Inner City in the Listener's Auditory Bubble

Altering the Listener's Perception of the Inner City through the Intervention of Composed Soundscapes

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Figure 1: The composition for the audio walk included a version with sound elements typical for the inner city.

ABSTRACT

This paper describes the effect on the listeners' experience of head-phone listening to a music composition including inner-city sound while being in an inner-city environment, using a research through design approach. The study focuses on the listeners' described experiences through the lens of Berleant's aesthetic sensibility and Bull's phenomenon of the auditory bubble. We produce a composition which participants listen to in an urban context and discuss the two main themes found, soundtrack and awareness, together with the indications of the possibility to direct listeners' attention and level of immersion by including inner-city ambience and sound in music when listening with headphones in an urban environment.

CCS CONCEPTS

• **Applied computing → Sound and music computing**.

KEYWORDS

research through design, artistic research, audio walk, auditory bubble, soundtrack, awareness.

1 INTRODUCTION

Mobile technology and music streaming services have made music ubiquitous in different contexts and environments. People bring music with them wherever they go, listening via headphones [19]. This listening can reshape the environment one resides in into a private space. Our paper explores immersion and spatial experiential qualities of a music composition audio walk in an inner-city environment through listeners' descriptions of their perceptions of headphone listening whilst in the inner-city. We are using the phenomenon of the auditory bubble [6] as a lens to examine the listeners' descriptions. Listening to music via headphones can put

the listeners into an auditory bubble where they create their own sound world, and where they take control of their impressions, experiences, feelings, and thoughts [6]. An auditory bubble provides seclusion from the outside world where impressions from the surrounding visual environment are dampened, and listeners turn their gaze introspectively inward. In an auditory bubble listeners can create their own space, even among many people in a public space, for example in an inner-city environment or in public transport [11]. The music piece composed for this study has a version with added sounds that are typical of an inner-city environment. We were interested in whether the listeners' described experience was affected or not when the sound in the headphones partially matches the surrounding environment. The field of research for this paper is audiovisual studies through, and in, music production. Therefore, the reader is recommended to listen to the composition [1].

2 BACKGROUND

This study has similarities to the art form of audio walks or sound walks. Soundwalking is an embodied active listening to the surrounding environment [23]. Composed audio walks, listened to via headphones, can be made for a specific place with ambience and sound connected to the place, together with a voiced narrative, urging the listener to discover and observe their environment. This is related to Berleant's [3] aesthetic sensibility where he emphasises the engagement with the environment in shaping our aesthetic experience, where sensory perception is an active process that involves both the perceiver and the environment. Aesthetic sensibility can be described as a "perceptual awareness that is developed, guided, and focused" [3] that becomes an embodied intuition.

Music is a powerful medium for creating and shaping spatial experiential qualities, it can evoke and transform our sensory and emotional responses [6]. Spatial experiential qualities with music as a medium can be examined through Schafer's [18] concept of soundscape, which refers to the totality of sounds that make up a given environment, including both natural and human-made sounds. He argues that the soundscape is an important aspect of our spatial experience as it shapes our perception and understanding of the world around us. This is seen in Cardiff´s audio walks designed to be practiced in specific places [21]. Her material comprises sound recorded from the intended listening places, and a voiced narrative guides the listener's movement and attention and asks rhetorical questions. Audio walks can integrate site-specific sounds in the recorded audio material, reflecting a soundscape truer to reality. Dynamics in the site-specific recording can also be manipulated by, for example, amplifying certain elements in the soundscape, thus creating a dissonance between the listener's visual and aural environment. This ambivalence is an essential part of work within the genre, as it evokes emotion and thought while directing the listener's attention.

In arts-based research, audio walks aim to alter the listeners experience and evoke reflexivity. Behrendt [2] suggests that audio walks can be used as a tool to understand the listener's experience

of a context-dependent artistic practice. Biserna [4] says that audio walks burst the auditory bubble, by containing a sound world separate from the listener's reality while simultaneously incorporating sound elements strongly associated to the listener's physical environment, where the boundaries between the listener's inner and outer world become blurred, counteracting the isolation and control typical for the auditory bubble.

Adhitya and Scott [1] claim that urban city designers favour visual and spatial aspects in front of auditory aspects. They recognise the emotional and physical impact of the urban city's sound atmosphere and suggest that an incorporation of sound planning in urban design may improve well-being and a more pleasurable urban experience. They designed and studied an interactive installation, which contained different sounds associated with London's soundscape. These sounds were selected to align with Schafer's [18] perspective of the sonic soundscape, modified to conform into a more normative musical Compositional format, for example by using sounds in tune with each other and structuring them into bars. The installation piece was a map portraying London's tube system with symbols representing corresponding used sounds. By triggering pressure pads on the map, sound was played through speakers. Adhitya and Scott found that their installation promoted social interaction and increased attentiveness to the sound environment [1].

Cliffe et.al. [8] describe two projects exploring the process and outcomes of applying audio augmented reality in a museum context. Both projects stem from a practice-based research through design approach where they made a system aiming to provide the visitor with a personalised audio experience via headphones using smartphone camera tracking. A key concept was to use tracking information to adapt audio material according to the visitor's angle and distance to each object or artefact.

Music listening using mobile devices and music streaming services has become increasingly favourable according to Sinclair et.al. [19]. Their study examined participants' experience of music in various spaces, they found that participants used music as a tool to isolate themselves from their environment, control emotions, and to separate different spaces or activities from each other. Moreover, Sinclair et.al. [19] write that mobile music listening makes the separation between spaces more indistinct, that the music can alter the experience of the space. Kuch and Wöllner [11] explored the function of music and found that self-isolation, immersion in music, and altering one's emotional state were key aspects and reasons to engage in mobile listening. This is related to how Sloboda [20] describe people's individual use of music for the function of mood change and mood enhancement.

The studies we presented above imply a need for further research in mobile music listening, which calls for a need for development and understanding for composing and producing music. Intervention and exploration in how the inclusion of sound and noise from the listener's environment affects the listener can possibly depict how one as a composer can use this as a tool to alter the listener's experience and contribute with an additional dimension, catering to the listener's experience by adding an element of surprise, depth, or level of awareness. This led us to explore the research question: How do listeners describe their inner-city environment experience of walking in an urban context while listening to two versions of a

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[1]Link to production without environment sounds: https://on.soundcloud.com/BLLnQ
Link to production with environment sounds: https://on.soundcloud.com/VjBdc

composition through earphones, the first version without, and the other with, typical city environmental sounds?

3 METHOD

The method contained composing, sound design and production of a composition, an audio walk listening test and gathering data, and eventually analysing the empirical data. The overarching framework for this study was inspired by the well-established research through design method [24]. Löwgren [12] explains that this method can be used to achieve scientific knowledge if its result is relevant, has novelty, and is grounded through empirical studies or analytical reasoning. Moreover, Löwgren [13] states a possible area of use: "Designing prototypes for empirical evaluation with the intention to study the qualities of the new design idea in use." Here, design in the context of our study is the production of a composition evaluated through the participants' described experiences of an audio walk in an urban environment.

Steindorf [22] argues that an audio walk may be used as a research tool to explore the listener's experience, which motivate our use of music compositions as a research tool when the composition is listened to in a specific physical environment. Setting the study in a real-life context well known to the participants decreased the risk of diluting the findings due to placing participants in an unfamiliar and artificial environment.

After the audio walk, the participants described their experience either via an online survey or in an interview. The combination of the survey and interviews allowed us to obtain survey data that was not influenced by the presence of an interviewer, while the interviews gave opportunities for follow up and clarification. Both these instances included three open questions: (1) What is the meaning or purpose for you of listening to music? (2) How did you experience the compositions? (3) Did you notice anything specific in your surroundings?

The collected data was analysed with Braun and Clarks' thematic analysis [5], which is a pragmatic method for guiding and organizing the interpretation of qualitative data. The analysis work is carried out in six steps as follows (1) become familiar with the data, (2) generate codes, (3) search for themes, (4) review themes, (5) define themes and (6) write up. The analysis is mainly carried out inductively, but unlike, for example, grounded theory, the method does not claim to generate theoretical contributions and allows us to have a relatively good pre-understanding of what we are studying. Thematic analysis provides guidance in the analysis work and interpretation of the data.

3.1 Research Ethical Statement

All participants were informed of their voluntary participation, they gave their approval and informed consent to the interview audio recordings, and they could at any time cancel their participation. We have considered the GDPR, and all the data was pseudonymised using generic labels. We did not collect any personal and sensitive data. As the study adhered to these restrictions, no ethics approval was needed according to Swedish regulation.

The first author had the idea and did the design of the study, assisted, and guided by the second author. The first author is the composer and producer of the music for the study and has carried out the data collection. The first author and third author have also done the analysis of the data. The first author also wrote most of the first draft of the article. All three authors have revised and are accountable for the entire article.

3.2 Composition

We composed and produced a music piece in two versions: A[2] without inner-city sound, and B[3] with inner-city sound. The composition is within the film-music genre, but it can also be interpreted to belong to the audio walk genre due to the inclusion and manipulation of the inner-city sound elements that were site-specific or typical for the intended listening site — the inner city. For example, ambience and sound such as murmur from crowds and people in inner city environments were raised in level in relation to other elements, thus altering the balance between the heard and seen environment, intervening with what was perceived to be there, and not; attributes key in audio walk works [4, 21]. What differentiates the composition the most from common audio walk compositions in this study is the absence of a voiced narrative or guide, and a determined movement path for the participant.

The inner-city sounds for the composition version B were recorded in urban locations in Stockholm and Uppsala with a Zoom H5 equipped with a condenser XY-stereo microphone capsule. The intention with recording our own material was to place ourselves in the study's context and the listener's perspective. We used field recordings from big cities with the intention to create a livelier sound environment and include more typical inner-city sound elements. The recorded material used in the composition included sounds from escalators, on subway stations, murmur, street-traffic, and crosswalks. Benefits of using a hand-held recorder were the ability to capture typical Swedish urban city sound both in terms of efficiency and convenience, and a sound environment that participants were likely to be familiar with, though it may have resulted in the disadvantage of decreased sound quality due to the used equipment's limits of produced sound quality. The music was composed and produced using three reference productions, *Let Out* [14], *Blue Spring* [15], and *He Still Has the Key* [16]. Instruments and sounds in the music were electric guitar, and sound samples of a gate, which was used to emulate a similar timbre as the wind and string sections and synth melody in the reference productions. Recording an electric guitar, MIDI editing, and arranging the piece was done in Pro Tools, as well as mixing and mastering. The production of the compositions, including mixing and mastering, was done through headphones to prepare the soundscape for headphone listening.

3.3 Gathering Data

Data was gathered using an online survey and interviews with the participants. Here, both snowball- and convenience-sampling were used to reach participants [9]. The online survey included open questions to give room for reflection. The interviews were semi-structured, containing thematic and dynamic questions, to promote a comfortable interview setting, and to create a more reciprocal conversation. This enabled participants to some extent steer the conversation, which could be beneficial in conveying unforeseen

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[2]Link to version A **without** environment sounds: https://on.soundcloud.com/BLLnQ
[3]Link to version B **with** environment sounds: https://on.soundcloud.com/VjBdc

subjects in their described experiences. Audio from each interview was recorded with a smartphone or computer. Prior to the interview each participant was informed of the overall interview procedure, which kind of questions may be asked, and the opportunity to ask questions. After the interview, participants were given more information about the study and given the opportunity to inquire more if desired.

3.4 Guiding the Analysis

Each interview was transcribed to a separate document and later merged with all interview transcriptions into one document, using questions to structure the interviewees' responses and colour codes for each participant. Braun and Clarkes' [5] thematic analysis guided the examination of the data. Initially we reduced the data and excluded irrelevant information to concentrate data to ease the analysis. Our interpretation of the transcribed material was done by applying codes for reoccurring words or phrases and by identifying patterns. The interpretation was done iteratively, re-evaluating and adjusting codes throughout the analysis process, reading transcriptions several times and reorganising responses [17]. The codes were used to potentially convey links between different codes and to discover similarity or lack thereof in the participants' responses. Furthermore, interpretation was also applied by reviewing responses in the context of the study's theoretical framework.

4 FINDINGS

A total of thirteen people participated in the study. Eight persons performed the audio walk and then answered the survey, whereas five persons participated in an interview after their audio walk. Utterances from survey participants are labelled S1-S8, likewise interviewees' utterances are labelled I1-I5. Each interview lasted between fifteen and twenty minutes. We analysed the results from interviews and surveys jointly to acquire an overall view. In the analysis we first highlighted codes where themes then emerged from the participants' responses. In our quest to understand the auditory bubble phenomenon, we have found two overarching themes: soundtrack and awareness. We present the excerpts from the interviews below in verbatim translated from Swedish.

4.1 Soundtrack

This theme relates to the participants' experience of the compositions as such, and to how the participants describe the meaning of music, where the music constitutes a kind of emotional soundtrack. The participants expressed that the meaning of listening to music for them was linked to emotions. For instance, S1 writes: "When you listen to songs that confirm you get an outlet for your feelings without talking. For example, if they sing about it. [To] listen to what you feel, also if you want to change your mood, if I'm sad I can sometimes listen to happy music or more upbeat music to get in a better mood. [...] So, music for me has both an enhancing and an emotionally affirming function."

The participants' categorization of genres and artists they listen to in relation to activities and environments can, according to Bull [6, 7], indicate that the participants used their auditory bubbles to control and adapt feelings and thoughts in relation to different

contexts. I5 says: "When I'm sitting, I have specific songs that I can point out 'ah these fits right now, this calm song fits when I'm sitting and doing emails, this song is a little faster, I can have it at the gym.' You connect songs to where you are right then and there." This indicates that people are curating a soundtrack to their activities and environment.

In the audio walk the composition became a soundtrack to the walking in the environment that was different depending on whether the listener heard the version without city sounds, version A, or if the environmental sounds were included, version B. For instance, I1 says: "The first version [version A], I was thinking about the music as I was walking, it felt like this is like a scene from a movie. But that is in slow motion. You don't hear the sounds from the film, only the music." This quote connects to soundtrack both as an experience and as a function, where the function is connected to our intention that the composition has a cinematic quality. Similarly, I4 describes their experience of the composition: "Yes, it felt like I was in a movie, it felt like the soundtrack of the world, so then I felt very far away from everyone else who was in the same area. It was very exciting; I feel like I went into that experience quite a bit." This quote indicates the detachment from the surroundings that is typical of an auditory bubble but also that the composition provides a soundtrack to being in the bubble.

Soundtrack connects to aesthetic sensibility by the listener curating their flow of music in their auditory bubble depending on the situation, what emotional function the music should have in the situation, and what activities they perform in the situation. This also corresponds to Sloboda's [20] description of people's music listening use, in particular the use music to change or enhance emotions. The listeners' descriptions of their experiences of our composition point to a connection to aesthetic sensibility where negotiation between the listener, and the composer and producer, is based on a common cultural understanding of the music's properties and function. The music was composed to give a cinematic feeling, so in a way the theme is a reference to the intended function of the composition. However, at the same time, the composition contributed to the feeling of, on one hand, immersion and, on the other hand, attention to the surroundings, which connects to the theme of awareness.

4.2 Awareness

The awareness theme describes how listeners are aware of their surroundings while in an auditory bubble. Awareness here is about a negotiation between being in the music and being in the surroundings. When the inner-city sound and ambience in the composition almost match the visual impressions from the surrounding environment, the closeness or dissonance between the impressions from the two senses appears to create an awareness extending beyond the boundary of the auditory bubble, an awareness existing both in the auditory bubble, and in the surrounding environment. Interviewee I3 explained how the compositions "transported" them to another place, emotionally and mentally. Notable in person I3's description was that version A and B were not distinguished to the extent that the other participants in both the survey and interviews had stated. I3 said that the second composition felt like a continuation of the first. What I3 did say differed between A and B was

the sense that version A was carrying the emotions, and version B placed the emotions in a certain place: "It's like you're on autopilot a little, but you're still there... a car came towards me, and I knew I had to move, but until that point, I wasn't really there. It was like a button switched on and off. So, you were still aware, but I was somewhere else emotionally. I felt that I wasn't really where I was, but I also wasn't in the urban environment for example like the music explained, it was more like sometimes when you walk you can feel distanced from your own reality. As if you are an observer in yourself and you see everything almost a bit cinematically. I was there in that feeling, but in a different environment, with the music, because of the music in the background. It feels like [that] part of me was transported to this other environment, so I wasn't there physically in myself...It's hard to explain but it's kind of like you're there, but you're also in this second place at the same time somehow, it felt like it got bigger kind of." This points at the extended awareness between the auditory bubble and the surrounding environment, as if the experiential qualities of the composition helped to merge these two realities. The quote above can also be interpreted as the music creating emotional continuity between version A and B, which may have led to the effect of I3's auditory bubble appearing to persist when listening to both versions.

Participant S3 wrote "the surroundings flowed into the music with city sounds", similarly described by interviewee I5, who believed that version A gave a stronger experience of the world being screened off to focus on the music itself. Whereas the similarity between the surrounding environment and the composed urban sound environment found in version B created a feeling of what was happening in the physical surroundings was heard in the headphones. The shift of awareness of the surroundings is also described as distinct through the occurrence of signals — "acoustic warning devices: bells, whistles, horns and sirens" [18] — for instance the crosswalk clicks in the following quote from I4: "Maybe a little more that I got out of it on the first [version B] because there I felt I was getting a little stressed by the crosswalk clicks. Like, and you just, what the hell is going on? Then it felt like maybe you became a little more aware of what was around you."

5 DISCUSSION

Within the awareness theme, each version of the composition contributed to different experiences for the participants. This result indicates that music production can have a function, for example to increase awareness of the surroundings or, conversely, to exclude the surroundings. For the latter, Bull [6] argues that the listener's auditory bubble provides a form of isolation from the outside world, making external impressions from the visual environment less intrusive. However, our findings regarding the theme of awareness show that listeners can be simultaneously immersed in the music and aware of the surrounding environment depending on the composition, sound design, and production. Our findings indicate that the extended awareness is like a merged reality between the auditory bubble and the surrounding environment, like Cliffe et al.'s [8] concept of ambient inclusion. Hazzard et al. [10] also blur the boundary between the audio walk and the real world ambient through geo-positioning, spatialized audio, and elaborate mobile technology, where the listeners were both immersed in the

experience and aware of their surroundings. However, as our findings suggest, this awareness can be achieved through composition and sound design which we believe are related to the composer's and listeners' aesthetic sensibility [3]. Thus, the composer and the sound designer are the makers of this world through their artistic decisions, and the soundtrack theme indicates that they can give a focused utility to their work. However, the soundtrack theme appears to be unaffected by the introduction of typical city environmental sounds in the music composition. Whereas the awareness theme, explains how the listeners change their awareness of, and attention to, the urban environment from within, and beyond the auditory bubble, partially due to the similarities and misalignment between the sounds in the earphones and the sounds from the urban context.

Our study confirms how audio walk as a method, alike Behrendt's [2] shows how the audio walk can be used in art-based research to induce reflexivity, in combination with systematic qualitative studies can contribute to what sound means for the experience of a public urban environment. Based on the awareness theme, we believe that the audio walk as a method in combination with carefully composed audio walks that creates an aural merged reality in a continuum of the auditory bubble would enable urban designers to improve well-being and provide a sustainable and enjoyable urban experience.

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