Linkages Between Gameplay Preferences and Fondness for Game Music

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Abstract. In this paper we explore connections between players' preferences in gameplay and their desire to listen to game music. Music always takes place in cultural contexts and the activity of music listening is likewise entangled with versatile cultural practices. This is arguably evident in the case of game music since the primary context of encountering it is the active and participatory experience of gameplay. By analyzing survey data (N=403) collected from the UK, we investigate how contextual preferences in gameplay activities predict fondness for game music. It was found that player preference for *Aggression* and *Exploration* are two precedents for liking game music. These findings indicate that a better understanding of the extra-musical qualities of game music is crucial for making sense of its overall attractiveness and meaningfulness.

Keywords: game music · music preferences · player preferences · survey · factor analysis.

1 Introduction

It is quite common to consider music as an entity of its own, thus making a distinction between musical and extra-musical substances. There are, however, plenty of everyday instances, in which one can say that music becomes entwined with particular kinds of situations and activities. Dance music is a prime example of such music that by its name is defined by a certain type of activity. It is even difficult to consider music as something that would intrinsically exist only as music. Contemporary music cognition research argues that music is essentially embodied [11] and coupled with capabilities of human action [8]. We may speculate that a preference for dance music might indicate a preference not only for certain musical features, but also for the contextual activity of dancing. Hence, for a person who likes to dance, music arguably is about moving to the

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music, gestures heard in music, a feeling of togetherness through music and, in all, bodily engagement with music. Continuing with this line of thought, we may come up with an array of other examples. Using a quick internet-search, playlists can be found for jogging, relaxing, nostalgia, hanging out with friends, dining, and so on. It might not be too far-fetched to suggest that our understanding of, as well as our preference for a given music genre is structured also by the activity and context related to it.

Game music is an example of a type of music that is deeply entangled with its experiential contexts. It is part of the designed game artefact, and a piece of music is therefore intended to be experienced in a specific state of game and during ongoing player-game interaction. This condition denotes that during a gameplay experience, a piece of game music is encountered while the player is doing something in relation to the game environment and its internal dynamics. Differently put, the player is likely to be engaged with particular gameplay activities when listening to game music – whether those activities are about exploring the gameworld, engaging in battles, strategizing, or menu management, for example. Thus a player who focuses on unfolding game events often does not listen to music but rather encounters it as a part of the fictional gameworld and her own active agency in it.

The overarching goal of this paper is to explore how players' preferences in gameplay activity types may be related to their desire to listen to game music, whether they enjoy game music during ongoing gameplay or in situations external to it. We define game music in this study as any music that is intended to accompany the ongoing gameplay, be it original compositions, licensed songs by popular artists or a more ambience-like soundscape that perhaps meshes with other sounds of the game and changes in relation to the player's actions. By investigating the relations between gameplay activity types and game music preferences, we also ask what kind of music genre game music appears to be. A synthesis of game research and music research approaches should be beneficial for both of these academic fields. The explorative approach of this study also adds to the understanding of music as a constituent of the gameplay experience. Simultaneously, it generates insight into music listening in terms of contextual activity.

In order to analyze how players' preferences in engaging with gameplay activities might be related to their preferences in listening to game music, we first need to consider how both music and game preferences should be approached in this kind of research setup. After that, we will introduce our research hypotheses for empirical investigation. We will then proceed to introduce our methods and a survey sample (N=403) that was collected for the purposes of this research. Finally, we will report the results which will be followed by a discussion on the impacts of our findings.

2 Background: Music and Game Classifications

Music has been a part of game experience from very early on. Likewise, both musicians and amateurs alike were quick to adopt influences from videogames as well as to utilize the technological possibilities of game-related devices. More recently, alongside the growing popularity and recognition of videogames as a legitimate form of culture, game music has also established itself as a noteworthy category of music. Game music thus seems to be a relatively prominent area of consumption even outside the actual gameplay context (see [7]) and, perhaps more importantly, one of the many situations of everyday life where music is listened to as an integral part of some other activity.

Despite this, game music has not yet found its way into many studies of music preferences. For example, in a meta-analysis [18] surveying 28 studies on the relation between personality traits and musical preferences, game music was not among the 150 different musical styles and substyles used in the studies. However, several of the studies did include the more general category of "soundtracks", which arguably could also include game music. What game music and soundtracks have in common is that they are not styles or genres which could be easily defined or denoted by certain musical features. (cf. [17]) This situation makes it difficult to discuss game music as a music genre, as the latter are typically identified primarily based on underlying structures of the music itself, instead of its reoccurring contextual uses.

It could be posited, then, that considering game music as a music genre would require rethinking the criteria used in identifying a music genre. Traditional genre-based approaches have indeed been criticized as being problematic in various ways (see [4]) and several authors have attempted to overcome these problems. Arguably the most influential line of research is based on the work of Rentfrow and Gosling who in their seminal paper [16], developed the Short Test of Music Preferences (STOMP) which organized musical preferences into four independent dimensions comprising several genres. These dimensions are based on underlying structures of musical preferences and thus go beyond traditional genre labels. This work was later refined and elaborated into a revised version of STOMP and into the five factor MUSIC model [13] (see also [15]). Yet there remains critical discussion about whether the dimensional models are still too tightly interwoven with genre-based ideas and primacy of musical features (see [4, 13]). Despite this we consider that dimensional models of music preferences [13], such as the STOMP, make it possible to include game music in the analysis.

Regarding game preferences, the most intuitive approach would be to make use of game genre classification models since the purpose of any genre classification system is to make sense of a large number of cultural expressions by identifying common structures in how these expressions are manifested in our experiences. Genres are patterns of expectations and communicative maps between an item of culture and our ways to encounter it [12]. Thus genre conventions should help us in understanding and communicating what kind of item we are dealing with.

There are at least three interrelated problems that make game genre analysis and, consequently, utilizing genres as analytical concepts especially challenging. Firstly, researchers, game industry representatives, and players alike have constant difficulties in identifying which criteria should be used in separating one game genre from another. The second problem concerns game ontology and asks: "What makes something a game?" This question is paramount for any game genre analysis, because the purpose of these studies is to identify those qualities and characteristics which not only separate a particular game from another type of game but also simultaneously separate games from other forms of cultural expressions. The third problem deals with what Espen Aarseth [1] has called genre trouble, and it refers to how the phenomenon of game should be understood and approached theoretically and methodologically.

Furthermore, genres are historical constructs that are entangled with contextual cultural meaning-making and practices of subjective interpretation. Some authors also consider game genres to be partly defined by or even bound to the material structure of technology which enable them to exist [9]. Taken together, the above means that a single game can be regarded to be a genre-defining product. *Doom* (Id Software; 1993) is a good example of that kind of game as it has been generally regarded as the game that established the first-person shooter (FPS) game genre [3]. The complexity in identifying game genres is easily demonstrated by how game marketplaces and databases still utilize classification systems that differ from each other.

As a result of identifying these broad challenges, many researchers have considered the task of defining game genres to be very difficult or even impossible. Shortly put, game genres lack analytical explanatory power [2, 3, 5]. Although game genres are important for game cultures and their discourses, these concepts are not optimal units of analysis in investigating how gaming preferences are related to other phenomena, including music preferences. To find a solution to this problem, we explored alternative ways to study structures in players' enduring gaming preferences.

3 Method

3.1 GAIN and STOMP Models

By definition, games are interactive and participatory rule-based systems that change their state dynamically based on user input and the game's code. From this perspective it makes sense that typical game classifications are mostly *ludological*. As Myers [5] wrote: "The most fundamental characteristics of computer games, those that properly determine genre, lie in the pattern of interactivity between player and the game". Instead of building on e.g. narrative style, story setting, theme, game functions, or art style, ludological game genres are based on distinguishable types of gameplay.

Following this line of thought, Vahlo, Holm, Kaakinen and Koponen [19] developed an approach of measuring players' preferences in game dynamics which

they defined as player–game interaction modes that emerge from game mechanics during gameplay. By analysing 700 game review articles, the authors developed a set of 33 recurrent game dynamics that were further edited into Core Game Dynamics (CGD) scale items for survey studies. The scale was further amended by Vahlo, Smed, and Koponen [20] who validated the scale as the Gameplay Activity Inventory (GAIN) by investigating its psychometric properties and dimensionality with large survey samples collected in Canada, Finland, and Japan.

The validated 15-GAIN as well as the full 47-GAIN [20] consist of five gameplay activity type factors: Aggression, Caretaking, Coordinate, Exploration, and Management. *Aggression* measures player preference in activities such as destroying, shooting, and warfare. *Caretaking* covers player preferences in e.g. decorating, dressing up, dating, and taking care of others. *Coordinate* refers to players' desire to engage with activities such as jumping, running, racing, performing in sports, and keeping in rhythm. *Exploration* is the player's preference in investigating a game's story, exploring the gameworld, developing a character's skills and abilities, and collecting treasures. And *Management* assesses a player's preference for activities including building and construction, trading, directing and commanding, and resource management.

In the context of this study, we consider applying GAIN to be a better solution instead of using a list of game genres such as action games, adventure games, RPG games, puzzles, and simulations. As noted above, players do not have a common shared way to understand what actually is, for example, an action game and what makes it different from an RPG or an adventure game. GAIN items aim to illustrate recurrent activity types in a way that does not operate with genre concepts and is intuitive for different kinds of player types, regardless of whether they have first-hand experience of playing any games that have elements of *Aggression* or *Management*, for instance. Since there are no earlier studies on how GAIN dimensions might be associated with game music preferences, we adopted a more extensive 25-item GAIN version which was based on a combination of the 15-GAIN and the full 47-GAIN. The authors of GAIN [20] have argued that also the 47-item GAIN consistently measures the five above-mentioned preference dimensions with relatively high primary loadings.

The main idea behind the STOMP instrument is similar to GAIN as STOMP aims to tap into the underlying structures of music preferences. In order to investigate the latter, Rentfrow and Gosling utilized STOMP in three separate empirical studies that yielded, through factor analysis, an organization of genres into four independent dimensions of music preferences. These dimension were named *Reflective & Complex* (consisting of classical, jazz, blues and folk), *Intense & Rebellious* (alternative, rock, heavy metal), *Upbeat & Conventional* (country, pop, religious, sound tracks) and *Energetic & Rhythmic* (rap/hip hop, soul/funk, electronica/dance). The different qualities of these dimensions were investigated in another study, which related to characterization of the four dimensions in terms of 25 attributes related either to music (e.g. relaxed, angry, romantic) and/or lyrics (e.g. boastful, reflective, bitter) or more generally to tempo (fast, slow) and mode (acoustic, electric) of music.

Later studies using a similar approach of clustering styles into larger factors have found differing numbers of preference dimensions (see for example [18]). The authors of STOMP themselves, in their subsequent studies, elaborated the inventory to include 23 genres and by using music excerpts instead of genre labels found five dimensions (Mellow, Unpretentious, Sophisticated, Intense and Contemporary), hence the MUSIC model [13, 14].

While there is variability in the factor structures uncovered by different studies, which is at least partly explained by different sets of musical styles used by researchers, there seems to be an overall consistency to the findings: Most of the STOMP studies have found independent dimensions for at least musical preferences overlapping with "reflective & complex" (e.g., jazz and classical), "intense & rebellious" (e.g., rock and heavy metal) and "energetic & rhythmic" (e.g., rap and hip hop). We therefore judged the original 14 item STOMP to be a robust enough starting point for the investigation of music preferences in this study.

However, because of the aim of the study, we modified the STOMP by adding the item "video game music" to the list of musical styles. This was an informed decision to be made and consistent with our approach since the STOMP model does not utilize music genres as analytical tools but instead operates on the level of latent preference factors of the inventory. It should also be made clear that fondness for game music in this study is therefore comparable to preferences for other music genres included in the STOMP. Since the STOMP model does not specify the context in which music is encountered (e.g. soundtracks and theme songs can be encountered as part of a movie watching experience or in contexts external to it), this kind of distinction cannot be made either about game music preferences. Therefore fondness for game music in this study may refer to both players' fondness for listeniing to game music as they play and to their desire to engage with it outside ongoing gaming situations.

3.2 Research Hypotheses

The main research question (RQ) of this study was to understand *if and how players' gameplay activity type preferences predict their fondness for game music.* Because game music is composed and arranged for the gameplay experience and thus intended to be encountered as a part of active player participation, it is plausible to assume that preferences in gameplay activities and game music listening are related. It is also plausible to assume that experiences of gameplay activities and thus also gameplay activity preferences are precedents for a habit of game music listening. There are exceptions, of course, as some prefer to listen to game music although they do not play games at all. However, generally speaking, we can expect that *H1: A higher preference in gameplay activity types predicts higher preference for game music.*

Game music is not something associated only with games of a particular kind. Instead, players have encountered and will encounter game music in a wide variety of games ranging from 8-bit retro arcade games to multiplayer computer games and casual free-to-play mobile games. Because practically all types of games commonly include game music, and because there are no earlier

studies made on the subject, we expect that *H2: A particular kind of gameplay activity type preference does not predict game music preference more than the other types.*

The original STOMP did not include "video game music" as an item but it did include "soundtracks". We might suppose that in terms of musical features these two categories are somewhat similar at least in the sense that they do not denote a clear musical genre but rather a certain context of use. We thus expect the "video game music" item to be correlated with "soundtracks". However, game music might distinguish the specific preferences of those who identify as gamers and therefore game music may not have any clear relation to preference for soundtracks or any other STOMP item, either. We therefore assume that *H3: The game music item is moderately correlated with the soundtrack item and that it loads on the same factor as the latter when included in the STOMP.*

4 Survey Participants and Procedure

A total of 403 survey participants (ages 18–65) were obtained from the UK via a commercial crowdsourcing platform Prolific which maintains an online panel of over 70,000 users in several countries. No other inclusion criteria for survey participation were used since the focus of the survey was on investigating experiences of music listening and it is reasonable to expect that everyone without a hearing impairment has listened to music. We also decided not to target the survey only at active players as the purpose of this study was to understand the general relationship between gameplay preferences and game music preferences.

The survey included an adapted 25-item version of the GAIN and the 14-STOMP with the game music item. Survey participants were asked to indicate their preference in the 15 musical styles with this question setup: "For the following items, please indicate your basic preference level for the music genres listed using the scale provided" with a 7 point scale from "strongly dislike" to "strongly like". They were then asked to answer the 25-item GAIN according to this question setup: "Imagine yourself playing a digital game. How pleasurable do you find the following in-game activity types based on your earlier gaming experiences?" and with a 5-point scale from very unpleasant to very pleasant. The reported analyses were made by using the statistical software Stata/SE 16.1.

In addition to the 25-item GAIN and 15-item STOMP, the survey included questions about the participants' age, gender, game genre and social play preferences, and their experiences regarding music listening in general. Results regarding the latter inventories are not reported in this paper.

On an average, it took a participant 13.5 minutes to complete the survey. A total of 43.5 % (N=175) survey respondents identified as males and 55.5% as females (N=223). In addition to that, 5 survey participants (1%) reported that their gender was non-binary. Of a list of 15 game genres, adventure games, puzzle games, and strategy games had the highest mean preferences. Male players reported higher preference for action games, fighting games, and sports games

than female players whereas female players had higher preference especially for puzzle games and educational games than male players.

5 Results

In the 25-GAIN version applied in our research, *Aggression*, *Caretaking*, and *Management* were all measured by five items whereas *Exploration* and *Coordinate* were both assessed by six items. A total of 11 items of the 25-GAIN were same or very similar to the 15-GAIN (marked with * in Table 1) whereas 13 items were included in the more extensive 47-GAIN (see [20]). We also included a new item in the GAIN. This item was "Engaging in a battle" and the decision to include this was based on a partly similar item "Attacking, defending and casting spells" that was dropped from the original GAIN as it had showed a relatively high loading on *Exploration* alongside *Aggression* [20]. We wanted to explore if this was because the wording of the item referred to the role-playing specific activity of "casting spells".

To make sure that the 25-GAIN version we applied would indeed measure the aforementioned five gameplay preference dimensions, we made an exploratory factor analysis (EFA) for the 25-GAIN. The second reason for an EFA was that we wanted to explore 1) how the gameplay activity preference in general (H1) and 2) each of the five dimensions individually (H2) may predict a preference for game music. To study the first question, a single sum variable was constructed from all of the 25-GAIN items. But for examining the latter question, computing five factor sums was not the best solution as factor sums do not take cross-loadings on other factors and unique variance of each item into account. Instead of using factor sums we wanted to be able to compute factor scores for each item as factor scores provide information about how an item loads on every factor. Computing factor scores is possible after making an EFA (Table 1).

Parallel analysis [10] suggested a five factor solution. The inventory passed the Kaiser–Meyer–Olkin (KMO) test for factorability with the value of 0.91 and also the Bartlett test of sphericity (chi-square=5427, df=351, p=0.000),and thus we proceeded to investigate a five-factor solution (promax rotation). As a cut-off criterion, we utilized a factor loading over 0.4. The item "Crafting items and valuables by combining raw materials" showed a loading under 0.4 and was therefore removed from the analysis. The parallel analysis test still suggested a five-factor solution and in the second iteration all items had over 0.4 loading on a factor. The solution reported in Table 1was similar to what Vahlo et al. [20] had reported, all of the five dimensions were identified with the following Cronbach's alphas and 95% confidence interval and coefficient omegas (McDonald's omega/Raykov's rho): *Aggression* α=0.91 (CI 0.90-0.93) and ω=0.92, *Caretaking* α=0.82 (CI 0.79-0.85) and ω=0.79, *Coordinate* α=0.72 (CI 0.67-0.76) and ω=0.73, *Exploration* α=0.82 (CI 0.79-0.85) and ω=0.82, and *Management* α=0.80 (CI 0.76-0.83) and ω=0.81. We did not make a confirmatory analysis on the 24-item GAIN as our sample was not representative on the population level.

Table 1. An EFA for the 24-item GAIN (Cut-off 0.4, promax rotation). Factors in order: *Aggression*, *Exploration*, *Management*, *Caretaking*, and *Coordinate*.

	f1	f2	f3	f4	f5	Uniqn.
Engaging in a battle	0.86					0.22
Exploding and Destroying	0.82					0.31
Shooting Enemies and Avoiding Fire*	0.77					0.29
Waging war and conquering	0.75					0.30
Weapons and skills selection for characters	0.71					0.34
Trading items, weapons or resources*	0.49					0.45
Investigating the story and its mysteries		0.67				0.47
Exploring the gameworld and its secrets*		0.64				0.41
Developing skills and abilities*		0.63				0.56
Searching for and collecting rare treasures		0.62				0.55
Making meaningful choices in dialogues*		0.54				0.51
Managing and directing cities and their inhabitants*			0.74			0.39
Building and developing a city or a base			0.70			0.33
Managing resources such as money or energy*			0.56			0.57
Dressing up and choosing looks*				0.75		0.45
Decorating rooms and houses				0.66		0.44
Taking care of pets and training them*				0.61		0.53
Character Customization				0.59		0.49
Flirting, seducing and romantic dating				0.59		0.60
Gardening and taking care of farms*			0.42	0.43		0.56
Racing in a high speed					0.72	0.40
Piloting and steering vehicles					0.63	0.42
Performing in athletics, gymnastics or other sports*					0.51	0.69
Moving to the beat and staying in the rhythm					0.42	0.67

We computed regression factor score variables for the rotated five-factor 24-GAIN solution (promax rotation) to study H2 (see [6]). In addition to that, we also calculated a factor sum for all of the 24 items included in the analysis to investigate H1. Next, we calculated the correlation (Spearman's rho) between the general gameplay preference factor sum and the preference to listen to game music. The correlation was moderate (0.43), which confirmed that these variables were associated with each other.

A linear regression between the combined gameplay preference factor sum and the game music listening preference variable showed that gameplay activity preferences do predict preference for game music listening (coefficient 1.05, standardized error 0.11, p=0.000, t=9.32, β=0.42). The gameplay preference measured by 24-GAIN explained 18% of the variance in the game music listening preference. This association and direction of the effect supported H1.

We continued to investigate how the five GAIN factors were related to game music preference. This was done by calculating multiple regressions between the GAIN factor scores and the game music variable. We also added age, squared age and information on whether respondents identified as males to the regression model to better understand the effect of the GAIN factors (Table 2).

Age and squared age did not have a statistically significant effect on game music preference, but identifying as a male did. The effects of *Caretaking* and *Management* on game music were not statistically significant, but the other three factors predicted a preference for game music. However, the effects were not only different in their size but also in their direction. Preference for *Coordinate* predicted negatively for fondness for game music listening. *Exploration* and

especially *Aggression* both had a clear positive effect on game music preference. Based on these results, we conclude that player preferences in the GAIN factors do not predict fondness for game music similarly to each other. Thus, H2 was not supported by our analyses.

Table 2. Regression between the GAIN factors and game music preference

Game music preference [a]	**coef.**	**std.err.**	**t**	**p**	**β**
Aggression factor	0.619	0.126	4.930	0.000	0.347
Exploration factor	0.411	0.114	3.610	0.000	0.219
Management factor	-0.188	0.103	-1.830	0.068	-0.100
Caretaking factor	0.117	0.106	1.110	0.269	0.063
Coordinate factor	-0.245	0.103	-2.380	0.018	-0.125
Age	-0.021	0.041	-0.500	0.614	-0.141
Squared Age	0.000	0.001	-0.150	0.881	-0.042
Identifies as a male	0.497	0.185	2.690	0.007	0.144

[a]The model explains 33% of the variance in the game music variable

Although game genres are not well-suited for analyzing player preferences and gaming behavior, we decided to calculate correlations (Spearman's Rho) between the GAIN factors and popular game genres. This was done because in the questionnaire the survey participants had also indicated their basic preference level for several game genres (1=Strongly dislike, 7=Strongly like) and because reporting correlations further describe how the GAIN factors are related to game genre preferences (Table 3).

Next we studied connections between the video game music item and 14-STOMP. In our sample, rock, pop, and soundtracks were the three most liked genres. Female respondents had a higher preference for pop music whereas male respondents enjoyed heavy metal and game music more than females. Game music was the fifth most liked music type among the male sub-sample whereas it was the third least liked genre among female respondents. (Table 4)

The relationship between the validated 14-STOMP inventory and the new game music item we added to the inventory was further studied by making two EFAs, first with the original 14-STOMP and then with the 15 item scale version which included the video game music item. For the 14-item version, the Bartlett test of sphericity resulted in Chi-square=1391, df=91, p=0.000. The Kaiser–Meyer–Olkin (KMO) test for factorability and sampling adequacy for the 14-item version had a value of 0.72 which can be considered as middling. The KMO test measures the proportion of variance among the inventory variables.

Table 3. Correlations (Spearman's Rho) between the GAIN factor scores and game genre preferences. Moderate correlation (over 0.4) are bolded.

	Action	**Adventure**	**Racing**	**Puzzle**	**RPG**	**Strategy**
Aggression	**0.63**	**0.51**	**0.40**	-0.18	**0.50**	0.28
Exploration	**0.42**	**0.51**	0.18	0.10	**0.45**	0.31
Management	0.18	0.22	0.22	0.07	0.26	**0.40**
Caretaking	0.15	0.16	0.12	0.08	0.23	0.12
Coordinate	**0.44**	0.28	**0.66**	-0.05	0.14	0.18

Table 4. Descriptive statistics of the 15-STOMP

N	**175**		**223**		**403**	
Gender	**Male**		**Female**		**Total**	
	Mean	SD	Mean	SD	Mean	SD
Alternative	4.91	1.57	4.89	1.65	4.90	1.61
Blues	4.38	1.30	4.12	1.40	4.24	1.36
Classical	4.35	1.58	4.39	1.70	4.38	1.64
Country	3.73	1.64	4.05	1.65	3.91	1.65
Dance/Electronica	4.61	1.64	4.46	1.76	4.52	1.72
Folk	3.77	1.58	3.80	1.60	3.80	1.59
Heavy Metal	4.23	2.02	3.41	1.98	3.79	2.04
Jazz	4.14	1.49	3.91	1.66	4.03	1.61
Pop	4.88	1.54	5.73	1.11	5.34	1.39
Rap/hip-hop	4.65	1.95	4.39	1.70	4.51	1.81
Religious	2.57	1.54	2.75	1.64	2.67	1.60
Rock	5.48	1.50	5.41	1.47	5.44	1.49
Soul/funk	4.41	1.44	4.42	1.44	4.42	1.44
Soundtracks/theme songs	5.07	1.40	5.35	1.26	5.23	1.33
Video game music	4.68	1.59	3.58	1.65	4.07	1.71

A value of 0.72 means that there was some common variance in the 14-STOMP, but also that making an EFA is still suitable for this inventory. In both EFAs, we used orthogonal rotation (varimax) similarly to the original research in which STOMP was developed [16].

The Parallel Analysis (PA) test suggested a four-factor solution for the original 14-STOMP. The extracted four factors were mostly similar to the validated STOMP factors with the exception of the Soul/Funk item which loaded on *Reflective and Complex* instead of *Energetic and Rhythmic* and Religious which similarly loaded on *Reflective and Complex* instead of *Upbeat and Conventional*. Cronbach's alphas (95% confidence intervals for the alphas) and coefficient omegas for the four 14-STOMP factors were acceptable for *Reflective and Complex* α=0.75 (CI 0.70-0.79) and ω=0.78 as well as for *Intense and Rebellious* α=0.70 (CI 0.65-0.75) and ω=0.72, but low for *Upbeat and Conventional* α=0.48 and *Energetic and Rhythmic* α=0.48. We did not calculate confidence intervals or omegas for *Energetic and Rhythmic* and *Upbeat and Conventional*, because only two items loaded on these dimensions.

We then made another PA test for the 15-item version of the STOMP. The Parallel Analysis (PA) test suggested a six-factor solution and we thus proceeded to extract six factors. Because the purpose of this analysis was to explore all correlations and intercorrelations between the game music item and the STOMP factors, we did not utilize a cut-off criterion. Instead we report below the full factor loading table after a varimax rotation (Table 5).

The game music item loaded on the same factor as soundtracks in the modified 15-STOMP. It is also worth noticing that neither of these two items cross-loaded on other factors which suggests that preference in soundtrack and game music listening might be a standalone dimension of music genre preference. However, the relatively low loading (0.41) and quite high uniqueness (0.69) of the game music variable indicate that listening to game music is also associated with other practices alongside music listening. Something similar is indicated by the results reported in Table 5 about religious music, for instance.

Table 5. Results from the EFA conducted with the 14-STOMP, complemented by the videogame music item. Varimax rotation.

	f1	f2	f3	f4	f5	f6	uniqn.
Blues	**0.76**	0.17	0.17	0.03	-0.03	-0.01	0.36
Jazz	**0.69**	0.05	0.16	0.08	0.16	-0.05	0.46
Soul/funk	**0.66**	0.06	0.00	0.08	0.12	0.09	0.53
Rock	0.14	**0.70**	0.05	0.06	-0.08	0.11	0.46
Heavy Metal	0.07	**0.69**	-0.07	0.04	-0.02	-0.16	0.49
Alternative	0.17	**0.54**	0.11	-0.12	0.23	-0.14	0.58
Folk	0.41	0.05	**0.53**	0.02	-0.03	-0.07	0.54
Country	0.31	-0.06	**0.51**	0.15	-0.09	0.24	0.56
Soundtracks	0.14	0.01	0.11	**0.61**	0.02	0.17	0.57
Video game music	0.00	0.22	0.00	**0.41**	0.19	-0.25	0.69
Rap/hip-hop	0.27	-0.12	-0.18	0.10	**0.49**	0.05	0.63
Dance/Electronica	0.10	0.07	0.02	0.04	**0.45**	0.09	0.78
Pop	-0.02	-0.18	0.03	0.19	0.18	**0.45**	0.70
Religious	0.26	-0.25	0.23	0.29	0.06	-0.13	0.71
Classical	0.37	0.14	0.39	0.34	-0.02	-0.18	0.54

6 Discussion

The objective of this study was to explore the relationship between gameplay activity preferences and game music preferences. It was found that gameplay preferences predict fondness for game music (H1), and that both *Aggression* and *Exploration* are precedents of game music preference whereas a preference for *Coordinate* predicts it negatively (H2). This also suggests that those who like to listen to game music as a music genre may generally enjoy both *Aggression* and *Exploration* more than those who do not like game music very much. We also included age, squared age, and a dummy variable for male gender in the regression model. Male gender identity was associated with game music preference but age or squared age were not. Future research could explore to what extent the effect of gameplay activity type preferences on game music listening preference is mediated by weekly play time and how gaming motives are associated with game music preferences.

Regarding GAIN, our 24-version measured the same five dimensions as the validated 15-GAIN and the more extensive 47-GAIN (see [20]). Our study thus provides support for applying also more extensive versions of GAIN than only the 15-item short version. This may be relevant for future studies which are interested in adopting different GAIN versions based on how relevant specific GAIN items are for their analyses. Also, the new item we developed "Engaging in a battle" showed a high loading on *Aggression* and did not cross-load on *Exploration* similarly to the validation study [20]. However, a new confirmatory factor analysis should be done to validate any alternative GAIN versions. For that purpose, representative survey samples should be collected and analysed.

It was also found that each game genre, except puzzle games, were correlated with more than one GAIN factor. Preference for racing games, for instance, was correlated with both *Coordinate* and *Aggression* which is interesting from the perspective of our study as *Aggression* predicted positively and *Coordinate* negatively a preference for game music. In contrast to this, preference for role-playing games (RPGs) was correlated with preferences for *Aggression* and *Exploration*

both of which were found to be precedents for enjoying game music. These results suggest that game music might be a more constitutive element for RPGs and action games than it is for puzzles and strategy games. Future research could continue to explore these associations and also game music's impact on player retention and product attachment. This insight could aid game developers in making informed decisions about what kind of game music they should add to their game and how it should be linked with specific gameplay activities. Future research should also aim to make a distinction between player preferences for game music during ongoing gaming sessions and in situations external to gaming. It could be studied, for instance, how the designed in-game function of game music may be associated with its uses in other contexts.

Earlier research has shown that preference in *Aggression* predicts a higher player preference in emotions of negative valence (e.g., anger, shock, fear, distress) in gameplay whereas *Exploration* has been argued to be the main precedent for enjoying emotions of positive valence (e.g., pleasure, interest, curiosity, satisfaction) while gaming [21]. This association between the GAIN factors and desire to experience emotions of negative and positive valence in gameplay indicates that the preference for game music may also be associated with game experiences of high arousal. Especially experiencing *Aggression* and thus also negative emotions in gameplay seems to predict a high preference for evoking these experiences by listening to game music also outside gaming situations. Future research should investigate in more detail how emotional game experiences and perhaps compelling game experiences at large predict preference for game music.

Regarding our adaptation of the STOMP, it was found that including a game music item changes the dimensionality of the inventory. Instead of the four-factor solution of the 14-STOMP, our 15-STOMP version consisted of six factors in which game music loaded on the same factor as the item "Soundtracks/theme songs". The clustering together of these styles was a likely outcome in the sense that both represent musical categories defined by extra-musical (multimedia) contexts as well as presumably connoting similar kinds of musical features (for example symphonic instrumental music suitable for emotional scenes). Indeed, one might even consider game music as a "subgenre" of soundtracks. It is, however, noteworthy that by including game music in the inventory, the soundtrack item aligns with it to form a unique dimension of music preference instead of clustering together with country, religious and pop as in the original STOMP. Further studies should investigate whether this factor structure of individual game music/soundtrack dimension holds and whether it would be better defined by musical and psychological attributes or by some other features.

Taken together, the results of this study provided support for the argument that music preferences in general and game music preferences in particular are strongly embedded in cultural practices and activities. A novel finding of this study was that gameplay activity types predicted game music preference in different ways to each other and that the differences were about both the magnitude and the direction of the effect. This finding has both theoretical and practical

implications. From a theory perspective, the study provides empirical support for approaches that emphasize music listening as an experience indistinguishable from its contextual and experiential factors. The notion that *Aggression* and *Exploration* in gameplay predict desire for game music has practical significance as appetite for game music keeps players attached to game products and franchises, which again fuels both player cultures and future consumer behavior.

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