

## SHORT COMMUNICATION

# Impact of Smartphone Use on Gait Indices among Physiotherapy Students

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### ABSTRACT

Smartphone use has become an inevitable habit among the college students. Texting and reading on smartphone while performing daily activities is very common. The relationship between biomechanical alteration and the use of smartphone during walking is urgently needed. So this study intended to find out the impact of smartphone use on gait indices among physiotherapy students. Step length, stride length, cadence was studied in 150 physiotherapy students while they are reading and texting in smart phones and compared with the same data observed from same individuals when not using smart phone. Measure of gait parameters revealed that stride length and step length are reduced where cadence is increased while reading and texting during walking ( $p < 0.001$ ). Reading and texting during walking can affect walking performance adversely.

**Key words:** Smart phone, Gait indices, Step length, Stride length, Cadence.

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## INTRODUCTION

Smartphones have quickly become an essential component in the lifestyle of all individuals. It allows us the freedom to communicate with people from all over the world, it enables us in accessing any information that we desire, and it provides us with a fantastic outlet for pleasure. 77% of the entire population of the globe has a mobile phone in their possession [1-3]. Several new features and advancements have been made to cell phone over time. One such change was the larger touch screen, which greatly facilitated the quick creation of text messages. As a result, messaging becomes for the user considerably quicker, simpler and practically automated [4]. Young individuals carry a cell phone with them constantly, included as they eat, study, and travel. Young adults are distracted from the activities they are participating in by the use of their cell phones [5]. According to the findings of a study that was carried out between the years 2000 and 2011, over 5000 persons under the age of 40 required medical attention for injuries that were caused by distractions caused by the use of smartphones [6]. Everyone eventually becomes dependent on their cell phones. Addiction to mobile devices is a very serious risk that should raise significant concerns. It has an effect on our health as well as our work and our relationships [7]. Sanjeev Davey draws the conclusion from his team's research that between 39 and 45 percent of young people are prone to become addicted to their smartphones [8].

Walking has been linked to numerous benefits for people's well-being and physical health. As the same way, Constant smartphone use is linked to recurrent joint stress, which causes inflammatory changes in healthy joints [9]. Walking is a more difficult job than standing or sitting because it requires integration of coordination and function between different portions of the body and the brain. To be able to adapt one's gait patterns to a shifting environment demands a level of concentration that is disrupted by the use of cell phones, which is necessary for successful adaptation. This causes a shift in an individual's gait patterns, and the individual is even at an increased risk of falling. According to the findings of a research that was carried out by the emergency department, the number of pedestrians who are injured or killed in accidents while

using their smartphones is on the rise in today's society [10-12]. The need of attention in safe walking and the importance of cognitive elements in balance capacity are well documented in the extensive literature. For a work that is particularly difficult, additional focus and care are required. Even in individuals who are in otherwise good condition, motor adaptation rates slow down when the circumstance involves difficult dual tasks. As a consequence, the person is unable to successfully accomplish even a single job [13, 14]. The potential dangers associated with using mobile phones while walking may be better understood by examining changes in temporo- spatial gait characteristics during the various mobile phone tasks<sup>15</sup>. Thus, the study investigates to find out the influence of reading and texting while walking on gait indices in healthy individuals.

## MATERIAL AND METHODS

It is the cross sectional study design, 150 physiotherapy students from Puducherry are recruited as the samples of this study according to the selection criteria. Inclusion criteria comprises of either sex, age between 18 to 25 years. Samples who are having pain in their lower limbs, using orthosis, not very familiar in using smart phone and any recent fracture in lower limb and any history of neuro pathology were excluded from this study. The overall data collection was completed in 4 consecutive weeks. The data was collected through randomized selection method.

After explaining the study procedure and getting informed consent from the samples. The Selected samples are made to walk under two condition 1- walking, 2- walking with texting and reading on mobile phone. The samples were asked to dip their foot in ink filled tray without wearing footwear and then walk without distraction on a corridor . A one hour break is given for relaxation, and the same sample is again asked to dip their foot in ink filled tray and then walk with texting and reading in mobile phone. To gain their distraction ,a prefixed comics story was sent to them and they were asked to read that and after few steps of walking, questions related to that story was sent in text message, the samples were instructed to reply in text. The samples are asked not to relieve the content to the comembers. Initial five steps were discarded to avoid errors due to the samples are being conscious and were adjusting their walking pattern.

Spatiotemporal parameters [Stride length, Step length and Cadance] were measured. 1. Stride length – a line perpendicular at the heel of foot and another line drawn perpendicular at the heel of same foot, distance is measured in centimetre. 2. Step length – a line drawn perpendicular at heel one foot and another line at the heel of opposite foot and the line is draw between the perpendicular line, the distance is measured in centimetre. 3. Cadence – number of steps taken by a participants per minute is measured. The collected data are statistically analyzed.

## RESULT AND DISCUSSION

The measured data were statistically analyzed using t test. The stride length, step length and cadence were significantly different in both walking condition ( $p < 0.001$ ) while comparing stride length during walking (SD = 19.94) and walking with smartphone (SD = 19.09). step length during walking (SD = 10.89) and walking with smartphone (SD = 1.58) and cadence during walking (SD = 1.85) and walking with smart phone (SD = 1.61). Thus it can be seen that step length and stride length were reduced and cadence were increased while texting and reading on smart phone during walking when compared to normal walking.

Table 1 showing stride length and step length

		Mean	n	Standard Deviation	P - value
<b>Pair 1</b>	Stride length normal	92.07	150	19.94	0.001
	Stride length while texting and reading on smart phone	87.58	150	19.09	
<b>Pair 2</b>	Step length normal	50.37	150	10.89	0.001
	Step length while texting and reading on smart phone	46.12	150	10.58	
<b>Pair 3</b>	Cadence normal	14.85	150	1.85	0.001
	Cadence while texting and reading on smart phone	17.69	150	1.61	



A) Sample walking without smartphone B) Sample walking with using smartphone C) Footprint of a sample



Figures 1 – 4 D Analyzing and measuring of gait parameters

## DISCUSSION

In the twenty first century, smartphone abuse is in the rise as more and more teenagers spend their leisure time using smartphone. There is mounting evidence that problematic smartphone use has negative social and health effects, and that heavy smartphone use raises the risk of serious psychopathologies in adolescents. Nomophobia – defined as the “fear of being without your phone” is arising problem of the modern era [16-19]. People frequently complain of neck and back pain after using their smartphone for an extended period of time. Human locomotion necessitates a symbiotic relationship between the nervous system, musculoskeletal system and the environment. Several studies have proved that attention and thinking are important precursors for efficient dual task performance, attention diversion may result in task distraction, causing decreased performance in one or both task [20-22]. We hypothesized doing dual task simultaneously may affect performance. So, the study is assigned to find out whether there is a difference between normal walking and walking with reading and texting on smartphone. Gait involves complicated mechanism, and there are currently few clinical approaches that are accessible, quantifiable and trustworthy for assessing gait. Temporal and Spatial factors including step length, stride length, cadence and step duration give crucial quantitative data and are frequently employed in classic research that has been conducted for more than 30 years [23-27]. Numerous research was preoccupied with the increased cadence, shorter stride and step length and greater toe out angle (1,8,13). According to this study it was observed that stride length and step length are decreased and cadence were increased. This suggests asymmetrical gait cycle. Thus the hypothesis of gait parameters while doing dual task [ walking, walking with texting and reading] on smart phone was found to be true in this study. A disquisition may rise regarding informing the participants about their consciousness to walk in normal phase. In order to abide the ethical rules, we informed the procedure and did not mention the selective sequence from which we were monitoring. This information can be used for awareness generation in youngsters regarding the hazards of cell phone usage on roads as distraction-based injuries is increasing which is a matter of concern. Policymakers can make use of this information for making and implementation of steps to enhance safety during dual tasking conditions of walking.

## LIMITATION

The study procedure is carried out by the manual method [use of ink], a computerized system i.e Vicon 3D motion analysis, automated video analysis etc, can be used to assess a significant value for gait parameters. This study has assessed only students in their 20s, all the age group people can be assessed. The samples in this study only walked for

short distance in closed setup to prevent from other distraction and moving traffic, a similar study can be performed in open environment to assess the accurate effect of changing environment on these parameters.

## CONCLUSION

The study's findings revealed how much cell phone use affects gait. Increased cadence, decreased stride length and step length are the changes occurred in each comparison. This proves that reading and texting on smart phone has a great impact on gait pattern.

**All the authors have contributed significantly**

**No conflict of interest**

**Ethical issues – Yes**

**No financial aid**

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