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Listening Space: An Exploratory Case Study on a Persuasive Game Designed to Enrich the Experience of Classical Music Concerts

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Classical music venues in the Netherlands and throughout the world are struggling to attract new audiences. Especially younger visitors are underrepresented. Previous research emphasizes the importance of providing new, potentially interested audiences with more means to consume the music. This paper presents an exploratory case study with the persuasive game *Listening Space* which we developed to help attract new audiences and thus preserve Western classical music heritage. In particular, we studied to what extent this game could promote more varied ways of listening to classical music and thus enrich the experience of visiting a classical music concert. We designed and executed a controlled randomized trial with surveys before and after the experiment as well as a series of in-depth interviews with participants after the experiment. Our treatment group consisted of 139 participants (both new and existing visitors). They played our digital game at their own convenience, followed by a visit to a concert in a renowned classical music concert hall. A control group of 165 participants only visited the concerts. We measured the effects of the game – changes in the ways participants listen to classical music – through self-report in questionnaires before and after the experiment. Results show that *Listening Space* seems most effective for new audiences: the game promoted more varied ways of listening in the treatment group and thus enriched their experience of visiting a classical music concert. The control group of new visitors did not show an effect and also no differences were found between the treatment and control groups of regular visitors of classical music concerts We employed regression analysis to identify predictors of the game's effect on listening styles: participants' age and their level of appreciation of the classical music genre were negatively related to the effectiveness of the game. The way in which participants experienced the game also significantly influenced the effectiveness. This case study shows the potential of using games to promote classical music concerts: games seem to be valuable in attracting new, young audiences and, therefore, represent powerful instruments to help preserve Western classical music cultural heritage.

CCS Concepts: • **Applied computing** → *Arts and humanities*; **Performing arts**;

Additional Key Words and Phrases: Cultural heritage, classical music, persuasive gaming, digital game, case study

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1 INTRODUCTION

As part of the interdisciplinary research **project *GAmeful Music Performances for Smart, Inclusive, and Sustainable Societies* (GAMPSISS)**, this paper describes an exploratory case study with the digital music game *Listening Space.* To broaden the knowledge and awareness of different ways 'how to listen to classical music' among new, potential audiences, an experimental research design was executed to find out to what extent *Listening Space* could change the way its players listen to classical music. Results showed that playing the game reinforced more differentiated ways of listening among these new audiences. This effect was most pronounced for relatively young players. With this case study, we hope to boost the application and further research of gaming in the classical music sector in order to enhance people's experience and reach out to new audiences.

1.1 The Search for New Audiences

Classical or 'art music',[1] is often celebrated as one of the main achievements of Western civilization (see [1] p. 15-18 for a collection of references and [2] for further discussion). Associated with the emergence of civic society today, it is one of the most celebrated forms of cultural heritage. Most major cities in the world are home to large concert halls and orchestras, offering their citizens opportunities to enjoy music that offers potentially powerful affordances such as supporting individuals in self-reflection, identity building and mood management [3].

Attendance rates of classical music concerts have long been a concern: the representation of young cohorts and minorities in particular have been found to be in decline in the USA and the UK in the last decades [4, 5]. However, more recently there are indications of relative stability of audience numbers at classical music concerts in Western Europe [6] (for Flanders), [7] (for the Netherlands) and [8] (for Germany). Young audiences, however, remain underrepresented at these concerts and there is little evidence that young people will start to attend classical music concerts by themselves once they turn older [9, 6, 10]. Despite the relatively stable audience numbers, there has been increasing financial pressure on the classical music sector in the Netherlands and elsewhere as governmental subsidies have decreased in recent years [11]. Classical music in the Western world, considered to be one of the most highbrow of cultural forms, further shows a very limited reach among people with non-Western backgrounds or lower educational levels [12].

A lack of both interest and time have been found to be crucial barriers for cultural participation [13], where lack of interest appears more dominant for people with lower schooling levels while lack of time seems more prominent among higher educated respondents. Another, more specific barrier for classical music attendance is uncertainty about how to listen to classical music [14, 15]. Given the strong highbrow associations, people less familiar with the music are often uncertain about how to best appreciate it, which apprehends enjoyment. Dobson [16] highlights new audiences who might not have extensive knowledge about classical music, which raises the question of how to educate these potential audiences so that "*they can appreciate and understand classical performances, without simultaneously proliferating the idea that classical music is something that one is morally obligated to like*" (p. 122). While embedded information was effective in her small-scale research, Dobson also suggests to provide new audiences with a greater choice over the means by which they want to consume classical music, involving different educative, entertaining and traditional performance formats to encourage new but interested concert goers to attend classical music concerts (p. 123).

[1] As classical music is the most widely used umbrella term for the broad genre addressed in this paper, we will refer to it as classical music.

Throughout the last decades, several attempts to include more diverse, younger audiences have been undertaken by the sector and the search for innovation to revitalize classical music by making it more relevant for new audiences continues [17]. Contributing to this quest, this paper describes a case study that investigates how to broaden the needed knowledge on 'how to listen to classical music' from a new perspective, namely with the use of gaming. The focus on this somewhat underexposed medium in the field of classical music seems promising; it seems to both match the educational and promotional goals, as well as the target group of potential new visitors.

1.2 Persuasive Gaming to Enrich the Experience of Classical Music

During the last decade, gaming has increased in popularity within the arts and culture sector. Games are deployed for a variety of purposes addressing both tangible and intangible cultural phenomena (*e.g.*, paintings and theatre performances, respectively). Examples include educational games in museums [18] and games that create cultural awareness including the language, beliefs, and rules of behavior in a society [19]. Just like other media, games can express certain values [20]. Their interactive character, however, makes them unique, because it allows people to experience choice [21]. These choices can generate feedback and thus reflection, allowing for personal experiences and resulting in interactive learning environments [22]. When games are explicitly designed to shape, reinforce or change players' attitudes and behavior in a certain way that exists beyond the gaming session, they are often referred to as 'persuasive games' [23]. They aim to convey a certain message that should motivate people to think differently about a certain topic. Persuasive games are applied in many different fields such as education, health, advertising and politics [23]. Within the field of classical music, however, their promising application does not seem to have been investigated yet.

Persuasive games seem to be a suitable tool to make new, potentially interested audiences of classical concerts experience a variety of ways in which they could listen to classical music, in order to be able to enjoy this type of music more. Through the interactive learning environment that the game creates, players can have the opportunity to broaden their knowledge and experience different ways of listening to classical music. At the same time, the game can convey the message that there are different ways of listening to classical music and that applying them might enrich the experience of classical music. As such, a persuasive game can positively influence the attitude of its players towards listening to classical music and ultimately stimulate classical concert attendance.

It is crucial to notice that, while persuasive games generally promote quite straightforward persuasive messages, the message in this particular case is somewhat more complex. Instead of '*this is* ***the*** *way to listen to classical music'* the game should rather open up the possibilities for listeners and take away their preconception that there is one 'right way' of listening. It would thus rather promote '*this is how one could listen to classical music*'. Due to its persuasive goal, however, we would still categorize it as a 'persuasive game'.

1.3 Approach: Exploratory Case Study on *Listening Space*

This study is part of the interdisciplinary research project GAMPSISS, a collaboration between Codarts University of the Arts Rotterdam, Erasmus University Rotterdam and Delft University of Technology. Each partner focuses on a particular part of the research from their field of expertise; this involves the aesthetic experience of classical music, the experience of classical concerts and persuasive game design.

In an innovative way, this study focuses on the current need of the classical music sector to attract new, potentially interested audiences. With the use of the persuasive game *Listening Space,* an explorative case study was set up to investigate if and how a game could positively influence the attitude of its players towards listening to classical music. Apart from new audiences, the main target group of the game, the study also included existing audiences because it could be enriching their listening experience and thereby benefit them as well. To strengthen the intended effect of the game and place it in a real-life context, the case study also included attending a live classical music concert. This offered participants, after they had played the 'listening game', the possibility to

apply their newly learned listening skills in practice and experience a live classical concert that could be enjoyable to them.

The introduced explorative case study using *Listening Space* was driven by the following research question: To what extent does playing the game *Listening Space* change the way in which new and existing audiences listen to classical music? And as a secondary question: What are possible drivers of this change in listening to classical music?

1.4 Structure of Paper

This paper will first describe the development of *Listening Space:* Section 2 describes the theoretical background of the game concept, based on conducted artistic research and a literature review of game studies research. Also, a short description of the general game play of *Listening Space* is provided. In Section 3, the methodology concerning the case study is clarified, followed by Section 4 with the main results of the study. Finally, Section 5 provides the conclusion and the discussion of the research, as well as recommendations for similar projects and suggestions for future work.

2 CONCEPT AND GAME PLAY OF *LISTENING SPACE*

Within the larger research project GAMPSISS **,** the persuasive game *Listening Space* was developed by the project team in collaboration with the TU Delft GameLab. We employed Harteveld's **Triadic Game Design (TGD)** method [24]. This method describes three important game 'worlds' – *Reality, Meaning,* and *Play* – and how to balance them while designing the game. *Reality* refers to the representation of the real-world system and can also be considered a validity check of the game. *Meaning* stands for the intended goals of the game and the transfer of knowledge from the game world to the real world. The last component, *Play*, refers to elements such as the rules of the game and a certain amount of fantasy and fun.

To ensure the required level of *Reality* in the game, artistic research about listening to classical music was conducted (2.1). The component of *Meaning* was based on recommendations concerning persuasive game design principles from the field of game studies and the element of *Play* was mainly represented through the chosen scenario and its theatrical execution (2.2). The concept of the game resulted in a working prototype that, after several rounds of testing the UI and the gameplay, was found suitable for carrying out the study. The general game play is described in Section 2.3.

2.1 Listening to Classical Music - Three Different Styles

Artistic research was conducted as part of the larger GAMPSISS project, with the aim of mapping out the variety of ways in which one could listen to classical music in order to enrich the listening experience. Based on a literature review drawing on music philosophy, semi-structured interviews with composers and musicians, as well as structured 'listening sessions' with participants, three different styles of listening were discovered. These findings could then be used to determine the content of the game.

2.1.1 The Historical Construct of the Ideal of Analytical Listening. The first listening style to be addressed is what could be called 'analytical listening'. Analytical listening is the ability to discern the technical elements of a piece of music and enjoy the music not purely as an emotional utterance but also as a piece of craftsmanship. The skill of analytical listening and its status are likely to be as old as musical notation is; compositional operations expressed on paper facilitate complexities that exceed the immediacies of perception. Together, these operations constitute a standalone artefact: the 'musical composition'. To genuinely and deeply enjoy such composition, the activity of decoding and unwrapping this product of some master's craft enables an experience of spatiality. The architecture of the music becomes manifest in the conceptual space, *i.e.*, the mind, of its listeners thus rewarding them for their mental efforts. Since composers kept on discovering the possibilities of elaborate operations,

music theory gained importance over the course of the centuries in Western Europe, up to the point that music philosopher Adorno considered analytical (or structural) listening the essential skill for a 'serious' audience [25].

Apart from these findings based on literature, ten in depth semi-structured interviews were conducted with Dutch professional musicians and composers of classical music about 'listening to classical music'. These interviews showed little decay of the ideal of analytical listening among professionals. According to many interviewees, the main task of the audience is to concentrate on the music in order to understand the music.

2.1.2 Listening Sessions Revealing Personal and Physical Listening. Five so-called 'listening sessions' were organized in a variety of contexts, such as a research festival at one of the research institutions, a conference on transdisciplinarity, and among groups of non-musicians who were invited through social media. Interestingly, these sessions showed that the analytical approach is only one among many ways in which people listen to classical music. While listening to live classical music, participants were asked to write and draw intuitively and discuss their experience afterwards. Aggregating, combining and analyzing their materials into legible 'listening maps', two more styles of listening were discovered. The first one was called 'personal listening'. In this mode, the listener enjoys an abundance of memories, thoughts, associations, or images that keep triggering one another. The second one was named 'physical listening': the listener immerses himself in the sound, completely surrendering to the experience, simply undergoing the bliss of being part of a sumptuous wholeness that may provide meaning (or not).

2.1.3 Findings of Artistic Research Translated Into Game Concept. Looking closer and more critically into these experiences, we discern that the ideal type of the analytical listener may understand the music very well. However, they might have trouble to dedicate themselves to the sensual dimensions of the music, since the musical object is something that is experienced more in a discourse of meaning than as an interface for physical desire. The personal listener, in contrast, seems to have a rich inner world, although one might also question whether this person actually listens to the music or rather is the director and the spectator of their own inner theatre. Finally, the physical listener might experience a splendid sensorial voyage, but might miss out on all kinds of cultural and informational layering. Of course, these three 'listening styles' – analytical, personal, physical – are connected, and never appear completely separated. Any musical listening is potentially a mixture of the three. Also, we do not claim that the identification of these three dispositions is entirely new [26]. It is, however, both crucial and innovative that we do not rank them hierarchically, because our aim is to create an inclusive listening interface.

The conclusions we draw from our artistic research formed the basic substantive objectives of the concept of *Listening Space*. It made clear that the game should make players aware of the fact that there are different ways of listening to classical music and that ideally one combines those while listening to a piece. Thus, the game had to firstly enable players to explore those different listening styles through several playful distinctive listening exercises. Next, it was designed to persuade players that applying those three different ways of listening could add an extra layer to their listening experience: an enriching layer for a more enjoyable experience.

2.2 Persuasive Game Design Principles in *Listening Space*

As described in the introduction of this paper, the game was designed with both an educational and a promotional goal. Apart from being just an educational game about listening to classical music, *Listening Space* should also convey the message that there are different ways to listen to classical music and that applying these may enrich the experience of classical music. To ensure that this message would be incorporated into the game design in an effective manner, a literature review concerning persuasive game design principles was conducted.

2.2.1 Lack of Specific Design Recommendations for Effective Persuasive Game Design. Game researchers Orji et al. [27] identified ten popular persuasive game design principles: 1. Competition 2. Praise 3. Simulation 4. Reward 5. Self-monitoring 6. Comparison 7. Suggestion 8. Cooperation 9. Customization 10. Personalization. Unfortunately, proper design-oriented strategies that suggest how persuasive game design principles like these

should be implemented are scarce and the design principles are often not validated [28, 29, 21]. While there are plenty persuasive game design principles at hand, there is a shortage of research results that show which principles are effective in which context and which are not.

For the development of *Listening Space*, this implies that the choice and the suitability of a design principle that contributes to the successful transmission of the persuasive message of the game was mainly based on the experience and intuition of the project team. The game design was informed by the identification of the popular persuasive game design principles by Orji et al. [27], and by other relevant research outcomes.

2.2.2 Selection of Persuasive Game Design Principles. As discussed in 2.1.3, the artistic research showed the game had to aim at enabling players to explore and practice the three different listening styles: analytical, personal and physical. Therefore, first of all, several playful listening exercises were created. These exercises used mainstream instrumental Western classical music, ranging from Bach (18th century) to Berg (early 20th century); music that in a regular concert season could be played. We chose solely instrumental music because song and opera transfer meaning(s) through words, which would narrow the multiplicity of meanings of instrumental music that we wanted to bring to the participants' attention. For each listening style, three to four 'mini games' or exercises aimed at providing the step by step idea of what that type of listening implied. Those exercises formed the core of the game. Next, in order to persuade players that applying those three different ways of listening could enrich their listening experience of classical music, several specific game elements were added to the design.

- **Value-free.** First of all, *Listening Space* clearly wanted to communicate that there is no 'right' or 'wrong' in listening to classical music. This means that players would not be rated in any way on their ability to listen in the game. In their research concerning persuasive game design, Antle et al. [30] found that indeed for a persuasive game that aims to make people think differently about a topic, value-free content is preferred. The game therefore aimed to focus on causes and consequences but not on right and wrong.
- **Scenario perspective.** Previous research showed the value of a story line in persuasive games [31, 32]. To create an overlapping story, the game was presented from a simple scenario perspective: each listening style was presented as a 'planet' and together the three planets created the 'Listening Space'. Players were invited to travel through *Listening Space* and explore the unknown planets. Each planet was represented by a 'listening guide'. These were actors who introduced the listening styles through short videos and then guided the players through the different listening exercises. The listening guides presented themselves through speech, movement and clothing style corresponding to the listening style they represented.
- **Suggestion and Praise.** Inspired by the work of Orji et al. [27], the persuasive game design principles *Suggestion* and *Praise* were implemented in the game design. During the listening exercises at each 'planet' the 'listening guides' suggested certain tasks for achieving favorable outcomes to players (*Suggestion*) and applaud the player for performing the target behavior with words/compliments and images as a way to give positive feedback to the user (*Praise*).
- **Simulation.** The persuasive game design principle *Simulation* [27] was reflected in several listening exercises; for example in an interactive animation through which players could observe the cause-and-effect linkage between wandering thoughts and the listening experience of classical music.
- **Reward.** The principle of reward is described by Orji et al. [27] as '*the game offers virtual rewards to users for performing the target behavior'*. However, the targeted behavior of listening according to different listening styles seemed impossible to monitor and in addition the game claimed there is no 'right' or 'wrong'. Although a subtle virtual reward is built in after completing a 'planet', the focus on another type of reward became most relevant: after the last assignment in the game, the player received the 'cash register code' for the subsequent live classical concert.

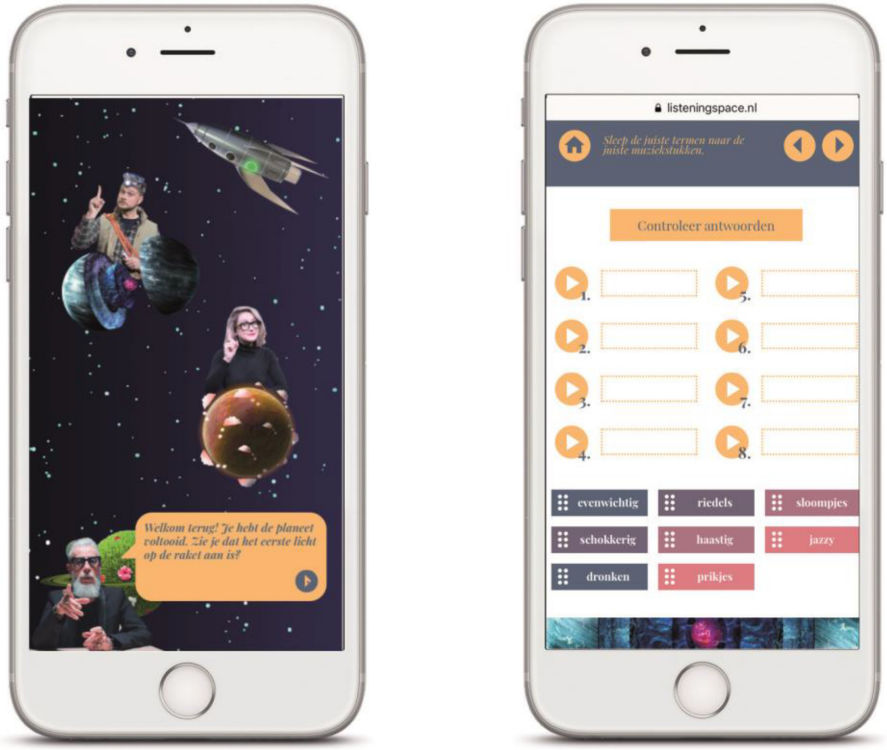


Fig. 1. Images of game hub (left) and an example of a listening exercise (right).

2.3 Gameplay of Listening Space

The outcomes of the artistic research (2.1) and the literature review of persuasive game design principles (2.2) resulted in the initial concept of *Listening Space*. The game was designed as a responsive website and took approximately 60 minutes to complete. Players only needed access to the internet in order to play the game and a suitable device such as a PC, laptop, tablet or smartphone. In order to provide an idea of the general experience players had when they played *Listening Space*, a short overview of the gameplay will be given.

2.3.1 Entering Listening Space. After creating a personal account (username and password), the game starts with an introduction video in which a mysterious host invites the players to start their travel into the so called 'Listening Space' to explore 'a new way of listening to classical music'. Next, a few playful questions about music listening are presented to the players, which then determines in which area of the game they begin. The players enter the hub of the game: a space-like environment with one planet and a rocket with three lights (see Figure 1).

2.3.2 Discovering the First Planet. Depending on the outcome of the playful questions, the first planet that appears presents a listening style that is as close as possible to the preferred listening style of the player; either analytical, personal or physical. In that way, the player starts with something rather familiar, before the game becomes more challenging.

At the start of each planet, the 'listening guides' of that planet introduce themselves and the specific listening style via a short video. Next, the players are presented with several short playful listening exercises that together should let them experience what that specific type of listening entails (see Figure 1 for an example). In between

the exercises, the 'listening guide' gives the players instructions and support via images with speech bubbles. After completing all the exercises on the first planet, a corresponding light at the rocket switches on (one out of three), allowing players to intuitively discover that the goal of *Listening Space* is to turn on all the three lights of the rocket. Also, three moons appear next to the planet that provide extra background information in case the players want to know more about that certain style of listening, but this is just optional.

2.3.3 Visiting the Second and Third Planet. Having completed the first planet, the players can choose to visit two more planets that appear in the 'Listening Space'. The order of completing these planets is up to the players, since there is no hierarchy between the different styles of listening. What matters is that all three lights of the rocket switch on at the end. For each of the two remaining planets again the same procedure holds as for the first planet.

2.3.4 Take-off of the Rocket and Master Test. When all three lights of the rocket are on, the players are ready to travel through *Listening Space* by themselves without the guidance of the listening guides. After the last encouragements of the guides, the rocket takes off and the players are confronted with the ultimate 'Master Test'. For this last and summarizing exercise, the players are instructed to listen to a classical fragment with their 'new ears', that are the results of discovering the three different listening styles. The players are challenged to apply the new different listening modes while listening to the piece; either combining them or taking turns focusing on one of the three.

2.3.5 Finishing the Game: Receiving the 'Cash Register Code' for the Live Classical Concert. After the 'Master Test', the players have finished the game. The mysterious host of the introduction video appears again and congratulates them with their successful journey through *Listening Space*. Finally, the ultimate reward is presented by the host: he shows the players the 'cash register code' for the live classical concert, to be attended by the players after finishing the game.

3 METHODOLOGY

The game *Listening Space* was evaluated by potential new audiences and existing visitors of classical music concerts. These two groups were included to see if the game could be simultaneously helpful for audience members with different levels of experience with classical music. This allowed us to test whether our innovative approach would appeal to newcomers who might need this type of guidance, without deterring more experienced audience members. In order to create a comprehensive evaluation of the experience and desired effects of the game, a large-scale experiment was set up with four experimental groups (see Figure 2). Participants in the two experimental groups first filled out a pre-survey about one week before the concert, played the game in their own time (at home) on their own devices and visited an accompanying classical concert. The content of the game was the same for all participants, regardless of the type of concert they visited. In the week after the concert, a post-survey was completed and with a selection of participants an optional semi-structured interview was conducted. The two control groups followed the same procedure but did not play the game.

3.1 Recruiting and Group Assignment of Participants

We cooperated with two renowned international concert venues in the largest cities in the Netherlands, *Muziekgebouw aan't IJ* in Amsterdam and *De Doelen* in Rotterdam, and a number of musical partners. This cooperation enabled us to not only provide participants who do not usually attend classical music concerts with free concert tickets, but also to involve regular concert visitors in the experiment. Thus, we could expand the scope of participants and also gain an idea about the game experience of existing audiences of 13 different classical concerts in spring and fall 2019.

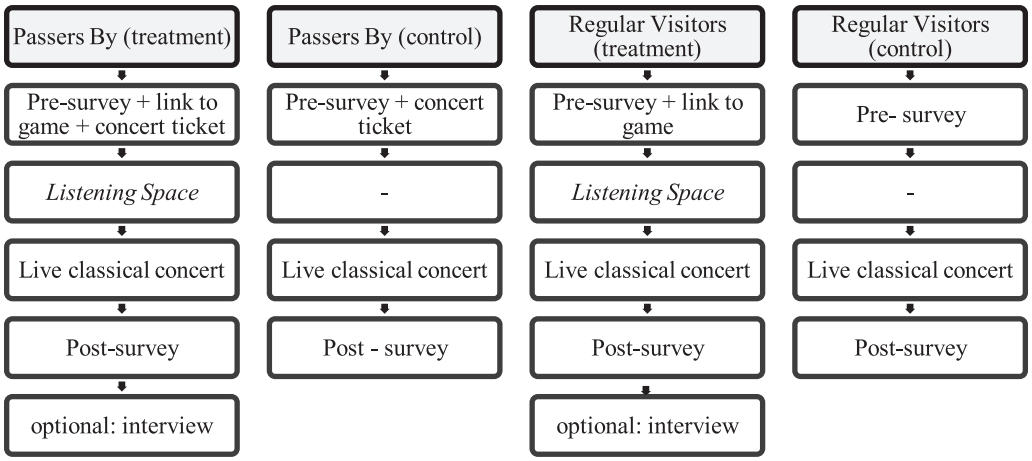


Fig. 2. Visualization of experimental set up.

3.1.1 Passers By - Treatment and Control Group. For clarity's sake, we name the research participants who do not usually attend classical music concerts *Passers By;* a term coined by sociologist Henk Roose [33]. The term describes our sample well as we were aware from the start that participation in our study would require comparably much commitment from participants. We therefore suspected that participants would quite likely already bring in a certain interest, or openness to classical music (and or gaming) with them.

To recruit these Passers By, we distributed our call for 18- 45 year old participants who are curious to play a game and a free classical concert in a renowned concert hall among various groups on social media (Twitter, Facebook, LinkedIn), our project web page, email-lists and private email accounts. Additionally, physical post card sized flyers were spread amongst community centers, universities and flyer corners in coffee bars and in random mailboxes of private houses. In this way we tried to recruit among a broad range of the Dutch population with a focus on Amsterdam and Rotterdam where the concert venues were located. As an incentive for participation, we mentioned the free concert ticket and the possibility to win a cinema voucher in order to increase participation among people who would not be motivated enough by a free classical concert. The Passers By were randomly (with the help of survey-software Qualtics) divided into two groups: one experimental group that played *Listening Space* and one control group.

3.1.2 Regular Visitors – Treatment and Control Group. The participating concert venues invited their regular visitors to participate in the research as well, with the help of pre-drafted emails. By means of random group assignment, 50% of those Regular Visitors who accepted the invitation were asked to play *Listening Space* in preparation of the concert they were going to attend, including participating in the pre- and a post-surveys. The other half of the Regular Visitors were asked to help us researchers to 'learn about listening' and therefore fill in a pre- and a post-survey of the concert, thus functioning as a control group.

3.2 Questionnaires

In order to measure the overall game experience and the desired effects of the game, as well as the overall concert experience, two surveys (pre- and post-survey) were drawn up.[2] The pre-survey is inspired by Roose's [33 work and contained questions about past concert attendance, music-listening habits (with regard to classical

[2]The surveys are in Dutch language and can be found here: http://doi.org/10.5281/zenodo.4612001.

music), pre-conceptions regarding classical music concerts, classical music as a genre, and socio-demographic questions. Passers By (treatment and control) could also indicate their preferred date for the visit of the live classical concert. The post-survey included questions about the overall game experience (In-game Module of the *Game Experience Questionnaire*, [34]. Furthermore, again the same questions about music-listening habits (to classical music) and classical music as a genre were asked, as well as the experience of the visited concert which corresponded to the pre-questionnaire items on preconceptions regarding classical music concerts, and another set of socio-demographic background characteristics. At the end of the post-survey, Passers By (treatment) and Regular Visitors (treatment) were asked whether they would be available for an interview about their overall experience of their research participation. All participants could choose to receive a future newsletter with the results of research as well.

3.3 Semi-Structured Interviews

From the Passers By (treatment) and Regular Visitors (treatment) who indicated at the post-survey that they could be contacted for an interview, a selection was made by the researchers based on their general game experience, age and experimental group, in order to provide as much variety among the interviewees as possible. Selected interviewees were approached by e-mail to set a date and time for the interview. This was either a face to face meeting or via telephone/Skype, depending on the preference of the participant. Also, a digital version of the informed consent form was sent to them, allowing participants to study its content beforehand and to request clarification in case of ambiguities. When conducting the interviews, the researchers also had a printed version of the informed consent form to be signed by the interviewees. The semi-structured interviews lasted for approximately 30 to 45 minutes and contained questions about the game experience (content and implementation) and the concert experience (content and context).[3] Concerning the effects of the game, participants were asked to what extent this made them aware of their own preferred listening style and to what extent the game had influenced the way they listen to classical music. At the end of the interviews, participants had the opportunity to ask questions about the research and to indicate whether they wanted to be informed about the results of the research.

4 RESULTS

Of all initially registered participants (N = 621), 540 participants completed the pre-survey whereas 304 participants completed the post-survey (both game experience and game effect components). In order to be allowed to participate in the research, a participant had to be at least 18 years old. Overall, ages ranged from 18 to 88 years, with 37.1% being 45 or younger. The gender distribution of the participants was fairly balanced (pre-survey: 48.0% men and 50.3% women; post-survey: 48.5% men and 51.2% women). Despite our efforts to recruit not only a younger but also more varied audience to participate in our study, a large majority of the participants had the Dutch nationality and were highly educated. Table 1 shows how the participants were divided over the four different experimental groups.

What is noticeable is that the control group of Passers By is considerably smaller than the other three experimental groups. As we collected data in spring and fall 2019, separated by the summer-break of regular concert performances, we had time to assess the group distribution of our sample after the first eight game sessions + concerts. Here we noticed that inviting 50% of the Regular Visitors to play *Listening Space* and 50% to only participate in the control group resulted in a much smaller group of players of *Listening Space* among the Regular Visitors. There was thus a self-selection effect indicating that Regular Visitors were less interested in participating in playing *Listening Space* than in completing surveys. We therefore adjusted our strategy for the last five game sessions + concerts in the fall and invited 70% of the Regular Visitors to play the game and only 30% to join the control group. This resulted in a more solid distribution of players and control group. Similarly, we were

[3]The interview guide of the semi-structured interviews can be found here: http://doi.org/10.5281/zenodo.4612001.

Table 1. Overview of Assignment of Participants in Experimental Groups

Experimental group	Pre-survey		Post-survey	
	N	%	N	%
Passers By (treatment)	66	30.7	76	25.0
Passers By (control)	31	5.7	19	6.3
Regular Visitors (treatment)|	151	28.0	63	20.7
Regular Visitors (control)	192	35.6	146	48.0
Total	**540**	**100**	**304**	**100**

Table 2. Three Clusters of Respondents Based on Their Game Experience

Cluster name	N	%
Enthusiasts	53	36
Neutrals	58	39
Critics	38	26
Total	**149**	**100**

initially planning to have only a small control group of Passers By to measure the variety of *Listening Space* experiences and effects with a large sample. Realizing that a solid control group was needed for the evaluation, we expanded the control group among Passers By in fall only, which makes it a smaller group than the Passers By (treatment) group.

For the semi-structured interviews, we made a selection of participants (N = 15) that represented a more or less even spread of game experience and participant age (20–73). We selected members from both the Passers By and Regular Visitors treatment groups.

4.1 Game Experience

Before analyzing the game's effectiveness, we measured how players experienced the game play. Analyses were carried out with quantitative data from the post-survey, complemented with qualitative data from the semi-structured interviews.

We measured game experience through the *In-game Module* of the *Game Experience Questionnaire* by IJsselsteijn, De Kort, and Poels [34]. This validated questionnaire measures seven dimensions of game experience (*competence, immersion, flow, tension, challenge, negative affect*, and *positive affect*; two items for each dimension). Items are scored on a 5-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree). In total, 149 participants from the treatment groups 'Passers By (treatment)' and 'Regular Visitors (treatment)' completed this part of the survey. This number is higher than the total number shown in Table 1, since not all of these participants completed the post-survey completely after they finished this part about their game experience.

4.1.1 Clustering Game Experience. We applied a statistical method in SPSS – two-step cluster analysis – to identify clusters of participants that had reported similar game experiences. The algorithm yielded three clusters. We examined the clusters and found that the discriminating factor was how players had enjoyed the game. Therefore, we labelled the three clusters: *Enthusiasts* (most positive experience), *Neutrals* (intermediate experience), and *Critics* (least positive experience). The cluster sizes can be found in Table 2.

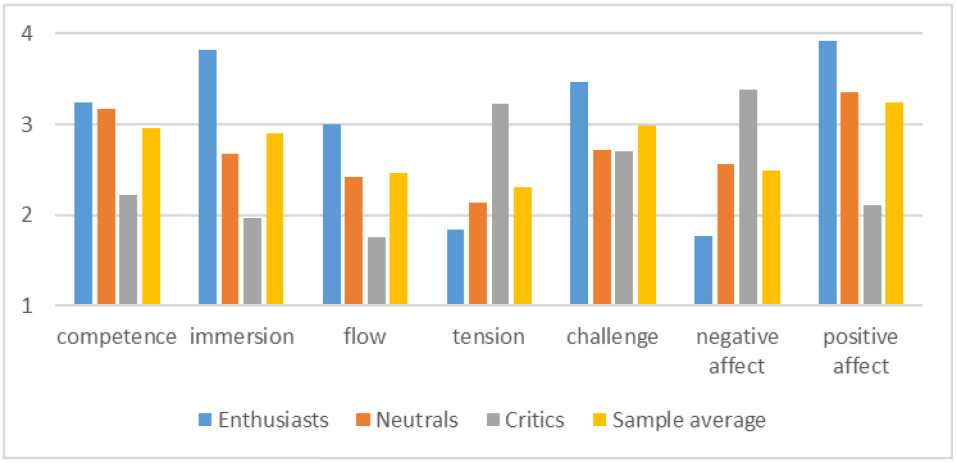


Fig. 3. Average scores on seven dimensions of game experience (calculated per cluster and for the entire sample of respondents; original item scores ranged from 1 to 5).

Table 3. Distribution of Passers By (treatment) and Regular Visitors (treatment) Over the Three Game Experience Clusters

Experimental group	N	% Enthusiasts	% Neutrals	% Critics	Total (%)
Passers By (treatment)	82	39	44	17	100
Regular Visitors (treatment)	67	31	33	36	100
Total	**149**	**36**	**39**	**26**	**100**

For each cluster, we calculated the average scores on all seven dimensions of game experience (see Figure 3). Averages for the entire sample of respondents are shown as well. **Analysis of Variance (ANOVA)** showed that, on each dimension, significant differences between the three clusters were found.

The sample averages (yellow columns in the figure above) lie around the theoretical average (3) on most dimensions, except for the dimensions *flow, tension*, and *negative affect. Flow* measures to what extent players are absorbed by the game and forget everything around them. *Tension* is about feeling irritable and frustrated, while *negative affect* stands for feeling bored or tiresome. The average game experience scored well below the theoretical average on these three dimensions.

Figure 3 also shows that, compared to other clusters, *Enthusiasts* felt most competent while playing the game (although the difference with the neutrals is not significant), were most immersed (impressed and interested by the game story), and experienced the most flow. Also, they were significantly more challenged and felt more positive affect than the neutrals and critics while playing the game, while their experience of tension and negative emotions was lowest of all three clusters (although their tension levels did not differ significantly from those of the neutrals). The reverse holds for the cluster *Critics* who felt least competent, were least immersed, etc.

4.1.2 Distribution of Experimental Groups Over Clusters. We determined how the experimental groups were distributed across the clusters. The results are shown in Table 3. The percentages of *Enthusiasts* and *Neutrals* are somewhat larger in the group Passers By than in the group Regular Visitors. The percentage of *Critics* is much lower among Passers By; just over half of the percentage among Regular Visitors. A chi-square test of independence was performed to examine the relation between Cluster-membership and Experimental group.

The relation between these variables was significant; X^2 (2, N = 149) = 6.853, p = .032. Therefore, it was concluded that Passers By experienced the game significantly more positively than Regular Visitors did, but also a large fraction (nearly one third) of the Regular Visitors experienced it in a positive way while 39% of this group was neutral.

4.1.3 Qualitative Analysis of Game Experience. To obtain greater detail about the general game experience, the quantitative findings concerning the general game experience can be complemented with outcomes of the semi-structured interviews. Interviewees were asked: 'How did you experience the game overall?' First of all, and most noticeably, the majority of interviewees reported they specifically enjoyed the game because it put something in motion, it made them think about classical music and listen in a different way. The game experience seemed to provide a deepening and broadening experience of classical music; providing them with another dimension of experiencing music. In other words; people enjoyed the general game experience because it increased their awareness of how they listen to classical music.

- "Yes, so positive. Because you learn to listen in different ways... What I may have done already unconsciously, but I had never thought about it like this." [4]- Passer By, age 26, female
- "The game is an introduction to a new musical genre, not with facts but with awareness of listening; very interesting." - Passer By, age 38, male

Some interviewees also reported they enjoyed the game because of its variety of listening exercises. Although the game mainly consisted of a series of exercises, all interviewees experienced it as a 'game'.

- "I also enjoyed doing the exercises. Because they were very varied. Many kinds of music came along and the types of interaction were always different. Very creative too. I think that's why you didn't feel too much like you had to struggle your way through it. It actually went quite smoothly." - Passer By, age 34, female

Next, several interviewees mentioned the nice execution of the game when asked about their general game experience. People indicated that they noticed that quite some attention had been paid to the design of the game, despite the fact that *Listening Space* is a research game and 'still' a prototype. The execution was perceived as consistent and one participant admitted that he thought it was done much better than he had expected.

- "Nice to see how much attention was paid to it. With all those people and those characters and that there really is a story in it. I really liked that."- Passer By, age 33, female
- "I thought it was very nicely made. With all those... it was kind of fairy-tale like. Yes, a fairy tale." – Passer By, age 47, female

Apart from mainly positive experiences, the interviews also revealed a negative aspect concerning the overall game experience. Two interviewees indicated they did not enjoy the tone of voice of the game: to them it was too childish due to the theatrical way information was given to the players.

- "For me it might have been a bit too childlike. It might have appealed to me more if it had been more abstract or more contextual. More 'I can learn something from this', instead of a theatre show like that." - Passer By, age 33, female

When specifically asked about the actors in the game and the tone of voice, indeed most of the other interviewees confirmed this criticism. However, interestingly only two interviewees reported this when asked about their general game experience. To them, it really influenced their overall experience, while for the others this seemed just an element they did not enjoy but it did not seem to spoil the entire game experience.

[4]All interview quotes were translated from Dutch into English by the authors.

Table 4. Factor Loadings of Questionnaire Items That Measure Different Listening Styles

Item	Component 1	Component 2
1. When I listen to classical music I listen with full attention.	.170	.768
2. It is important to me to have background information about the music that I listen to.	.231	.623
3. When I listen to classical music I often hear a wall of sounds that are difficult to distinguish.	.091	−.611
4. Listening to classical music can also be a spiritual experience to me.	.576	.165
5. Listening to classical music makes me think about myself.	.818	−.069
6. When I listen to classical music my imagination is stimulated.	.678	.158
7. When I listen to classical music I can often connect the music with events from my own life.	.771	.145
8. In classical music you move from one feeling to another.	.572	.198
9. Listening to classical music often triggers an inner dialogue or conversation with myself.	.850	−.065

To summarize: Quantitative results of the general game experience show that *Listening Space* was experienced more positively by potential new audiences of classical concerts than by existing audiences, although also a large fraction of those Regular Visitors experienced the game in a positive way. Three types of participants with significantly different game experiences could be distinguished: *Enthusiasts, Neutrals*, and *Critics*. The qualitative data showed that the majority of the interviewees enjoyed the overall game experience because it increased their awareness of listening to classical music. In addition, some interviewees indicated they liked the variety of exercises and they appreciated the nice execution of the game. Although the majority of interviewees were critical about the tone of voice of the game, only two interviewees mentioned this had a negative effect on their overall game experience.

4.2 Effects of *Listening Space* on Listening to Classical Music

In order to answer the main research question 'To what extent does playing the game *Listening Space* change the way in which new and existing audiences listen to classical music?', analyses were carried out with the quantitative data from the pre- and post-survey, again complemented with qualitative data from the interviews. First, the results on how players listen to classical music before and after playing *Listening Space* are reported in Section 4.2.1 (quantitative analysis) and Section 4.2.2 (qualitative analysis). Results cover both the entire sample of respondents and differentiated findings per experimental group. Finally, in Section 4.2.3 we present factors that may predict the effectiveness of the game *Listening Space*.

4.2.1 Effects on Listening Styles of Participants. To measure the effects on listening styles we first validated the part of the questionnaires that measured the three listening styles identified in Section 2.1. For this we performed a factor analysis on all items of the pre-survey that measured the listening styles. After validating the questionnaire, we measured the experimental effects using a paired student t-test. This test determined the statistical significances of the differences in average listening styles before and after the experiment.

The factor analysis resulted in the factor loadings shown in Table 4 below. Based upon the results we decided to calculate the construct 'analytical listening' as the average value of items 1 and 2 and the reverse of item 3 in the table below. The construct 'personal & physical listening' was calculated as the average value of items 4 – 9.

We forced the algorithm to yield various numbers of components (2, 3, and 4 components). However, the factor analysis showed that respondents did not distinguish between the listening styles 'personal listening'

Table 5. Effects on Listening Styles (averaged over all participants) and Significance of the Effects

Listening style	M(SD) before	M(SD) after	t	df	p-value
Analytical listening	3.8 (0.8)	3.9 (0.6)	−.847	304	.398
Personal & physical listening	3.1 (0.9)	3.3 (0.8)	−6.285	303	.000

Style Values Ranged from 1 (low) to 5 (high).

Table 6. Effects on Listening Styles 'Analytical Listening' (top) and 'Personal & Physical Listening' (bottom) Per Experimental Group and Significance of the Effects

Analytical listening					
Experimental group	M(SD) before	M(SD) after	t	df	p-value
Passers By (treatment)	3.4(0.7)	3.5(0.5)	−1.969	75	.053
Passers By (control)	3.0(0.9)	3.3(0.5)	−1.484	18	.155
Regular Visitors (treatment)	4.1(0.6)	4.0(0.5)	1.656	62	.103
Regular Visitors (control)	4.1(0.6)	4.1(0.5)	.160	146	.873

Personal and physical listening					
Experimental group	M(SD) before	M(SD) after	t	df	p-value
Passers By (treatment)	3.0(0.9)	3.3(0.7)	−4.850	75	.000
Passers By (control)	2.9(0.7)	3.0(0.8)	−1.143	18	.268
Regular Visitors (treatment)	3.1(0.9)	3.2(0.8)	−2.277	62	.026
Regular Visitors (control)	3.1(0.8)	3.3(0.8)	−3.686	145	.000

and 'physical listening'; all items related to these two styles were reduced to one component. The items related to 'analytical listening' were reduced to another component. Forcing the algorithm to increase the number of components from two to three resulted in the items for 'analytical listening' being divided over two components while the items for 'personal listening' and 'physical listening' were still reduced to one single component. Therefore, we decided to distinguish only between two listening styles in the following analyses to two styles only: 'analytical listening' and 'personal & physical listening'. Table 5 first shows the results of the paired t-tests on these two styles averaged over the entire sample (all four experimental groups) before and after the experiment.

From the table above it was concluded that the experiment did not significantly affect the mean value of the listening style 'analytical listening'. However, 'personal & physical listening' increased slightly but significantly after the experiment from 3.1 out of 5 (SD = 0.9) to 3.3 (SD = 0.8, p = .000). Breaking down the effects per experimental group yielded the results shown in Table 6.

From Table 6 (top), it was concluded that 'analytical listening' had not increased significantly in any of the experimental groups, although the difference for Passers By (treatment) was almost significant (p = .053) and the high p-value for Passers By (control) may be due to a small sample size (p = .155; N = 19). Note that the regular visitors already had very high scores on analytical listening on the first survey, suggesting there was only limited room for further enhancement of this listening mode. In contrast, the average value of 'personal & physical listening', where initial scores were more similar and somewhat lower across the board, *did* increase significantly in all experimental groups except for Passers By (control) (which, again, may be due to a small sample size; N = 19).

This implies that only visiting a live concert without playing the game *Listening Space* (as did both control groups) did not contribute to more 'analytical listening'. However, if they had played the game *Listening Space* before visiting a concert, many Passers By (treatment) listened *more* 'analytically'. Conversely, many Regular

Visitors (treatment) who had played the game before visiting a concert reported to listen somewhat *less* 'analytically', although the difference was not significant (p = .103). These results suggest that the game contributes to more 'analytical listening' amongst people who are new to classical music concerts.

Moreover, as is shown in Table 6, Passers By (treatment) reported to listen significantly more in a 'personal and physical' way while no significant change was found among Passers By (control) who only visited the concert. Regular Visitors (both treatment and control) reported to listen significantly more 'personally and physically' after the experiment. Therefore, with respect to 'personal and physical listening' the results suggest positive game effects on Passers By. The effects of the game on 'personal and physical listening' by Regular Visitors cannot be exclusively attributed to the game, as these may also occur as effects of other parts of the experiment (the concert, the questionnaires, the interviews, etc.).

4.2.2 Qualitative Analysis of Game Effects. The quantitative results above are corroborated and partly explained by qualitative findings from the semi-structured interviews. When asked about the extent to which the game made them listen differently to classical music, several interviewees indeed indicated that they listened more 'personally and physically' to the music during the live concert than they did before. The following quotes represent their experiences.

- "When I hear a piece I think: is this beautiful or ugly and why? That's what I liked about *Listening Space*: that second exercise, or that second planet; that went a bit more towards listening with your body. It was presented in a different way than how I normally listen. I liked that. It provided an extra dimension." - Regular Visitor, age 55, female
- "I was just trying to listen to the music and not to think too much. Then things went much better and I could appreciate it, I'll say. It's because of the game that I thought: I have to listen differently."- Regular Visitor, age 62, female

Other interviewees, from the Passers By (treatment) group, indicated they had become more 'analytical' in their way of listening to classical music after they played the game.

- "When I normally listen to music, I listen to the entire piece as a whole and not to any detail. In the game this was shown." Passer By, age 47, female

Interestingly, the interview data also showed why the game had no effect on certain players. These interviewees indicated that, although they tried to apply their newly learnt listening skills during the live concert, it was simply too difficult for them. This was either due to a lack of focus or to involuntarily falling back into existing listening habits.

- "Just because it was part of the game, I did try out things in my mind. But again, because you're sitting there like that, your thoughts keep wandering." - Passer By, age 47, female
- "But I just fell back very much into my own way of listening. I couldn't keep in mind all the time what I had learned, so to speak. But I was aware of it." - Passer By, age 34, male
- "Every now and then I tried to do that: to listen in different ways. But I noticed that I also very quickly relapsed as it always goes." Passer By, age 34, female

Concluding, the qualitative data confirmed the results from the quantitative analysis. They showed that for several players the game indeed presented them with different ways of listening and it encouraged them to apply these new skills during the concert; the game seems to have enriched their listening experience. Other interviewees reported that, although they tried to apply a different way of listening, this turned out to be quite difficult for them due to a lack of focus or falling back into existing listening habits.

4.2.3 Predictors of Game Effect. The reported results in the previous sections show that the game's effects on how participants listen to classical music differ between Passers By and Regular Visitors of classical concerts.

Table 7. Regression Table for Variables Predicting 'Change in Analytical Listening'

	Unstandardised Coefficients		Standardised Coefficients
	B	SE	Beta
Constant	0.215	0.252	
Age	−0.011	0.002	−0.352**
Competence	0.281	0.068	0.399**
Positive affect	−0.156	0.064	−0.248*
R^2		.207	
F for change in R^2		5.899*	

*p < .05. **p < .001. N = 135.

Table 8. Regression Table for Variables Predicting 'Change in Personal and Physical Listening'

	Unstandardised Coefficients		Standardised Coefficients
	B	SE	Beta
Constant	1.721	0.355	
Appreciation of classical music	−0.178	0.044	−0.333**
R^2		.111	
F for change in R^2		16.560**	

*p < .05. **p < .001. N = 135.

To determine predictors of game effects, multiple linear regressions were calculated based on the background variables measured in the pre-questionnaire (gender, age, appreciation of classical music, frequency of playing digital and analogue games). To these independent variables we added the seven dimensions of game experience that were measured in the post-questionnaire (see Section 4.1). We used forward selection as a method to enter variables into the regression analysis.

For the dependent variable 'change in analytical listening' a significant regression equation was found ($F(3, 131) = 5.899$, $p = .017$), with an R^2 of .207. Thus, the resulting regression model explains about 20% of the variance in the dependent variable. Table 7 shows that age and positive affect have a negative effect on the change in analytical listening, while competence has a positive effect. The other independent variables (gender, appreciation of classical music, frequency of playing games, and the remaining five dimensions of game experience) did not significantly predict the change in 'analytical listening'.

The results suggest the following three points. First, young participants' 'analytical listening' is more affected by the game than older participants. This may be partially due to the fact that older participants had higher scores for this listening style before the experiment anyway (calculating Pearson's correlation between age and 'analytical listening' in the pre-questionnaire yielded $r(516) = .500$, $p < .001$). Therefore, young participants had more 'room for improvement'. Second, the game has more impact on respondents who felt more competent in playing the game (*i.e.*, who scored high on the items 'I felt successful' and 'I felt skillful' in the game experience questionnaire) than on respondents who felt less competent. Third, the game's effects were less for respondents who experienced more positive emotions in the game (*i.e.*, who scored high on the items 'I felt content' and 'I felt good' in the game experience questionnaire) than with respondents who experienced fewer positive emotions.

Also for the dependent variable 'change in personal and physical listening' a significant regression equation was found ($F(1, 133) = 16.560$, $p = .000$), with an R^2 of .111. Table 8 shows that the variable 'appreciation of classical music' has a negative effect on the change in personal and physical listening. The other independent variables (age, gender, frequency of playing games, and the seven dimensions of game experience) did not significantly predict the change in 'personal and physical listening'.

The results suggest that the more a participant appreciated classical music, the less they reported an increase in personal and physical listening. This may have to do with the fact that classical music enthusiasts see 'analytical listening' as a more 'proper' way to listen to classical music than 'personal and physical listening'. In addition, as the more avid classical music lovers will have more listening experience, it may be harder for them to change their ways of listening.

5 CONCLUSION AND DISCUSSION

Through the last decades, the Western classical music sector has made several attempts to attract more diverse, younger audiences. As was mentioned in Section 1.1, earlier studies show that one specific barrier for classical music attendance is uncertainty about how to listen to classical music (14, 15). In addition, previous research emphasizes the importance of providing new, potentially interested audiences with more means to consume the music (16).

In order to contribute to the sector's attempts, we aimed to broaden the ways in which one could listen to classical music and added a new perspective, namely through the use of games. An exploratory case study was set up around the persuasive game *Listening Space*. We studied to what extent this game could change the way in which players listen to classical music and what could be possible predictors for this change in listening styles. We defined three listening styles – analytical, personal, and physical listening – and designed a controlled randomized trial to measure the extent to which the game changed these listening styles in the participants to our study. Apart from attracting new audiences (Passers By) the study also targeted regular visitors of classic music concerts, because the game could be of some benefit to them as well. Both audiences were divided over a treatment group and a control group.

We found that Passers By experienced the game significantly better than Regular Visitors did. However, a small fraction of the Passers By (17%) did not enjoy playing it and nearly one third of the Regular Visitors experienced it in a positive way.

Also, we found that playing *Listening Space* significantly changed the ways in which players listened to classical music, although these effects were relatively modest. For instance, Passers By reported a small, but significant increase of their physical and personal listening styles after playing the game. A control group of Passers By reported no significant increase, although this could be due to the relatively low number of participants in this group. The analytical listening style of the treatment group increased slightly as well, but less significantly. There were no significant changes in the control group.

The game did not affect the analytical listening style of Regular Visitors; neither the treatment group nor the control group reported significant increases in analytical listening. In contrast, Regular Visitors did report a small, but significant increase in 'physical and personal listening'. This increase can, however, not be attributed to the game since both the treatment and control groups reported a similar increase. The interview data confirmed the results of our quantitative analyses. Also, the data explained that the game enabled players to listen to classical music in radically new ways and thus enriched their concert experience.

It was found that the analytical listening style of younger participants increased more after playing *Listening Space* than that of the older participants. This is encouraging since younger people are among the new audiences that classical music concerts hope to attract. Also, feeling competent in playing the game was found to predict an increase in 'analytical listening', while feeling content in the game predicted a lower increase in 'analytical listening'. The single predictor for the effect on 'personal and physical listening' was the appreciation of classical music: enthusiasts were less likely to report an increase after playing the game than players who valued the genre less. Therefore, we conclude that the game has different effects on different groups of players.

We noticed that quite a few effects were not significant. This can be due to a number of reasons. First, the numbers of respondents in some of the experimental groups were quite small. This applies especially to the control group of Passers By. Second, the study required a rather intensive time investment from our participants,

which may have diminished the presence of people with little or no interest in classical music in the sample. This logically leaves less room for discovering new listening styles, or for changing ways of listening that may have already been incorporated due to earlier experience. The latter is what some of the interviewees reported as well: falling back into familiar listening habits. Third, our participants visited actual live concerts. Participants could choose from a wide variety of concerts. Some of these concerts may have been more suitable than others for participants to be introduced to the new listening styles that *Listening Space* was designed for. Finally, the game itself did not appeal to all players – many participants found it too childish – which might have contributed to relatively modest game effects.

In conclusion, given the fact that *Listening Space* was essentially a pilot project and a first step in a larger endeavor, we consider the results of this study encouraging. The game enabled significant changes in listening styles in the group that we were most eager to reach: Passers By, and especially the younger ones among them.

In future work, we aim to change the tone of voice of the game. We found that the game experience significantly influenced the effectiveness of the game. And from our evaluation we found that a large number of players did not enjoy playing the game due to the way in which they were addressed. Probably, a different tone of voice will improve the game's effectiveness. Also, we recommend to improve the way in which playing the game and visiting the concert are connected. Many participants report that, at the time of visiting the concert, they recalled little of the lessons learnt from the game. We expect that providing the audience with a short recollection of the main insights from the game before entering the concert hall will improve the game effectiveness and improve the new listening experience at the concert.

Although we see room for improvement as sketched above, we believe this case study shows the potential of using games to promote classical music concerts: games seem to be valuable to attract new, young audiences and, therefore, represent powerful instruments to preserve the Western classical music heritage.

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