TUG- DT motor.

CONCLUSION

In the current it was found that physical activity level is higher in young age group, whereas it has been depicted to be the lowest among geriatric age group. Middle age group seems to have moderate level of activity. It is concluded that there is significant difference between young, middle and geriatric population dual task performance. This underlines the fact that dual task training can be initiated from middle age to reduce the occurrence of falls among geriatric population.

DISCUSSION

The present study was conducted to compare dual task performance in young, middle and geriatric population and to correlate the dual task performance with physical activity.

A sixty individuals were divided in three groups group A consisted of 20 young age adults with mean age of 21 years ,group B consist of 20 middle age adults with mean age of 40 years and group c consist of 20 elder age adults with the mean of 60 years of age .

According a recent study conducted by Roomy Parker *et al.* 65 % of students participated in sports activities. This study was conducted using IPAQ - short. Students were either classified with “low” or “moderate “physical activity. The IPAQ score revealed that majority of students had low physical activity level only 37.5% of the students engaged in high physical activity. Whereas in the current study it was found that 10 % young adults can be classified as performing vigorous physical activity, 60% were screened as involved in moderate physical activity and 30% were classified as performing mild physical activity. This remarkable difference in amount of physical activity among students could be owing to the fact only paramedical students were screened in current study and current study was conducted during Covid -19 lockdown in 2020.^[16]

Wladyslaw Mynarski *et al.* in year 2014 evaluated middle aged group adults using IPAQ questionnaire and found that women and men did not meet the criteria of the vigorous and moderate intensity of physical activity; the group was classified under low physical activity Levels where as in the current study out of 20 middle aged adults no men or women meet the criteria for vigorous activity, but 46% of them meet the criteria of moderate physical activity level. This positive difference in the physical activity in study could be associated with inter country, inter - racial, lifestyle and economical and resource availability factors.^[17]

Jeffery Hughes *et al.* conducted study on leisure time physical activity among American adults aged 60 year and more and found that more than half of adults reported no leisure time physical activity. In current study the result showed much low level of physical activity in geriatric population. This inters- country difference could be because of difference in lifestyle, norm, social life and other cultural habits.^[18]

Shivani Verma *et al.* conducted study on comparison of dual task performance in young adults and geriatric population using Timed Up and Go test and found that there is difference in ability to perform dual task between young adults and geriatric population. Results of the current study are that young adults can manage to perform dual task more appropriately than middle aged adults and geriatric population.^[19]

Paolo Riccardo Brustio *et al.* conducted study on comparison of different mobility and cognitive tasks in young, middle and older aged participants and found that mobility task and cognitive task combined with dual task cost significant decrease in mobility and cognitive performance in all age groups. Similarly in the current study it was found that there was significant attenuation in performance level of both motor and cognitive dual task in all age groups.^[20]

Beauchet O. *et al* conducted study on the changes in a gait while counting backward to predict the occurrence of fall in older adults and found that dual task related gait changes were poorly associated with occurrence of fall and provided no additional predicted value compared to gait performance under single task, suggesting that changes in basic clinical gait parameters while counting backward are unsuccessful to predict the first fall among the older adults. The current study did not take in to consideration the risk of falls in geriatrics during dual task performance but rather only declination of speed was noted.^[21]

B.R.Bloem *et al.* conducted study on the development of strategies using multiple task tests which consist of 8 different tasks. 50 young healthy adults and 13 elderly healthy adults were administrated to it and was found that the multiple task provided to younger adults and older adults came up with difference in result , the elderly performed all task slower than younger adults .Similarly in current study , 20 young age adults (with mean age of 21years) , 20 middle age adults (with mean age of 41 years) and 20 geriatric population (with mean age of 60 years) were assessed and it was found that geriatric population are slower in performing dual task compared to middle aged and young adults .^[22]

Rahul Songra *et al.* conducted study that concluded that dual tasking does not increase fall risk in healthy young and older adults. It was found that a dual task paradigm had no slip initiation and slip severity, rather it suggested that dual task elicits "caution gait mode". The current study also showed caution gait mode in healthy young and geriatric population.^[23]

The current study shows that "caution gait mode" strategy is adopted by young adults while performing dual task. This strategy is characterized by reduced walking speed, shorter step length, increased step width and reduced heel contact velocity, is likely to be an adaptation to minimize attention demand and decrease slip and fall risk. This was concluded by the observation of difference in gait pattern during single task performance and dual task performance but these changes were not quantified/assessed.

LIMITATION

- Gender distribution in each group was not equal. And gender wise correlation with physical activity and DT was not taken into consideration.
- Age wise groups could be increased.

FUTHER IMPLICATION

- Improvement in DT performance can be brought by increasing physical activity.
- Caution gait mode strategy can be assessed in participants performing dual task.

SUMMARY

Dual tasking is the ability to execute two tasks at the same time. It is necessary and commonly used by human beings in the performance of various activities of daily living. The loss that one - or both - suffers is called dual task interference. Its presence creates disadvantages and may lead to the risk of bodily injury when one of them requires close postural control or screening of environmental risks. moreover Physical activity has been shown to reduce anxiety as a condition (individual physical exercise, without continuity), anxiety as a personality trait, psycho-physiological signs of anxiety - blood pressure and heart rate moderate physical activity can lead to a decrease in the intensity of short-term physiological reactivity and encourage recovery from short-term physiological stressors. For people with a severe depressive episode and anxiety disorder, long and short walks proved to be the most effective.

Therefore a co-relational study on dual task and physical activity among young middle and old age population is conducted.

Population having impairment or inability to perform dual tasks can lead to falls, which is the biggest cause of mortality. Our limited search had yield very few results regarding the importance of physical activity and its impact on dual task performance. So this study is conducted to compare the dual task performance across various age groups and to correlate it with physical activity.

Sixty individuals who fulfilled inclusion criteria were divided into three age groups that are young, middle and geriatric. Initial screening was done using IPAQ. Then each individual was asked to perform TUG, TUG DT motor and TUG DT cognitive.

The result of the study revealed that majority of the population are classified under low level of physical activity, and according to dual task performance the time taken by geriatric was higher comparing to middle and young age population.

The study concluded that physical activity level was found higher in young age than middle age and geriatric population. There is significant difference in dual task performance between young, middle and geriatric population.

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