Post-flâneur in Public Space

Altering walking behaviour in the era of smartphones

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Smartphones have become an ordinary accompanier of our walks and created new modes of appropriation of public space. This study aims to research these modes by observing the altering visual attention and walking behavior of people using smartphones in public space, and in this way, to reveal the emergence of different types of post-flâneurs. In order to address these aims, 346 (195 females, 151 males) smartphone users were observed in a central public square in Ghent, Belgium for seven days in 10-minute time intervals. Each person's gender, age, number of accompanies and their dominant mode of smartphone usage(s) were identified. Afterward, each person's walking timeline was organized into seconds and coded according to their focus of visual attention in 24 different modes which grouped under the three gaze types; visual attention on the environment, on the environment through the smartphone screen, and on the smartphone screen. Results of the descriptive statistics, multivariate graph, and rhythm-based in-depth analysis show that different types of smartphone activities affect visual attention and speed differently. Different types of post-flâneurs such as navigators and photo takers were identified based upon their high percentage of visual attention on the environment and slower walking speed. The study also revealed the frequent presence of phone-walkers (who walk while only holding the smartphone) and smartphone zombies (who walk slowly and without attention to their surrounding) in public space. In addition to these, our research revealed rapid smartphone zombies who walk faster than the average walking speed, a finding contrary to the former studies reviewed.

Keywords: *visual attention, public space, smartphone, walking behaviour, post-flâneur*

INTRODUCTION

Smartphones are one of the most rapidly adopted technologies in history (Kalin and Frith 2016). By enabling the use of Information and Communication Technologies (ICTs) in mobile mode (mICTs), smartphones have become an essential part of our everyday life in public space and an ordinary accompanier of our walks. Today, more than 65 percent of the world population own mobile devices and over half of them are smartphone users (Intelligence 2017). Countries with advanced economies take the lead with a median of 76 percent smartphone ownership rates and these rates become even higher when it comes to the young adults (Smith and Anderson 2018). A recent survey shows that over 20 percent of young adults use their smartphone during walking (Lennon et al. 2017). The rapid closing of the age gap between smartphone users (Anderson and Perrin 2017; Smith and Anderson 2018) implies that using a smartphone whilst walking will become even more prevalent in the near future.

Empirical studies indicate that using a smartphone while walking can enable sensorial engagement with the surrounding urban space (Frizzera 2015). On the other hand, it can also have adverse effects due to the negative relationship between smartphone usage and attention (Wilmer et al. 2017). Humans switch gazes between the smartphone screen and the urban environment whilst walking. This affects the attention and walking behavior of smartphone users and has been associated with many pedestrian safety problems. The dominant part of the literature on this multitasking activity focuses on these effects (Hartfield and Murphy 2007; Haga et al. 2015; Laurier et al. 2016; Lim et al. 2017; Lin and Huang 2017; Yoshiki et al. 2017; Alsaleh et al. 2018). There is an increasing variety of solutions to address the changing walking behavior such as physical interventions and interface based solutions. Physical design interventions can serve this purpose to some extent. On the other hand, interface-based interventions have proven to be incapable to reduce the risks related smartphone distractions while walking since they take more attention from the environment while expecting to do the opposite (Lu and Lo 2019). In this sense, understanding the altering walking behavior beyond the safety risks and its effects on the appropriation of public space are important to both understand and design the public space of today and tomorrow.

Walking behavior in public space shows itself in different modes with respect to the rhythm, speed and the aim of the walk. While a destination-oriented walker walks with a brisk pace, aimless strolling or ambling are slow activities. These ways of walking are also differentiated within themselves by referring specific figures such as flâneurs who use strolling as a mean of experiencing the city instead of arriving somewhere (Benjamin 1999). Today, with the proliferation of smartphones, we are facing with new figures in public space. Smartphone zombies or smombies who walk slowly as a result of their high attention to the smartphone screen can be listed as one of the most significant examples of these figures. Another emerging figure is the 'post-flâneur' which constitutes the focal point of this study. The post-flâneur who is shuttling between the digital and physical space can be called mainly -but not only- as the "photographer of modern life", walks the city with a smartphone, takes photographs and shares them in the social media (Vlachou et al. 2017).

The increasing use of smartphone use implies that the presence of these figures in public space will continue to increase and new ones will be added. With respect to this, this study aims to determine these new figures of smartphone users among the people walk in public space by analyzing their visual interaction with smartphone screen and the surrounding environment. By analyzing the temporal configuration of gaze shifts through an observational survey, the study addresses the following research questions:

- How do smartphones affect gazes and visual interactions while walking through public space?
- What are the different figures of smartphone

users in public space according to their visual attention and walking behaviors?
- Can we identify a 'post-flâneur' among these figures?

In order to address these research questions, we will present an in-depth literature review on the changing nature of the walking behavior of humans using mobile phones in public space (Section 2). This will be followed by an empirical study in a square in Ghent, Belgium through which 346 (195 females, 151 males) smartphone users were observed between 20 October and 14 December 2018 (Sections 3 and 4). As a result, we will make conclusions on the implications of the results for the future of public space and draw future directions.

BACKGROUND

Observing pedestrians with smartphones in public space

A significant part of the studies on smartphone usage in public space base on self-report data (Exler et al. 2016; Lennon et al. 2017). However, research studies indicate that self-reported usage of smartphone hardly reflects the real use. For instance, a 2015 research showed that actual uses amounted more than double the estimated number of smartphone uses (Andrews 2015). With this respect, observational research is essential to understand the actual use and effects of smartphone use in public space.

The usage of smartphone and its effects on walking behavior in public space is observable since the device itself has mobility in relation to the gestures and actions of the walkers (Laurier et al. 2016). A predominant part of the observation-based studies concentrated on this phenomenon approaches the subject from the perspective of pedestrian safety. In this context, many related studies observe walking behavior of smartphone users in a simulated environment in which they can restrict environmental factors (Haga et al. 2015; Lim et al. 2017; Lin and Huang 2017; Lu and Lo 2018).

On the other hand, there is still a relatively small number of studies on smartphone use in public space. These observation-based studies examine the changing walking behavior of smartphone users in real-world public spaces based on egocentric (Laurier et al. 2016) or controlled (prescripted) walking experiences (Yoshiki et al. 2017). There are a limited number of passive-observation studies that examine smartphone usage in public spaces. A 2010 study on cellphone users in public space focus on talking whilst walking showed that cell phone usage can cause "inattentional blindness" (Hyman et al. 2010). Another passive-observation study held in 2015 (Hampton et al. 2015) revealed that the percentage of people who use a mobile phone in public space is not dominant and people tends more to use a smartphone when they are walking alone comparing to being with groups (Hampton et al. 2015). However, if we think about the rapid increase in smartphone use and the particular interest of this study on using a smartphone whilst walking, the necessity for further research on the topic leaves no room for doubt.

New figures in public space

With the emergence of smartphones, the activities that we are capable of handling while walking with mobile devices has been increased. As navigation became one of the most significant modes of smartphone use in public space with the advances in location-based applications, modes of photo taking and video capturing also became popular with the improvements of camera systems of the smartphones over the years. Modes of texting, reading, talking, and listening still constitutes the majority of smartphone use while walking as in the case of cell phones. Besides these, holding a smartphone without using whilst walking became one of the major modes of smartphone users in public space. With this respect, in the following part of our study, we will examine the existing literature on specific types and characteristics of smartphone users in public space.

Post-flâneur. The modern city of nineteenth-century introduced the concepts of flâneur and flânerie. Ben-

jamin's (1999) 'flâneur', a nineteenth Century character firstly portrayed by Baudelaire, strolls in the city and uses walking as a way of experiencing the city. A flâneur does not have a purpose of getting somewhere, the act of walking is the purpose itself. The basic necessity of a flâneur is the sense of presence and attention to the urban environment and the passers-by and a particular pace which makes a place and what is experienced there, memorable (Connerton 2009). Today, advances in mobile technologies created a new kind of urban wanderer which can be named as 'post-flâneur'. This post-flâneur walks the city with a smartphone, takes photographs and shares them in the social media (Vlachou et al. 2017). This study will try to detect post-flâneurs by examining their walking speed and visual interaction with the surrounding environment and try to bring a new definition of the concept according to these observations.

Smartphone zombie. Besides the post-flâneur, new types of walking behavior can be detected by examining the same variables introduced. Today, the phenomenon of people walking while looking their smartphones is identified as a new character that becomes more and more prevalent at public space and named as "smartphone zombies", "smombies" or "head-down tribe". This new character is a person "who walks slowly and without attention to their surroundings because they are focused upon their smartphone" (Mwakalonge et al., 2015) and associated with many pedestrian safety issues.

Phone-walker. Phone-walker holds the device without using whilst walking becomes one of the observable characters in public space due to its large proportions and a 2018 study shows that the tendency of holding phone whilst walking has a correlation with the gender of the walkers accompanies (Schaposnik and Unwin 2018).

STUDY DESIGN AND THE RESEARCH METHOD

For the purpose of the study, Korenmarkt, a public space from Ghent, Belgium was selected as a case study area. The selection had been made on the basis of the social media usage rates [1], the scale and the movement patterns: Ghent, Korenmarkt. In the context of this research, a defined area of the square had been selected for its appropriate scale for observation of the pedestrian flows. To observe different behavioral patterns of pedestrians using smartphones, 10-minute videos of Korenmarkt square were recorded from the same spot for each day of the week (figure 1). People who walk between designated observation gates with a visible smartphone were observed.

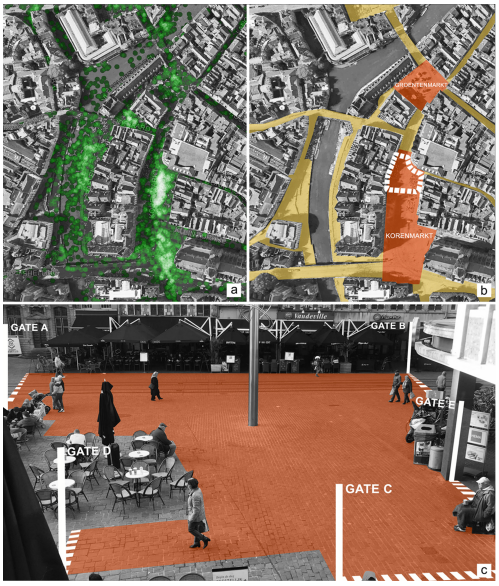

Figure 1
(a) Superposition of Eric Fischer's 6 billion tweets map [1] with Korenmarkt square, (b) pedestrian route network (yellow), public squares (orange) and case study area (white dash line) in Korenmarkt, and (c) defined observation gates in Korenmarkt square.

Eventually, 346 (195 females, 151 males) smartphone users whose total walking path ranges between 26,4 and 33,3 meters (Mean: 31,2 m) observed. Each person's estimated gender and age group, number of accompanies and their dominant mode of smart-

phone usages were identified. These smartphone related modes were specified as holding, checking, listening, speaking, reading, typing, navigating, photo taking and video taking. Afterward, each person's time spent between their entrances and exits were divided into seconds and coded according to their gaze directions by specifying whether it's a walking or a stationary activity. 24 different codes were created which can be listed under 3 different gaze types; visual attention on the environment, on the environment through the smartphone screen, and on the smartphone screen (table 1).

After decoding, the data were examined by using several methods. This paper presents a summary of the results derived from descriptive statistics, multivariate graph analysis and rhythm-based in-depth analysis for some types of smartphone users in public space. Statistical and graph analysis were completed by using SPSS (v25.0) for Mac OS.

RESULTS

Descriptive Statistics

Results from descriptive statistics show that adult (40%) and young adult (37%) age groups are more dominant among the smartphone users in the Korenmarkt example. Teenagers and elders constitute 15 percent and 8 percent of the users respectively. As opposed to the findings of Hampton et al. (2015) that suggests people tend more to use a smartphone when they are walking alone, this study shows that the number of people using a smartphone while walking alone goes head to head with walking in groups. Even, the percentage of using a smartphone while walking in groups (54%) is slightly more than walking alone (46%).

Smartphone activities. Among the different types of smartphone activities we observed in public space, reading (28,6%) takes the lead which is followed by typing (16,5%), checking (14,2%) and speaking (13,3%) respectively. The high percentage of only holding (11,6%) shows that phone-walkers are one of the emergent modes of smartphone users in public space which needs more consideration as suggested by Schaposnik and Unwin (2018). Navigation (11,6%) which has the same percentage as only holding is another major modes of smartphone usage in public space whilst walking. Photo taking (7,8%) follows navigating and lastly listening (4,6%) and video taking (4%) are the least used modes of the smartphone in walking and transient stationary activities in public space. The low percentage of listening can be expounded by the fact that only people who use their smartphones visibly for listening taken into account during the observations.

Altering movement and objects of visual attention. When the holders (n=40) are excluded from the sample, 27 percent of the smartphone users stopped during their route (n=83) and 84 percent of them used their smartphones during these stationary activities (n=70). Results show that 63,5 percent of smartphone user's visual attention is on the environment (Gaze 1) and 36,5 percent of it is smartphone-based visual attention (Gaze 2 and Gaze 3) in the total walking and stationary activities. The percentages of visual attention during walking indicate similar results. However, if we focus on visual attention during stationary activities, smartphone screen based attention (Gaze 2 and Gaze 3) increases to 54 percent. Our detailed examination clearly illustrated that especially photo taking that focus attention on the environment through the smartphone screen shows itself mostly in stationary activities.

When we examined the average percentages of visual attention and the average walking speed (m/sec) for each smartphone activities, it can be seen that there is a positive correlation between walking speed and visual attention on the environment (Gaze 1), and a negative relationship between walking speed and visual attention on the smartphone screen (Gaze 3). The activity of speaking goes beyond this rule. Although it has a high percentage of visual attention on the environment, it has a slower average walking speed. This can be explained by the fact that although speaking does not take much visual attention, it can create a cognitive distraction (Lennon et al. 2017) which can decrease the walking

GAZE 1 visual attention on environment		GAZE 2 visual attention on the environment through the smartphone screen		GAZE 3 visual attention on the smartphone screen	
walking	**stationary**	**walking**	**stationary**	**walking**	**stationary**
we_gaze on the destination or an accompany	**se**_gaze on an accompany or an object	**wv**_taking video	**sv**_taking video	**wm**_gaze on screen	**sm**_gaze on screen
wd_showing directions	**sd**_showing directions	**wp**_taking photo	**sp**_taking photo	**wso**_sharing own screen	**sso**_sharing own screen
wes_wandering gaze	**ses**_wandering gaze	**wse**_taking selfie	**sse**_taking selfie	**wtv**_speaking on a video call	**sss**_sharing someone's screen
wh_photo and video hunting	**sh**_photo hunting		**spo**_posing for a photo		
wt_speaking on the phone	**st**_speaking on the phone				
wth_speaking on the phone by holding in front of the face					

Table 1
Codes for different gaze types.

speed. Besides, navigating and photo taking draw apart from other activities with their high percentage of visual attention on the environment and low walking speed. Accompanied by video taking, they also have the highest percentages of wandering gaze which calculated from the codes of wandering gaze (wes, ses) and photo/video hunting (wh, sh) (figure 2).

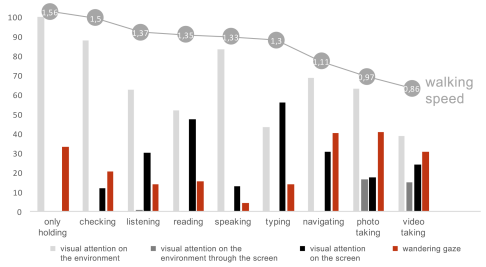

Figure 2
The average percentages of visual attention and the average walking speed (m/sec) for each smartphone activities.

Multivariate Graph Analysis

In this part of the study, each smartphone user was mapped in the scatter graphs specialized for different smartphone activities according to their total percentage of smartphone-based visual attention (Gaze 2 and Gaze 3) whilst walking and average walking speed (m/sec). Then, the data were colorized according to their percentage of wandering gaze (walking and stationary) (figure 3). While we focus on the area of the maximum 50 percent smartphone-based visual attention and the maximum 1,4 m/sec average walking speed for pedestrians (grey rectangular), it becomes visible that navigators and photo takers mostly cluster in this area comparing to other users. Readers, on the other hand, sprawl to a larger area that extends over 100 percent smartphone-based visual attention and 2,26 m/sec walking speed. Typers show similarities with readers in visual attention, however, their maximum speed is 1,98 m/sec. Only holders and listeners show resemblance in speed which is higher than 1 m/sec in general. Video recorders clearly constitute two groups in terms of the percentage of smartphone-based visual attention and wandering gaze, and do not exceed 1,4 m/sec average walking speed.

DISCUSSIONS

In this study, we researched new modes of appropriation of public space by observing the altering visual attention and walking behavior of people using smartphones in public space (Korenmarkt, Ghent, Belgium), and revealed the different types of post-flâneurs. We mapped and grouped the smartphone users based on the percentages of smartphone-based visual attention and walking speed graph and colored according to their percentage of gaze wanderings to detect new figures of public space. Results indicated that people using a smartphone while walking can be characterized by analyzing their visual attention and walking behavior.

Post-flânerie is aimless wandering which also involves a high level of gaze wanderings (Gros 2009). When users who have a minimum 60 percent wandering gaze and a maximum 1,4 m/sec walking speed are identified for each smartphone activity, post-flâneurs appear within navigators, photographers, video takers, checkers, and readers. However, if we look at the general distribution of smartphone users according to the smartphone activities (figure

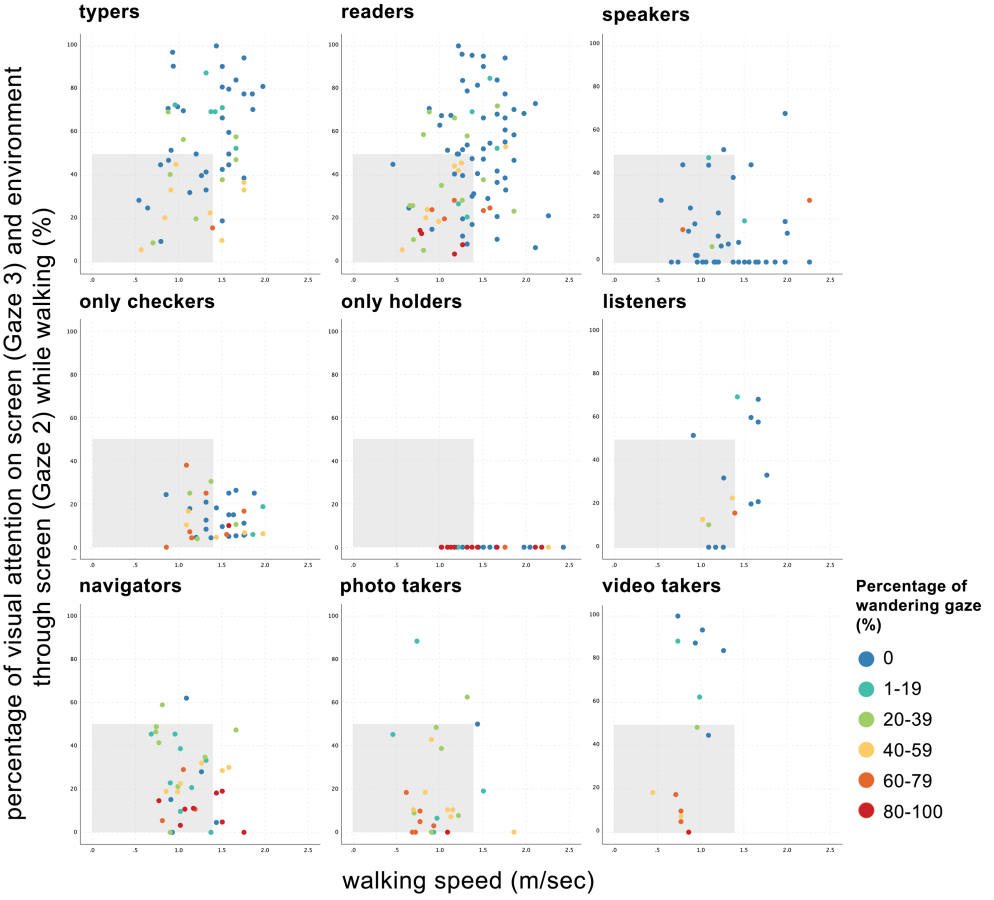

Figure 3
Distribution of smartphone users according to their smartphone activities in the scatter graphs of the total percentage of smartphone-based visual attention (Gaze 2 and Gaze 3) whilst walking and average walking speed (m/sec). Smartphone users were colorized according to their percentage of wandering gaze (walking and stationary).

4), it can be claimed that photographers and navigators are more appropriate to look for a post-flâneur with their general distribution within the desirable interval (percentage of smartphone-based visual attention<50, walking speed<1,4m/sec). For instance, there are post-flâneurs within the video shooters, however, the general distribution of the video takers shows that there is a clear distinction between post-flâneur video takers and video-walkers whose visual attention is highly on the smartphone screen and experience environment mostly through the screen.

This study also proves the frequent presence of smartphone zombies in public space and suggest that smartphone zombie is more than a buzzword. We detected two kinds of smartphone zombies in public space. The first one walks with dominant attention on the screen (attention on screen is more than 80 percent) and walks slower than the average walking speed (1,4 m/sec) as the definition of the term indicates. On the other hand, there is also an-

other kind of smartphone zombie who walks with immense attention on the screen and faster than the average speed. Figure 3 clearly shows that these rapid smartphone zombies mostly appear among readers and typers, while smartphone zombies emerge mostly among video takers who we call as video-walkers whose visual field is restricted by smartphone screen during the whole walk. We also observe that all of these (rapid) smartphone zombies walk through a straight route without any turnings.

The smartphone users in the area between (rapid) smartphone zombies and post-flâneurs varies between immersed to destination oriented walkers. The users who have maximum 40 percent smartphone-based attention and walk faster than the average walking speed are mostly constituted by checkers who give their visual attention to their smartphone screen for short periods. Rhythm-based in-depth analysis of the types of smartphone users also shows the varying timelines of different users on the same route depending on the smartphone activity (figure 4). Examples among the different types of smartphone users in public space show how visual engagement with the surrounding can change according to smartphone activities. It also shows that there can be varying types among the users of the same smartphone activity. For instance, figure 4 shows how a photographer and a photographer post-flâneur differentiates from each other with respect to their focus of visual attention. While the former one immerses into smartphone before and after the photo taking activity, the latter one gives his/her attention into the environment with a high percentage of wandering gaze. It can be claimed that while the former one uses smartphone and photo taking as the aim of the walk, the latter one uses as a tool for the experience.

CONCLUSION AND FUTURE DIRECTIONS

Visual stimuli have been increasing in our surrounding urban environment for a long time and smartphones by rapidly penetrating our everyday life, have been becoming another stimulus that take more and more attention every day. Even though smartphones can give its place to another technology in the near feature, it seems like the demand for our visual attention in public space will continue to increase. When this is the case, understanding the effects of these mobile devices on our visual attention and examining how the interactions with smartphones transform the walking behavior in public space became important to understand changing needs of public

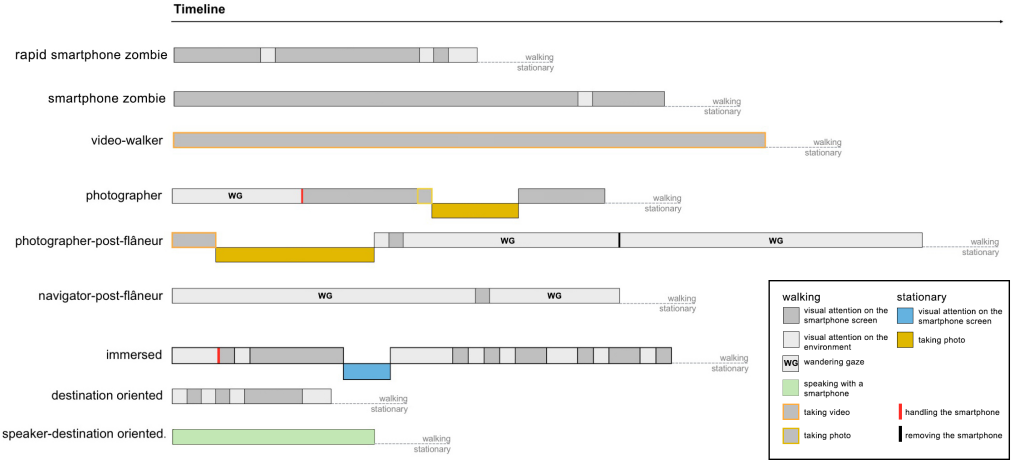

Figure 4
Rhythm-based in-depth analysis of the different types of smartphone users who walk through the same route.

space design.

In line with the former research, this study claims that different smartphone activities affect visual engagement with the surrounding environment and movement within the public space differently. The individual users of the same activities vary within themselves according to their visual attention to the environment and walking speed. By examining these differentiations, this study claims that possible post-flâneurs can be detected mostly among photographers and navigators. According to the same logic, smartphone zombies who gave their attention to the screen whilst walking can be detected among readers, typers, and video-walkers. Results of this research show that smartphone zombies walk in the routes that they do not need to turn and also a significant part of them are walking more rapid than observed in former studies.

Recognizing these new modes of appropriation of public space raises questions on their design implications and possible approaches addressing the emergent "post-public" space. In this sense, this study suggests three strategies towards the phenomenon of the rapid adoption of smartphone in public space.

Taking back the attention: The configuration of the space creates the movement (Hillier and Hanson 1989). While a connected space relieves the movement and can be desirable for a well-designed public space, (rapid) smartphone zombies within this study presents how these walkers show up in the straight routes in which they can move without any attention to their surroundings. With this respect, *breaking the cognitive routine* of the pedestrians with smartphones can be a solution especially in critical locations where the visual attention is vital. With this attempt, the visual attention of the head-down walker who acts by rote can be drawn back to the environment. *Designing spaces for wandering* is also a significant tool. Decreasing the speed increase engagement with the surrounding. Public spaces should be designed to provide more spaces that promote decreasing the pace, wandering through and being stationary.

Becoming the object of hybrid attention: It is clear that humans are getting more and more connected to the virtual world and they bring this virtual space into the physical space with the help of developing mobile technologies. This means the public space of the future should be regarded and designed not only as a physical construct but instead as a *hybrid construct* in which the public space itself can turn into an information technology which can raise smartphone users heads towards the public space and improve the engagement.

Going beyond the visual: Although this study did not focus on audial attention, our reflective observations show that audial stimulants play a significant role in drawing visual attention to the environment. In the Korenmarkt example, street music (in Saturday example) in front of the statue in the middle of the case area drew visual attention of the passers-by from their smartphone screen. In the era of increasing visual stimulants that fights for the visual attention, it is important to due consideration and rethink the *soundscape* (Schafer 1993) *design of public space*. This can be also an important tool to create more collective forms of audial spaces in the era of individual listeners who walk through the city in their personal "mediated urban isolation" (Bull 2012) balloons.

These strategies can be enhanced with a further research on examining altering attention (visual, audial and cognitional) and engagement with the environment from the egocentric perspective of the smartphone users. The rapid penetration of smartphones and location-based applications into public life and its effects on human behavior and public space show that there will be challenges such as privatization and commercialization of the experience. However, by understanding these altering experiences we can rethink the design of public space and improve the relationship between human and their environment and overcome these challenges.

REFERENCES

Alsaleh, R, Sayed, T and Zaki, MH 2018, 'Assessing the Effect of Pedestrians' Use of Cell Phones on Their Walking Behavior: A Study Based on Automated Video Analysis', *Transportation Research Record*, 2672(35), pp. 46-57

Anderson, M and Perrin, A 2017, 'Tech adoption climbs among older adults', *Pew research center*, May, pp. 1-22

Andrews, S, Ellis, DA, Shaw, H and Piwek, L 2015, 'Beyond self-report: tools to compare estimated and real-world smartphone use', *PloS one*, 10(10), p. e0139004

Benjamin, W 1999, *The Arcades Project*, Harvard University Press

Bull, M 2012, 'The End of Fla□nerie: iPods, Aesthetics, and Urban Experience', in Ekman, U (eds) 2012, *Throughout: Art and Culture Emerging with Ubiquitous Computing*

Connerton, P 2009, *How modernity forgets*, Cambridge University Press

Exler, A, Braith, M, Schankin, A and Beigl, M 2016 'Preliminary investigations about interruptibility of smartphone users at specific place types', *Proceedings of the 2016 ACM international joint conference on pervasive and ubiquitous computing: Adjunct*, pp. 1590-1595

Frizzera, L 2015, 'Mobile media as new forms of spatialization', *Interdisciplinary Science Reviews*, 40(1), pp. 29-43

Gros, F 2014, *A philosophy of walking*, Verso Trade

Haga, S, Sano, A, Sekine, Y, Sato, H, Yamaguchi, S and Masuda, K 2015, 'Effects of using a smart phone on pedestrians' attention and walking', *Procedia Manufacturing*, 3, pp. 2574-2580

Hampton, KN, Goulet, LS and Albanesius, G 2015, 'Change in the social life of urban public spaces: The rise of mobile phones and women, and the decline of aloneness over 30 years', *Urban Studies*, 52(8), pp. 1489-1504

Hillier, B and Hanson, J 1989, *The social logic of space*, Cambridge university press

Intelligence, G 2017, 'Global mobile trends 2017', *GSMA*, September, pp. 1-105

Hyman J, IE, Boss, SM, Wise, BM, McKenzie, KE and Caggiano, JM 2010, 'Did you see the unicycling clown? Inattentional blindness while walking and talking on a cell phone', *Applied Cognitive Psychology*, 24(5), pp. 597-607

Kalin, J and Frith, J 2016, 'Wearing the city: Memory p(a) laces, smartphones, and the rhetorical invention of embodied space', *Rhetoric Society Quarterly*, 46(3), pp. 222-235

Laurier, E, Brown, B and McGregor, M 2016, 'Mediated pedestrian mobility: walking and the map app', *Mobilities*, 11(1), pp. 117-134

Lennon, A, Oviedo-Trespalacios, O and Matthews, S 2017, 'Pedestrian self-reported use of smart phones: Positive attitudes and high exposure influence intentions to cross the road while distracted', *Accident Analysis \& Prevention*, 98, pp. 338-347

Lim, J, Chang, SH, Lee, J and Kim, K 2017, 'Effects of smartphone texting on the visual perception and dynamic walking stability', *Journal of exercise rehabilitation*, 13(1), p. 48

Lin, MIB and Huang, YP 2017, 'The impact of walking while using a smartphone on pedestrians' awareness of roadside events', *Accident Analysis \& Prevention*, 101, pp. 87-96

Lu, JM and Lo, YC 2018 'Can Interventions Based on User Interface Design Help Reduce the Risks Associated with Smartphone Use While Walking?', *Congress of the International Ergonomics Association*, pp. 268-273

Schafer, RM 1993, *The soundscape: Our sonic environment and the tuning of the world*, Simon and Schuster

Schaposnik, LP and Unwin, J 2018, 'The phone walkers: a study of human dependence on inactive mobile devices', *Behaviour*, 155(5), pp. 389-414

Smith, A and Anderson, M 2018, 'Social media use in 2018', *Pew Research Center*, 1, pp. 1-4

Vlachou, C, Gkanouri, P and Skayianni, M 2017, 'Constructing the post flâneur', *Gavagai*, pp. 16-45

Wilmer, HH, Sherman, LE and Chein, JM 2017, 'Smartphones and cognition: A review of research exploring the links between mobile technology habits and cognitive functioning', *Frontiers in psychology*, 8, p. 605

Yoshiki, S, Tatsumi, H, Tsutsumi, K, Miyazaki, T and Fujiki, T 2017, 'Effects of smartphone use on behavior while walking', *Urban and Regional Planning Review*, 4, pp. 138-150

[1] https://api.tiles.mapbox.com/v4/enf.c3a2de35/page.html?access_token=pk.eyJ1IjoiZW5mIiwiYSI6IkNJek92bnMifQ.xn2_Uj9RkYTGRuCGg4DXZQ#17/51.05452/3.72212