

Impact of Mobility on Spatial Presence during Audio Narrative Reception

María T. Soto-Sanfiel

Audiovisual Communication and Advertising Departmen
Autonomous of Barcelona University
Bellaterra, Barcelona (Spain)
e-mail: MariaTeresa.Soto@uab.cat

Abstract— This exploratory research analyzes the effect of mobile listening on spatial presence during audio fiction consumption. Spatial presence is the feeling of being physically located in a virtual environment or experiencing physical objects as if they were real. A quasi-experimental research was conducted with 2x2 factorial design, the independent variables being listening condition (moving vs. stationary) and two narratives (s1 vs. s2). 327 participants were randomly assigned to each of the experimental situations. For moving listening, they listened to the story while walking around the building and back to the place they started. For stationary, they listened while seated in the same place where the moving condition started. They completed a questionnaire with the spatial presence scale after listening. The main results show that mobility affects attention, spatial situation and high cognitive involvement. Listeners pay less attention to the story, concentrate on it less and it captures fewer of their feelings. Also, the spatial situation (the capacity to imagine the layout, the precise the spatial environment, the calculation of time and the specific mental image of the spaces presented in the story) is lower when the user moves in an open space while listening. Likewise, due to movement, there is less imagination of things related with the story, relation between things in the story itself, activation of thought and perception of the usefulness of the story. These results contribute to the understanding of the psychological processes associated to the reception while on the move.

Keywords: *mobility; reception; audio narratives; spatial presence; psychological processes.*

I. INTRODUCTION

This exploratory research observes the effect of mobile listening on *spatial presence* during audio fiction consumption. The general concept of *presence* refers to the feeling of “being there” or “being inside” the scene where the story is unfolding. The phenomenon is often described as the perception of non-mediation [1]. It can be understood as the psychological state in which the person’s subjective experiences are created by some form of media technology, with a scant notion of how the technology shapes this perception [2]. According to Lee, presence is a psychological state in which the experience of virtuality goes unnoticed [3]. Spatial presence is one of the dimensions of presence [4]. It is specifically defined as the feeling of being physically located in a virtual setting or experiencing physical objects as if they were real [5].

There is no known research that explores the effect of the modality of consumption (mobile or stationary) to the reception of sound products, in spite of the proliferation of audio portable devices and audio offers since long ago. The consumption of radio while on the move is nothing new, indeed. Particularly, there is a lack of empirical information on how mobile reception affects the psychological relation between audiences and audio products. In spite of that, there are tentative explanations of the characteristics of mobile listening in urban environments, particularly of music, which have originated from researchers from disparate disciplines. For example, it has been said that the use of earphones fosters the creation of a private listening bubble within a public space. The earphones provide the ears with the personally desired listening experience that seeks to eliminate the sounds of congested industrial cities [6]. It has been also stated that the use of earphones produces a spatial experience of individual listening that destroys the perception of external space or position, and reveals the boundaries between private and public listening spaces [7]. As a matter of fact, it has been argued that audiences seek to engage with the media not only to connect, but also to disconnect from the different spheres of reality [8]. Finally, it has been proposed that due to the fact that we experience acoustic saturation because of the constant exchange of sounds caused by different media, modern-day listening is characterized by an overall and disengaged listening in which media sounds form our everyday background [9].

Truax defines listening as a system of holistic interconnection between sound, the listener and the ambience [10]. This suggests that mobile urban listening, produced in physical places that are not designed for projecting sound, or for detailed mediation and exploration by the user, could affect the reception. That idea also implies that the qualities of the social setting in which listening occurs affect the actual sound due to the spatial characteristics of the surrounding urban geography, and the complexity of sounds produced for the spatial and temporal simultaneity of experiences, agents or events occurring within said geography. That idea also suggests that audio content could alter behaviour (e.g. moving in rhythm to music) or the psychological treatment of content or of one’s environment (e.g. reduce attention and/or affect spatial or temporal position).

In spite of the lack of known empirical evidence, some other researchers have also speculated about the consequences and/or effects of mobile listening using portable devices. For example, it is believed that the sounds that accompany an everyday action are used as tool for the appropriation of experiences [11]. It is stated that everyday mobile listening embellishes one's own environment, marks frontiers, and controls time and/or learning, too [12]. The general belief is that mobility inevitably changes the way we relate both with sound and space, which, in turn, could affect behaviour [13]. Nevertheless, new listening practices have led to consumer habits that should be observed specifically by content and situation (in terms of mobility) and the listening environment [14][15].

II. METHOD

A. Participants

There were 327 university students who cooperated with the research without receiving any compensation. 58.7% were women and 41.3% men. The average age was 21.18 years ($R_g = 17-40$, $SD = 3.99$). The students were invited to collaborate in the vicinity of the Faculty of Communication Science, at a large University from Spain, where the data was collected.

B. Procedure

Quasi-experimental research was conducted with 2x2 factorial design, the independent variables being listening condition (moving vs. stationary) and narrative (s1 vs. s2). The participants were randomly assigned to each of the experimental situations. The narratives used were two horror stories, of high aesthetic quality.

Both listening situations were in the open air. For mobile listening, the participants were asked to listen to the story while walking around the Faculty building and back to the place they started. Having studied the route beforehand, we calculated that this was the distance required to hear the complete story and get back in time to answer the questionnaire immediately after. For stationary listening, the participants were asked to listen while seated in the same place where the moving condition started. All participants, but particularly the moving ones, were asked not to interrupt the narrative and to abstain from communicating with anybody while doing the experiment, as this could spoil the results.

C. Materials

The participants answered a questionnaire containing a 35 item *spatial presence* previously formulated scale [16]. It was performed a factorial analysis of it. After different tests, it was agreed that the results offered by the method of varimax rotation and extraction of main components showed the clearest structure. The results revealed the existence of 8 factors that together explain 68.50% of variance. The Kaiser-Meyer-Olkin (KMO) Test value was .881 and

Bartlett's Sphericity was 5691.145. The model was statistically significant ($p < .001$) [17].

The results of said procedure were fairly aligned with the proposal of the original scale, with some exceptions. To begin with, a difference was found in the first of the factors, which here contained 8 items. It was found that the factor was the subset of the 4 items that, in the scale's proposal, appeared in the sub-factor self-location of spatial presence, plus the other 4 items of the sub-factor *possible action*, of the same spatial Presence. We therefore decided to call the factor obtained by this study spatial presence. Afterwards, another difference was found in the suspension of disbelief factor in the original scale, which in this study was divided into two different factors. Because of the items forming part of each, they were called persistence of disbelief and suspension of disbelief. Table 1 shows the first four factors that appeared during the validation of the scale and Table 2 shows the next second four.

Eight subscales were formed, each corresponding to one of the factors, based on the sum of the partial scores of each item. We also obtained an overall index of spatial presence from the sum of all scores of all items in the scale. These were incorporated in the analysis.

III. RESULTS

Results show an effect of listening condition on some of the dimensions of the factors. There were found statistical differences for attention ($F = .769$, $t = -1.93$, $p > .054$), which was higher when stationary ($M = 5.18$, $SD = 1.15$, $N = 168$) than when moving ($M = 4.93$, $SD = 1.15$, $N = 159$). Attention to the story, thus, is greater when the receiver is stopped than when he/she is on the go. Listeners pay less attention to the story and concentrate less on it during movement. Moreover, the story captures less their feelings or they full dedication to it. It could be explained by the conjunction of two facts. First, people need to pay attention to their own movements and to the characteristics of the road, for assuring successful displacements. Second, the sounds of the audio narrative could interact with those of the environment. It is expectable that in noisy spaces, like those of densely-populated urban cities, attention to the story could even decrease. The experiment was produced in the calm area that surrounds a within campus school.

There were also found differences for spatial situation ($F = .665$, $t = -2.58$, $p < .010$), which was higher when stationary ($M = 5.14$, $SD = 1.16$, $N = 168$) than when moving ($M = 4.80$, $SD = 1.21$, $N = 159$). Likewise, there was found a tendency towards difference for high cognitive involvement ($F = .220$, $t = -1.83$, $p > .067$), which tended to be greater when stationary ($M = 4.42$, $SD = 1.15$, $N = 168$) than when moving ($M = 4.18$, $SD = 1.19$, $N = 159$). These two results are logical and coherent between them. The first one recognizes that the intellectual characterization of the spatial situation in which the narrative takes place is affected by the movement of the listener.

TABLE 1. FACTORIAL ANALYSIS. ROTATED SATURATION MATRIX OF THE JOINT SAMPLE. (N= 327)
SCALE OF SPATIAL PRESENCE (4 FIRST FACTORS)

Items	Factors (% variance explained)			
	<i>Self-location and Possible action</i> (28.85)	<i>Attention</i> (10.01)	<i>Specific terrain of interest</i> (7.33)	<i>Spatial situation</i> (6.08)
I felt like I was in the setting of the story	.601			
It was as if my real position had moved to the setting of the story	.717			
I felt physically present in the setting of the story	.737			
I felt as if I had played a part in the action of the story	.810			
I got the impression that I could be active in the ambience of the story	.819			
I felt as if I could move between the objects in the story	.769			
The objects in the story gave me the feeling that I could do things with them	.762			
I felt I could do what I wanted in the setting of the story	.765			
I paid full attention to the story		.815		
I concentrated on the story		.834		
The story captured my feelings		.693		
I was fully dedicated to the story		.786		
I'm generally interested in the subject of the story			.807	
For some time I felt great affinity with the subject of the story			.808	
I was already a fan of the subject of the story before I heard it			.798	
I love thinking about the subject of the story			.817	
I could imagine the layout of the spaces presented in the story				.671
I had a precise idea of the spatial environment presented in the story				.710
It was impossible for me to calculate the size of the space presented in the story				.806
Even now I have a specific mental image of the space presented in the story				.794

TABLE 2. FACTORIAL ANALYSIS. ROTATED SATURATION MATRIX OF THE JOINT SAMPLE. (N= 327)
SCALE OF SPATIAL PRESENCE (4 SECOND FACTORS)

Items	Factors (% variance explained)			
	<i>Imag. of visual space</i> (4.85)	<i>High cog. Involve</i> (4.45)	<i>Persistence of disbelief</i> (3.74)	<i>Suspension of disbelief</i> (3.15)
When someone shows me a map I can easily imagine the space	.767			
I find it easy to manage a space in my mind without really being there	.800			
When I hear a story I can normally imagine the distribution of the objects described	.746			
When someone describes a space to me, I can normally imagine it easily and clearly	.807			
Most things I was thinking were related with the story		.600		
I only thought a tiny bit about the things in the story being related with others		.699		
The story made me think		.658		
I wondered whether the story would be useful for me		.519		
I concentrated on working out whether there were any inconsistencies in the story			.782	
I took a critical stance with respect to the representation of the story			.782	
I paid no attention to the existence of errors or inconsistencies in the story				.751
It didn't matter to me if the story contained errors or contradictions				.809

Considering all of the above, it means that the capacity of imagining the layout of the spaces presented in the story, the precision of the idea about the configuration of the spatial environment recreated by the narrative, the calculation of the size of the space in which the story develops, and the specific mental image of the space recreated are greater when the listener is stopped than when is moving. Besides, results show that the intellectual link with the narrative decreases on the move. In comparison when they are stationary, listeners who move think less about things related to the story, about the relation of the story with other people, about the personal usefulness of the narrative, and about the thoughts provoked by the story. All of this confirms that the intellectual involvement with the audio narrative, probably because of the effect of the lowering of attention, is affected by the mode of consumption.

Regarding the effect of the story on the factors that define spatial presence, we found statistical differences for cognitive involvement ($F = 2.159, t = -2.13, p = .034$), which was higher for s2 ($M = 4.44, SD = 1.22, N = 162$) than s1 ($M = 4.16, DS = 1.11, N = 165$). We also found differences for persistence of disbelief ($F = .305, t = -2.03, p > .043$), which was higher for s2 ($M = 4.44, DS = 1.50, N = 162$) than for s1 ($M = 4.10, SD = 1.50, N = 165$). Finally, we found a tendency towards difference for special interest ($F = 1.67, t = -2.07, p > .039$), which tended to be greater for s2 ($M = 3.92, SD = 1.52, N = 162$) than for s1 ($M = 3.56, SD = 1.64, N = 165$).

IV. CONCLUSIONS

The reported results led us to conclude that mobility during audio narrative reception affects attention, spatial situation, and high cognitive involvement. Particularly, mobility causes attention to the audio product to be lower: listeners pay less attention to the story, concentrate on it less and the narrative captures fewer of receivers' feelings.

Also, when the user moves in an open space while listening, spatial situation (the capacity to imagine the layout, the precise the spatial environment, the calculation of time and the specific mental image of the spaces presented in the story) is lower.

Likewise, due to movement, compared to stationary listening, there is less imagination of things related with the story, relation between things in the story itself, activation of thought and perception of the usefulness of the story.

This result makes sense given the experimental conditions of our study: the participants listened in the open air with no restrictions on movement in space (although those in the stationary condition were asked to remain seated). But it suggests something else, in light of the contributions regarding acoustic aesthetics [19]: during non captive audio consumption, and in which movement is possible, in the definition of the psychological state of spatial presence there could be interaction between the localization and perception of actions possible in the real

world, and those of the story's imaginary world. The sensation of being situated in the mediated space [20], and in the real physical space in which the mediation occurs, may interact. So, although presence is a psychological state in which the qualities of the media are more influent than the inherent properties of the experience [21], this would also have an effect.

All this data, of which we know of no previous equivalents, contribute to the study of the formation of mental images, especially those produced by audio or radiophonic products [18] and their relation with behaviour. In this sense, further studies could observe the effect of audio narrative engagement in movement itself and in the relation of listener to specific behaviours. In fact, it is somehow surprising that, in spite of the long history of radio contents, their consumption while moving through different means, and the proliferation of portable audio devices, this topic had not been investigated previously. In the light of the creative possibilities that new digital technologies offer to the production of all kind of contents, the results of this study could be useful for conceiving more effective contents, messages, products, and modes of consumption. Apart from being of the interest of digital contents producers and technological developers, the results of this study could be useful for audiovisual regulatory authorities. These studies can also be of interest to different scientific disciplines (e.g., psychology, neuropsychology, acoustics, aesthetics, audiovisual communication, engineering, or narrative studies). Given that this investigation only examined the effect of behaviour on psychological responses to narratives, a first reverse study could be made of the effect of psychological responses on specific aspects of behaviour.

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