The relationship between art and sound: An experiment on the engagement of the cultural tourist

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ABSTRACT (ENGLISH)

In recent years many cultural institutions have been moving towards the design of visit experiences that engage visitors through multisensory immersive experiences. These tours are constructed using cross-modal stimuli, as well as augmented and virtual reality, which allow the combination and overlaying of real and digital elements. Along the line of multisensoriality, the research presented in this paper addresses the relationship between sight and hearing during the enjoyment of a cultural site. The focus is on how their combination can influence visitors' emotions and perceptions. To this end, we designed a multisensory experience where participants listened to a narrative based solely on sounds and music (no speech) while visiting a real cultural site. We evaluated the effectiveness of the approach by measuring visitors' responses to three different stimuli. Results show that sound can be exploited as an aid to improve the visit of a cultural site.
Keywords: multisensory experience; emotional responses; acoustic stimuli; culture enjoyment

ABSTRACT (ITALIANO)

Analisi del rapporto tra arte e suono: un esperimento sul coinvolgimento del turista culturale

Negli ultimi anni le istituzioni culturali si stanno orientando verso la creazione di esperienze di visita in grado di coinvolgere il pubblico attraverso esperienze immersive multisensoriali. Percorsi di questo genere sono costruiti mediante l'uso di stimoli cross-modali, ma anche di realtà aumentata e virtuale che permettono di combinare e sovrapporre elementi reali e digitali. La ricerca descritta in questo lavoro segue la direzione della multisensorialità, focalizzandosi come la combinazione tra vista e udito possa migliorare la fruizione di un sito culturale, in particolare su come possa influenzare la percezione dei visitatori. A questo scopo, è stata progettata un'esperienza multisensoriale all'interno della quale i partecipanti ascoltavano una narrazione sonora basata esclusivamente su musica e rumori (senza l'utilizzo del parlato) durante la visita di un sito culturale. Le risposte dei visitatori a tre diversi stimoli sonori sono state valutate attraverso la somministrazione di un questionario. I risultati indicano che le tracce sonore possono essere utilizzate per aumentare il coinvolgimento dei visitatori.
Parole chiave: esperienza multisensoriale; risposte emotive; stimoli acustici; fruizione culturale

1. INTRODUCTION

In current museum environments, visitor's engagement is becoming increasingly relevant, and experiences are designed to be immersive on both emotional and sensorial aspects. Moreover, there is a growing interest towards inclusivity and accessibility for visitors with sensorial impairments. The common approach oriented towards 'seeing' is shifting to an approach oriented towards 'interacting' (Chivaran et al., 2022). The visitor's role is changing from being a passive consumer, to taking on an active role in the learning processes (Coppola & Zanazzi, 2020).

A widely used approach to multisensoriality involves blending of visual and auditory elements. Various studies showed that the combined presentation of these stimuli can intensify participants' emotional engagement. To this end, we designed an experiment to measure the effectiveness of three different acoustic experiences for visitors of a cultural site. The goal was to analyze to what extent the acoustic accompaniment interferes with the enjoyment of artworks.

2. RELATED WORK

A common tool in museums is the audio-guide: it allows visitors to improve their knowledge about a particular artwork or object through a voice that describes its appearance, history, and the context in which it was created (Mandarano, 2021). Sometimes the audio track includes music, which contribute to the construction of the narrative (Mildorf, 2024). Music and sounds in audio guides help setting the right mood and evoke sensations that increase the enjoyment of what is been said in the recording.

An experiment carried out by Miu et al. (2016) compared the emotions raised by watching a painting or listening to music by measuring the frequency of emotions and their relationship with other factors

(background, mood, kind of stimulus). Results showed that art and music tend to evoke different emotions when the Geneva Emotional Music Scale (GEMS) has been used. GEMS has been described as "the first model and instrument specifically designed to capture the richness of musically evoked emotions"[1]. The same scale was also chosen for the experiment in the present project.
Other studies investigated the relation between images/artworks and sounds/music and how it can condition the individual perception. For instance, the aim of the study conducted by De Benedetto et al. (2024) was to examine whether look at a painting while listening to a classical music piece with an emotionally incongruent content could alter the perception of the visual stimulus. The experiment was conducted in an anechoic chamber recording the brain activity of 25 participants. The results show that the emotional incongruence between music and painting alters the painting's emotional experience.
Baumgartner et al. (2006) aimed at understanding which brain regions were activated by the presentation of audiovisual stimuli first separately and then in combination. Also in this case, the experiment took place in a laboratory setting using various measurement parameters (e.g., EEG, EOG, HR, SCR) with 24 participants. The stimuli were chosen in association with three basic emotions (happiness, sadness, fear) from classical music pieces and images from the International Affective Picture System (IAPS). They observed a more intense emotional perception when images and music were presented together. It can be concluded that music can significantly amplify the emotional experience evoked by images. Another study on basic emotions raised by art and music (Braun Janzen et al., 2023) involved 142 participants who could admire a Kandinskij's painting in person at the Museo de Arte Contemporânea da Universidade de São Paulo while listening to musical excerpts by Schönberg through headphones. The surveys filled out by the participants reveal a tendency to rate the artwork generally more positively if the background music was appreciated. The comparison of these outcomes with the control group showed that the simultaneous presentation of emotionally congruent audiovisual stimuli intensified the emotional experience.
There studies can be extended also to the visit of museums and cultural sites. As theorized by Webb (1995), background music during a visit can influence mood, pleasantness and time perception. These observations are in line with the findings of a study carried out by Chen & Tsai (2015) at the Laiho Memorial Museum in Taiwan with 20 participants and two different music pieces. Brenner (2016) has done a similar experiment with 50 participants at the Renton History Museum. She compared the feedback of the experience with and without background music observing an influence of the music on length, comfort and engagement of the visit. In both cases only musical pieces were used and they served as background during the visit.

3. EXPERIMENT AND METHODS

Most researchers focused on the relationship of visual art and music, while environmental sounds and noises made by objects and persons have been left aside. In our study we aim to investigate how the *soundscape* can interfere with enjoyment of a cultural place.
Thus, the goal of our experiment was to analyze if and how an auditory accompaniment to the visit of a cultural site impacts the elicited emotions and the way the experience is described. Based on the literature review, the expected result is that the combination of visual stimuli (seeing the interiors of a chapel) and auditory stimuli (hearing audio recordings of soundscapes) will allow participants to live an immersive visit and intensify their perceptions.
We aimed at developing an experiment in a real scenario, because a laboratory setting would not be suitable for providing the immersive experience that should be elicited by soundscapes. The chosen place is the Scoletta del Carmine in Padua (Figure 1), a chapel adjacent to the Parish of Santa Maria del Carmine. It was built in the 1300s and in the interiors are present frescoes from the 16th century realized by Giulio and Domenico Campagnola, Girolamo Tessari 'dal Santo' and Stefano dall'Arzere.[2] Despite its richness, it is not very well known by citizens and tourists.
We realized three audio tracks[3] that were related to the function of the chapel by providing an acoustic narrative of the place but were not specifically linked to the frescos. They aim to evoke moments when the place is *alive*, like during concerts or religious celebrations. All recordings are all less than three-minute long to avoid a loss of attention and concentration of the participants. Two registrations are constructed

[1] Geneva Emotional Music Scale (GEMS), https://musemap.org/resources/gems

[2] La Scoletta del Carmine in Padova, by Litardi, A., Parrocchia di Santa Maria del Carmine, https://carminepd.it/storia-e-arte/56-la-scoletta-del-carmine-in-padova

[3] The audio files are available at this link; https://www.game4culture.com/carmine/

through a sequence of ambient sound and music to create a narrative and allow listeners to imagine events happening around them. The third one in purely made of music.

Figure 1. Interiors of the Scoletta del Carmine

This should enable them to connect more deeply with their surroundings, experiencing an immersive environment. The sounds aim at bringing the chapel to life, extending beyond its function as a tourist destination.
A description of the audio recordings is provided in Table 1.

Stimulus	Description
Prayer	A moment of prayer begins in the empty chapel: a door closes, steps sound of a small group of people walking through the nave, noise of a book pages being flipped, a choir starts singing a Latin version of the 'Ave Maria' prayer that fades away at the end of the audio
Mass	Beginning of a mass in the chapel full of people: bells ringing, the noise of a crowd, a bell rings to start the celebration, steps sounds, the organ plays a lively piece that fades away at the end of the audio
Organ	A piece of music with a cheerful tone, as if played by an organist practicing

Table 1. Narratives associated to the three stimuli

The experiment took place in a single day with 143 participants, divided in small groups of no more than 20 persons. They were all students at the School of Human and Social Sciences and Cultural Heritage at the University of Padua. Instructions were to visit the Scoletta while listening to one of the three audio tracks, available through a QR-code, using the headphones of their personal device. A control group of participants did the visit without the audio. After the visit, participants were asked to fill a survey and then, if they liked, to listen to the other audio tracks and provide verbal feedback on which they considered the best accompaniment for the visit.
The survey was in Italian and included four sections. Firstly, participants indicated which audio they listened to during the visit (or no audio). The second section collected feedback about the pleasantness of the visit, its most significant aspects, and the quality of the audio. In the third section, participants were asked to indicate the intensity of various emotions experienced during the visit. The last section was dedicated to final comments and suggestions about the experiment. The control group did not answer the second section about the audio assessment.
According to the GEMS scale, the nine addressed emotions were: wonder, transcendence, nostalgia/longing, tenderness, tranquility, joy, power, tension, sadness[4].

4. RESULTS

The first output is that the majority of the participants considered the visit with audio accompaniment to be pleasant and would recommend it to a friend (Figure 2), according to a Likert scale from 1 ('not at all') to 7 ('a lot'). The figure shows that the acoustic narratives with environmental sounds were more appreciated than the music-only audio. The audio 'organ' was appreciated but the tendency to recommend it is lower than the others. In general, the audio 'organ' was generally less engaging than the other two.

[4] "9 great composers explained in 9 emotions | Marcel Zentner | TEDxInnsbruck", TEDx Talks, https://www.youtube.com/watch?v=_WPOsrRQfkk

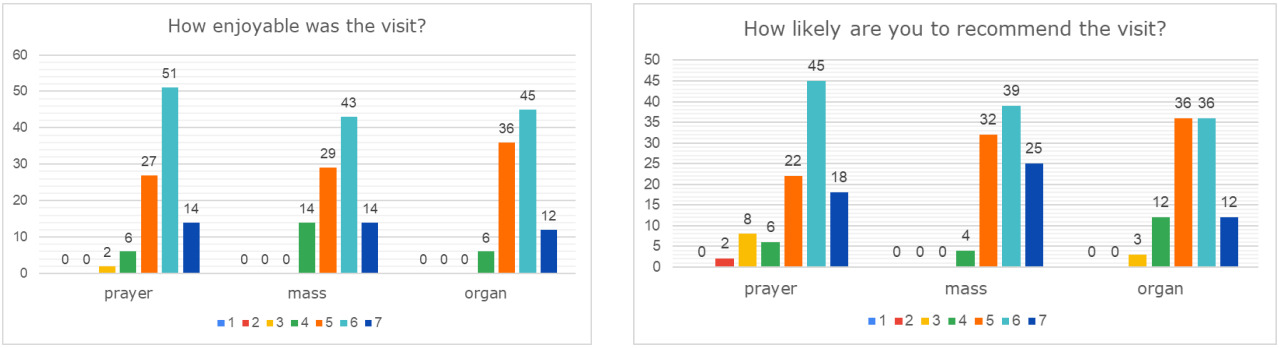

Figure 2. Distribution of responses to the questions about the appreciation of the visit

Using the same scale, participants were asked to evaluate the pleasantness of the audio tracks. The audio 'prayer' was appreciated by the 39% of the participants (considering responses with 6 and 7 points), the audio 'mass' by the 43%, and the 'organ' one by the 45%.
The survey also addressed the evocative power of the sound accompaniment. 44.6% of the participants answered affirmatively and some of them provided more details in an open-end question. As showed in the word cloud (Figure 3), frequent words are 'family' (famiglia), 'Sunday' (domenica), 'childhood' (infanzia) but also 'art' (arte), 'frescos' (affreschi).

Figure 3. Word cloud generated based on the question
'Did the visit bring to mind any particular memories, situations, or past experiences?'

As regards the emotional intensity experienced during the visit, it is possible to compare the responses between participants who did the experience with and without the audio. We used the same Likert scale from 1 ('not at all') to 7 ('a lot'). The emotions 'tension' and 'sadness' were in general rarely experienced and the modal value is 1 in both cases.
In the graph related to 'transcendence' (Figure 4), it can be observed a concentration of responses in the values 2 and 3 of rating scale for the audio 'prayer' and for the visit in silence (corresponding to the visit without the audio tracks). For the audio 'mass' the modal value is 6, whereas for the 'organ' one the responses are more distributed along the entire scale.

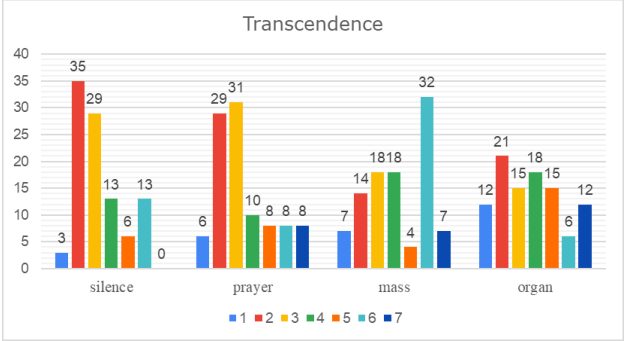

Figure 4. Distribution of responses on emotional intensity in relation to transcendence

Regarding ‘peace’, it is interesting to notice that the percentage of participants who experienced a strong emotional intensity (summing up the responses with values 6 and 7) is higher in relation to the audio 'mass' (36%), which is the loudest among the three. In the other cases, this emotion was experienced very intensely by 29% of the control group, 26% of the audio 'prayer', and 33% for the audio 'organ'.
The ‘nostalgia’ graph (Figure 5, left) shows that the range of responses for visit without audio goes from 1 to 5, whereas in presence of audio are present responses of high emotional intensity. From the ‘joy’ graph (Figure 5, right) it is possible to notice a similar distribution of responses for silence and ‘organ’. Similar results have been obtained also to ‘wonder’ and ‘tenderness’. This may highlight a possible difference and emotional engagement between the narration with than the visit with silence or music-only.

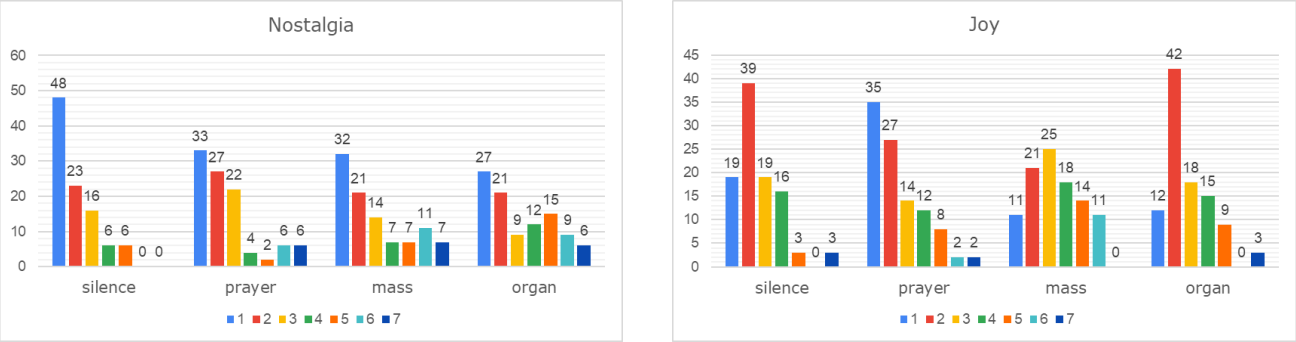

Figure 5. Distribution of responses on emotional intensity in relation to 'nostalgia' and 'joy'

Finally, ‘power’ was not experienced by participants and the responses are concentrated in the low values of the scale except for the ‘mass’ audio, where the responses are more distributed (showing more interference).
Participants could leave comments and suggestions about the experience both in the last part of the survey and verbally. In general, the experiment received positive feedback and considered able to bring people closer to places with historical and artistic importance. Several participants asked for longer audio tracks and the inclusion of information about the historic and artistic elements present in the environment. In additions, some suggested more connection between the music and sounds and the fresco scenes decorating the walls, that could be described through the audio.
At the end, participants were invited to verbally share their personal judgement on which of the three audio they considered the best and most suitable accompaniment for the visit of the Scoletta del Carmine. The responses were quite varied, but it is interesting to notice that around 47% of participants (who visit the place with the audio tracks) indicated as favorite the first one that they listened. This can be due to a priming effect, where exposure to a given stimulus influence the perception and the processing of subsequent information, even in the absence of explicit awareness of the influence.

5. CONCLUSIONS AND FUTURE WORK

The work presented in this paper explores how an acoustic narrative, based solely on environmental sounds and music, can improve the experience of visiting a cultural site. Results of the experiment we carried out show that participants appreciated the ability of acoustic narratives to elicit memories and increase the engagement during the visit. The effect on the emotions evoked by the audio tracks depended on both the stimulus and the kind of emotion, with some noticeable differences compared to the results obtained from a control group.
Our experiment was preliminary in nature. We are aware that the sample, consisting solely of students, is not representative of the entire population of potential visitors to the cultural site yet it can provide initial hints on how nonverbal audio can be exploited. The research is at its early stages, as results need to be confirmed by a larger number of acoustic narratives tested in different cultural sites. In particular, the fact that participating to a mass is a shared experience of many participants may explain the specific effect of one of the stimuli. Additional experiments should be carried out in different environments to verify this.
Another direction of research is the analysis of the contribution of music towards a pure soundscape, assuming that the former could be more likely to elicit emotions while the latter might be more effective to evoke memories. In conclusion, further research could also compare visit experiences similar to the one here experimented with more traditional ones, such as guided tours and audioguides.

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