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Original Research Paper

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A STUDY TO ASSESS THE EFFECT OF GAIT INDICES ON READING AND TEXTING OF MOBILE PHONES WHILE WALKING, AMONG COLLEGE STUDENTS-AN OBSERVATIONAL STUDY

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INTRODUCTION

Distraction caused by mobile phone usage is cognitive, visual auditory and physical distraction. Cognitive distraction is the reduction of environmental and situational awareness due to performance of cognitively demanding task. Visual distraction leads to visual impairment and attentional blindness. Auditory distraction leads to auditory impairment due to the continuous use of head phones. [1]Mobile phones have become an important part of everyone's life. 77 percentage of the total world's population uses mobile phones. Texting has become popular and easy. [1,12]. A recent study shows that 79% of the population between the age 18 – 44 have their cell phones with them almost all the time, with only 2 hours of their walking day spend without their cell in hand.

Attention can get diverted using mobile phones and doing motor task simultaneouslythat affects either one or both task adaptations. This changes the gait pattern. Gait patterns changes due to simultaneous performance of an attention demanding task are interpreted as inference caused by competing demands for attentional resources involving the cortical level in gait control.Texting on a smartphone creates a significantly greater interference effect on walking than talking or reading.[5] The activity of texting while walking is a more complex task, since it usually integrates visual motor coordination, bimanual movements for tapping with thumbs of both hands and cognitive attention to the messagecontent.College students in adulthood are expected to have more control over smartphones.

AIM OF THE STUDY:

The main aim of the study is to assess the effect of gait indices on reading and texting of mobile phones while walking, among college students.

OBJECTIVES OF THE STUDY:

- To assess the effect of gait indices (step length, stride length, step width,cadence)

RESEARCH DESIGN AND METHODOLOGY:

An observational study was conducted with 100 samples within the age group of 17 to 20 years who fulfilled the inclusion and exclusion criteria.

INCLUSION CRITERIA:

- Healthy college students among 17 to 20years.
- Ability to ambulate with no assisting device (i.e. cane, crutches or walkingframe).
- Normal visualacuity.
- Regular uses of mobile phone equipped with a touch screen and standard QWERTY keyboard.

EXCLUSION CRITERIA:

- Neurologicalproblems
- Musculoskeletalproblems
- Cognitive deficits
- Visionproblem

PROCEDURE:

100 participants were taken for this study based on inclusion and exclusion criteria, after getting consent.The procedure requires only a stopwatch, two felt tip marking pens with washable or erasable ink, and 16m (53 feet) walkway that is pre-measured and marked with masking tape at four points. A hallway, at outside corridor area at college used for the walkway.The walkway is marked to show a centre area of 6m long and 5 m areas on each end measurements. The first 5m area is for warming period and the second 5m area is for cool down period.

Felt tip marking pens are taped at the back of the student heel so that the tip just reaches the floor when he/she is standing before the procedure.The student should take a few steps at the side of the walk way to ensure that the makers are correctly positioned to indicate heel contact if several trials are on the same walk way, marks must be erased after each trial. Several students are to be tested at the same time so that different coloured markers are used to eliminate the need to erase the marks after each subjectgait.

The student is instructed to walk at his usual walking speed from one end of the (6M walkway to the other end. The therapist using a stopwatch records the time taken for the subject to walk the centre 6m. Measurement within the 6M area includes the distances from each heel contact pen mark to the heel mark on the same (stride length)and alternate sides (step length) and of distances of width between successive marks (step width) and cadence (no of steps).And finally the total number of contact marks in the centre 6m is counted.Gait parameters were assessed.

DATA ANALYSIS:

Descriptive Statistics of allParameters

	Mobile Weight	Steplength (cm)	Stride Length (cm)	Step Width (cm)	Cadence In Steps	Peak Hours Of Using Mobile Phone
Count	100	100	100	100	100	100
Min	20	12	20	4	63	2
Max	200	26.4	284	14	98	14
Mean	175.93	17.72	35.42	7.91	84.75	5.37
SD	32.46	3.44	25.76	1.93	10.01	2.65

Thedescriptivestatistics show sthatth eaveragemob ileweightis175.93 gm with the standard deviation of 32.46 gm. Similarly, the average step length is 17.72 cm(SD=3.44), theaveragestridelengthis35.42cm(SD=25.76),theaverageste pwidthis7.91 cm (SD = 1.93), the average steps per minute is 84.75 steps (SD = 10.01) and the average hours of using mobile phone is 5.37 hours (SD = 2.65).

InferentialStatistics:

To test whether the mean step length of all subjects is significantly different from the normal value of 2.5 feet (i.e., 76.20cm)

Result of t-test:

	n	Mean	SD	Pop. Mean	Diff	SE	Z	P-value
STEP LENGTH	100	17.72	3.44	76.20	-58.48	0.34	-169.90	0.000

From the above output, we see that the p-value of the test statistic is less than 0.05, and hence we reject the null hypothesis at 5% level of significance.

CONCLUSION:

Hence, the evidence is sufficient to conclude that the mean step length of all subjects is significantly different from the normal value of 76.20 cm. In particular, the sample mean of step length is 17.72 cm which is less than that of normal value. Therefore, we conclude that the mean step length is getting reduced because of reading and texting while walking.

To test whether the mean Stride length of all subjects is significantly different from the normal value of 5 feet (i.e., 152.40cm)

Result of t-test

	n	Mean	SD	Pop. Mean	Diff	SE	Z	P-value
STRIDE LENGTH	100	35.42	25.76	152.40	-116.98	2.58	-45.42	0.000

From the above output, we see that the p-value of the test statistic is less than 0.05, and hence we reject the null hypothesis at 5% level of significance.

CONCLUSION:

Hence, the evidence is sufficient to conclude that the mean **stridelength** of all subjects is significantly different from the normal value of 152.40 cm. In particular, the sample mean of **stride length** is 35.42 cm which is less than that of normal value. Therefore, we conclude that the **mean stride length** is getting reduced because of reading and texting while walking.

To test whether the mean step width of all subjects is significantly different from the normal value of 8 to 10 cm (i.e., around 9cm)

Result of t-test:

	n	Mean	SD	Pop. Mean	Diff	SE	Z	P-value
STEP WIDTH	100	7.91	1.93	9.00	-1.09	0.19	-5.64	0.000

From the above output, we see that the p-value of the test statistic is less than 0.05, and hence we reject the null hypothesis at 5% level of significance.

CONCLUSION:

Hence, the evidence is sufficient to conclude that the mean **step width** of all subjects is significantly different from the normal value of 9 cm. In particular, the sample mean of **step width** is 7.91 cm which is less than that of normal value. Therefore, we conclude that the **mean step width** is getting reduced because of reading and texting while walking.

To test whether the mean cadence in steps of all subjects is significantly different from the normal value of 115 steps per minute (i.e., around 115 steps perminute)

Result of t-test:

	N	Mean	SD	Pop. Mean	Diff	SE	Z	P-value
Cadence In Steps	100	84.75	10.01	115.00	-30.25	1.00	-30.21	0.000

From the above output, we see that the p-value of the test statistic is less than 0.05, and hence we reject the null hypothesis at 5% level of significance.

CONCLUSION:

Hence, the evidence is sufficient to conclude that the mean **cadence** of all subjects is significantly different from the normal value of 115 steps per minute. In particular, the sample mean **cadence** is 84.75 steps per minute which is less than that of normal value. Therefore, we conclude that the **mean cadence (steps per minute)** is getting reduced because of reading and texting while walking

RESULT:

Step length, stride length, step width and cadence have reduced significantly in reading and texting of mobile phones, while walking ($p<0.0001$). Thus, the parameters during reading and texting of mobile phones while walking were affected.

DISCUSSION:

The main aim of the study is to evaluate the effect of gait indices on reading and texting of mobile phones while walking among college students. In this study the sample consists of 56% female and 46% male students. Healthy college students both male and female among 17 to 20 years who are using mobile phone equipped with a touch screen and standard QWERTY keyboard with normal visual acuity and ability to ambulate with no assisting devices were included in this study.By using a clinical method-QUANTITATIVE GAIT ANALYSIS various gait parameters were assessed such as, step length, stride length, step width and cadence. In this study the average values of step length, stride length, step width and cadence in steps were found to be significantly less than that of the respective normal values.

CONCLUSION:

The present study concluded that reading and texting of mobile phones while walking affect their gait parameters (step length, stride length, step width and cadence) among college students,which were statistically significant ($p<0.001$).As a result, reading and texting of mobile phones while walking affects the walking pattern by distraction of surroundings.

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