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## *Wirkung: Gebrauchskontexte von Musik und Musikpräferenzen*

# The influence of music and video game preferences on the perceived effects of music while gaming

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## Zusammenfassung

Bisher haben nur wenige Studien die Wirkung von Musik in Videospielen untersucht. Oftmals wurden mögliche moderierende Variable wie die Musik- und Spielgenrepräferenz vernachlässigt. Innerhalb dieser Studie wird unter Berücksichtigung bisheriger Ergebnisse und theoretischer Ansätze der Einfluss dieser Präferenzen auf die Dimensionen *subjektive Wirkung, Konzentrationsbeeinträchtigung* und die Bedeutung der *persönlichen Musikpräferenz* beim Gaming untersucht, welche über einen 146 Items umfassenden Fragebogen mittels einer explorativen Faktorenanalyse konstruiert wurden. Die Ergebnisse zeigen, dass die Präferenz von *Action/Shooter-* und *Geschicklichkeitsspielen* einen Einfluss auf die subjektiv wahrgenommene Wirkung und Konzentration besitzt, sowie, dass keine Unterschiede innerhalb der Skalen in Abhängigkeit von der generellen Musikpräferenz existieren.

## Abstract

Few studies have yet investigated the effect of music in video games on players. In studies found, likely moderating variables such as music and game preferences were often not considered. The following article discusses the findings of a recent study on the influence of music and game preferences on the following dimensions *perceived effects, disturbance of concentration* and the *personal music preference*. These scales were constructed via an explorative factor analysis of a questionnaire consisting of 146 items. The results show that the preference of the game-dimension *Action/Shooter* and *Skill Games* influences the intensity of the perceived effects and concentration, music preferences have no effect on either dimension.

## 1 Introduction

Video games, more specifically, computer and console games are a relatively new topic of research. Considering the impending trend of providing complex and elaborate productions of soundtracks for video games, a rapid increase in musicological interest can be found regarding:

a) the historical development of soundtracks in due consideration of technical innovations (e.g. Collins, 2008a, 2008b; Fritsch, 2013),
b) the analysis of synergies between music industry and game industry (e.g. Bullerjahn, 2011; Kärjä, 2008; Tessler, 2008),
c) the analysis of generically chosen video game soundtracks endeavouring to systematise the functions of music based on theoretical function models of film music (e.g. Chan, 2007; Donnelly, 2014; Kaae, 2008; Lerner, 2014; van Geelen, 2008; Whalen, 2007), and
d) experimental research on the effects of music on emotional and aesthetic gameplay-experience, immersion and performance in specific video games (e.g. Cassidy & McDonald, 2008, 2009, 2010; Lipscomb & Zehnder, 2004; North & Hargreaves, 1999; von Georgi et al., 2010; Wharton & Collins, 2011).

Existing studies on the effects of music on the gameplay-experience, immersion and performance were able to determine that music seems to influence these variables during gameplay to a certain extent; however, their research concepts disclose certain methodological and theoretical weaknesses. These studies often focus on the analysis of experimenter-selected music; as a result, the effects of original soundtracks and game-external music cannot be compared. This is important since most interactive games provide the option to regulate the music and sound as well as to integrate personal playlists. General conclusions on the varying functions and effects of music in relation to different video game genres also cannot be made with their data, as video game case studies are not representative for a whole genre. In addition, game soundtrack designs are influenced by the complexity of narration, interactivity and the virtual environment of a game. Therefore, it is not possible to assign any typical, intended effects of music to game genres, because games, which are dedicated to a specific genre, can vary in complexity, narration and design of virtual environment. Finally, past research has not taken moderating variables on the subjective perception of gameplay experience such as music and game preferences, personality or gaming expertise into account.

For these reasons, this study investigates the influence of general music and videogame genre preferences as well as of personal music preference (during gameplay) on the subjective perception of immersion, motivation, arousal and concentration while gaming.

### *1.1 Models of dynamic soundtracks*

The design of game soundtracks depends mainly on interactivity (Summers, 2011), complexity of narration (Bullerjahn, 2011; Munday, 2007) and the vir-

tual environment of games (Summers, 2011). Then again, the level of interaction between player and game as well as the virtual environment determine the style and genre of music and the intended effects of a soundtrack (Summers, 2011). The style and function of the game soundtrack depends on the complexity of narration of a game (Bullerjahn, 2011; Munday, 2007). Therefore, soundtracks of games with complex cinematic narration such as role-playing or strategy games are often dynamic and composed in the style of traditional Hollywood film music. These soundtracks fulfil different functions such as guidance through the virtual world or creating atmosphere (Jørgensen, 2008).

To gather and categorise different functions and possible effects of video game soundtracks, many authors (e.g. Berndt, 2013; Bullerjahn, 2011; Collins, 2007, 2008a, 2008b; Zehnder & Lipscomb, 2006) based their theories on models used for film music. In 2011, Bullerjahn applied her theoretical model developed for film music (2001) to game-soundtracks and classified intended functions of music in the metafunctions *perceptual-psychological* and *economic functions* as well as *functions in a narrower sense (dramaturgical, epic/narrative, structural, persuasive)* (Bullerjahn, 2011). Like Karen Collins (2007), Bullerjahn stresses the interactivity of games in contrast to films (Bullerjahn, 2011). In this context, Munday (2007) refers to three central functions of game music: the perception of virtual environment, the narration of the game and immersion, dividing the latter in mythic and cognitive immersion (Munday, 2007). This discrimination of different types of immersion can be compared to the differentiation made by Sean M. Zehnder and Scott D. Lipscomb (2006) who distinguish between *psychological* and *perceptual immersion*. Sander Huiberts (2010) differentiates, alternatively, between *sensory, challenged-based* and *imaginative immersion* based on the concept developed by Laura Ermi and Frans Mäyrä (2005). Even though there is no generally accepted definition of immersion, the diverse concepts of immersion summarise various functions of film music and game music respectively. Hence, immersion seems to be a meta-function, which combines motivation, attention and concentration, orientation in the game world, emotional involvement and identification with the own avatar or fraction. Based on these theoretical models of intended effects of game soundtracks, music seems important to modulate the gameplay experience. Few empirical studies have yet investigated possible effects of game music.

## 1.2 Existing Studies

Studies on the effect of music while gaming focus most often on the emotional and aesthetic experience, immersion, performance and the evocation of fear, anxiety and aggression. Only few studies have investigated the musical game design and the individual usage of music while gaming. Zehnder and Lipscomb (2006) analysed 159 games released between 1985 and 2004 to categorise the usage of popular music and the player-regulation-functions in meta-genres. In *Racing/Driving* and *Simulation Games*, volume and sound can be regulated more often than in *Role-Playing* and *Action/Adventure Games*. Popular music is used

more frequently in *racing/driving* and in *sport games* than in *action/adventure games*. However, their systematisation of the various genres in meta-genres is problematic considering that the meta-genres used were not based on an empirical analysis but rather a result of the researchers' personal views.

Rhianna Pratchett (2005) established in her study that more than 70 percent of 3,500 subjects listen to TV, radio or self-selected music while gaming. In 2008, Gianna Cassidy and Raymond McDonald (2008) questioned 130 adolescents on their usage of music when playing video games. Eighty-one percent considered the individual selection of music very important, whereas 94 percent remarked that this depended on the video game genre played. Self-selected music was described as less distracting. These descriptive studies clearly show that listening to individual selected music while playing a specific video game could be particularly significant for the subjective game experience.

Alexander Wharton and Karen Collins (2011) investigated the gameplay experience of 15 volunteers and the usage of music in regard to listening to self-selected music and its influence on the gaming experience while playing *Fallout 3: Operation Anchorage* (Bethesda Games Studio, 2009). The research participants were able to decide at every game checkpoint, to which music they wanted to listen. The gaming experience was measured by protocols of verbalized opinions and questions at each checkpoint. Some subjects playing without music perceived this as less concentration-distracting allowing for greater and a more realistic immersion. Other subjects described the situation as mechanical. According to Wharton and Collins, the subjective perception of the gaming experience with or without music mainly depends on the player's level of expertise. Furthermore, the authors stated that most of the subjects were not able to evaluate which music increases immersion and joy while gaming. Despite the interesting findings, this study has several methodological flaws. Firstly, it is not clearly stated how long the subjects played between checkpoints. Secondly, detailed information on subjects' level of gaming expertise was not imparted. Thirdly, the motivation and functions of the self-selection of music remain unclear. However, their analysis of subjective perceptions provides valuable information on the varied uses of music and its different effects on the gaming experience.

The study conducted by Cassidy and McDonald (2009, 2010) focuses on the effect of music on the performance in the racing game *Project Gotham Racing*. They also investigated the different effects of experimenter-selected and self-selected music on the gaming experience. The results show that racing with self-selected music leads to an overestimation of time passed and the number of collisions experienced, even though the music actually has a positive effect on both variables. Conversely, experimenter-selected music appears to lead to a poorer gaming performance and a less enjoyable gaming experience.

While these studies attempt to examine the importance of self-selected music, they often ignore the effects of the original soundtrack on the overall gaming experience. Two researchers who recognize the importance of original soundtracks are, however, Zehnder and Lipscomb (2006). In their study, they focussed on the role of the soundtrack music for immersion and the aesthetic perception in the role-playing game *The Lord of the Rings – The Two Towers*

played by the participants for two minutes. Bearing in mind that immersion is a time-based process, the level of immersion participants can reach in this short time must be questioned (Brown & Cairns, 2004). Nevertheless, Zehnder and Lipscomb determined differences between gaming with and without soundtrack in the experience variables "colorful", "dangerous", "relaxed" and "simple". Interestingly enough, Zehnder and Lipscomb interpret their findings in terms of an intensification of the aesthetic and emotional experience through music. In this context, Huiberts (2010) also investigated the by gamers perceived influence of music on immersion via qualitative interviews and found that music rich in detail intensifies the *sensory immersion*, fast and stimulating music intensifies the *challenged-based immersion* and emotion-evocative music the *imaginative immersion.*

Overall, these studies confirm that music generally does have an effect on the experience and performance in gaming situations. However, only very few studies actually consider possible moderating variables such as music preferences while gaming to a certain extent. A reliable statement about the usage respectively the role of self-selected music based on their findings cannot thus be made. Furthermore, the relation between general music preferences and game genre played still remains unclear, since the study results each apply only to the specific game investigated.

## *1.3 Hypotheses and explorative questions*

An empirically based questionnaire on the cognitive and aesthetic-emotional effect of music while gaming that could be used to analyse differences in the subjective perception of music contingent on individual music and game preferences had yet to be developed. As part of this research project, an item pool of 146 questions about the perception and reception of music while gaming was generated. Explorative factor analyses (varimax-rotation) yielded four scales, which were then tested and validated in two pilot studies. This resulting psychometric inventory has been labelled *Computer and Music Questionnaire (CamQ)*[1] and encompasses the following scales (Bötsch, 2014):

a) *Perceived effects* (10 items) ($\alpha = .93$) containing items on motivation, immersion and arousal, for example: "Music in videogames motivates me" or "With the adequate music, I feel more immersed in game".
b) *Disturbance of concentration* (10 Items) ($\alpha = .89$) consisting of items on the influence of music on the concentration and performance while gaming, for example: "I am able to concentrate better on the gameplay, when there is no music" or "I play better, when I am not listening to music".
c) *Personal music preferences* (10 items) ($\alpha = .90$) encompassing items on the use and function of self-selected music on mood such as "When I am gaming,

1 The development and improvement of this inventory is still in progress and further publications are planned. The item pool and questionnaire as well as detailed results of factor and scale analyses can be provided on request.

I rather listen to my own music" and "I choose music depending on my mood while gaming".

d) *Game-external relevance of soundtracks* (8 items) ($\alpha = .85$) containing items on the everyday use of soundtracks, for example "I would buy a CD of the game's soundtrack" or "My music preferences have changed through listening to soundtracks of games" (see Bötsch, 2014, pp. 60–123).

Based on the results of the existing studies, their conceptual weaknesses and existing theories (c.f. chapter 1.1 and 1.2) as well as the results of the above-mentioned pilot studies, the following hypotheses were formulated:

H1 If games with a complex cinematic narration are preferred by the gamer, the music and its effect are perceived more intensively.

H1a If games of the dimension *Action/Shooter* are preferred, then the music and its effect are perceived more intensely and not viewed as distractors to concentration.

H1b If games of the dimension *Strategy/Simulation* are preferred, then music and its effect are perceived more intensely and not viewed as distracting concentration.

Bearing in mind that video game genres cannot be tagged with a typical music genre or style, the following hypothesis is to be tested:

H2 If the gamer is free to choose his or her preferred music (including the specific soundtrack or no music) to regulate the subjectively perceived emotional, aesthetic and cognitive effect of music, the gamer will perceive a more intensely effect on motivation, immersion and arousal as well as no negative effect of the music on his/her concentration.

In addition, the following explorative questions were formulated:

Question 1: Does the game genre preference influence the importance of the self-selected of music?

Question 2: Does game preferences influence the music preferences?

## 2 Method

### *2.1 Sample*

The majority of subjects in our study were students of the Justus-Liebig-University Giessen and studying music education and musicology. The sample was composed totally of 108 female and 92 male subjects with an average age of 24.2 (SD = 4.9, Md = 23, Mo = 22, min = 18, max = 48) and average gaming experience of 8.5 years (N = 198, SD = 5.6, Md = 10, Mo = 10, min = 0, max = 24). In reference to the music preference dimensions developed by Peter J. Rentfrow and Samuel D. Gosling (2003), most of the test persons, regardless of their gender, preferred music of the preference dimension *Intense/Rebellious* (see

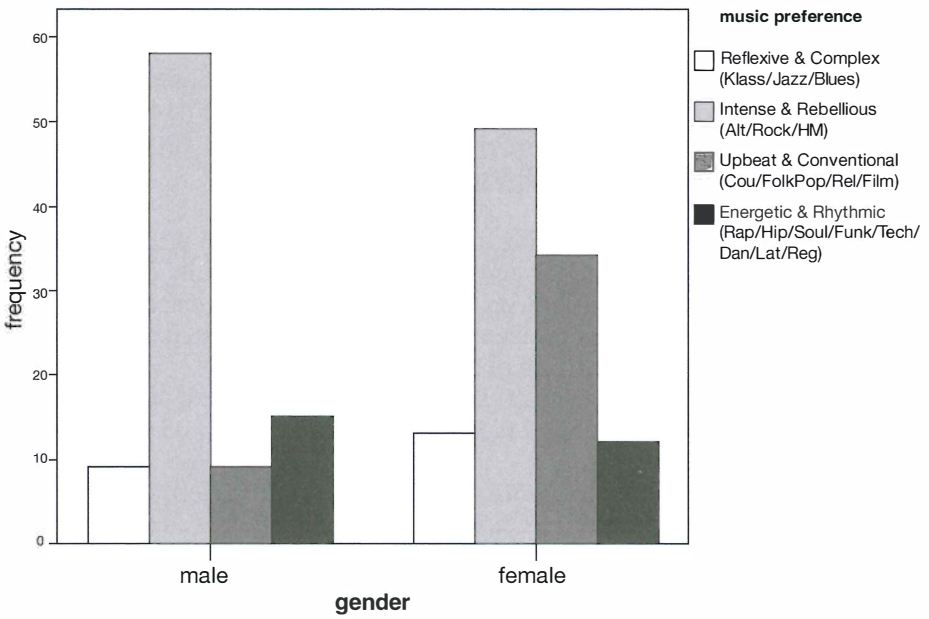


**Fig. 1:**
Music preferences by gender

Figure 1). Contrary to the men in our sample, the women surveyed also favoured *Upbeat/Conventional*.

The sample contained no subjects who preferred the game genres *Horror, Economy Simulation* and *Military Flight Simulation Games.* The men surveyed favoured *Role-Playing, Strategy* and *Ego-Shooter Games*, the women *Jump'n'Run* and *Thinking/Tossing Games.* While the male subjects were generally more inclined to play games of the dimension *Action/Shooter* and *Strategy/Simulation*, female subjects declared a preference in dimensions *Strategy/Simulation, Skill Games* and *Parlour Games* (see Figure 2).

## 2.2 Procedure and measurement of music and video game genre preference

The test persons were initially asked to complete the psychometric inventory *CamQ* for perceived effect of music while gaming (cf. chapter 1.3 Hypotheses and explorative questions). Participants also completed Rentfrow and Gosling's *Short Test of Musical Preferences* (2003). The subjects were asked to choose one of the 16 musical genres listed in the test to describe their music preference. These genres were categorized into following dimensions: *Reflexive/Complex* (Blues, Jazz, Classic), *Intense/Rebellious* (Heavy Metal, Rock Alternative), *Up-*

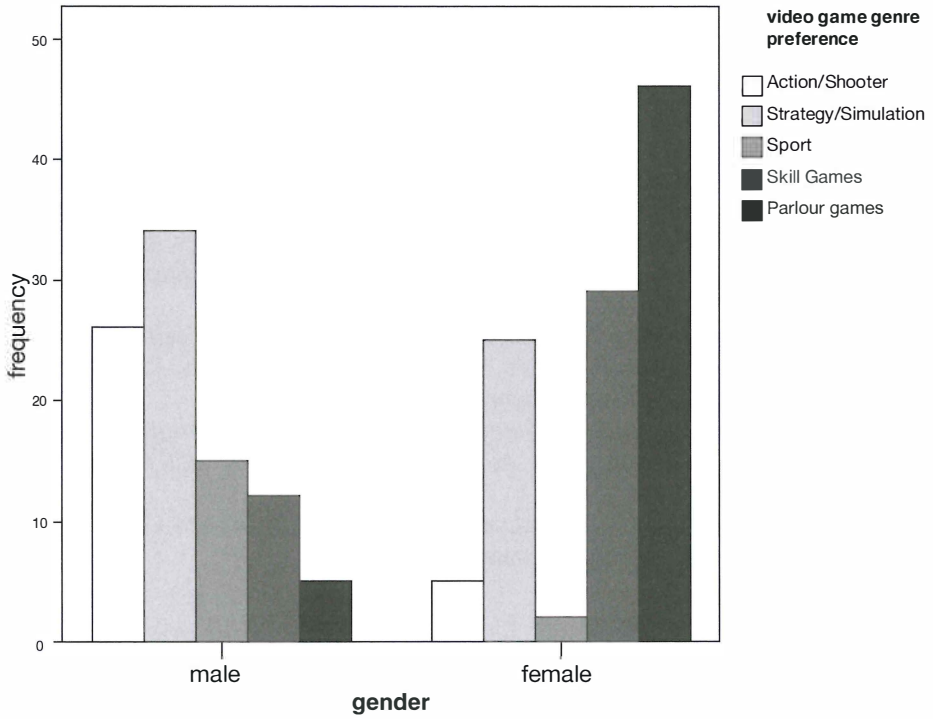


**Fig. 2:**
Video game genre preferences by gender

*beat/Conventional* (Pop, Soundtracks, Religious, Country/Western) and *Energetic/Rhythmic* (Rap/Hip-Hop, Soul/R'n'B, Techno/Dance, Latin/Reggae).

Finally, the participants were asked to state their most preferred game genre out of 30 genres listed and to rate all game genres on the basis of a five point Likert scale ranging from dislike (1) to like (5) as well. These genres were selected based on the game genre list of the USK (2015) and their listed subgenres, the pc games database (2015) as well as Wikipedia (http://de.wikipedia.org/wiki/Genre_%28Computerspiele%29) and PC Games (2014).

Initial exploratory factor and scale analyses led to the five genre dimensions which will be described in chapter 3.1.

## 2.3 Statistical analysis

The hypotheses were tested using correlation, regression and multivariate variance analyses. The explorative questions were tested by correlation, multiple regression and logistic regression analyses. Significance level was set at .05.

# 3 Results

## 3.1 Genre dimensions of game preferences

The explorative factor and scale analysis of the preferred single game genres yielded the following genre dimensions (for details see Bötsch, 2014) which were used in further analyses:

a) *Action/Shooter* ($\alpha = .90$) containing *Ego-Shooter Multiplayer, Ego-Shooter Single, Action Games, Tactic Shooter, Horror, Action-Adventures, Beating Games*.
b) *Strategy/Simulation* ($\alpha = .81$) encompassing *Economy Simulation, Building Games, Strategy, Military Flight Simulation, Space Action, Role-Playing Games, Online Role-Playing Games, Simulation.*
c) *Sport* ($\alpha = .82$) including *Sport Single, Sport Team, Craft Simulation, Racing*.
d) *Skill Games* ($\alpha = .76$) containing *Adventure, Point'n'Click, Skill Games, Music Games*.
e) *Parlour Games* ($\alpha = .84$) encompassing *Card Games, Board Games, Quiz Games* and *Thinking/Tossing Games*.

## 3.2 Correlation between video game genre preferences and CamQ-scales

The correlation and regression analyses conducted show relevant correlations between the *CamQ*-scales *perceived effects, game-external relevance of soundtracks* and video game genre preference-dimensions *Action/Shooter* and *Strategy/Simulation.* A negative correlation between the scale *disturbance of concentration* and the dimension *Action/Shooter* was determined. However, no significant correlation was established between the scale *disturbance of concentration* and the dimension *Strategy/Simulation.* Nevertheless, a significant correlation between the dimension *Skill Games* and *perceived effects* and *game-external relevance of soundtracks* was found (see Table 1).

These results were partly validated by the regression analysis. The regression model for the scale *perceived effect* explains 28.9 percent of variance with an effect-size of $f^2 = .406$. Considering the different predictors, a significant regression of this scale through the preference of the genre-dimension was established for the dimensions *Action/Shooter* and *Skill Games* (see Table 2).

The regression model for *disturbance of concentration* explains 5.6 percent of the variance and tend to be significant with $p = .067$. Specific predictors show a slight negative effect regarding the preference for *Action/Shooter* games on the *disturbance of concentration* (see Table 3).

The regression model for the scale *personal music preferences* proved not to be statistically significant with $p = .253$, even though the predictor *Action/Shooter* has a significant negative effect on this scale ($p = .039$) (see Table 4).

**Tab. 1:**
Correlation analysis of the *CamQ*-scales and the dimensions of game genre preferences

| Scale | Perceived effect | Disturbance of concentration | Personal music preferences | Game-external relevance |
|---|---|---|---|---|
| Action/ Shooter | .481*** | –.186* | –.120 | .452 *** |
| Strategy/ Simulation | .316*** | –.120 | –.009 | .326 *** |
| Sport | .041 | .046 | .087 | –.024 |
| Skill Games | .238*** | –.104 | .075 | .208 ** |
| Parlour Games | –.098 | .047 | .063 | –.099 |

*Notes:* $*p \leq .05$; $**p \leq .01$; $***p \leq .001$; *n* min 186, max 191

**Tab. 2:**
Regression of the *CamQ*-scale *subjectively perceived effects* by dimensions of game genre preferences

| Measure | Scale | perceived effects | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | $\beta$ | *t* | *p* | *B* | *SE* | $C.i._l$ | $C.i._u$ |
| Genre | Action/ Shooter | .414 | 5.339 | .001 | .419 | .079 | .264 | .574 |
| | Strategy/ Simulation | .108 | 1.366 | .174 | .122 | .090 | –.054 | .299 |
| | Sport | –.116 | –1.625 | .106 | –.165 | .102 | –.366 | .035 |
| | Skill Games | .183 | 2.421 | .017 | .322 | .133 | .059 | .584 |
| | Parlour Games | –1.131 | –1.743 | .083 | –.237 | .136 | –.506 | .031 |
| Regress | *R* | | | | .538 | | | |
| | $R^2$ | | | | .289 | | | |
| | $R^2_k$ | | | | .269 | | | |
| | *df* | | | | 5/178 | | | |
| | *F* | | | | 14.482 | | | |
| | *p* | | | | .001 | | | |
| | *n* | | | | 183 | | | |

*Notes:* $\beta$: standardized Beta; *t*: t-value; *p*: Significance; *B*: not standardized Beta; *SE*: standard error; $C.i._l$ = lower confidence bound (confidence level = 95 %); $C.i._u$ = upper confidence bound; *R*: multiple regression coefficient; $R^2$: multiple squared regression coefficient; $R^2_k$: adjusted multiple squared regression coefficient; *df*: degrees of freedom; *F*: F-value; $f^2$ =.406

**Tab. 3:**
Regression of the *CamQ*-scale *disturbance of concentration* by dimensions of game preferences

| Measure | Scale | disturbance of concentration | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | *β* | *t* | *p* | *B* | *SE* | $C.i._l$ | $C.i._u$ |
| Genre | Action/ Shooter | –.167 | –1.886 | .061 | –.135 | .071 | –.275 | .006 |
| | Strategy/ Simulation | –.056 | –.614 | .540 | –.049 | .080 | –.207 | .109 |
| | Sport | .123 | 1.502 | .135 | .137 | .091 | –.043 | .317 |
| | Skill Games | –.098 | –1.116 | .266 | –.136 | .122 | –.377 | .105 |
| | Parlour Games | .053 | .608 | .544 | .075 | .124 | –.170 | .320 |
| Regress | *R* | | | | .238 | | | |
| | $R^2$ | | | | .056 | | | |
| | $R^2_k$ | | | | .030 | | | |
| | *df* | | | | 5/176 | | | |
| | *F* | | | | 2.107 | | | |
| | *p* | | | | .067 | | | |
| | *n* | | | | 181 | | | |

*Notes:* *β*: standardized Beta; *t*: t-value; *p*: Significance; *B*: not standardized Beta; *SE*: standard error; $C.i._l$ = lower confidence bound (confidence level = 95 %); $C.i._u$ = upper confidence bound; *R*: multiple regression coefficient; $R^2$: multiple squared regression coefficient; $R^2_k$: adjusted multiple squared regression coefficient; *df*: degrees of freedom; *F*: F-value; $f^2$ =.059

## 3.3 Deviations in the perceived emotional-aesthetic and cognitive effects dependent on music preferences

As Table 5 shows, the overall multivariate variance test is not statistically significant with $p = .402$. Nevertheless, it should be noted that a slight significant difference was determined regarding *game-external relevance of soundtracks* in correlation to musical preferences. The greatest divergence exists between the subjects preferring *Upbeat/Conventional* and those favouring *Intense/Rebellious* (see Table 5).

**Tab. 4:**
Regression of the *CamQ*-scale *personal music preferences* by dimensions of game genre preferences

| Measure | Scale | personal music preferences | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | *β* | *t* | *p* | *B* | *SE* | $C.i._l$ | $C.i._u$ |
| Genre | Action/ Shooter | –.186 | –2.084 | .039 | –.175 | .084 | –.340 | –.009 |
| | Strategy/ Simulation | .022 | .246 | .806 | .023 | .095 | –.164 | .211 |
| | Sport | .125 | 1.519 | .131 | .164 | .108 | –.049 | .377 |
| | Skill Games | .082 | .931 | .353 | .134 | .143 | –.149 | .416 |
| | Parlour Games | –.045 | –.518 | .605 | –.076 | .146 | –.364 | .213 |
| Regress | *R* | | | | .189 | | | |
| | $R^2$ | | | | .036 | | | |
| | $R^2_k$ | | | | .009 | | | |
| | *df* | | | | 5/180 | | | |
| | *F* | | | | 1.331 | | | |
| | *p* | | | | .253 | | | |
| | *n* | | | | 186 | | | |

*Notes:* *β*: standardized Beta; *t*: t-value; *p*: Significance; *B*: not standardized Beta; *SE*: standard error; $C.i._l$ = lower confidence bound (confidence level = 95 %); $C.i._u$ = upper confidence bound; *R*: multiple regression coefficient; $R^2$: multiple squared regression coefficient; $R^2_k$: adjusted multiple squared regression coefficient; *df*: degrees of freedom; *F*: F-value; $f^2 = .15$

## 3.4 Relationship between video game preferences and music preferences

To test a relationship between the video game preferences and music preferences, a logistic regression analysis was used. Due to the nominal scale of the variable "music preferences", it logistic regression could only be tested in relation to the video game preferences. The regression indicated a significant likelihood ratio ($p[Chi^2 = 3.476$; $df = 15] = .010$). In general, the predictors explain a variation of 16.5 percent (Nagelkerkes $R^2 = .165$). The results denotes that preference of *Action/Shooter* has an effect on the preference of *Intense/Rebellious* ($p[\text{Wald} = 5.716$; $df = 1) = .017$. In 92 percent of the cases, subjects preferring *Action/Shooter*-Games also prefer music of the dimension *Intense/Rebellious* (Backhaus, Erichson, Plinke & Weiber, 2013, pp. 249–302).

**Tab. 5:**
Mean differences in the *CamQ*-scales depending on music genre preferences

| Test | *p* (MANOVA) | Scale | *p* (ANOVA) | PRF | | | | |
|---|---|---|---|---|---|---|---|---|
| CamQ | PFR | | **PFR** | **R/C** | **I/R** | **U/C** | **E/R** |
| | | perceived effects | .599 | 27.60 | 29.24 | 27.92 | 3.97 |
| | | disturbance of concentration | .552 | 22.00 | 2.27 | 21.72 | 21.59 |
| | .402 | personal music preference | .976 | 24.70 | 25.39 | 24.74 | 25.21 |
| | | Game-external relevance of soundtracks | .056 | 14.85 | 15.19 | 12.10 | 13.85 |

*Notes:* MANOVA: multivariate variance analysis; ANOVA: univariate variance analysis; *p*: significance level (Pillai's trace); *CamQ*: *Computer and Music Questionnaire*; PRF: music preference; R/C: mean-value for *Reflexive/Complex*; I/R: mean-value for *Intense/Rebellious*; U/C: mean-value for *Upbeat/Conventional*; E/R: mean values for *Energetic/Rhythmic*

# 4 Discussion

## *4.1 Conclusion of the results*

In the course of our analysis, we verified the following hypothesis:

H1a If games of the dimension *Action/Shooter* are preferred, then the music and its effect are perceived more intensely and not viewed as distractors to concentration.

H2 If the gamer is free to choose his or her preferred music (including the specific soundtrack or no music) to regulate the subjectively perceived emotional, aesthetic and cognitive effect of music, the gamer will perceive a more intensely effect on motivation, immersion and arousal as well as no negative effect of the music on his/her concentration.

The following hypothesis was disproven:

H1b If games of the dimension *Strategy/Simulation* are preferred, then music and its effect are perceived more intensely and not viewed as distracting concentration.

Regarding the explorative questions, we found no statistical significant influence of the game genre preferences and the importance of the personal music preferences while gaming. However, the preference of *Action/Shooter* games appears to influence the preference for *Intense/Rebellious* music genres.

## 4.2 Study design, used sample and measured variables

Before discussing the various findings, it is important to bear the following methodological limitations of our study in mind. To begin with, it should be noted that the homogeneity of our sample (i.e. age, schooling) could possibly have had a significant effect on their answers concerning the influence of music on the gaming experience. Due to the sample's homogeneity it is also not possible to form statements about the general perceived effect and usage of music while gaming. Future studies should consider different age groups for testing the role of different levels of music usage, media socialisation and development of preferences and personality.

This study also did not distinguish between preferences for computer, console or phone games. Subsequently, it is not possible to test for differences in the perceived effect and use of music while gaming dependent on such preferences. Especially with regard to phone games, which can be played in the public, the function of music is likely to differ. Furthermore, this study did not differentiate between the preferences of gaming with the original soundtrack, no music or self-selected music. Only the *CamQ*-scale *personal music preferences* reflects the functions the preferred music plays while gaming.

Moreover, for testing music preferences mandatory choice items were used instead of the initial Likert scale. On the one hand, it allowed for a straight forward assignment to the preferred genre and therefore, the dimension to which they belonged. On the other hand, this method does not account for subjects who liked different genres to different degrees, thus information was lost. Nevertheless, the subjects were asked to rate their preferences of the selected video game genres to gather data on video game genre preferences, thus, emphasising subjective aspect of their assessed preferences.

Defining genre categories for video games is similarly difficult as those of music and very much shaped by economical interest of the respective industries. As the inter-correlation showed, all categories are linked to the others, with the exception of *Parlour Games*. A systematisation is essential for future studies, by means of either an empirically validated test or a good theoretical concept which circumnavigate the problem of the genre-term. Summers (2011), Munday (2007) and Bullerjahn (2011) attempted to develop a concept that relinquishes media controlled genre ascription. Summers developed a model for avoiding typical genre ascription based on Mark J. P. Wolf's model of interactive genre (Wolf, 2005; Summers, 2011). His differentiation between *interactive* and *environmental* genre shows promise as a productive concept; yet, it lacks a definition of interactivity as well as systematisation of environmental genres. Similar to Summer's concept, although differing in detail, are the models developed by Munday (2007) and Bullerjahn (2011). Bullerjahn differentiates game genres using the categories "complex cinematic narration", "simple non-cinematic narration" and "complex narration in reality simulating environments" seems to be a concept suitable to avoid the dilemma of commercial genre-ascription through the media. However, she does not clear identify the criteria necessary to deem the game-narration as complex, cinematic or reality simulating. Depending on

the player's capacity to influence and possibly change the game-narration, the complexity of video games continues to increase. Therefore, a detailed theoretical systematisation of video game genres rapidly becomes more essential for research of specific video game preferences.

## 4.3 Interpretation of the results

Taking the methodological limitations discussed above into account, the given results may be interpreted as follows:

### 4.3.1 Video game genre preference and scales

The data analysis determined a significant influence of the game dimension preferences *Action/Shooter* and *Skill Games* on the scale *perceived effects* of music. In other words, if the dimensional categories *Action/Shooter* or *Skill Games* are preferred, the subjective effects of music while gaming are perceived more intensely. This outcome confirms the theoretical and closed-form functions of dynamic soundtracks, which can be found in games with complex cinematic narration. *Action/Shooter* and *Skill Games* belong to the category of games with complex (cinematic) narration, in which the music fulfils the function of orientation within a game-world, the function of creating atmosphere, thus, promoting immersion and increasing arousal and motivation. The significant effect of these genre dimension preferences on the scale *perceived effects* can be traced back to items regarding atmosphere and immersion, motivation and arousal. In the genre *Survival/Horror*, which due to its main objective of killing and surviving is comparable to the dimension *Action/Shooter*, music has the primary function of giving signals for orientation. Further functions include increasing arousal and motivation by the so-called safety-danger-binarity (Whalen, 2004). Especially in *Skill Games*, the musical function of motivation and arousal is important. For example, the music indicates that time is running out by getting faster in *Jump'n'Run-Games*. Typical winning or losing motives can increase the motivation for improving skills or continuing on to the next level. Another aspect worth mentioning is that the dimension *Skill Games* includes Music-Games. This might have an influence on the verified effect of this game preference dimension on the scale *perceived effects*. In music games, for example, *SingStar* (Sony Computer Entertainment, 2004) or *GuitarHero* (RedOctane, 2005), the player receives a direct performance feedback, which can increase the motivation of improving skills.

Surprisingly, there is no influence of a video game preference for *Strategy/Simulation* on *perceived effects* of music. Guidance is most often one important function of music in the virtual world, by introducing, for example, leitmotifs for specific areas, groups or individuals in the virtual world such as in the popular massively multi player online role playing game (MMORPG) *World of Warcraft* (Blizzard Entertainment, 2014). However, this dimension often consists of interactive games with complex (cinematic) narration, this genre dimension

is most likely too heterogeneous to find a significant perceived effect of music. It combines *Strategy* and *Simulation Games*, which can be different in narration, complexity and interaction. The functions of music of the applied genres and styles of these two sub-dimensions differ greatly, in part. While music in traditional Hollywood film style is often applied in *Strategy Games*, popular music is used in *Simulation Games*; therefore music fulfils different functions (Bullerjahn, 2011).

Furthermore, our findings verify that the preference for *Action/Shooter* tend to have a statistically significant influence on the perception of music as *disturbing concentration.* A more differentiated measurement of genre-dimensions might show a higher probability of music in *Action/Shooter* being important for concentrating on the gameplay. This indication most likely pertains to the frequent musical signal-function, which directs the attention (e.g. Berndt, 2013; Jørgensen, 2008).

### 4.3.2 Music preferences

No significant differences in the perceived effects of music and disturbance of concentration by music were found in relation to music preferences. As described above in the $H_2$, this can be traced back to a wide variety of the music-selection on the one hand, of the game-developers and the individual player on the other hand. Some authors such as Summers (2011) and Pieter Jacobus Crathrone (2010) attempted to categorise the musical genres and styles used in games based on video game genres. It seems logical that a link between these components of a game should exist assuming so-called hard music, such as hard rock or metal, mirrors the violent narration of certain games best. However, as mentioned above, not simply the narration, but also the complexity of game-narration as well as the design of the virtual environment influence the selection, production and arrangement of music. Although commonalities between games of the same interactive genre exist, they can differ greatly in the dimension of environmental genres. Therefore, practically every musical style or genre can be used by the game developers depending on the virtual environment, which is complemented by appropriate music. The player can also choose the music he/she would like to listen to while gaming. Most games have a user-defined regulation of music and sound as a option. The player is allowed to play with the original soundtrack, no music or self-selected music. This great variety of possibilities could be responsible for a lack of significant results.

Furthermore, the linear regression model for the role of personally selected music also indicated no effects on game genre preferences. This could be explained by players' lack of ability to appraise the role of music for immersion or enjoyment (Wharton & Collins, 2011). It could also be the result of a methodological limitation of this study: the difficulties of genre ascription discussed earlier and the given fragmentary theoretical alternatives lead us to categorise using "typical" genres. Moreover, in the study we did not differentiate between the general preference of soundtrack and self-selected music including no music

while gaming at all. Pratchett (2005) also implied that the self-selected music appeared to be more common among their test subjects when playing *Parlour Games*. Finally, the individual music selection could be influenced by the level of experience with a particular game or games in general. If a player knows a game and therefore its music well, the choice of self-selected music is more likely. A closer look at these variables is needed in future studies.

### 4.3.3 Coherence of music and game preferences

Following existing studies on personality and music preferences (e.g. Cattell & Anderson, 1953; Rentfrow & Gosling, 2003; Zweigenhaft, 2008) and game-genre preferences (e.g. Zammitoo, 2010), we assessed our data as to whether music preferences are influenced by video game genre preferences. The multiple logistic regression analysis only indicated a correlation between the game preference dimension *Action/Shooter* and the music preference dimension *Intense/Rebellious*. This was unexpected considering that other studies had verified additional correlations: Marc Delsing et al. (2008), for example, confirmed a negative correlation between *Intense/Rebellious* and extraversion; Nicole Peever, Daniel Johnson, and John Gardner (2012) also determined a negative correlation of extraversion with role-playing games, MMORPGs, action role playing games, turn-based strategy and real-time strategy games. It is possible that personality is a mutually moderating variable of preferences. Nevertheless, a comparison with other studies is difficult considering the lack of standardised tests for measuring video game preferences.

## 5 Conclusion

Overall, it could be determined that video game genre preferences have an influence on the perceived effects of immersion, motivation, arousal and concentration. We found no indication of discrepancies between the perceived effects of music on these variables influenced by musical preferences, which might be due to the wide variety of soundtrack design and self-selection possibilities. Further research is necessary to investigate individual usage of music while gaming and the correlation between game and music genre preferences as well as game expertise. Experimental research following Wharton and Collins's study (2011) are needed in particular to evaluate a possible game experience modulating effect of music. Additionally, other potential moderating variables such as personality, expertise with videogames and music should be examined. On the theoretical level, research requires in general comprehensive models for video game genre ascription, systematisation of the construct immersion and more empirical research on the functions of interactive soundtracks.

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