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An observational study of secondary task engagement while driving on urban streets in Iranian Safe Communities

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Abstract

In Iran the prevalence of traffic injuries and death from vehicle collisions are high. Driver engagement in non-driving-related tasks has previously identified as an important contributing factor to crashes. Therefore, the objective of the present study was to investigate the prevalence of drivers' engagement in potentially distracting activities in Kashmar, Khalilabad and Bardaskan, which are three Iranian International Safe Communities. Observations took place at 12 randomly selected roadside locations in each city, which were comprised of six main streets and six side streets. In total 7979 drivers were observed. The prevalence rates of potentially distracting activity in Kashmar, Khalilabad and Bardaskan were 24.3%, 26% and 24.9%, respectively. In both Kashmar and Khalilabad the most frequently observed secondary tasks

were drivers talking to passengers (10.6% and 11.5%, respectively) followed by mobile phone use (3.4% and 4.0%, respectively). Although in Bardaskan the most commonly observed secondary task was also talking to passengers (12.7%), the second most common was reaching for an object (3.2%). In all three cities younger drivers were significantly more likely to be observed engaged in a secondary task while driving. Furthermore, involvement in secondary tasks while driving was significantly higher amongst females and those driving on a working day. The percentage of drivers identified as potentially distracted in these three Safe Communities was worryingly high. Thus, interventions should be integrated into the WHO Safe Community network in these cities, including: education regarding the risks associated with engaging in secondary activities while driving, law enforcement, tougher legislation, periodic assessment, raising public awareness, as well as attracting political and social support.

Key words: Potentially distracting activity; Secondary tasks; Mobile phone; Observational study; Safe Communities; Iran.

Introduction

Road traffic crashes (RTC) pose a major threat to public health and are a substantial socioeconomic burden for most nations, especially low and middle-income countries (LMIC) (Murray and Lopez, 1997, Peden, 2004). In Iran, which is a medium-income country, there were a total of 414161 traffic injuries recorded in 2010 (Bahadorimonfared et al., 2013) and a traffic fatality rate of 34.1 per 100,000 inhabitants (World Health, 2013), which is relatively high by global standards. The occurrence of traffic crashes is due to an interaction between the driver, the vehicle and the environment. Moreover, human factors have been identified as the main cause of traffic crashes, being the sole cause of more than 50% of all collisions (Lewin, 1982).

Driver distraction is one of the many human factors that can cause or contribute to a crash. Driver distraction has been defined as "a diversion of attention from driving, because the driver is temporarily focusing on an object, person, task or event not related to driving, which reduces the driver's awareness, decision making ability and/or performance, leading to an increased risk of corrective actions, near-crashes, or crashes" (Hedlund et al., 2005).

The importance of driver distraction as a contributing factor in RTC has received a lot of attention in recent years, due in part to the increasing use of modern technologies in vehicles, such as mobile phones and Global Positioning System (GPS) devices (Sullman, 2012, Huisingh et al., 2015). Furthermore, there are many other activities that can potentially distract a driver, such as: talking to passengers (Koppel et al., 2011), eating and drinking (Engstrom et al., 2008), manipulating vehicle electronics (Stutts et al., 2001), as well as the environment outside the car (Stutts et al., 2005).

In the United States, in 2010, some types of distractions or secondary tasks have been shown to cause about a fifth of motor vehicle collisions according to the National Highway Traffic Safety

Administration (NHTSA), and in 2012 driver distraction was reported to be a contributing factor in 3,328 fatalities and 421,000 injuries (Ascone et al., 2009, NHTSA, 2013).

Engaging in a secondary task while driving also has adverse economic effects. For instance, a Harvard study has estimated that the annual cost of crashes associated with mobile phone use to be US $43 billion (NHTSA, 2013)

A large body of research has investigated the prevalence of mobile phone use while driving, as one type of potentially distracting activity amongst drivers, but there is little observational research that has more broadly studied the prevalence of driver engagement in secondary tasks while driving.

In one of the few roadside observational studies which investigated this issue, using fixed cameras on high speed highway at different locations across the span of New Jersey turnpike to take photographs both during the day and night, Johnson et al. (2004) found that 4.16% of the drivers were engaged in some type of secondary task at speeds of 100 feet per second or greater., with the most common being mobile phone use. Another US study used roadside observations to collect data close to intersections on arterial/collector roads and local streets, in different types of traffic flow (stopped, slow moving, moderate congestion, free flowing) and different estimated vehicle speed (stopped, <25, 25–50, >50 miles per hour) were observed. This study found that 32.7% of the drivers observed were engaged in a secondary task, with talking to passengers being the most common non-driving-related activity (Huisingh et al., 2015). Furthermore, research has also been undertaken in six urban centres in the UK (Sullman, 2012). Observations took place on 30mph roads at least 100 m from controlled intersections and only vehicles in motion were included. This research found that 14.8% of British drivers were engaged in some type of secondary task, with talking to passengers again being the most frequent. In a second UK study, which was carried out in a single city under the same conditions this figure was found to be 16.8%, with the most common secondary task again being talking with passengers (Sullman et al., 2015).These findings were largely supported by two separate studies in Spain which reported that the prevalence of secondary task engagement was 19%, and talking to passengers was the most commonly observed activity (Gras et al., 2012, Prat et al., 2014). Spanish studies

were carried on only motor vehicles travelling in the lane closest to the curb in urban locations during the day and roads had a legal speed limit of 50 km/h.

In-car naturalistic observational research using sensors, video cameras and recorders constitute another approach to assessing the prevalence of driver engagement in secondary tasks. A naturalistic study in the US (Stutts et al., 2005) found that drivers were engaged in some type of secondary task 31% of the time the vehicles were moving. The results of another American study showed that participants engaged in potentially distracting behaviours about 34% of their driving time (Sayer et al., 2005). In the 100- car study, Klauer et al. (2006) found that 44% of drivers were engaged in secondary tasks. Furthermore, these drivers engaged in secondary tasks 23.5 percent of the time that they were driving.

The Safe Communities (SC) concept was introduced at the First World Conference on Accident and Injury Prevention held in Stockholm, Sweden in 1989. Three following core values have shaped the vision and focus of International Safe Communities around the world, which are:

"1. Safety is a fundamental human right;

2. People are at the heart of making communities safer places in which to live, work, learn, travel and play; and

3. Everybody has a responsibility to promote, maintain their safety and the safety of others (Nelson Tasman, 2015)."

The WHO Safe Community (SC) model is an international, sustainable, intersectional, community-based and integrated approach that aims to achieve safety promotion based on injury prevention. The model emphasizes community participation and cultural, social and political support. Therefore, multidisciplinary cooperation and collaboration must take place between non-government organizations, the business sector, local and government authorities and part of the World Health Organization (WHO) Safe Communities Coalition. Furthermore, programs

based on the Safe Community model focus on high-risk groups and environments, in order to promote safety for vulnerable groups. Also, the most prevalent causes of injuries must be documented, and programs are implemented based on the available evidence. Lastly, a principal component of this model is the assessment of programs, processes and achievements (WHO Collaborating Centre on Community Safety Promotion (WHO CCCSP), 2014).

In 1989, Lindkoping in Sweden was designated as the first International Safe Community in the world. In 2014, 25 years later a total of 362 communities from 29 countries were members of the WHO Safe Community. At present programs based on the International Safe Community model have been implemented in seven Asian countries, including: China, Iran, Vietnam, South Korea, Israel, Japan and Thailand. Iran is one of the most active nations with regards to implementing ISC programs, and a total of 34 Iranian cities and municipal districts are designated as members of the WHO Safe Communities networks (WHO Collaborating Centre on Community Safety Promotion (WHO CCCSP), 2014). In 2007, Kashmar in the east of Iran became the first Iranian Safe Community, followed by Bardaskan and Khalilabad, which were designated as Iranian members of this international network in 2009 and 2010, respectively (Rahimi-Movaghar, 2010, Safe Community Bardaskan, 2007, Safe Community Khalilabad, 2010). Iranian Safe Communities are involved in implementing plans in different safety areas, and traffic injury prevention is considered a priority in the interventional programs based on the ISC model in Iran (Safe Community Association (S.G.A), 2014).

To the best of our knowledge, this is the first roadside observational study to broadly investigate the prevalence of secondary tasks in a developing country and whether there are differences according to: driver age, gender, street type (main and side streets), day of the week (weekdays/weekend) and time of the day (morning and afternoon). This study aims to provide

evidence-based information on secondary task engagement which can be used to develop interventional programs based on the WHO Safe Community model.

2. Methods

This roadside observational study of secondary task engagement while driving was carried out in Kashmar, Khalilabad and Bardaskan. These three cities are located in the east of Iran and their populations in 2011 were 157149, 72626 and 49111 people, respectively (Iranian Statistics Center, 2011).

2.1. Timing & Locations

The observations took place between July and August 2014 on Friday (Iranian weekend) and Monday (working day) from 9–10:30 am and 4-5:30 pm. Observations were undertaken in July and August because the temperate climate and weather condition during these months were perfect for roadside observational surveys and allowed a clear view of the driver.

According to the Driving Manual of the Islamic Republic of Iran, Main Streets are roads which are wider than 6 metres and Side Streets are roads connected to main streets that are not as wide (The Police Force of the Islamic Republic of Iran, 2013). On maps of Kashmar, Khalilabad and Bardaskan urban areas all main and side streets with legal speed limits of 50 km/h were given a number. Following this a total of 36 observation sites were randomly selected using SPSS software (Version 21). In each city, observations took place at 12 locations, which were comprised of six main streets and six side streets.

Two teams, consisting of an observer and a data collector were dispatched to the observation sites. Teams positioned themselves close to the traffic lane(s) to allow a clear view, but also aimed to be as unobtrusive as possible. Some observation sites were close to intersections and

others were away from ones. They observed and recorded drivers' characteristics and engagement in observable secondary tasks while the vehicles were in motion. The points of observation were chosen at sites where there were no traffic cameras or police patrols, as it is possible that some people would modify their driving behaviours, such as mobile phone use, smoking, eating and or drinking.

2.2. Measures

The following variables were measured during this study: whether the driver was engaged in a secondary task, type of secondary task, sex, estimated age, day of the week, time of day and street type. Using a timer, observations were made every 10 seconds.

In accordance with previous roadside observational surveys, drivers' age was recorded using three age groups: less than 30 years, 30-50 years, and more than 50 years old (Sullman, 2012, Sullman et al., 2015, Prat et al., 2014, Huisingh et al., 2015, Gras et al., 2012, Taylor et al., 2003, Taylor et al., 2007, Young and Lenne, 2010). Also in order to facilitate comparisons with previous research, secondary tasks were defined according to the classifications used by previous research (Sullman, 2012, Sullman et al., 2015, Prat et al., 2014). These secondary tasks were:

1-Mobile phone use: a mobile phone is held close to their ear.

2-Smoking: Holding a cigarette and smoking it whilst driving a vehicle. This includes smoking, lighting and extinguishing a cigarette or cigar

3- Eating/drinking: Holding or drinking a beverage or holding or eating food while driving.

4- Talking to passengers: Having a conversation or interacting with other people in the car. Evidence of this may be that the driver is turning their head towards the passenger to either listen or talk, or appears to be talking and gesturing.

5- Adjusting controls: Leaning forward to manipulate controls on the dashboard of the car (e.g. stereo, heating).

6-Manipulating a phone: Holding a mobile phone in their hand while driving. Includes visibly touching the screen/buttons in a manner to send a text message or dial a number.

7- Reaching for an object: The driver is seen reaching for an object on the floor, beside them or behind them (excluding the dashboard).

8- Other: This included such things as: reading, blowing their nose, grooming, using a satellite navigation device, counting money, picking their nose, finger in mouth, head out the car window, fastening buttons, cleaning car dashboard with a tissue, adjusting car mirrors, cleaning nails, using a hands-free mobile phone, and moving a baby."

According to Iranian traffic laws some of the above- mentioned secondary activities, namely, mobile phone use, smoking, eating/drinking, manipulating a phone, reading, using a hands-free mobile phone, head out the car window and moving a baby while driving are prohibited.

In order to reduce selection bias, emergency vehicles, driving school cars, tractor-trailer trucks, buses, minibuses and police vehicles were excluded (Sullman et al., 2015, Huisingh et al., 2015).

2.3 Inter-observer reliability

A 90 min session was conducted in order to familiarize the two observers and two data recorders with the objectives of the study, the definitions of the secondary tasks, along with how to conduct a roadside observational survey. Following this session, a pilot was conducted on a main

road and side street. Each team was comprised of an observer and a data collector who observed 256 drivers independently and simultaneously at the same site, and recorded the estimated age and sex of each driver, along with the types of secondary task, if any, they were engaged in. Tests for inter-observer reliability, using the percentage agreement and Cohen's Kappa coefficient, showed that there was complete agreement for mobile phone use, manipulating a phone and smoking. All other coefficients were between 0.89 and 0.98 (Table 1), indicating very good inter-observer agreement.

2.4. Ethical considerations

The study received ethics approval from the Standing Committee on Ethics in Research Involving Humans of the Kerman University of Medical Sciences. The observers did not record vehicle registration numbers or any other identifying information, such as manufacturer, model, name or colour.

2.5. Statistical analysis

In order to provide precise information for future intervention programs in each International Safe Community, separate analyses were undertaken for each city. A chi-square test and Fisher's exact test were carried out using SPSS 21 to compare the frequency and types of secondary tasks according to: age, sex, day, time and street type. A probability value of <0.05 was considered statistically significant.

3. Results

A total of 7979 vehicles were observed during the study. Table 2 shows that slightly more than half of the drivers were observed in Kashmar, about a third of the drivers observed were in Bardaskan and the remainder were in Khalilabad. About 95% of all drivers were male in each

International Safe Community. Less than fifty percent of the drivers were in the 30-50 years old age group in all three cities and about a third of the observed drivers were in the youngest age group. Most drivers in Kashmar, Khalilabad and Bardaskan were observed on working days. In Khalilabad the majority of the vehicles were recorded in the afternoon, while more drivers were observed during the morning in Kashmar and Bardaskan. In addition, more observations were made on main streets in each city than on side streets.

3.1. Secondary tasks in Kashmar

Table 3 shows that about a fourth of the drivers observed were involved in some type of secondary task in Kashmar. The most frequently observed secondary tasks were talking to passengers, mobile phone use and secondary tasks classified as other. Manipulating a phone, eating and/or drinking, reaching for an object, smoking and adjusting controls made up the remainder of the secondary tasks commonly observed.

The prevalence of smoking was higher amongst male drivers, than female drivers, Fisher's exact test, $p = 0.049$. There was a higher percentage of female drivers who were observed talking to passengers, in comparison to males, $X^2 (1, N = 2212) = 5.744$, $p = 0.017$.

The proportion of drivers engaged in secondary tasks was higher amongst those less than 30 years old, compared to those aged 30–50 and more than 50 years of age, $X^2 (2, N = 4200) = 15.078$, $p = 0.001$. The percentage of mobile phone use differed by age group, $X^2 (2, N = 4200) = 11.222$, $p = 0.004$. The highest prevalence of mobile phone use was among drivers aged 30-50 years old, while the lowest mobile phone use was observed amongst those more than 50 years of age. The youngest drivers were, however, less likely to be observed smoking while driving, $X^2 (2, N = 4200) = 9.905$, $p = 0.007$.

The prevalence of secondary tasks was lower on working days than on weekends, X^2 (1, N = 4200) = 8.212, p =0.004. Furthermore, the drivers observed on the weekends tended to engage more often in adjusting controls, talking to passengers and more "other" secondary tasks, compared to those observed on working days, X^2 (1, N = 4200) = 9.975, p =0.002 & X^2 (1, N = 2212) =8.538, p =0.003& X^2 (1, N = 4200) =4.334, p =0.037, respectively. There was also a difference by day of the week for manipulating a phone, which was higher on the working day than on the weekend, X^2 (1, N = 4200) = 3.123, p =0.077. There was also a difference by street type, with more adjusting controls being observed on the main street than on side streets, X^2 (1, N = 4200) = 12.431, p <0.001).

3.2. Secondary tasks in Khalilabad

Table 4 shows that in Khalilabad the prevalence of secondary tasks was slightly higher than a fourth of drivers. The most common secondary task was talking to passengers, followed by mobile phone use, manipulating a phone, eating and/or drinking, reaching for an object, and secondary tasks classified as other. The remaining secondary tasks were observed amongst less than 1% of the drivers, including smoking and adjusting controls.

Engagement in secondary tasks while driving was higher amongst those younger than 30 years old, than in those 30–50 year olds and older than 50 years old, X^2 (2, N = 1229) = 15.078, p <0.001). Furthermore, the percentage of drivers manipulating and using a phone in the youngest age group were higher than in the two older age groups, X^2 (2, N = 1229) = 15.300, p <0.001 & X^2 (2, N = 1229) = 15.300, p =0.006, respectively. There was also a difference for manipulating a phone by day of the week, which was more common on working days, Fisher's exact test, p = 0.005.

3.3. Secondary tasks in Bardaskan

Table 5 shows that almost a quarter of drivers were observed to be involved in some type of secondary task. The most common secondary task was talking to passengers, followed by reaching for an object, eating and or drinking, and manipulating a mobile phone. The less frequently observed secondary tasks were adjusting controls, smoking, using a mobile phone and those classified as other. Involvement in a secondary tasks was higher among females than males, X^2 (1, N = 2550) = 6.904, p =0.009, and tended to decrease with increasing age, X^2 (2, N = 2550) = 18.418, p <0.001. The youngest drivers were also observed engaging more often in manipulating a mobile phone than the other two age groups, X^2 (2, N = 2550) = 8.958, p =0.011. Drivers were observed engaged in secondary tasks more often on working days than on the weekends, X^2 (1, N = 2550) = 5.561, p =0.018. Also, using a mobile phone and reaching for objects were observed less often on weekends than on working days, X^2 (1, N = 2550) = 6.498, p =0.011 & X^2 (1, N = 2550) = 5.137, p =0.023, respectively. Furthermore, adjusting controls was more common in the afternoon than in the morning, Fisher's exact test, p = 0.009, and mobile phone use was lower on side streets than on main roads, X^2 (1, N = 2550) = 4.508, p =0.034.

4. Discussion

4.1. Prevalence of engagement in non-driving-related activities

The present study set out to investigate the prevalence of secondary task engagement amongst drivers in three Iranian cities which are all part of the International Safe Communities network. The overall prevalence of drivers who were observed engaged in any type of secondary task was worryingly high. This study found that almost a quarter of drivers in Kashmar, Khalilabad and Bardaskan were observed engaged in some type of secondary task. This was considerably higher than that found in New Jersey (USA) in 2001 (4.16%) (Johnson et al., 2004), Hertfordshire (England) in 2012 (16.8%) (Sullman et al., 2015), the south of England in 2010 (14.4%)

(Sullman, 2012), and Girona (Spain) in 2009 and 2011 (19%) (Gras et al., 2012, Prat et al., 2014). The only study which found a higher rate of secondary task engagement was the 32.7% found in Alabama (USA) in 2012 (Huisingh et al., 2015).

However, there are several methodological differences between these studies which may account for the discrepancies in the proportion of drivers reported to be potentially distracted. For example, (Stutts et al., 2005) collected data using still photographs and therefore the quality of the evidence was much lower than the above mentioned observational studies. Also, the research by (Gras et al., 2012) was conducted only on drivers leaving an urban area and several variables, such as the day of the week or time of day were not included. Furthermore, unlike other road side observational studies, Huisingh et al. (2015) also undertook observations in areas with a range of vehicle speeds (stopped, <25, 25–50, >50 miles per hour). Regardless of the above-mentioned discrepancies with other western countries, this study found a high prevalence of secondary task engagement amongst drivers in these Iranian Safe Communities. Therefore, it is important that programs for reducing or preventing secondary task engagement amongst drivers are developed and integrated into the existing safe community networks in these cities.

Similar to the UK, Spain and the US studies (Sullman, 2012, Sullman et al., 2015, Gras et al., 2012, Prat et al., 2014, Johnson et al., 2004, Huisingh et al., 2015) in these Iranian cities the most frequently observed secondary task was talking with passengers. Nevertheless, the prevalence of talking with passengers in the three Iranian cities was higher than that found in the UK studies (7.4% and 8.8%) (Sullman, 2012, Sullman et al., 2015), but was considerably lower than the 53.2% found by (Huisingh et al., 2015). However, there was no major difference between the findings of this research and the Spanish studies (13.2% and 11.9%) (Gras et al., 2012, Prat et al., 2014). These discrepancies may be due to differences in the number of passengers in cars, the

type of relationship between drivers and their passengers (people with a close relationship tend to talk more) or cultural differences.

The percentage of drivers observed using mobile phones in Kashmar and Khalilabad was higher than in Bardaskan in this study, Kerman in Iran (3.26%) (Asgharabad et al., 2013), Spain (1.3%) (Johnson et al., 2004, Prat et al., 2014), the UK studies (2.5% & 1.0%) (Sullman, 2012, Sullman et al., 2015), and the US (1.5%) (Johnson et al., 2004), but was considerably lower than the 31.4% found by Huisingh et al. (2015) in the US.

Furthermore, the prevalence of manipulating a phone in Bardaskan was lower than in Kashmar and Khalilabad, as well as in the US research (16.6%) (Huisingh et al., 2015), but was higher than that found in the UK (0.7%) (Sullman et al., 2015), Spain (0.4%) (Prat et al., 2014) and Australia (1.7%) (Young et al., 2010). There are a number of potential reasons for these discrepancies, including differences in legislation and the level of traffic law enforcement. For example using a hand held mobile phone was not illegal in Alabama (Huisingh et al., 2015). Also the cultural settings are likely to influence the prevalence of mobile phone use and online social media use is also likely to differ by country and also across time.

The results of this research found that eating and/or drinking in Kashmar, Khalilabad and Bardaskan was about 2%. Therefore, eating and/or drinking were more common than in the UK and Spain, which reported prevalences lower than 1% (Sullman, 2012, Sullman et al., 2015, Gras et al., 2012, Prat et al., 2014). However, this type of non-driving-related activity was higher in the US (3.6%) than in these Iranian cities. These differences may be associated with cultural factors related to traffic, legislation and the degree to which drivers respect traffic laws.

On the other hand, a lower proportion of drivers were observed smoking in our research than in previous studies (Sullman, 2012, Sullman et al., 2015, Gras et al., 2012, Prat et al., 2014,

Huisingh et al., 2015). The differences between our research and other studies in western countries may be attributed to cultural differences, because in traditional Iranian communities many people, particularly women and young people, avoid smoking in public.

In Bardaskan drivers who were observed reaching or searching for something, was higher than in Kashmar and Khalilabad, as well as compared with studies from abroad (Prat et al., 2014, Sullman et al., 2015). Several factors including risk perception and the quality of driving education may underlie these discrepancies (Sullman, 2012).

In line with other studies (Sullman, 2012, Sullman et al., 2015, Gras et al., 2012, Huisingh et al., 2015, Prat et al., 2014), several behaviours, such as: adjusting car controls, grooming, using a satellite navigation device, counting money, head out of the car window, fastening buttons, cleaning the car dashboard with a tissue, car mirror adjustment, cleaning nails, using hands-free mobile phones, sitting a baby in the driver's lap; were not frequently observed. The low prevalence of these potentially distracting activity may be due to the difficulty in observing and identifying some of these secondary tasks, and therefore their proportions may have been underestimated (Prat et al., 2014).

4.2. Engagement in secondary tasks by gender

In agreement with the UK research (Sullman et al., 2015), the results of the current study found that in Kashmar female drivers were observed to be more frequently engaged in conversations with passengers. This may be because extroversion and talkativeness are more common among females, or it may be that female drivers were more likely to carry passengers than male drivers. Male drivers in Kashmar were more likely to be observed engaged in smoking, which is in contrast to previous research which found no gender-related differences for this type of potentially distracting activity (Gras et al., 2012, Sullman, 2012, Sullman et al., 2015, Prat et al.,

2014, Huisingh et al., 2015). The difference found here may be due to the existence of a stigma associated with women smoking in public, particularly in traditional Iranian communities.

In Bardaskan male drivers were less likely to be observed engaging in any type of secondary task, compared to female drivers. This could be because of the higher proportions at which female drivers spoke with passengers and manipulated a phone.

4.3. Engagement in secondary tasks by age

In Kashmar and Khalilabad, those in the oldest age group were less likely to be observed using handheld mobile phones, which is in agreement with several studies from abroad (Sullman, 2012, Sullman et al., 2015, Gras et al., 2012, Prat et al., 2014, Johnson et al., 2004, Huisingh et al., 2015, Horberry et al., 2001, Taylor et al., 2007, Asgharabad et al., 2013, Taylor et al., 2003). Furthermore, in Khalilabad and Bardaskan manipulating a phone also decreased with age. This finding is again in agreement with previous research, which found that younger drivers were more frequently observed texting/dialling while driving (Johnson et al., 2004, Huisingh et al., 2015, Sullman, 2012, Pickrell and Ye, 2009). Perhaps the reason for this finding is that younger people in general use modern technology more frequently, which also transfers into the driving environment. However, an alternative view might be that older drivers have a higher level of perceived risk and thus engage less frequently in these behaviours while driving (Sullman et al., 2015). In Kashmar the youngest drivers were less likely to be potentially distracted by smoking, which contrasts with previous research which has found smoking tended to decrease with age (Sullman et al., 2015). The less frequent engagement in smoking by younger drivers is probably related to the different cultural setting found in more traditional Iranian communities. For example, smoking by adolescents and young people is considered to be unacceptable behaviour

and is sometimes considered to be taboo among some Iranian families. The younger people, therefore, refrain from smoking, particularly in public.

In these three Iranian cities older drivers were less likely to be potentially distracted in general, which again supports previous research from the UK and US (Sullman, 2012, Sullman et al., 2015, Huisingh et al., 2015). This finding may be related to the fact that younger drivers were more likely to be engaged in technological distractions, as well as talking to passengers.

4.4. Engagement in secondary tasks by day of the week

In Bardaskan, drivers were more frequently engaged in mobile phone use on weekdays, which was supported by previous research in Spain, the UK and the US (Johnson et al., 2004, Prat et al., 2014, Sullman et al., 2015, Huisingh et al., 2015, Walter, 2010). Furthermore, manipulating a phone in Khalilabad was found to be higher on weekdays than on the weekend, but this finding is in contrast to the UK and Spanish studies which found no significant differences (Sullman et al., 2015, Prat et al., 2014). These findings may indicate that many text messaging and conversations on a handheld mobile phones are related to drivers' occupations or that mobile phones are used more on weekdays to contact friends and relatives (Sullman et al., 2015).

In Kashmar smoking among drivers was higher on working days, which contrast to the previous research which found no significant difference between working days and weekends for smoking (Prat et al., 2014, Sullman et al., 2015). This could be related to work-related stress which may result in more smoking amongst drivers during week days.

In line with previous road side observational studies (Prat et al., 2014, Sullman et al., 2015), drivers in Kashmar were more likely to be observed talking to passengers during weekends in comparison to working days. As the number of car occupants were not collected in this research, it is difficult to determine possible reasons for this difference. However, perhaps an explanation

of this phenomenon may be the fact that many Iranians travel with their family and relatives during the weekend, so the close relationship might result in more interaction between the driver and passengers.

Furthermore, in Kashmar adjusting controls and involvement in secondary tasks classified as other were both significantly higher on the weekends. These results are inconsistent with prior research which reported no significant differences (Prat et al., 2014, Sullman et al., 2015). The higher frequency of these types of secondary tasks on the weekend could perhaps be explained by the fact that drivers adjust some devices, such as the stereo and audio system for entertainment and the GPS for navigation while travelling which are more likely to be during the weekend.

In line with the UK and Spain research (Prat et al., 2014, Sullman et al., 2015), in Kashmar drivers' involvement in all secondary tasks combined was higher on weekends, but this is in contrast to the result of the current study in Bardaskan.

4.5. Engagement in secondary task by time of day

In Bardaskan, adjusting controls by drivers was more frequent in the afternoon than in the morning, which contrasts with the finding of Sullman (2015). However, caution should be taken when interpreting these figures, as the proportion of drivers engaged in this secondary task was very low (Morning=1, Afternoon=7). Therefore, future research is needed to confirm and explain these inconsistent findings.

Furthermore, in Bardaskan, smoking was more common among drivers during the afternoon, in comparison to the morning. This finding again contrasts with other studies which found no significant differences in smoking by time of day (Sullman, 2012, Sullman et al., 2015, Prat et

al., 2014). This could be due to the accumulation of work stress during the day which leads to an increased craving for smoking in the afternoon.

4.6. Engagement in secondary tasks by street type

In Kashmar, drivers on main streets were more likely to be potentially distracted by adjusting controls than on side streets. This appears to be the first study to make this finding, but in support of this finding previous research in the US has shown that drivers on local streets were more likely to be potentially distracted by something external to the vehicle compared to those on arterial/collector roads (Huisingh et al., 2015).

In Bardaskan, drivers on main streets were more likely to be observed using a mobile phone in comparison to side streets. However, the US study found talking on a handheld mobile phone was similar across local streets and arterial/collector roads (Huisingh et al., 2015). The difference in potentially distracting activities amongst drivers based on street types may be the result of different driving environments, the driver feeling safe to engage in a secondary task or the presence of traffic cameras or patrol police.

4.7 Practical implications based on the Safe Communities model

According to the available evidence, programs based on the WHO Safe Community model are effective, systematic and on-going, and have produced great results related to safety promotion in the world (Torkamannejad Sabzevari et al., 2015). The present study provides useful information regarding non-driving-related attention/activities in three Iranian Safe Communities and it is necessary that in these cities a multifaceted program based on SC concepts is formulated for establishing a safe traffic culture with regards to potentially distracting activities. Collaboration, personal contacts and the exchange of ideas are considered to be the main components for designing, implementing and assessing this promotional program. In this regard,

it is advisable that a team accepts responsibility, consisting of representatives from traffic police, schools, universities, local motor organizations, religious institutes and voluntary organizations. This team should provide the prerequisites for performing an interventional plan, including: preparing guidelines, training instructors, attracting community participation and political support, holding educational classes, targeting high risk groups and assessing interventional actions. It is also necessary that interventional measures taken, such as education are integrated into community networks such as religious networks. The focus of educational interventions should be on teaching traffic rules regarding secondary activities while driving, the possible consequences of engaging in secondary tasks while driving and the principles of safe driving. Collaboration with local media is also essential to support the program as they can play a considerable role in raising public awareness by distributing information with regards to the need to refrain from engaging in secondary tasks while driving (Nordqvist et al., 2009). Furthermore, enforcement of tougher laws regarding secondary activities can support interventional programs. Finally, authorities should focus on the periodic assessment of secondary task engagement to determine the effectiveness of the program (Lindqvist et al., 2001).

4.8. Limitations

There are a number of potential limitations of this research which should be taken into consideration. Firstly, the drivers in these cities may not be representative of drivers in all Iranian Safe Communities, and therefore, the finding cannot be generalized to all drivers in Iranian cities which are designated as WHO Safe Community members. Another limitation of this study is that although there were very good inter-observer agreements, some illegal behaviours such as mobile phone use and drinking/eating may be hidden by drivers, meaning that the level of secondary task engagement reported here may be an underestimate. Furthermore, although broad

age groups were used in a large body of road side observational research and the inter-observer reliability in this research was excellent, the age estimation by our observers might not be completely correct. Furthermore, the number of passengers in vehicles was not recorded which is likely to be an important factor in the interaction between the driver and other occupants.

Conflict of Interest

Javad Torkamannejad Sabzevari, and Ali Molaei Tajkooh as public health employees in Khalilabad Health Network participated in the International Safe Community Program. The other authors have no conflict of interest to declare.

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Table 1: Percentage of agreement & Cohen's Kappa coefficients

Variables	Percentage of agreement	Kappa coefficient
Gender	99.56	0.98
Estimated age group	94.24	0.89
Mobile phone use	100	1.00
Manipulating a phone	100	1.00
Smoking	100	1.00
Talking to passengers	99.56	0.98
Reaching for an object	99.11	0.97
Eating/drinking	99.56	0.95
Adjusting controls	99.56	0.89
Other	98.67	0.93

Table2: Descriptive statistics for the observed drivers

Variable	Kashmar	Khalilabad	Bardaskan
Gender, N (%)			
Male	3954(94.1)	1170(95.2)	2440(95.7)
Female	246(5.9)	59(4.8)	110(4.3)
Age, N (%)			
<30	1317(31.4)	444(36.1)	844(33.1)
30–50	1973(47.0)	570(46.4)	1168(45.8)
>50	910(21.7)	215(17.5)	538(21.1)
Driving day, N (%)			
Working day	3000(71.4)	975(79.3)	1450(56.9)
Weekend	1200(28.6)	254(20.7)	1100(43.1)
Driving time, N (%)			
Morning	2350(56.0)	486(39.5)	1525(59.8)
Afternoon	1850(44.0)	743(60.5)	1025(40.2)
Type of street, N (%)			
Main Street	2325(55.4)	843(68.6)	2000(78.4)
Side Street	1875(44.6)	386(31.4)	550(21.6)
Total drivers, N (%)	4200 (52.6)	1229(15.4)	2550(32)

Table 3: Type of secondary task by gender, age group, day of the week, time, and street type in Kashmar

Variable	Mobile phone use (%)	Manipulating a phone (%)	Eating/ drinking (%)	Smoking (%)	Talking to passenger (if available)* (%)	Adjusting controls (%)	Reaching for an object (%)	Other (%)	All distractions (%)
Gender, N (%)									
Male	136(3.4)	81(2.0)	74(2.0)	61(1.5)	402(19.6)	34(0.9)	72(1.8)	106(2.7)	953(24.1)
Female	8(3.3)	4(1.6)	5(1.9)	0(0)	45(27.4)	0(0)	4(1.6)	6(2.4)	69(28.0)
P value	0.875	0.648	1.000	0.049*	0.017*	0.262	1.000	0.819	0.162
Age, N (%)									
<30	50(3.8)	34(2.6)	25(1.9)	8(0.6)	150(21.7)	17(1.3)	21(1.6)	41(3.1)	336(25.5)
30–50	79(4.0)	40(2.0)	41(2.1)	38(1.9)	210(18.9)	11(0.6)	44(1.8)	50(2.5)	509(25.8)
>50	15(1.6)	11(1.2)	13(1.4)	15(1.6)	87(21.3)	6(0.7)	11(1.2)	21(2.3)	177(19.5)
P value	0.006*	0.077	0.490	0.007*	0.284	0.06	0.125	0.343	0.001*
Driving Day, N (%)									
Working Day	112(3.7)	68(2.3)	53(1.8)	53(1.8)	282(18.5)	16(0.8)	54(1.8)	67(2.2)	694(23.1)
Holiday	32(2.7)	17(1.4)	26(2.2)	8(0.7)	165(23.2)	18(1.5)	22(1.8)	45(3.8)	328(27.3)
P value	0.086	0.077	0.389	0.007*	0.003*	0.002*	0.952	0.006*	0.004*
Driving Time, N (%)									
Morning	75(3.2)	42(1.8)	48(2.0)	34(1.4)	256(20.7)	19(0.8)	40(1.7)	57(2.4)	566(24.1)
Afternoon	69(3.7)	43(2.3)	31(1.7)	27(1.5)	191(19.5)	15(0.8)	36(1.9)	55(2.3)	456(24.6)
P value	0.341	0.220	0.385	0.973	0.493	0.993	0.556	0.274	0.673
Type of Street, N (%)									
Main Street	81(3.5)	42(1.8)	36(1.5)	32(1.4)	251(19.9)	29(1.2)	48(2.1)	62(2.7)	569(24.5)
Side Street	63(3.4)	43(2.3)	43(2.3)	29(1.5)	196(20.6)	5(0.3)	28(1.5)	50(2.7)	453(24.2)
P value	0.826	0.256	0.077	0.646	0.667	< 0.001*	0.167	1.000	0.814
Total, N (%)	144(3.4)	85(2.2)	80(1.9)	61(1.4)	447(10.6)	34(0.8)	76(1.8)	112(2.7)	1022(24.3)

* Significant at the 0.05 level

Gender, N (%)									
Male	1(1.7)	33(2.8)	30(2.6)	7(0.6)	130(22.2)	5(0.4)	29(2.5)	28(2.4)	303(25.9)
Female	48(4.1)	1(1.7)	2(3.4)	0(0.0)	11(27.5)	0(0)	1(1.7)	1(1.7)	17(28.8)
P value	0.727	1.000	0.664	1.000	0.440	1.000	1.000	1.000	0.618
Age, N (%)									
<30	28(6.3)	23(5.2)	17(3.8)	2(0.5)	61(25.6)	1(0.2)	10(2.3)	7(1.6)	147(33.1)
30–50	17(3.0)	9(1.6)	11(1.9)	4(0.7)	59(20.0)	4(0.7)	16(2.8)	17(3.0)	132(23.2)
>50	4(1.9)	2(0.9)	4(1.9)	1(0.5)	21(22.8)	0(0.0)	4(1.9)	5(2.3)	41(19.1)
P value	0.006*	<0.001*	0.128	0.849	0.302	0.292	0.708	0.343	<0.001*
Driving Day, N (%)									
Working Day	38(3.9)	33(3.4)	25(2.6)	6(0.6)	107(22.6)	4(0.4)	27(2.8)	22(2.3)	256(26.3)
Holiday	11(4.3)	1(0.4)	7(2.8)	1(0.4)	34(22.5)	1(0.4)	3(1.2)	7(2.8)	64(25.2)
P value	0.753	0.008*	0.864	1.000	0.988	1.000	0.144	0.640	0.732
Driving Time, N (%)									
Morning	19(3.9)	18(3.7)	14(2.9)	2(0.4)	59(24.5)	4(0.8)	12(2.5)	14(2.9)	137(28.2)
Afternoon	30(4)	16(2.2)	18(2.4)	5(0.7)	82(21.4)	1(0.1)	18(2.4)	15(2.0)	183(24.6)
P value	0.911	0.105	0.622	0.710	0.363	0.083	0.959	0.330	0.164
Type of street, N (%)									
Main Street	32(3.8)	26(3.1)	18(2.1)	4(0.5)	93(23.5)	5(0.4)	25(3.0)	24(2.8)	220(26.1)
Side Street	17(4.4)	8(2.1)	14(3.6)	3(0.8)	48(20.9)	0(0.0)	5(1.3)	5(1.3)	100(25.9)
P value	0.613	0.316	0.127	0.685	0.440	0.333	0.78	0.156	0.944
Total driver Distraction, n (%)	49(4.0)	34(2.8)	32(2.7)	7(0.6)	141(11.5)	5(0.4)	30(2.4)	29(2.3)	320(26)

Table 4: Type of driving distraction by gender, age group, day of the week, time, and street type in Khalilabad

* Significant at the 0.05 level

Table 5: Type of driving distraction by gender, age group, day of the week, time, and street type in Bardaskan

Variable	Mobile phone use (%)	Manipulating a phone (%)	Eating/ drinking (%)	Smoking (%)	Talking to passengers (if available)* (%)	Adjusting controls (%)	Reaching for an object (%)	Other (%)	All distractions (%)
Gender, N (%)									
Male	3(2.7)	44(1.8)	62(2.5)	27(1.1)	302(24.2)	7(0.3)	79(3.2)	42(1.7)	595(24.4)
Female	36(1.5)	6(5.5)	1(0.9)	0(0)	22(34.9)	1(0.9)	2(1.8)	4(3.6)	39(35.5)
P value	0.235	0.19	0.552	0.628	0.055	0.298	0.581	0.134	0.009*
Age, N (%)									
<30	16(1.9)	20(2.4)	23(2.1)	4(0.5)	116(28.0)	4(0.5)	31(3.7)	21(2.5)	232(27.5)
30–50	20(1.7)	28(0.4)	25(2.8)	17(1.5)	156(24.1)	3(0.3)	40(3.4)	21(1.8)	306(26.2)
>50	3(0.6)	2(2.0)	15(2.5)	6(1.1)	52(21.1)	1(0.2)	10(1.9)	4(0.7)	96(17.5)
P value	0.112	0.011*	0.612	0.104	0.120	0.578	0.139	0.059	<0.001*
Driving Day, N (%)									
Working Day	30(2.1)	30(2.1)	42(2.9)	16(1.1)	181(26.8)	7(0.5)	56(3.9)	29(2.0)	386(26.6)
Holiday	9(0.8)	20(1.8)	21(1.9)	11(1.0)	143(22.6)	1(0.1)	25(2.3)	17(1.5)	248(22.5)
P value	0.011*	0.651	0.112	0.848	0.080	0.149	0.023*	0.393	0.018*
Driving Time, N (%)									
Morning	25(1.6)	35(2.3)	34(2.2)	11(0.7)	190(23.2)	1(0.1)	46(3.0)	24(1.6)	367(24.1)
Afternoon	14(1.4)	15(1.5)	29(2.8)	16(1.6)	134(27.3)	7(0.7)	35(3.4)	22(2.1)	267(26)
P value	0.581	0.138	0.339	0.042*	0.099	0.009*	0.574	0.287	0.256
Type of street, N (%)									
Main Street	36(1.8)	40(2.0)	50(2.5)	20(1.0)	236(23.8)	7(0.4)	65(3.3)	40(2.0)	489(24.5)
Side Street	3(0.5)	10(1.8)	13(2.5)	7(1.3)	88(27.8)	1(0.2)	16(2.9)	6(1.1)	145(26.4)
P value	0.034*	0.785	0.855	0.580	0.154	1.000	0.686	0.156	0.358
Total driver Distraction, n (%)	39(1.5)	50(1.9)	63(2.5)	27(1.0)	324(12.7)	8(0.3)	81(3.2)	46(1.8)	634(24.9)

* Significant at the 0.05 level