



Impacts of Mobile Phone Distractions on Walking Performance

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ABSTRACT

This work studies the effect of playing mobile phones while walking to pedestrian safety. Thirty young-adults were observed while walking around Skanderbeg square with and without playing Pokemon GO. Results show that the walking performance deteriorated when the participants played Pokemon GO as can be seen from the average number of laps decreased from 2.47 to 1.58 laps, the average number of collisions increased from 0.27 to 3.93, and the average number of slip, trip and fall increased from 0.03 to 2.07. It can be concluded that using mobile phone while walking could be dangerous for pedestrian safety.

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1. INTRODUCTION

Albania is a country with high fatality rate, where 17% of the recorded road traffic accidents in Tirana during 2000-2005 were fatal (Qirjako *et al.*, 2008). Pedestrian is the type of road user with the highest fatality risk. Pedestrian death comprises 35% of total deaths by the accidents in Albania in 2016 (United Nations Economic Commission for Europe, 2018). The main cause of accidents involving pedestrians is the careless road use such as reckless crossing.

One of the causes of the reckless pedestrian behavior is the distraction amongst pedestrians. Young-adults are

frequent pedestrians and they often use their mobile phones to send text messages or play games anytime and anywhere (Nurwulan *et al.*, 2015). These activities have becoming a habit such that it is normally done every day. This habit has becoming more intense especially after Pokemon GO, a popular augmented reality mobile game, was launched. This game requires players to search around the city for wild animals to be trained as pets. The wild animals could appear anytime and the players need to catch them to level up. Although this game is beneficial to encourage people to exercise, it is rather dangerous when people do not really pay attention to the road (Barbieri *et al.*,

2017). The use of mobile phone during memory that increases perturbation and finally may cause accidents (Nurwulan *et al.*, 2015; Nurwulan & Jiang, 2016).

Nowadays, pedestrians always engage in multi-tasking activities such as using hand-held devices, listening to music, snacking, or reading. These activities draw their attention while walking. With the popularity of mobile phones' games such as Pokemon GO, the risk of pedestrian fatality may increase. There have been various warnings given to pedestrian such as not using mobile phone while walking, always aware of traffic, and avoid any kind of distractions while walking. However, to what extent the distracted walking may threaten safety remains unclear (Mwakalonge *et al.*, 2015). Therefore, this study aims to assess the relationship between distracted walking caused by mobile phone use, in this case playing Pokemon GO, and pedestrians' performance in walking around the busy main plaza in Tirana, Albania. To the author's knowledge, there were no past studies specifically evaluating the impacts of pedestrians behavior in Albania especially when using mobile phone. Previous studies regarding road traffic accidents in Albania were based on historical data and surveys without direct field observation or experiment (Qirjako *et al.*, 2008; Lenjani *et al.*, 2019). Furthermore, the focus of their study was on the drivers behaviour instead of pedestrians. Hypothetically, distracted pedestrians would exhibit poor performance in walking. In this study, the performance of walking was quantified by counting the number of walking laps and number of collisions with other pedestrians in 30 minutes.

This paper is organized as follows. Section 2 describes the methods in conducting the experiment protocol. Section 3 presents the results and discussion of

walking has a negative impact on working the study. Finally, the conclusion is presented in section 4.

2. METHODOLOGY

Previous studies have evaluated the distracted walking of the pedestrians while crossing a busy intersection (Russo *et al.*, 2018; Stavrinou *et al.*, 2018; Wells *et al.*, 2018). In this study, the data collection was conducted by doing field observation in order to imitate the real situation. However, the observation was not conducted at the intersection due to the safety consideration. The data were collected at Skanderbeg square, Tirana instead. This location was selected because this main plaza in the center of Tirana is always full of people.

Thirty young adults (17 males, 13 females) with age of 21.20 ± 1.73 years were asked to walk around the determined route with length of 1,000 m at Skanderberg square. All of the participants were free of neurological disorders based on self-report. The participants signed the consent forms before participating in the experiments. There are two activities conducted, with and without playing Pokemon GO using their mobile phones. Each activity was performed for 30 minutes with 10 minutes of rest between activities. In the first activity (with playing Pokemon GO), the participants were asked to catch as many Pokemon as possible.

Number of walking laps and number of collisions or near-collisions with other pedestrians were observed to quantify the performance of the participants. These participants' behaviors are then described using descriptive statistics. Paired t-test and independent samples t-test were then used to evaluate participants' walking performances.

3. RESULTS AND DISCUSSION

The observation results are shown in **Figure 1**. Number of lap was calculated by dividing the walking distance to the distance of the determined route. Number of collisions was determined by counting how many times the participants bumped or almost bumped to the other pedestrians during the tasks. Whereas, number of slip, trip and fall was determined by counting how many times the participants slip, trip and fall or almost fall while performing the tasks.

From the observation, it is evident that the walking performance deteriorat-

ed when the participants played Pokemon GO. In general, the average number of laps decreased from 2.47 to 1.58 laps. This could happened because the participants needed to divide their attentions between walking and catching wild Pokemon.

As the participants were asked to catch as many Pokemon as possible, they walked slower in order to catch the Pokemon. In addition, the participants bumped or near-bumped into other pedestrians and/or slip, trip and fall during walking while playing Pokemon GO. The average number of collisions increased from 0.27 to 3.93 and the average number of slip, trip and fall increased from 0.03 to 2.07.

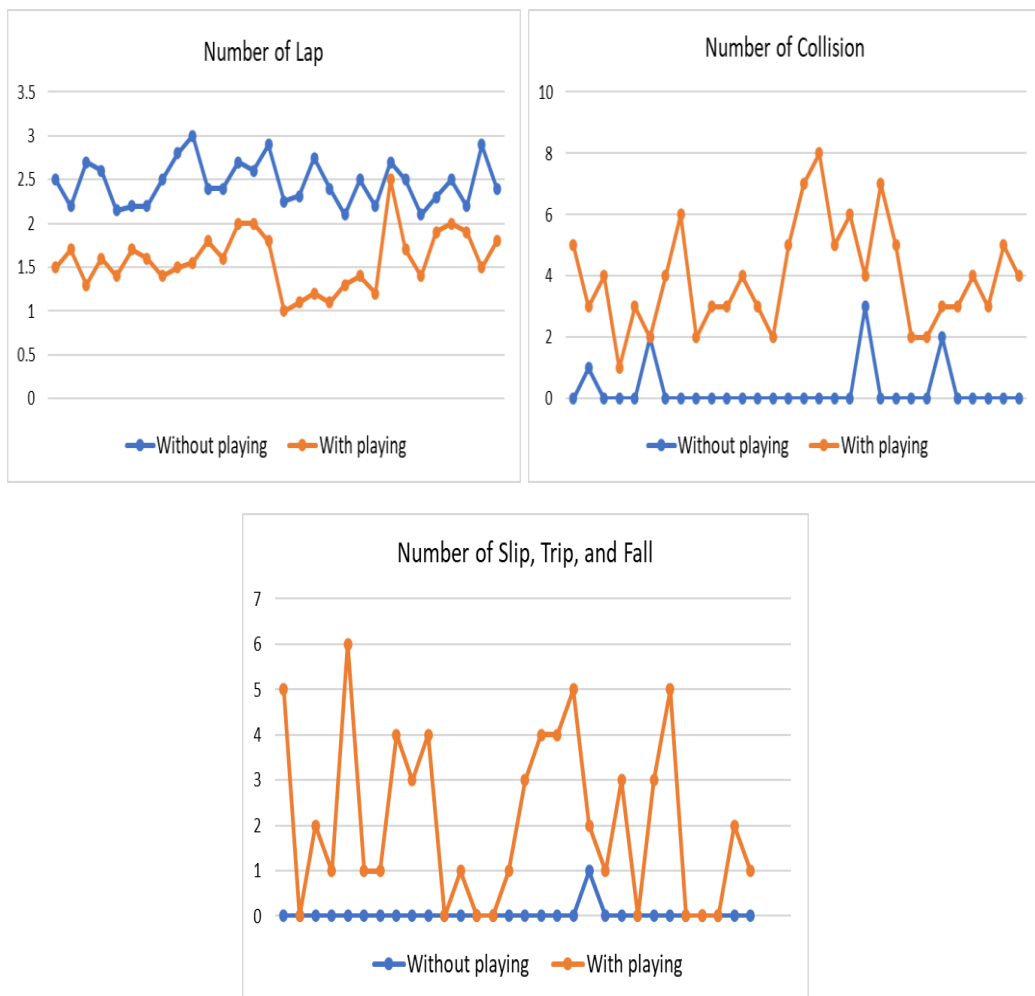


Figure 1. Observation Results

Table 1. Paired t-test of With and Without Playing Pokemon Go

Variable	Without playing	With playing	p-value
Number of lap	2.47±0.26	1.58±0.33	1.11 x10 ⁻¹³ *
Number of collision	0.27±0.74	3.93±1.70	4.31x10 ⁻¹¹ *
Number of slip, trip and fall	0.03±0.18	2.07±1.87	2.04x10 ⁻⁶ *

Table 2. Independent t-test of With and Without Playing Pokemon Go

Variable	Without playing			With playing		
	#Lap	#Collision	#Slip, trip, fall	#Lap	#Collision	#Slip, trip, fall
Age	3.72x10 ⁻¹⁴ *	2.71x10 ⁻⁴⁰ *	3.64x10 ⁻³⁴ *	1.37x10 ⁻²¹ *	7.37x10 ⁻³⁴ *	2.64x10 ⁻⁴³ *
Gender	3.87x10 ⁻²³ *	0.313	0.0002*	3.72x10 ⁻¹⁴ *	3.72x10 ⁻¹⁴ *	3.72x10 ⁻¹⁴ *

*significant

The paired t-test evaluation to evaluate the walking performance between with and without playing Pokemon GO shows significant differences ($p < 0.001$) for number of laps, number of collisions or near-collisions, and number slip, trip and fall, as shown in **Table 1**. The poor walking performance could be caused by the inability of dividing the attention between walking and using mobile phone. Previous studies showed that humans are not able to perform dual-task activities without sacrificing either tasks or even both tasks intersection (Russo *et al.*, 2018; Stavrinou *et al.*, 2018; Wells *et al.*, 2018). Performing dual-task activities will reduce the performance of the primary task, or secondary task, or both tasks. Previous studies showed that humans tend to sacrifice the primary task (Nurwulan *et al.*, 2015). This might be caused by the perception that primary task, in this study walking, is something that we can do easily and automatically. Further, the participants were asked to catch as many Pokemon as possible. Thus, they were more focused on the secondary task, in this study playing Pokemon GO, than the primary task.

Table 2 shows that age and gender affect walking performance ($p < 0.001$) in both with and without playing Pokemon GO, except that the effect of gender in

number of collisions when walking without playing Pokemon GO shows $p = 0.313$. However, these findings are considered to be weak since the participants are all young adults with close range of age.

Although this study shows the impact of walking while using mobile phone, this study could not distinguish the difference between normal walking and distracted walking physiologically. This study only observed the performance based on the real events such as collisions and falls. In the previous studies, devices such as force platform (Nurwulan *et al.*, 2015) and wearable accelerometers (Nurwulan *et al.*, 2019a; Nurwulan *et al.*, 2019b) was used to quantify the postural stability. By using wearable accelerometer, the stability of postural tasks such as standing and walking can be determined by calculating the postural stability index (Nurwulan *et al.*, 2019a; Nurwulan *et al.*, 2019b). Postural stability index is derived from the entropy analysis of the acceleration data. It has been shown that entropy analysis can differentiate the subtle changes in the postural stability (Nurwulan *et al.*, 2019a). The postural stability index would be very beneficial to evaluate the pedestrian safety in real environment. Future studies evaluating the pedestrians behavior in Albania should use this postural stability in-

dex to get better understanding of the postural stability of the pedestrian. This is because a mere observation cannot determine the walking performance unless the participants fall or near-fall. It is possible that the pedestrian has poor stability although there is no fall or near-fall during the performance. This poor postural stability might increase the fatality of the pedestrians while walking.

4. CONCLUSION

This study observed the walking performance of the pedestrians with and without using mobile phone especially playing

Pokemon GO. It has been shown that the walking performance deteriorated when the participants play Pokemon GO. Since one of the main causes of pedestrians fatality is the reckless behavior while crossing the road, it is important for pedestrians to not use their mobile phone while walking. This activity will cause divided attention that may cause fatality. The findings from this study are expected to raise awareness in conducting safe behavior while walking in order to reduce the number of fatality.

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