



## Impacts of using electronic devices on road crossing behaviors among medical college student

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**Abstract:** College-age individuals walked frequently. One factor that might contribute to increase unsafe crossing behaviors among this group is distraction while use of mobile phone and personal music devices. The main of this study was examining the effect of mobile phone use and personal music devices on crossing behaviors among Iranian medical college students. Two hundred seventy eight college students registered to participation in a cross-sectional study. Participants selected randomly from eight faculties of Isfahan University of medical science, Isfahan, Iran. Data was calculated by self-report questionnaire that measured crossing behaviors. Data were analyzed by statistical software SPSS version 21 by conducting independent sample t-test and chi-square test. Mean age of study participants was  $23.16 \pm 3.66$  years. One hundred thirty one (71.9%) undergraduate students and 78 (28.1%) were graduate students. Use of mobile phone and personal music devices in males was more than females. Males reported performing unsafe crossing behaviors while using of mobile phone, writing text message and listening to music on personal music devices more than females ( $p < 0.05$ ). Multivariate general linear model analysis showed a significant correlation between use of mobile phone (value= 0.099,  $df=7$ ,  $P= 0.001$ ), personal music devices (value= 0.54,  $df=7$ ,  $P= 0.036$ ) and writing text message (value= 0.53,  $df=7$ ,  $P= 0.038$ ) with unsafe crossing. In Conclusion, Use of mobile phone, music devices and writing text message appears to impair crossing behaviors related to road safety. Design and implementing interventions that highlight the dangers of using electronic devices while crossing is suggested.

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### 1. Introduction

Young adults Pedestrians are largely vulnerable road users. Despite the efforts of public, political and scientific to reduce pedestrian traffic accidents throughout the world, there is a significant number of pedestrians who seriously injured or killed (1). There are several factors that influence pedestrian safety such as no compliance with traffic legislation, crossing in non-signalized intersections, don't pay attention to traffic flow and red lights, use of multimedia devices and mobile phones(2-7). Use of multimedia devices (e.g; mobile phone, music player) is increasing

worldwide, and it is estimated that 77% of the world's people have a mobile phones and daily 6.1 million text messages were sent each day(8). A growing number of people own mobile phone and mobile technology to the extent that individuals are able to send and receive images, video files, and e-mail (9). The risk of injury in young adult's pedestrian is high for a few reasons. For example, they walk frequently and walk while distracted by mobile and multimedia devices (10). According to several studies pedestrian distractions by mobile phone is an important factor that influenced pedestrian safety while crossing a street (2, 3, 9). Many studies reported

that pedestrians who are distracted by phone or other electronic devices (e.g., music player, headphones) take greater risks when crossing streets (3, 6, 11). Nasar et al (2013) showed a decreased in situational awareness and attention while crossing the street due to use of multimedia devices, and also they reported that distracted pedestrians were often slowly walked when crossing the street (6). Byington et al (2013) in study on college students indicated that pedestrian engaged in greater risky behavior while using mobile internet when crossing a street and miss safer opportunity to cross (2). Cell-phone use can lead to cognitive and visual distraction, and it is important to illegal crossing in people who were distracted by a mobile phone. However, in cognitive and visual distraction, both cognitive and perceptual processes affect the visual system and probably can lead to very dangerous crossing (2). Hatfield et al (2007) reported that people who crossed a street while using a phone crossed more slowly at unsignalized intersections and don't check traffic flow before starting to cross compared to other people. They suggested that talking on a mobile phone is related to cognitive distraction that may undermine pedestrian safety (3). In addition, Nasar et al (2008) reported that mobile users unsafely entered into oncoming traffic to passed street significantly more than other groups and also situational awareness associated with talking on a mobile phone among pedestrians is reduce (11). Pedestrians when using music devices or talking with mobile phones are very at risk because of taking unsafe crossing behaviors frequently (6, 7, 11, 12). Neider et al (2010) in study on college students suggested that pedestrian when listening to music don't safely cross, and they took more time to initiate their crossing when talking on a mobile phone. They also indicated that pedestrians when talking on a cell phone are less likely to recognize and act on crossing opportunities (12). Thus, the present study was designed to consider the effect of mobile phone use and personal music devices on road crossing-behaviors among Iranian medical college students.

## 2. Method

Two hundred seventy eight college students aged 17 to 37 years were recruited in a cross-sectional study. The sample included 129 male and 149 female. Exclusionary criteria included only motor disabilities that proposed can affect on participant's crossing-behaviors. Participants completed self-report questionnaire in two sections. Section one was a brief

demographic questionnaire that measured information including age, sex, body mass index, family economic income, educational degree and traffic accident history as a pedestrian. Second section was a questionnaire designed to evaluate the use of mobile phone and music devices by participants while crossing a street and neither participant's crossing-behaviors while talking on a phone, writing text message and listening to music on personal music devices. To evaluate use of mobile phone and personal music devices, participants answered to three items. Three items were "Do you talking on mobile phone while crossing the street? (Yes/No), "Do you writing text message while crossing the street? (Yes/No), "Do you listening to music on headset and personal music devices while crossing the street? (Yes/No). To evaluate participants' road crossing-behaviors, they answered to seven items about cross a road based on existing validated versions of the Pedestrian Behavior Scale (PBS) (13). We asked participants "how often do you these behaviors when talking on the phone, listen to music and writing text message? Seven items were "cross outside the pedestrian crossing, even if there is one less than 50 m away," "look at the traffic light and start crossing as soon as it turns red", "cross the street even though the pedestrian light is red", "cross diagonally", "Start to cross and run the rest of the way to avoid oncoming vehicles," "cross even if vehicles are coming because you think they will stop for you", "crossed several streets and intersections without paying attention to traffic." All items were scored on the 5-point likert scale (never to always). Questionnaire reliability approved, firstly, by an expert panel and then to evaluate questionnaire reliability, a pilot study was conducted with 30 college students and Cranach's alpha ( $r=0.69$ ) was calculated. Finally, Data entered to statistical software SPSS version 21 and analyzed by undertaking statistical test, including chi-square test, independent sample t-test and Multivariate general linear model.

## 3. Results

Mean age of study participants was  $23.16 \pm 3.66$  years. One hundred thirty one (71.9%) undergraduate students and 78 (28.1%) were graduate students in Isfahan university of medical science, Isfahan, center of Iran. Mean of body mass index (BMI) was  $21.94 \pm 2.93$ . Thirty two participants (11.5%) reported accident history and 246 (88.5%) have not any history of the accident as a pedestrian. More details of demographic characteristics are shown in Tabl 1.

Table1. Distribution of the demographic characteristics among participants

variable	frequency	percent
<b>Degree</b>		
1.Undergraduate	131	47.1
2.Masters	55	19.8
3. Professional Doctorate	69	24.8
4.Ph.D	23	8.3
<b>Body mass index (BMI)</b>		
1.Underweight	20	7.2
2.Normal	227	81.7
3.Overweight	28	10.1
4.Obese	3	1.1
<b>Family income</b>		
1.Low	141	50.7
2.moderate	86	31.1
3.high	51	18.2
<b>Accident history as pedestrian</b>		
1.Yes	32	11.5
2.No	246	88.5

Significant differences were found overall between the self-reported behaviors among females and males. According to our findings, as showed in table 2, Females have more attention to safe crossing and while using of electronic devices rottenly checked traffic volume, don't run the rest of a way if vehicles

are oncoming, cross at marked intersections, cross if vehicles are stepped and don't enter to street if pedestrian light is red. Male reported more distraction and unsafe crossing behaviors when using of mobile phone and personal music devices while crossing a street. ( $p < 0.05$ ).

Table 2. Gender differences in crossing behaviors while use of mobile phone, personal music devices and writing text message

Variable	Male		Female		p-value
	Mean	SD	Mean	SD	
cross outside the pedestrian crossing even if there is one less than 50 m away	3.72	0.992	3.37	0.944	0.003
look at the traffic light and start crossing as soon as it turns red	3.70	0.933	3.21	1.03	0.001
cross the street when pedestrian light is red	3.79	0.939	3.42	0.916	0.001
cross diagonally	4.22	1.00	3.96	1.03	0.035
Start to cross and run the rest of the way to avoid oncoming vehicles	3.57	1.17	3.06	1.10	0.001
cross the street if vehicles are coming	4.14	1.17	3.86	1.22	0.047
crossed several streets and intersections without checking traffic flow	3.91	1.31	3.60	1.18	0.038

Chi-square test was conducted to comparing use of mobile phone, personal music devices and writing text message while crossing. A significant difference was found by gender. Males reported use of mobile phone

(talking on the phone and writing text message) and listening to music on headphone more than females ( $p < 0.05$ ). Gender differences in use of electronic devices were presented in table 3.

Table 3. Percentage of using mobile phone, personal music devices and writing text message while crossing a street amongst female and male

Variable	female		male		p-value
	Yes	N0	Yes	N0	
Use of mobile phone	65(43.6%)	84(56.4)	76(58.9%)	53(41.1%)	0.008
Use of personal music devices	42(28.2%)	107(71.8)	51(39.5%)	78(60.5%)	0.031
Writing text message	54(36.2%)	95(63.8%)	79(61.2%)	50(38.8%)	0.001

Multivariate general linear model is used to assess relationship between use of electronic devices and crossing behaviors among participants. Results showed a significant correlation between use of mobile phone (value= 0.099, df=7, P= 0.000), personal music devices

(value= 0.54, df=7, P= 0.036) and writing text message (value= 0.53, df=7, P= 0.038) with unsafe crossing among participants. Table 4. is shown the effect of electronic devices on crossing behaviors.

Table 4. Multivariate test: the effect of mobile phone, music device and writing text message on crossing behaviors

Variable	Use of mobile phone		Use of music devices		Writing text message	
	R square	p-value	R square	p-value	R square	p-value
cross outside the pedestrian crossing even if there is one less than 50 m away	.002	.475	.879	.000	.573	.001
look at the traffic light and start crossing as soon as it turns red	.001	.674	.186	.006	.166	.007
cross the street when pedestrian light is red	.003	.326	.775	.000	.080	.011
cross diagonally	.018	.024	.214	.006	.072	.012
Start to cross and run the rest of the way to avoid oncoming vehicles	.002	.433	.003	.032	.125	.008
cross the street if vehicles are coming	.028	.005	.000	.062	.000	.063
crossed several streets and intersections without checking traffic flow	.103	.000	.027	.018	.000	.052

#### 4. Discussion

This study aimed to examining the impact of electronic devices on crossing behaviors in Iranian college students. The results confirm risk of injury to pedestrians using electronic devices while crossing. Our finding showed a relationship between use of mobile phone (talking or texting), listening to music and unsafe crossing behaviors. Higher rate of using mobile phone, personal music devices, writing text message and distracted walking in male as comparing with female was revealed. Nasar et al (2013) indicated that men pedestrian use a mobile phone in public places frequently and this behavior put them in risky situation(6). Comparing pedestrians who crossed with using a mobile phone or personal music devices showed higher rate of unsafe crossing behavior among male participants. male as comparing female who distracted by electronic devices were less likely cross outside the pedestrian crossing, less likely to look at traffic before starting to cross, less likely to wait for

traffic light turn to green, less likely Start to cross and run the rest of the way to avoid oncoming vehicles, less likely to crossed several streets and intersections with checking traffic flow and likely cross diagonally. Schwebel et al (2012) in study on how talking on the phone, texting, and listening to music impact crossing the street reported that using of these media can lead to increasing of distraction and risk of traffic accident among pedestrian(8). Results demonstrate cognitive and visual distraction to crossing while using of electronic devices and were agree with findings of Nasar et al (2008) in study on the effect of mobile phone on distraction and safety crossing that reported a decrease in situational awareness while crossing because of talking on the mobile phone (11). Previous documents of study on Pedestrian injuries due to mobile phone use showed that pedestrian cross slowly and change line while using of mobile phone(6). Our findings were matched with results of Zhuang et al (2011) study on pedestrian crossing behaviors in China

and Schwebel et al (2012) study on impact of electronic devices in pedestrian distraction(7).

### 5. Conclusion

Use of mobile phone, music devices and writing text message appears to impair some behaviors that are important to crossing the road safely, particularly among males. Pedestrian safety may be improved by conducting interventions that highlight the dangers of communicating with a mobile, use of music devices, writing text message while crossing and that explicitly identify techniques for avoiding these behaviors.

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**Conflict of interest:** The authors declare that they have no conflict of interest.

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