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To Study The Effects Of Smartphone Multitasking On Dynamic Balance In The Age Group 20-25 In Both Genders

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Abstract:

Background: In today's world, multitasking while using smartphones has become a trend in today's era. The constant usage of smartphones while walking, standing, and sitting affects balance. However, constant dual-tasking can lead to distractions, risk of falls, and impaired dynamic balance of an individual.

Aim: To determine whether there are gender-based differences that influence dynamic balance while smartphone multitasking, in order to understand the potential impact on postural control and overall stability

Methodology: 60 participants were recruited by using convenient sampling. 25-35 years was the age criteria specified. Inclusion and exclusion criteria were formed, and the assessment was done. Also, the Time-Up and Go test was used as an outcome measure.

Results and Conclusion: The present study demonstrated that smartphone multitasking significantly affects dynamic balance among young adults aged 20–25 years. The results showed a progressive increase in Timed Up and Go (TUG) scores from general gait to multitasking conditions, indicating reduced -stability with increasing task complexity. The findings ($p < 0.0001$, highly significant) confirm that engaging in smartphone-related multitasking affects balance.

Index Terms—Smartphones, Multitasking, TUG, dynamic balance, physiotherapy

1. Introduction

Artificial intelligence has emerged as a present force globally, which is successfully driving the modern world [1]. Nowadays, smartphones are an integral part of our daily lives, however it has both benefits and flaws [2]. Ocular fatigue, myalgia, and neural dysfunctions are some of the complications [3]. Due to this, humans are very susceptible to developing postural abnormalities like round shoulders, forward head, and soft tissue injuries [4].

Balance is an integral component for accomplishing functional activities of functional movement. In today's era, teenagers are very involved with their phones. Activities like gaming and web surfing make users succumb to awkward postures. Further, it is balanced using compensatory strategies. Modifications like static-floor-based obstacles and users adapting gait and visual search behaviors, which allow them to maintain functional ability [5]. With the increasing use of smartphones by college students, dual-task training is a common phenomenon in today's society. Moreover, it has been documented and observed how it vigorously affects the concentration, balance, and attention of individuals. This synchronization of motor and cognitive networking negatively impacts the performance of daily tasks [6].

Physiologically, neural networks experience a complexity for resources, often leading to a "bottleneck." Engaging in multiple tasks such as "walking or texting" on cell phones places extra demand on the brain's region responsible for cognitive abilities. It further impacts the attention, concentration, planning, and other activities of an individual. A study discovered that conversing on the phone is less distracting than hearing music and speaking via messaging, as it includes both reading and typing. And hearing music causes continuous relative distractions. This paradox may stem from differences in muscle strength, anthropometry, cervical spine mobility, and postural adaptation strategies [7].

Additionally, females may show high fatigue levels due to activity in neck muscles. Research has also highlighted gender-based variations in trunk and head stabilization strategies, which may influence postural compensation mechanisms under increased external loads [8]. However, the extent to which gender influences responses to the combined effects of smartphone use and backpack load remains unclear

The integration of somatosensory, visual, and musculoskeletal systems is an integral system for maintaining balance. The balance of balance affects an individual's ability to carry out activities of daily living. Further, postural instabilities are very common in standing [9]. Also, gender differences were noted to affect dynamic balance. Thus, it is crucial to examine whether multitasking while using smartphones affects balance differently in males and females aged 20-25 years.

2. Research Question?

How does smartphone multitasking affect dynamic balance among males and females aged 20-25?

3. Objectives:

- To determine the effects of smartphone multitasking on dynamic balance among individuals age group 20-25 years.

- To determine whether there are gender-based differences that influence dynamic balance while smartphone multitasking

4. Material and Methods:

4.1 Study Design: Cross-Sectional Observational Study

4.2 Study Site: In Nagpur City

4.3 Study Population: Female and Male, aged 25-35 year

4.4 Sampling Size: 60 participants

4.5 Study duration: 6 months

4.6 Sampling Technique: Convenient Sampling

4.7 Study Tools:

It included socio-demographic details of participants, gender, Outcome measures (Time up and go).

5. Study Criteria:

5.1 Inclusion criteria:

Both male and female genders, aged 25-35 years

Those using smartphones for at least 4 hours.

Those having corrected spectacles or with normal vision...

5.2 Exclusion criteria

Those having ongoing histories of vestibular dysfunctions and symptoms like dizziness

Inability to stand due to lower limb injuries

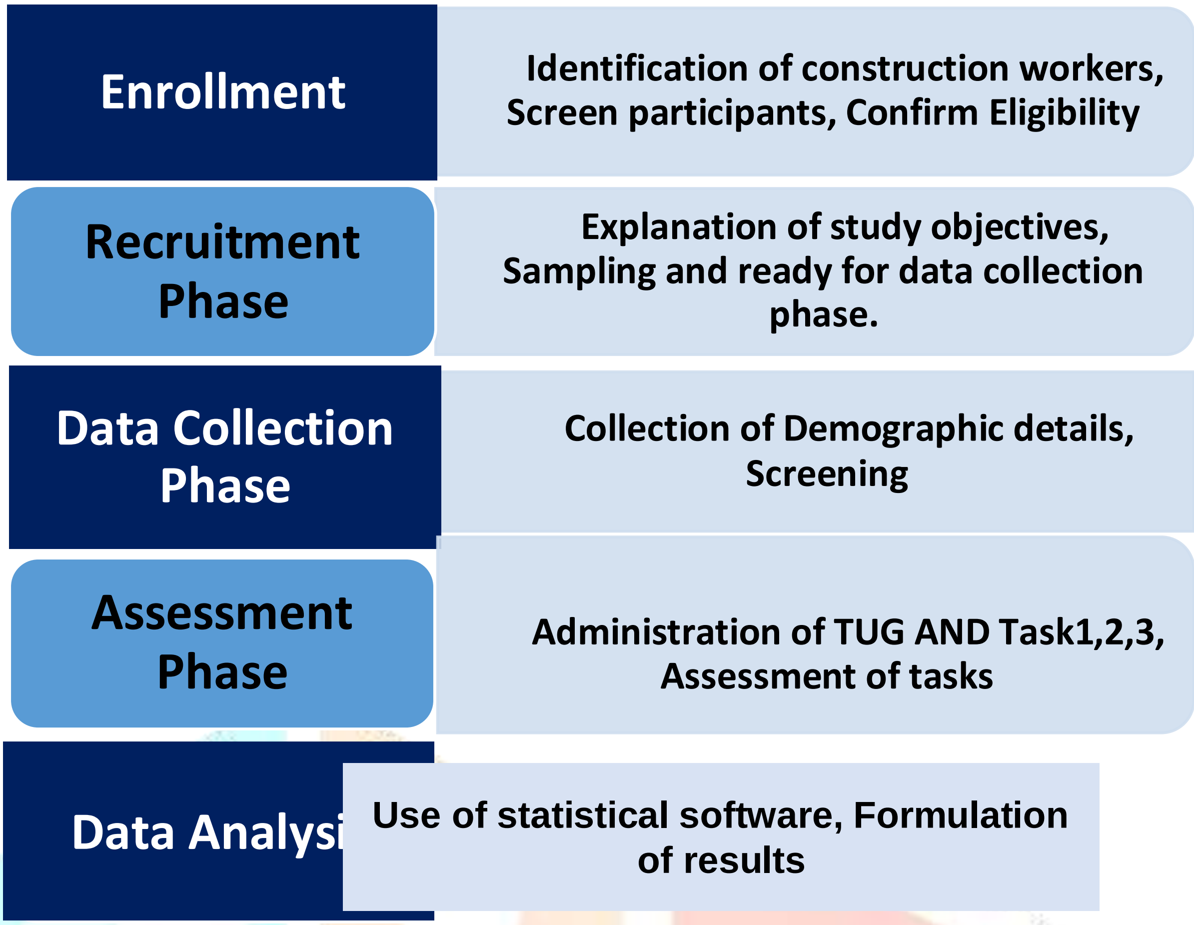
Cognitive impairments

Those suffering from psychiatric or neurological disorders.

6. Procedure

Prior to commencement of study, authorization from authorities were obtained from appropriate regulatory and institutional authorities was obtained. The study protocol was meticulously developed. Further, as a primary data, utilization of Time Up and Go Test as an Outcome Measure was done. Group A (n=30 female participants) Whereas, Group B (n=30 male participants). Participants were explained about the study objectives, procedures, and requirements. Moreover, written consent was obtained from each participant, and they were enrolled in the study. Further, an appropriate time was allotted for completion of the procedure, which was further divided into a few tasks, and the data extracted was analyzed with relevant statistical tests.

A total of 60 participants were involved in the study. Participants were instructed to wear their usual footwear and sit comfortably on a chair. The therapist will record the timing of the completion of the task. On the therapist's command, participants were asked to stand from chair and walk further for approximately 3 meters, followed by turning, walking backwards, and finally sitting back again. A total of 04 tasks were executed in the procedure **(Figure 1**).



Flowchart Figure 1: Describing Study Procedure

6.a. Data Collection method:

Females and males aged 25-35 years were included in the study.

7. Outcome Measures:

In 1991, Time up and Go test was used as a screening tool for functional ability. It measures the speed of performing tasks in standing, walking, turning, and sitting. This tool is used for assessing balance and for assessing fall risks in individuals. It is used as a predictive tool for evaluating risks of falls and locomotor difficulties. Further, it can also be used to evaluate aspects of mobility [10].

The reliability of TUG is ICC=(0.97-0.99). This revolves around a single parameter, time taken by an individual to complete the task. It is used for assessing motor systems, anticipatory postural adjustments, and dynamic balance. It is used for a wide age range, from young to adults. Furthermore, its application ranges from musculoskeletal diseases to brain diseases. However, the implementation of it is ambiguous. Furthermore, the site of TUG testing varies for the sake of convenience [11].

7.a. Data Analysis:

The obtained data will be entered into a Microsoft Excel spreadsheet.

8. Results:

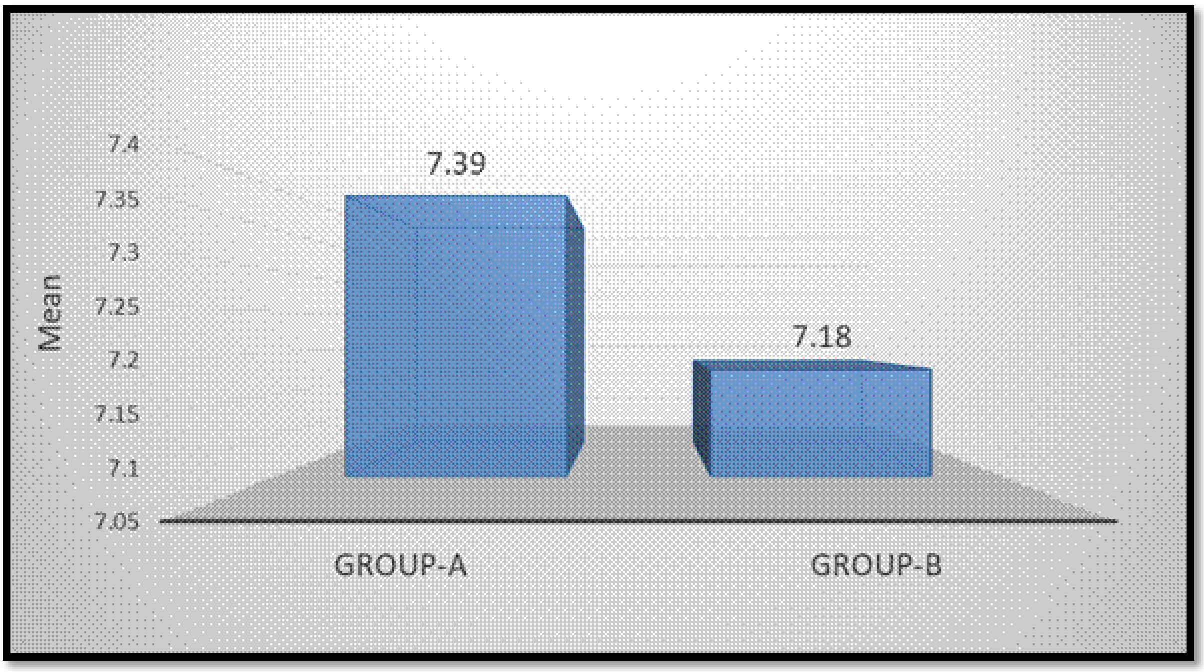
The mean of general gait scores for both groups, obtained by an independent t-test, Similarly, the Time-up-go test was compared at different tasks, using the one-way repeated ANOVA test. However, changes in TUG scores between tasks were analyzed using the Mann-Whitney test. A value of $p<0.05$ was considered statistically significant. A total of 60 participants were divided into two groups: Group A consisted of female participants, whereas Group B had male participants. Each group had 30 individuals.

The mean gait score for Groups A and B was 7.39 ± 0.21, compared to 7.18 ± 0.18, the results suggest that individuals in Group A yielded better results in mean Gait scores **(Table 1) (Graph 1**). Whereas, a comparative mean TUG score across three tasks. Group B recorded a lower mean score, 8.04 ± 0.27, compared to 8.73 ± 0.18. The mean TUG scores increased progressively from Task 1 to Task 3 in both groups, indicating a decline in balance performance with increasing task complexity. For Group A (females), the mean TUG scores were 8.73 ± 0.18 s, 9.69 ± 0.18 s, and 10.65 ± 0.19 s for Tasks 1, 2, and 3, respectively, whereas for Group B (males), the corresponding scores were 8.04 ± 0.27 s, 9.01 ± 0.31 s, and 9.97 ± 0.24 s respectively. Further, multiple comparisons between TUG scores were done. For group A, (Task 1 vs. Task 2, 0.96 ± 0.35), **(Table 2)(Graph 1),** whereas (Task 1 vs. Task 3, 2.04 ± 0.31); similarly, for group B (Task 1 vs. Task 2, 0.97 ± 0.30), whereas (Task 1 vs. Task 3, 1.93 ± 0.27) , it showed that although Group B is more mobile, both groups respond in a statistically similar manner (**Table 3)(Graph 3).**

Mean General Gait score.

	Group-A		Group-B		t-value	p-value
	Mean	SD	Mean	SD		
Mean Gait score	7.39	0.21	7.18	0.18	4.2161	0.0001, HS

Table No. 1: Mean General Gait Score Between Group A and Group B.

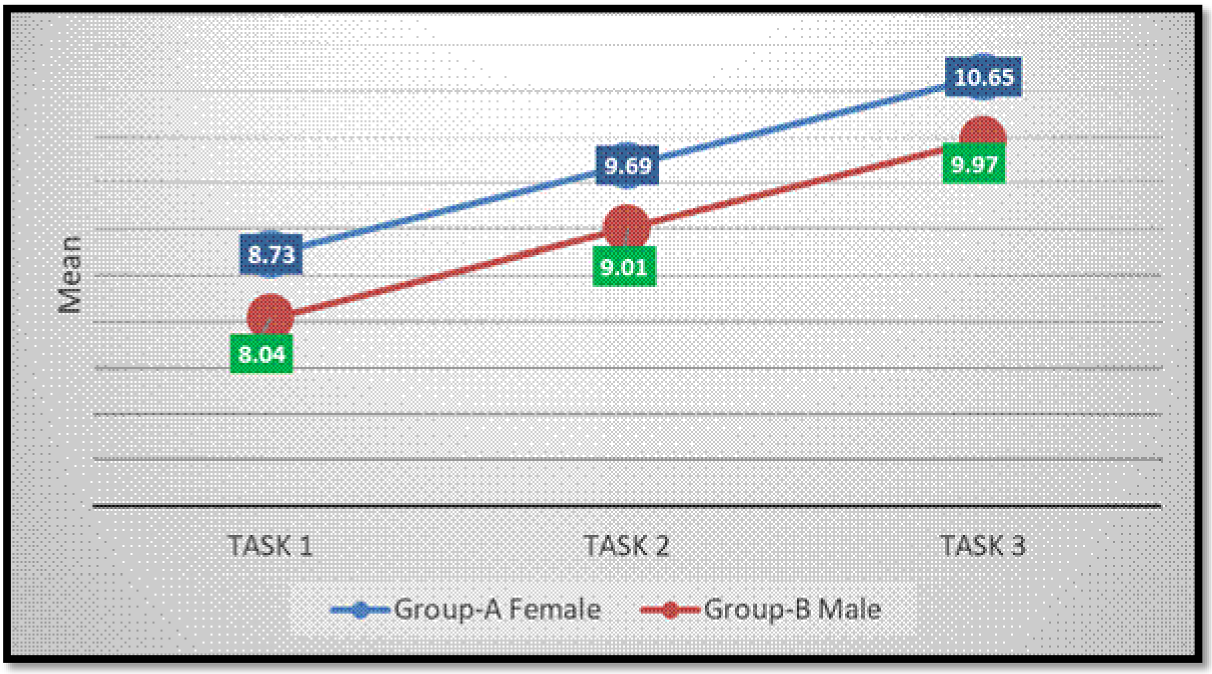


Graph 1: Bar Graph showing the Mean General Gait score between Group A and Group B

Mean TUG Score

	Group-A		**Group-B**		**t-value**	**p-value**
	Mean	**SD**	**Mean**	**SD**		
Task 1	8.73	0.18	8.04	0.27	11.3861	<0.0001, HS
Task 2	9.69	0.18	9.01	0.31	10.4440	<0.0001, HS
Task 3	10.65	0.19	9.97	0.24	12.2432	<0.0001, HS
F-value	651.00		679.37			
p-value	<0.001, HS		<0.001, HS			

Table No. 2: Mean TUG score between Group A and Group B.

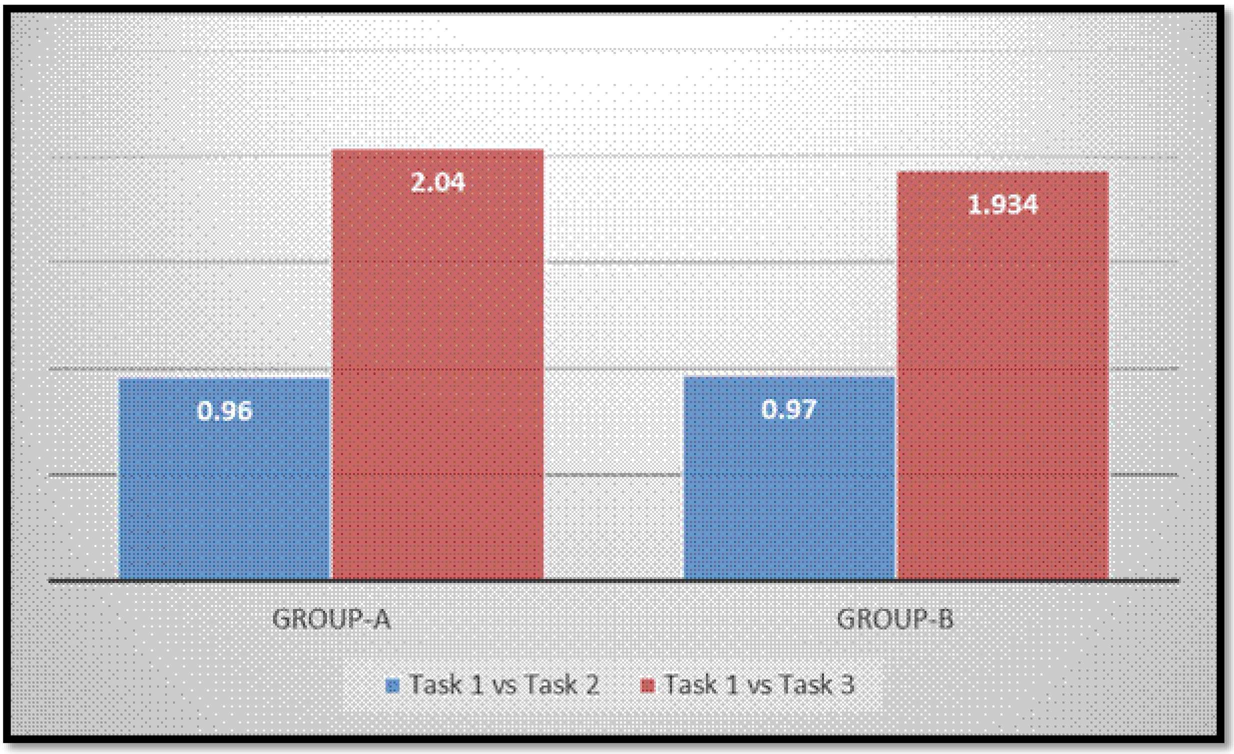


Graph 2: Mean TUG score at different tasks in Group A and Group B.

Mean TUG Score Multiple Comparison

Multiple comparison	**Group-A**		**Group-B**		**t-value**	**p-value**
	Mean	SD	Mean	SD		
Task 1 vs Task 2	0.96	0.35	0.97	0.30	0.1571	0.8757,NS
Task 1 vs Task 3	2.04	0.31	1.93	0.27	1.4402	0.1552,NS

Table No. 3: Mean TUG score between Group A and Group B.



Graph 3: Mean TUG Score between Group A and Group B with Multiple Comparisons between tasks

9. Discussion:

The simultaneous use of smartphones while walking and performing other motor tasks, referred to as smartphone multitasking, divides attention between cognitive and physical functions, which can hamper balance and compromise gait in individuals. The results of our study suggest that walking conditions, without smartphone multitasking, males demonstrated slightly better dynamic balance and gait efficiency compared to females. Further, confirming that multitasking while using a smartphone leads to impaired dynamic balance and that females exhibited greater instability compared to males. The findings of our study are supported by Lee et al. (2018), who reported that smartphone multitasking significantly reduced gait stability [3]. Similarly, Doaa Rafat El Azab et al. (2017) found a notable decline in balance performance, especially among females [9]. The present study's highly significant findings support their observations, indicating that even among young, healthy individuals, multitasking negatively affects balance. Further, gender-based differences were observed in this study (females > males in TUG times), which can be attributed to physiological and biomechanical variations such as differences in muscle strength, neuromuscular coordination, and postural control mechanisms.

The progressive increase in TUG times from general gait to more complex smartphone tasks in this study corroborates the results of Stuti et al. (2022), who also found statistically significant deterioration in dynamic balance during multitasking. The current study emphasizes the cognitive-motor interference that occurs during smartphone multitasking [12]. Similar to the findings of Lino et al. (2023), multitasking produced significant impairments in balance and gait, which confirm that engaging in cognitively demanding tasks while walking places excessive demands on executive control and attention, leading to slower, unstable movements

Our study has few limitations, like small sample size. For the specified age group (20-25 years), only selective multitasking tasks were involved, and real-world environmental factors (lighting, noise, uneven surfaces) were not considered. Future studies should include the use of advanced tools for detailed balance assessment. Explore interventions for balance training or awareness programs.

10. Conclusion:

The present study demonstrated that smartphone multitasking significantly affects dynamic balance among young adults aged 20–25 years. Reduced balance with task complexities was observed more in females. Further, indulging in smartphone-related multitasking activities increases the risk of falls. More awareness regarding safe smartphone use during movement should be encouraged using more advanced tools.

11: Acknowledgement: I would like to thank all the participants for being part of my study. I would like to thank my guide for helping me in formulating my study.

12: Conflict of Interest: None

13: Statement of Informed Consent: Written informed consent was obtained from all participants before commencement of the study.

14: Abbreviation:

TUG: Time Up And Go

15. References:

[1] Rasa AR. Artificial Intelligence and Its Revolutionary Role in Physical and Mental Rehabilitation: A Review of Recent Advancements. *Biomed Res Int*. 2024;2024:9554590. doi:10.1155/bmri/9554590

[2] Abernethy A, Adams L, Barrett M, et al. The Promise of Digital Health: Then, Now, and the Future. *NAM Perspect*. 2022;2022:10.31478/202206e.doi:10.31478/202206e

[3] Lee JH, Lee MH. The effects of smartphone multitasking on gait and dynamic balance. *J Phys Ther Sci*. 2018;30(2):293-296. doi:10.1589/jpts.30.293

[4] Kazi MN, Limbasiya RD, Ramaligam T, Shah M, Shakil SA. Effects of Smartphone Multitasking on Dynamic Balance.*IJDR*. 2023; 13(12): 64407-64410. doi: 10.37118/ijdr.27587.12.202

[5] Sahni, R, Kaur G, Singh H., and H. Singh. Effect of Smartphone Usage on Cognition and Balance in Geriatric Individual. *Indian J. Physiother. Occup. Ther. 2019;13: 52.* doi: 10.5958/0973-5674.2019.00131.X.

[6] Zhang J, Zeng Y. Effect of College Students' Smartphone Addiction on Academic Achievement: The Mediating Role of Academic Anxiety and Moderating Role of Sense of Academic Control. *Psychol Res Behav Manag*. 2024;17:933-944. doi:10.2147/PRBM.S442924.

[7] Anter EA, Tohamy MA. Impact of smartphone use on posture control in healthy adolescents. *Physiother. Q*. 2024; 32(1): 100–104. doi: 10.5114/pq.2024.135429.

[8] Chen YL, Tang WH, Guan YX. Gender-specific biomechanical effects of smartphone use with backpack load during standing and walking. *Scientific Reports*. 2025; 15: 36091. https://doi.org/10.1038/s41598-025-20015Y.-L..

[9] Azab DR. Effect of smart phone using duration and gender on dynamic balance. Int. J. Med. Res. 2017; 6(1): 42-49

[10] Thrane G, Joakimsen RM, Thornquist E. The association between timed up and go test and history of falls: the Tromsø study. *BMC Geriatr*. 2007;7:1. doi:10.1186/1471-2318-7-1

[11] Sakazaki J, Nakamura T, Kodama K, Higuchi T. Timed Up-and-Go Test with an Obstacle: Evaluating Anticipatory Locomotor Adjustments in Older Adults. *J Mot Behav*. 2025;57(6):777-787. doi:10.1080/00222895.2025.2559971.

[12] Stuti W, Sharma P, Pratap Y, Kumar N. To study the effect of smartphone multitasking on dynamic balance in young adults. *Indian J Physiother Occup Ther*. 2022;16(1):150–158. doi:10.37506/ijpot.v16i1.17789