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CELL PHONE USE AT CROSSINGS AMONG PEDESTRIANS IN DIFFERENT URBAN ENVIRONMENTS. AN OBSERVATIONAL STUDY IN MAPUTO CITY, MOZAMBIQUE

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Background: Using a cell phone while walking may impair attention and increases the risk of hits and injurious events, in particular at crossings. Reports from low- and middle-income countries on the prevalence of this behaviour for different types of use and settings are lacking despite pedestrians being at significantly higher risk of getting injured in those countries. This study investigates cell phone use among pedestrians in the city of Maputo (Mozambique) in different settings and its demographic variation.

Methods: A non-invasive observational study was conducted where pedestrians were observed when crossing the street in three types of sites and three daytime periods. Site- and period-specific prevalence data were analysed stratified by sex and age alongside type of use (cell phone functions).

Results: The overall prevalence of cell phone use was 8.5% (6.5% among female and 10.1% among male; 11.2% among children and 5.7% among adults). There were important differences by observation site, from an overall of 11.7% at roadside markets by the road to 6.3% at road intersections. Texting/reading was more common than speaking overall, with sex and age differences by site.

Conclusions: Pedestrians in Maputo City exhibit one of the lowest overall uses of cell phone at crossings reported so far. It is higher among men than women and in all demographic groups, it peaks at marketplaces, typically busy traffic environments not considered in previous studies. The specific type of use was also age-and sex-related. With expectable growth in cell phone ownership and in connectivity, the numbers observed will rise sharply, resulting in more pedestrians distracted while in at-risk situations. Revisiting the city planning and road traffic infrastructure will play a determinant role in protecting them.

Keywords: pedestrians, distracted walking, smartphone, crossings, Sub-Saharan Africa

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Introduction

At times when physical inactivity is a concern globally, walking is broadly promoted as a simple and accessible form of physical activity with a huge potential for numerous health benefits (2).[1-2] Globally, pedestrians represent 21% of the traffic related fatalities.[3] Yet, in low- and middle-income countries (LMICs) where walking infrastructures are weak, pedestrians are at excess risk of being injured and killed in the road traffic environment.[3-5] Distracted pedestrians, like those texting or talking in cell phones, run an even higher risk of getting injured,[6] particularly when they are crossing a street or at intersections.[7-10]

It is acknowledged that using a cell phone while walking impairs attention and increases the risk of hits and injurious events.[11-12] Pedestrians use their phones for many purposes, including e.g., talking, music listening, texting/browsing, gaming, and socializing.[9,11,13] This impairs most spatiotemporal gait characteristics,[1,14] including walking more slowly, having longer crossing time at intersections, having poorer perceptual visual field,[6-7,11,13] and being less aware of the surroundings.[9-11,13,15] While most cell phone activities distract pedestrians and impede their attention and ability to walk safely, some activities are more critical than others.[14,16-17] Sending a text message for instance, compared to talking and listening to music is associated with poorer performance on several behavioural measures, including looking left and right prior to and/or during street crossing .[11] Text messaging is a function that is accessible on all types of cell phones.

The prevalence of cell phone use while walking, in any or in specific environments, varies across studies and depending on whether the study is based on observations or self-reported surveys.[18] Observational studies have been conducted most typically at crossings where, as indicated above, the risk of hits is highest.[7-8] A recent review of such studies from American university campuses and urban environments from different high-income parts of the world e.g., Belgrade, Seattle, Sydney mentioned above reports variations from 12-45%.[11] Similarly, additional observational studies found phone-distracting activity in 16.5% of pedestrians in Athens,[13] up to 24.6% of all college students nearby a large US South-Eastern university,[19] with variation by type of intersection and by sex, and as many as 44.0% of the pupils observed in front of an educational centre in Vienna.[20] Surprisingly, there is a paucity of studies in this field that concern pedestrians from low- and middle-income countries (LMICs) whereas it is known that, among the vulnerable road users, they are the ones at greatest risk of being injured in the traffic environment,[4-5,21] not least in sub–Saharan Africa.[22-24] This adds to the research gaps relative to road safety highlighted in a recent review.[25]

The number of cell phone owners has grown rapidly over the past decades, as reflected in a survey from 2019 conducted in 34 countries from the region showing an ownership varying from 57% in Angola and Malawi to over 90% in as many as 11 countries. In Mozambique, the setting of the current study, the level was 62%.[26] The rapid rise has been attributed to the marketing of affordable phones from telecom operators over the years,[26] which also explains the predominance of feature phones over smartphones,[26-27] in contrast to many other regions. In s-Saharan Africa, 78% of the population are still not connected to internet (60% of the adult population), either because they are not covered by any mobile broadband network or because they face other barriers, including affordability, literacy, and digital skills.[27]

This study investigates the use of cell phone among urban pedestrians from the city of Maputo, and whether it varies in different traffic sites and time of day. Attention is paid to differences between children and adults, female and male pedestrians.

Methods

Study design and setting

A non-invasive observational study was conducted in Maputo city, Mozambique during September and October 2021.

Maputo city is the capital of the country and the largest city. The Maputo city area is mostly urbanized, and the growth experienced in recent years in residential and industrial development has taken place above all in neighbouring areas Matola and Marracuene rather than in Maputo city itself. Consequently, the city's population density remains low (an estimated 37 people/ha).[28] However, since almost all services are concentrated in the city centre, there is a considerable daily flow of people to and from the city, from Monday to Saturday, early morning to late afternoon. Most of them will travel in private vehicles.[28]

The city's rapid urbanization has been coupled with a considerable increase in car use,[28] cars that are often in poor condition and lacking safety features (e.g., seat belts, working brakes, brake lights, windshield wipers).[29] As the development of the road infrastructure and services did not keep up with that of motorization, traffic congestion is omnipresent in the city, which comes at the expense of a worsening of, in turn, the (poorly supplied) public transport, poor road safety, economic growth, and environment quality.[28]

Also detrimental to the traffic flow, parking facilities are lacking, not least in the city centre; cars parked on the road reduce the road capacity, and those parked on the sidewalks impede pedestrians.[28] Cars parked on the road and on the sidewalk reduce the visibility of the pedestrians who face additional constraints like a shortage of facilities e.g., sidewalks, crossings, and streetlights.[28,30] This, combined with inadequate road conditions and maximum speed limits of 60 km/hr on a public road within an urban area (less often 40 or 30 km/h) put pedestrians at a considerable risk of road-traffic injuries.[19,29] Finally, because of its grid street plan, where streets mainly run at right angles, intersections in Maputo city are numerous.

Selection of observation sites

As indicated in the introduction, distracted walking is particular risky at crossings as this practice includes omitting looking in both directions, misjudging vehicle speed and crossing in slower pace,[6,12,31] therefore crossings were selected for observing pedestrian's cell phone use. A cluster sampling technique was used, first selection of sites and then within each site locations for observation. To reflect the variety of environments where the pedestrians of Maputo cross the roads and streets, three typical sites were selected: straight roads, road intersections, and roadside markets (generally busy locations due to high concentration of vendors and buyers, and are areas typical for many urban settings in low-income countries; where informal transport systems (i.e., minibuses) without organized bus stops create unsafe scenarios for pedestrians). The observation sites are exemplified in pictures A, B, and C (see figure 1).

For each of them, three specific locations were determined. The three straight road with zebra crossings chosen were those that must be used to enter or exit the city, namely Joaquim Chissano Road, Vladmil Lenine road, and 24 de Julho road. The road/street intersections were those of Joaquim Chissano and Milagre Mabote roads; Eduardo Mondlane and Karl Marx roads; and 25 de Septembro and Guerra Popular roads (see figure 2). The roadside markets selected were that of Fajardo, Xipamanine, and Mercado central. These specific locations were selected as they are busy ones with high traffic density, particularly during rush hours.

Procedure

The data collection was initiated after ethical approval. Observations were performed at each of the nine selected sites, with minimal obstruction to the flow of the pedestrian traffic and from a location as safe as possible that allowed to face and watch pedestrians cross the street and see whether they used a cellphone and how. The observation zone was marked on the sidewalk, and the data were collected by two trained data collectors, one observer and one notetaker. An electronic, online observation grid was designed on google form and used on tablets or cellphones, with date and time being automatically recorded. The grid included 9 items that described among others whether and how a cellphone was used (coded as texting/reading, speaking, and unclear), the sex (male, female, unclear), and age of the pedestrian (child, adult, unclear).

An interval timer app was installed and used to determine when it was time to observe and register (about 30 seconds between the different pedestrians). So, after the first pedestrian crossing the street was observed and registered following the pre-determined observation grid, the pre-determined flow of observations was followed (see similar approaches in previous studies15,32). In instances when several pedestrians initiated crossing the street, it was decided that the closest one at the right-hand side of the observer should be selected for observation, to systematise and ensure that the same process was followed across the various observation sites, times and observers. This decision was also grounded in the fact that pedestrians at the right-hand side would be the ones closest to both the traffic and the cars at the crossings and were thereby in a relatively more vulnerable position than the other pedestrians.

The observations took place on from Monday to Saturday from September 6 to October 6, 2021, in the following time sequences: 7:00 to 7:40 (morning); 12:00 to 12:40 (midday) and 16:00 to 16:40 (afternoon) to capture a range of demographic population. Each site was observed over seven days, starting on different weekdays and always excluding Sundays, which are very quiet days in Maputo. Each observation period at each site lasted for 40 minutes.

Figure 1. Pictures of observations sites: A) typical intersection on straight road, B) typical crossing at intersection, and C) typical crossing at roadside market

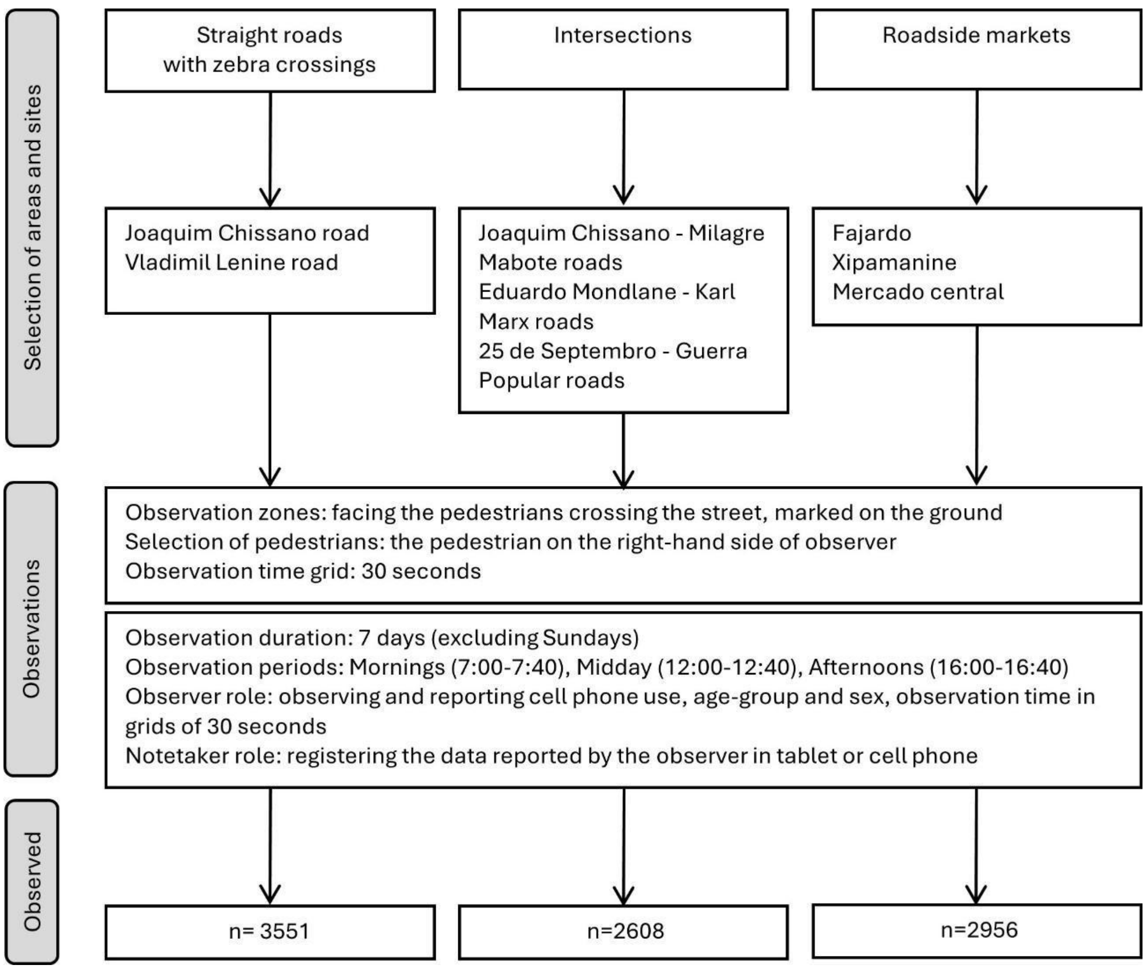

Figure 2. Schematic outline of the study design.

Participants

Data were collected by observation of all male and female pedestrians of all ages (regardless of whether they used a cell phone or not) at each of the nine site locations. Pedestrians assessed by the observer as being below the age of 18 was coded in the category child, in line with the law in Mozambique in which everyone below the age of 18 is considered as a child), whereas the rest in the adult category. This resulted in a total of 9115 observed pedestrians (see Figure 2 and Table 1), with similar sex distribution across observation sites straight roads (46% females and 56% males) and roadside markets (48% females and 52% males), but less females at road intersections (33.5% females and 66.4% males)

Table 1. Distribution of the pedestrians observed by age group and observation condition by sex and both sexes aggregated[1] (n=9115)

Characteristics	Female n=3918		Male n=5185		Total [2] n=9115	
	n	%	n	%	N	%
Site						
Straight road	1,621	41.4	1,914	36.9	3,551	38.9
Road intersection	874	22.3	1,726	33.3	2,608	28.6
Roadside market	1,416	36.1	1,534	29.6	2,956	32.4
Age group						
Child	1,944	49.6	2,655	51.2	4,618	50.6
Adult	1,963	50.1	2,514	48.5	4,488	49.1
Unclear	11	0.3	16	0.3	29	0.3
Time of day						
Morning	1,306	33.3	1,906	36.8	3,229	35.4
Midday	1,414	36.1	1,595	30.8	3,018	33.0
Afternoon	1,198	30.6	1,684	32.5	2,888	31.6

[1] Information about sex was missing for 32 individuals.

[2] Including the 32 individuals with missing information about sex.

Coding and analysis

We calculated the prevalence of cell phone use among the observed pedestrians (presented as percentages (%) with 95% confidence intervals (95% CIs) of all pedestrians aggregated and stratified by sex. Sex-specific data were further disaggregated by time and site of observation as well as by age group. In some instances, the observation conditions did not allow the observer to determine all the information, mainly due to unexpected disturbances in the observation, this was then registered as a separate category "unclear", for sex, age and cell phone use, and was not included in the analyses (n=97). Observations with "unclear" on type of cell phone use are presented as a separate category in table 3. All statistical analyses were conducted in Stata version 16.

RESULTS

Prevalence of cell phone use by sex and observation conditions

Table 2 presents the prevalence of cell phone use overall and for female and male respectively, considering observation conditions and age groups. The overall prevalence of cell phone use was 8.5% (6.5% among female and 10.1% among male). For both sexes, it was higher among children than adults (respectively 12.5% and 7.5% among men and 9.5% and 3.4% among women). The differences in prevalence were more remarkable by site than time of day, with the use of cell phone being much higher at roadside markets than at road intersections (overall 11.7%% and 6.3% respectively). It was also consistently higher among children than adults at all observation times and sites, but most remarkably at markets (14.4% and 4.0% for women and 18.5% and 8.0% for males).

Type of use

Table 3 presents the overall and sex-specific type of cell phone use observed at the different observation sites, stratified by age group. Overall, the differences between the prevalence of texting/reading versus that of speaking was bigger among males (53.9% v. 34.0%) than females (50.2% vs 42.6%). Those texting most were male children (52.7%) and less, female adults (43.3%). The larger differences between texting/reading and speaking were found at road intersections with a much higher prevalence among children of both sexes and, exceptionally a higher one among female than male children (65.5% vs 43.7% among females for texting/reading vs speaking and 62.7% vs 36.0% for males).

Table 2. Overall and sex-specific prevalence of cell phone use among children and adults stratified by time of observation and site (total number of observations = 9018)

2a: Male and female together

Observation conditions	Child n= 4,575		Adult n = 4,443		Total n= 9,018	
	%	95% CIs	%	95% CIs	%	95% CIs
Time of observation						
Morning	12.4	10.8-14.2	5.8	4.8-7.0	8.9	8.0-10.0
Midday	9.7	8.3-11.2	5.8	4.6-7.2	7.9	7.0-8.9
Afternoon	11.8	10.3-13.6	5.6	4.5-6.9	8.7	7.7-9.8
Site						
Straight road	8.6	7.4-10.0	6.5	5.5-7.8	7.5	6.7-8.4
Road intersection	8.2	6.8-9.8	4.4	3.4-5.7	6.3	5.4-7.3
Roadside market	18.5	14.9-18.6	5.9	4.8-7.3	11.7	10.6-12.9
Total	**11.2**	**10.4-12.2**	**5.7**	**5.1-6.5**	**8.5**	**8.0-9.1**

2b: Female

	Child n= 1,931		Adult n = 1,947		Total n = 3,878	
Time of observation						
Morning	10.9	8.6-13.7	3.4	2.3-5.0	6.7	5.5-8.2
Midday	8.0	6.3-10.2	3.2	2.0-4.8	5.8	4.7-7.2
Afternoon	10.2	8.0-12.9	3.8	2.6-5.7	7.0	5.7-8.6
Site						
Straight road	6.7	5.1-8.7	3.8	2.7-5.4	5.2	4.2-6.4
Road intersection	6.7	4.7-9.4	1.8	0.9-3.6	4.2	3.1-5.8
Roadside market	14.4	12.0-17.2	4.0	2.8-5.8	9.3	7.9-10.9
Total	**9.5**	**8.3-10.9**	**3.4**	**2.7-4.3**	**6.5**	**5.7-7.3**

Table 2c: Male

	Child n= 2,644		Adult n = 2,496		Total n= 5,140	
Time of observation						
Morning	13.3	11.3-15.7	7.6	6.1-9.5	10.4	9.1-11.9
Midday	11.1	9.2-13.3	8.2	6.3-10.4	9.8	8.4-11.4
Afternoon	13.0	10.9-15.5	6.9	5.4-8.8	9.9	8.6-11.5
Site						
Straight road	10.0	8.2-12.1	8.9	7.3-10.9	9.5	8.2-10.9
Road intersection	9.0	7.3-11.2	5.7	4.4-7.4	7.3	6.2-8.6
Roadside market	18.5	16.0-21.2	8.0	6.1-10.3	14.0	12.3-15.8
Total	**12.5**	**11.3-13.8**	**7.5**	**6.6-8.6**	**10.1**	**9.3-10.9**

Table 3. Sex-specific type of cell phone use prevalence among children and adults all observation sites aggregated and by site expressed in percentages (with 95% CIs) (total number of observations = 769)

Type of use by sex	Child		Adult		Total	
	%	95% CIs	%	95% CIs	%	95% CIs
3a: All observation sites aggregated						
Female	n = 184		n = 67		n = 251	
Speaking	41.3	34.4-48.6	46.3	34.7-58.2	42.6	36.6-48.8
Texting/reading	52.7	45.5-59.8	43.3	32.0-55.3	50.2	44.0-56.4
Unclear	6.0	3.3-10.5	10.4	5.1-20.4	7.2	4.6-11.1
Male	n = 330		n = 188		n = 518	
Speaking	31.8	27.0-37.0	37.8	31.1-44.9	34.0	30.0-38.2
Texting/reading	56.7	51.3-61.9	48.9	41.8-56.1	53.9	49.5-58.1
Unclear	11.5	8.5-15.4	13.3	9.1-19.0	12.2	9.6-15.3

3b: Straight road

Type of use by sex	**Child**	**Adult**	**Total**			
	%	95% CIs	%	95% CIs	%	95% CIs
Female	**n = 52**	**n = 31**	**n = 83**			
Speaking	40.4	28.0-54.1	32.3	18.3-50.3	37.3	27.6-48.2
Texting/reading	42.3	29.7-56.0	51.6	34.5-68.4	45.8	35.4-56.5
Unclear	17.3	9.2-30.1	16.1	6.9-33.4	16.9	10.2-26.5
Male	**n = 94**	**n = 85**	**n = 179**			
Speaking	19.1	12.4-28.4	30.6	21.7-41.2	24.6	18.8-31.4
Texting/reading	48.9	39.0-59.0	44.7	34.5-55.4	46.9	39.7-54.3
Unclear	31.9	23.3-42.0	24.7	16.7-35.0	28.5	22.4-35.5

3c: Road Intersection

Type of use by sex	**Child**	**Adult**	**Total**			
	%	95% CIs	%	95% CIs	%	95% CIs
Female	**n = 29**	**n = 8**	**n = 37**			
Speaking	34.5	19.6-53.1	50.0	20.0-80.0	37.8	23.8-54.2
Texting/reading	65.5	46.9-80.4	50.0	20.0-80.0	62.2	45.8-76.2
Unclear	0.0	-	0.0	-	0.0	-
Male	**n = 75**	**n = 51**	**n = 126**			
Speaking	36.0	26.0-47.4	41.2	28.6-55.0	38.1	30.0-46.9
Texting/reading	62.7	51.2-72.8	56.9	43.1-69.7	60.3	51.5-68.5
Unclear	1.3	0.2- 8.9	2.0	0.3-12.7	1.6	0.4-6.1

3d: Roadside market

Type of use by sex	Child	Adult	Total			
	%	95% CIs	%	**95% CIs**	**%**	**95% CIs**
Female	**n = 103**	**n = 28**	**n = 131**			
Speaking	43.7	34.4-53.4	60.7	42.0-76.8	47.3	38.9-55.9
Texting/reading	54.4	44.7-63.7	32.1	17.6-51.2	49.6	41.1-58.1
Unclear	1.9	0.5- 7.4	7.1	1.8-24.5	3.1	1.1-7.9
Male	**n = 161**	**n = 52**	**n = 213**			
Speaking	37.3	30.1-45.0	46.2	33.2-59.7	39.4	33.1-46.2
Texting/reading	58.4	50.6-65.8	48.1	34.9-61.5	55.9	49.1-62.4
Unclear	4.3	2.1-8.8	5.8	1.9-16.4	4.7	2.5- 8.5

DISCUSSION

Main findings

The overall prevalence of cell phone use at crossings among pedestrians of Maputo city was 8.5% and varied by sex (a male-to-female ratio of 1.55) and age (a child-to-adult ratio of 1.96) and observation conditions. Differences in prevalence were less remarkable by time of day than by observation site, from an overall of 6.3% at intersections to 11.7% at marketplaces. For any observation condition, the prevalence was consistently higher among children, peaking at marketplaces where it reached 14.4% for females and 18.5% for males.

Among the users of cell phones, the differences between the overall prevalence of texting/reading and that of speaking were bigger among males (53.9% v. 34.0%) than females (50.2% vs 42.6%). Texting/reading was most frequent among male children (52.7%) and least frequent among female adults (43.3%). Yet, at intersections, texting/reading surpassed speaking remarkably among children of both sexes, and it was exceptionally slightly higher among female than male children (65.5% vs 62.7%).

Comparisons with other studies

The overall 8.5% prevalence of cell phone use at crossings among Maputo city pedestrians is by far the lowest reported to date, to be compared with a prevalence ranging from 12% to 45% on university campuses or urban environments in high-income settings.[11,13,19] One of the most important explanations to this difference is likely to be related to "access issues", considering the lower rate of cell phone ownership in Mozambique and the predominance of (less expensive) features phones which offer fewer functions than smartphones.[26] While cell phone ownership in Maputo city might be higher than that of 62% estimated for the whole country, it is unlikely to be close to the high levels of the high-income settings where studies have been conducted up until now.[26] As smartphones will become more affordable and connectivity will rise,[26-27] the prevalence of cell phone use among all Maputo city road users will most likely rise. Barriers to cell phone use like digital literacy and skills will not affect much the young users,[27] who are not currently those with the higher prevalence of cell phone use but represent a great share of the population as a whole. In fact, as many as 52% of the population in Mozambique is under the age of 18 years.[33]

From another viewpoint, an additional plausible explanation to the lower prevalence observed is the poor road safety conditions of unprotected road users in the city.[28] Hazards can be attributable to the road traffic environment itself (that reduces the visibility of the pedestrians and exposes them to the risk of high-velocity collisions with motorized vehicles) but also to the reported little attention paid to the pedestrians by car drivers.[28-29]

Not all types of sites included in this study have been investigated before. Albeit specific to the context of this study, roadside markets are a common feature of urban areas of the whole sub-Saharan Africa region. They attract pedestrians of all ages, both vendors and consumers. Interestingly, the prevalence of cell phone use peaked in those observation sites, something that might require particular attention by the local authorities.

Besides the difference between children and adults mentioned above, the prevalence of cell phone use was consistently higher among male than female pedestrians, which is in contrast with some earlier studies but not all.[11,19] Whether this reflects differences in ownership/access or one of safety behaviour remains to be more closely investigated.

When it comes to the type of use, texting/reading was more common than speaking overall, but more so among male children (52.7%) and less, among female adults (43.3%). Yet, at road intersections, a documented hazardous site, young female pedestrians were much more inclined to texting/reading than their male peers.

Those differences between men and women and based on type of use are hard to compare to those from previous studies, all in high-income urban settings characterized by much higher levels of cell phone ownership and greater variability in the type of functions available. With feature phones being the most common ones in use in Mozambique, there are far less functions available to distract the pedestrians,[26] functions that are more susceptible to lead to maladaptive mobile phone use.[34]

Strengths and limitations

The strengths of this study pertain to its large sample of observations and the variety of sites where Maputo pedestrians typically cross a street or a road. This, in turn, enables stratified analyses without compromising statistical power. The methodology employed has also been used in previous peer-reviewed studies.[15,32]

In contrast to self-reports, observations of cell phone use are less affected by biases like recall bias or social desirability. However, they can only take measure use at a specific point in time, and do not assess daily patterns of cell phone behaviour nor across different traffic scenarios.

Observation studies of the like are subject to misclassification, in particular the sex and age of the pedestrians observed and how they use their cell phone. Although there were few pedestrians with missing data, misclassification might nevertheless have occurred. To minimize the risk of observer bias, those enrolled in the project were thoroughly trained, and regular data check took place during the data collection. It is possible that video filming and coding afterwards would have improved the precision of the study to some extent, but this was not economically feasible. Uniform procedures were implemented across the three different sites, and if systematically biased, the prevalences prone to the same amount of underestimation.

Another limitation is that there were no observations scheduled during evening and nighttime. One obvious reason is the difficulty of observing under those conditions, due to poor road traffic light system. An additional one is that, for safety reasons,[28] in the context of Maputo city, there are far less pedestrians on the street during those time periods and those on the street are much less likely to use a cell phone, to avoid having it stolen. Additionally, we did not observe changes in cell phone use right before pedestrians crossed roads, valuable information for safety planning.

Albeit the use of a non-invasive approach, it is possible that some pedestrians refrained from use or changed their type of use if they noticed being observed, leading to an underestimation of the behaviour. Whether and how this was the case is difficult to assess as many precautions were taken not to disturb the pedestrians (observers were instructed to observe discreetly, blending in, and avoid looking at the selected pedestrian more than once).It is also of note that the study did not assess the actual excess risk of road traffic injury attributable to the use of cell phone use at the selected sites, and whether it would surpass the one assess in other crossing situations.[6] However, it was beyond the scope of this study to provide such assessments.

Implications

Distracted walking is an important risk factor for road traffic injuries and a threat to the safety of pedestrians,[35] in particular those living or commuting in hazardous traffic environments as is the case in Maputo City. Given that both cell phone ownership and connectivity will most likely grow in the foreseeable future, so will their ownership among pedestrians. Protection can be achieved in many ways, including the build-up of safe road environments and rules that restrict risk behaviours among other road users e.g., motor vehicle drivers, preventive measures that are often poorly implemented in LMICs.[36] Another set of measures can be tailored to the pedestrians themselves in an attempt to make them pay greater attention to their spatiotemporal environment. A study among pedestrians based on the theory of planned behaviour (TPB) has shown that both “positive attitudes” and “high exposure” influence one’s intention to cross the road while using a cell phone.[37] Such results have contributed to the promotion of road safety strategies that reinforce negative attitudes to distracted walking in hazardous situations and raise doubt about its perceived advantages.[37] However, the latter might be a greater challenge with an upcoming rise in the number of users of smartphone given their inherent ubiquity and indispensability and, as a consequence, their influence on levels of maladaptive mobile phone use .[34,38] Unsurprisingly, reviews indicate that the effect of such interventions, none of which have been tested in LMICs, is not convincing.[39]

Therefore, while a transition towards smartphones can be expected, sparked by the promotion of information communication technologies for its economic and environmental benefits for resource poor countries, it might be wise to conceive and implement contextualized multifaceted strategies that will help promoting responsible and safe practice among pedestrians but even among other categories of road users.[38-41] But one must bear in mind that behaviours in general and safe behaviours in particular are very difficult to change. As others have indicated, risk reduction is not a matter of only one stakeholder.[41] Rather, a shared responsibility for road safety should be acknowledged rather than focusing on the elimination of errors committed by distracted pedestrians .[41]

As both cell phone ownership and connectivity will grow in the foreseeable future the prevalence observed herein are likely to rise, despite the hazardous road traffic environment. In view of the additional expected transition to affordable smartphones, it might be wise to implement well-tailored multifaceted strategies that will not only help promoting responsible and safe cell phone use practice but also, most importantly, create safe walking environments. To that end, the planned improvements of the formal public transport supply and its quality will definitely play an important role.[28]

Conclusion

The overall prevalence of less than one in ten pedestrians using a cell phone at crossings in Maputo city is by far the lowest reported to date but was notably higher among men than women and among children than adults. In all demographic groups, it peaked at marketplaces, typically busy traffic environments not considered in previous studies. The type of use was also age- and sex-related. Expectable growth in cell phone ownership and in connectivity is likely to spark the numbers observed, resulting in more distracted pedestrians in at-risk situations. Revisiting the city planning and road traffic infrastructure will play a determinant role in protecting them.

Conflict of interest

All authors declare no conflicts of interest.

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Ethics approval and consent to participate

The study was approved by the Ethical Committee of the Faculty of Medicine of the Eduardo Mondlane University (registration number: CIBS FM & HCM/003/2021). Due to the nature of the study informed consent was not collected. No personal identification information was collected for the observed pedestrians.

Availability of data and materials

The data that support the findings of this study are available upon request by contacting author Alfredo Maposse at the Eduardo Mondlane University, Department of Psychology, Center for Studies and Psychological Support (CEAP), Maputo, Mozambique.

Authors' contributions

Conceptualization (LL, AM, JM); Data curation (FF); Formal analysis (FF); Funding acquisition (LL); Investigation (AM); Methodology (LL, AM, JM); Project administration (AM, JM); Supervision (LL, JM); Validation (AM); Roles/Writing - original draft (LL); and Writing - review & editing (AM, FF, JM).

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