

“WORDS IN MOTION”

National Science Fair Research Paper

Level : Senior Level

Category : Life Science

Submitted by

HARINI S

(Grade XI)



FATHIMA CENTRAL SENIOR SECONDARY SCHOOL

Abstract

This study investigates how cognitive distractions—specifically talking while walking—affect functional mobility using the Timed Up and Go (TUG) test. Participants from four groups (athletes, dancers, singers, and non-specialists) performed the TUG test under two conditions: with and without distraction. The time taken was recorded across three trials per condition. Results indicated that talking significantly increased completion time, with athletes and dancers showing better balance and coordination than singers and non-specialists. The study highlights how multitasking impacts movement efficiency and safety.

Introduction

Have you ever tried walking while talking on the phone or thinking about something stressful? You may have noticed that it becomes harder to stay balanced or focused. These mental distractions, called cognitive loads, can affect functional mobility—our ability to move safely and efficiently while performing everyday tasks such as walking, turning, or bending.

The Timed Up and Go (TUG) test is a simple, widely used tool that measures functional mobility and risk of falls. In this test, a participant:

- Stands up from a chair without using their arms,
- Walks a
- of 3 meters,
- Turns around,
- Walks back to the chair, and
- Sits down with their back against the chair.

The TUG test is often used with older adults, but it is also valuable for individuals recovering from injuries, patients with neurological conditions, and children with motor challenges (e.g., cerebral palsy or spina bifida). Since many daily activities involve multitasking (such as walking while talking), studying the effect of distractions on TUG performance can provide insight into safety risks and mobility challenges in real-life situations.

Selection of Problem

In today's world, multitasking has become a part of daily life. People often walk while talking on the phone, engaging in conversations, or focusing on stressful thoughts. While this seems harmless, such distractions can affect balance, coordination, and movement safety.

Functional mobility is essential for performing everyday activities, and impairments can increase the risk of accidents, especially falls. The Timed Up and Go (TUG) test is a standard clinical tool used to assess mobility and fall risk. However, very little research has been done on how cognitive distractions, like talking, influence TUG performance across different groups of people (e.g., athletes, dancers, singers, and non-specialists).

This project addresses the problem:

Does talking while performing the TUG test affect functional mobility, and do different groups of people perform differently under distraction?

Objective

- To assess how cognitive distractions (talking) affect performance in the TUG test.
- To compare the impact of distraction across different groups—athletes, dancers, singers, and non-specialists.
- To analyze which group demonstrates the best balance and coordination under cognitive load.

Hypothesis

Talking while performing the TUG test will increase the time taken to complete the task, thereby reducing performance.

Athletes and dancers are expected to perform better than singers and non-specialists, as their training involves higher levels of physical coordination and balance.

Singers may experience greater distraction due to the cognitive load of talking, compared to athletes and dancers.

Experimental Design

Independent Variables

Participant group:

- Athletes
- Dancers
- Singers

Control group (non-specialists/normal persons)

- Presence of distraction:
- Talking (cognitive task)
- No talking (silent condition)

Dependent Variable

- Time taken to complete the TUG test (performance).

Controlled Variables

- Standard TUG test protocol
- Same testing room/environment
- Same chair, floor marking, and measurement tools
- Rest period between trials

Materials Required:

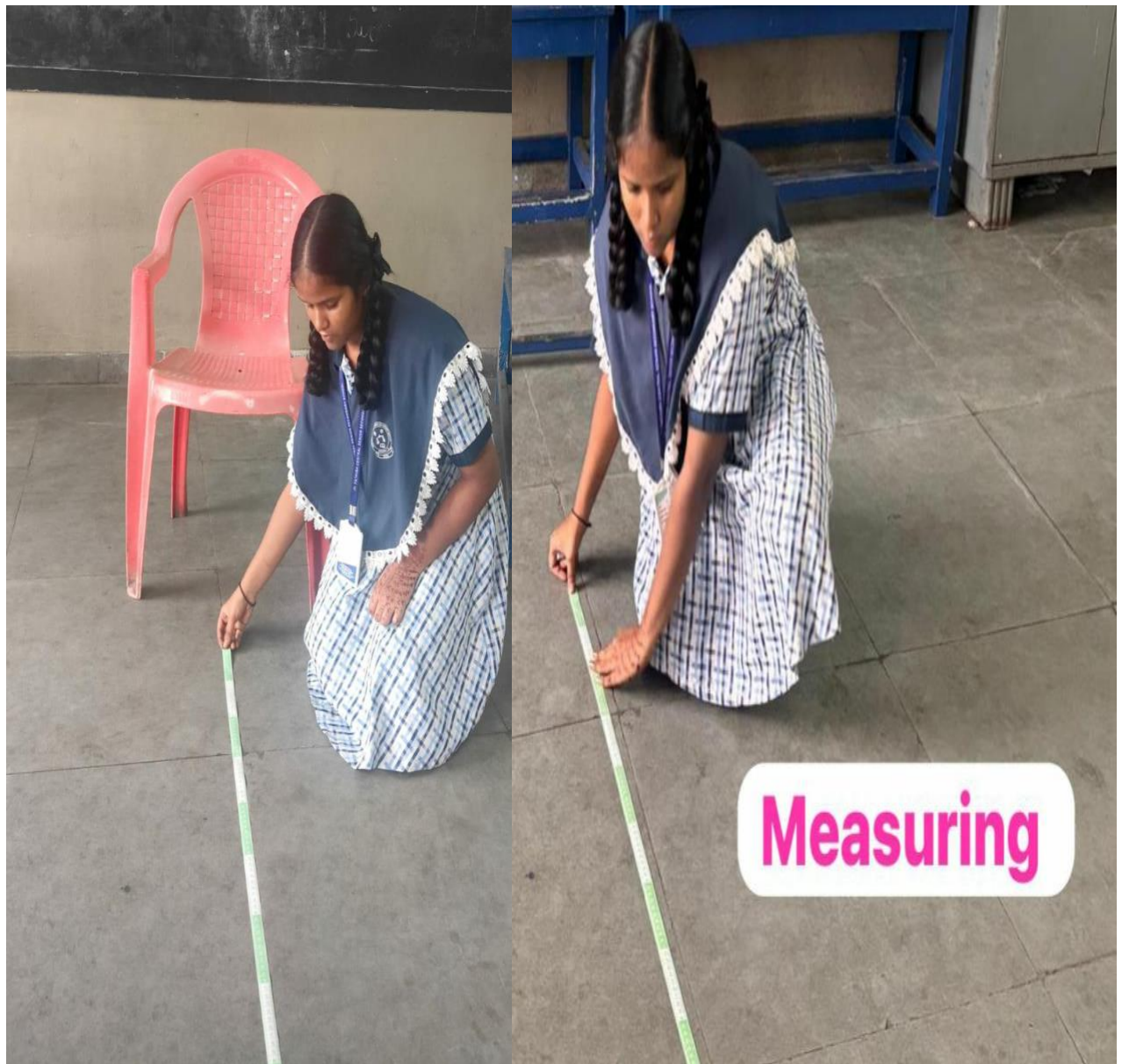
- Volunteers (participants)
- Stopwatch or clock with a second hand
- Standard chair (preferably with arms, sized appropriately)
- Measuring tape
- Masking tape or painter's tape (to mark 3 meters)
- Calculator or computer with spreadsheet software
- Data recording sheets/lab notebook
- Coin (for randomization of test order)

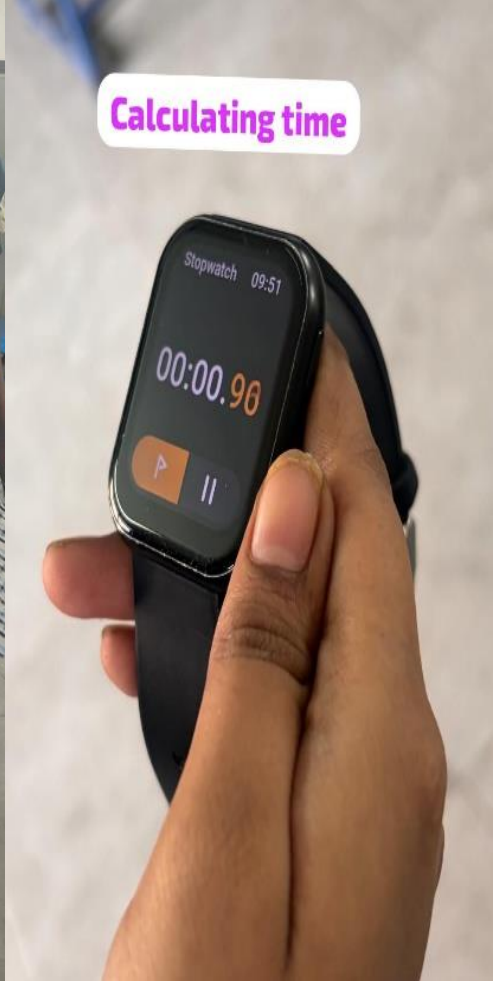
Procedure

- Find a safe, open testing space with enough room for the TUG test.
- Place the chair at one end, leaving space between the chair and wall. Mark a 3-meter line from the chair using tape.
- Explain the procedure clearly to each participant.
- On the word “Go”, start timing. Stop timing when the participant sits back down with their back against the chair.
- Ensure a supervising adult is nearby in case a participant loses balance.
- Allow a rest period of up to 60 seconds between trials. Record the time for each trial.
- Each participant completes the TUG test without distraction (silent condition) three times, in random order (decided by coin toss).
- Each participant then completes the TUG test with distraction (talking while walking) three times, again in random order.
- Ensure all trials for each participant are completed in the same session.
- Calculate the average TUG time for both conditions (distraction vs. no distraction).
- Compare results across groups (athletes, dancers, singers, and control).

Photographs:

TUG test





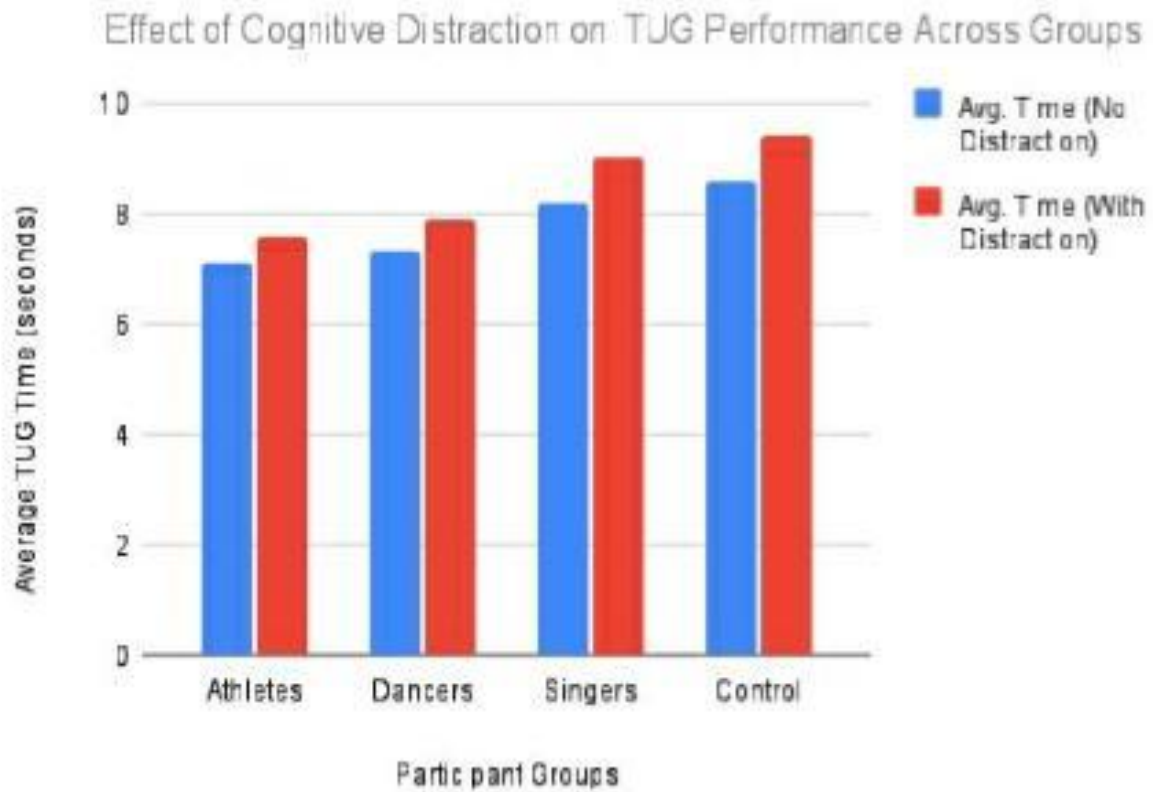
Data Table:**Effect of Distraction on TUG Test Performance**

Participant No.	Group	Trial Condition	Trial 1 (s)	Trial 2 (s)	Trial 3 (s)	Average Time (s)
1	Athlete	No Distraction	7.2	7.0	7.1	7.1
		With Distraction	7.6	7.8	7.5	7.6
2	Dancer	No Distraction	7.4	7.3	7.2	7.3
		With Distraction	7.9	8.0	7.8	7.9
3	Singer	No Distraction	8.3	8.2	8.1	8.2
		With Distraction	9.1	9.0	8.8	9.0
4	Control	No Distraction	8.6	8.7	8.5	8.6
		With Distraction	9.4	9.3	9.5	9.4
...	

Summary Table: Average TUG Times Across Groups

Group	Avg. Time (No Distraction)	Avg. Time (With Distraction)	Difference (s)
Athletes	7.1	7.6	0.5
Dancers	7.3	7.9	0.6
Singers	8.2	9.0	0.8
Control	8.6	9.4	0.8

Effect of Cognitive Distraction on TUG Performance Across Groups



Result

The data shows that cognitive distraction (talking while walking) increases the TUG test completion time across all groups.

1. Athletes and dancers demonstrated better adaptability, with minimal time increase.
2. Singers and control participants exhibited greater performance decline.

Thus, functional mobility decreases under cognitive load, especially in individuals without movement training.

Conclusion

The hypothesis is supported. Talking while walking negatively affects movement efficiency and balance. Physical training in sports and dance helps maintain better coordination under distraction. The findings suggest that multitasking can pose safety risks, especially for untrained individuals or those with mobility issues.

Application

- Useful for physiotherapists and trainers to design safer multitasking and rehabilitation exercises.
- Helps raise awareness about risks of distracted walking (e.g., using phones).
- Can be applied to fall-prevention programs for elderly or neurologically impaired individuals.

Future Enhancement

- Increase the number of participants for greater statistical accuracy.
- Include additional distraction types (e.g., mental arithmetic or listening tasks).
- Measure other parameters such as stride length and balance score using sensors or gait analysis apps.

References

<https://pubmed.ncbi.nlm.nih.gov/1991946/>

<https://pubmed.ncbi.nlm.nih.gov/10960937/>

<https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2022.952245/full>