

Faster, Harder? Investigating the Impact of Changing Background Music Speed on Gameplay Performance and Player Experience in an Endless Runner Game

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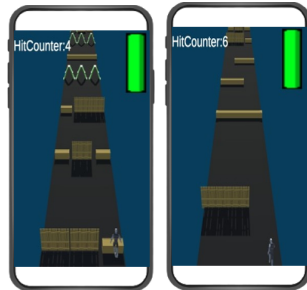


Fig. 1. Gameplay of City Escape. On the left, the player jumps over an obstacle by swiping up on the smartphone. On the right, the player evades the obstacle by switching lanes by swiping to the right.

Music is ubiquitous in our everyday lives and its tempo can affect our experience and behavior, be it in movies to emphasize a scene, during sports to increase the flow of a workout, or in games to complement the gameplay. While the impact of fixed beats per minute on the latter has already been investigated, we focus on the effect of continuously increasing or decreasing beats per minute of background music during gameplay in an endless runner game on player performance, perceived difficulty and player experience. In our within-subjects design study ($n=32$), participants played an endless runner game with continuously increasing, decreasing, or constant and no background music. While we found no significant effects in terms of player performance, our findings show that perceived stress, motivation and entertainment were affected by the different music conditions.

CCS Concepts: • **Human-centered computing** → *Empirical studies in HCI*; **Auditory feedback**.

Additional Key Words and Phrases: background music, games, bpm

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1 INTRODUCTION AND RELATED WORK

Music is part of our everyday life and changing its tempo may affect performance and experience in sports [12, 26], shopping flow in stores [17], driving accuracy [4] or cognitive task performances [3, 9, 23]. Thus, it is not surprising that audio plays an important role for the success of digital games as well [28]. It may contribute to the atmosphere of the game [20] and can affect a player's emotional state, as well as enhance their level of immersion and flow [19]. In games like Doom [25] or Tetris [11], past research has associated changes in background music with changes in the performance of players. But also the player experience can be influenced by music in video games [13, 20–22]. For instance, participants performed better when having background music compared to no background music in an exergame [16] or in the popular shooter game DOOM [25]. But the mere presence of music is not the only aspect that may influence player performance. In case of Tony Hawk's [8] or racing games [6], players performed better with their favourite music as opposed to experimenter selected music. Besides, not only the performance is affected by music, but also the player experience. A study shows more enjoyment, and more prevalence of positive emotions when background music was present compared to its absence in horror games or Assassin's Creed [13]. In addition, background music can affect the sense of time passing and immersion in 3D maze games when compared to no music [22].

Besides investigating background music as a whole, past research has focused on specific factors to explain why and how background music affects performance and player experience in games. A relevant factor in this regard is music tempo—it has been found to affect player performance and experience in games by numerous studies in the past [7, 11, 21]. For instance, Cassidy et al. [7] found that players were faster, but were also less precise with fast music tempo in comparison to slow music tempo in a racing game. Also, significant results in affect could be found in the study of Rogers et al. [21] with a platformer game in which the authors could show that different music tempi had an effect on immersion and the feeling of control. Another study on background music tempo was conducted by Hufschmitt et al. [11]. Utilizing the game Tetris, the authors investigated increasing and decreasing the music tempo during gameplay instead of playing background music at a constant speed. For the study, they had four conditions with increasing music tempo and one with decreasing music tempo. In addition, they also increased the falling speed of the Tetris blocks. They found that players performed significantly worse when continuously increasing music tempo, compared to all other conditions.

These presented works show that music in general and music tempo can make a difference regarding player performance and experience. Thus, we focus on the question whether increasing or decreasing the tempo of background music affects perceived game difficulty by measuring player experience and performance. This builds on the study by Hufschmitt et al. [11] where they found results in terms of perception and player performance and we want to continue this approach in the context of endless runners. To contribute answers to this question, we implemented an endless runner game called "City Escape", and conducted a within-subjects laboratory study (N=32), in which participants were playing the game in four conditions (increasing music tempo, decreasing music tempo, constant music tempo, no background music). Our results do not show any effects of music tempo on player performance. Regarding player experience, we could not find significant effects on factors of the Player Experience Inventory [1] either. However, based on participants' self-reported measures, we found that constant music tempo causes lower perceived stress as opposed to increasing and decreasing music tempo. Furthermore, results revealed that increasing music tempo is perceived as more motivating and fun than decreasing music tempo as well as that both increasing and decreasing music tempo cause a more intense subjective feeling of increased difficulty.

2 CITY ESCAPE: AN ENDLESS RUNNER GAME

We implemented an endless runner game to investigate the effect of background music speed on game performance and player experience. In this section, we provide information on the concept and implementation of this game.

2.1 Concept

The game belongs to the category "Endless Runner", which is a sub-genre of platformer games, where an avatar automatically moves forward on strictly defined lanes [18] and players must avoid obstacles. *City Escape* is built for mobile devices and players control an avatar that automatically moves in one direction in a parkour. The level is structured in three lanes. The avatar starts on the middle lane. By swiping from the left to the right side, the avatar goes one lane to the right. On the opposite direction, the avatar goes one lane to the left. By swiping from below to above, the avatar jumps. A swipe down brings the avatar to a slide position. However, the avatar stands up automatically after a certain amount of time. The goal of the game is to evade obstacles like fences, boxes, gaps, newspaper racks or telephone poles as long as possible while moving through the game world. Fences can be dodged by moving left or right, boxes by jumping and newspaper racks by sliding. We also implemented a mechanic called "Wallrun Movement". This movement is used to dodge fences in all lines or to overcome big gaps in the road. It can be activated by swiping left or right to the side of a wall. In this mode, it is possible to dodge every obstacle except telephone poles on the road. By swiping to the other side, the avatar jumps to this side. If there is a wall, the avatar starts wall-running on this side. A scale on the upper corner on the right side shows stamina, which depletes during wall-runs. If it reaches zero, the avatar stops and the game is over. The player can regenerate the scale by jumping on an opposite wall during the wallrun or by returning to the floor. The movement can also be aborted by swiping downwards. The game consists of two levels. The first level is a tutorial level. For this, each movement will be trained and explained separately and will be extended by a new mechanic with the same principle in the next step. The second level is the study level. Every game mechanic will be re-used in this level in a more challenging, but balanced setting [27]. This level is used later in the study to measure the performance of the participants. The tutorial and study level consist of different rounds. Each round is approximately one minute long. The tutorial level has two rounds, while in the study level there are six rounds. Figure 1 shows screenshots of the game.

2.2 Implementation

The game was implemented in Unity using C# for scripting. The mechanics were implemented by using the character controller of the engine in combination with self-written scripts. The graphical user interface was also realized using Unity. For each level, we split the route in tiles. At the beginning of a level, a certain amount of tiles will be instantiated by a self-written generator. If the avatar walks a certain amount on the road, the generator creates new tiles. To avoid performance problems, it deletes tiles from the level that passed the player and are not part of the view anymore. The swipe control saves the position of the finger on the screen in a two-dimensional coordinate system. If it moves a certain distance on the screen to the right or to the left for example, the avatar walks in this direction. The same principle is used when swiping up and down. If the player keeps the finger on the screen and continues with the swipe in a certain direction, the avatar walks in this direction. This was implemented by saving the current position of the last action, calculating the distance from this position and comparing it to a threshold. With that, it is possible to keep the finger on the screen or making greater swipes to move directly from the left side of the road to the right side and vice-versa. The music and changing of the music tempo in the game is implemented by using the Wwise sound engine and connecting

157 it with Unity. The Unity Engine itself also has a pitch function for sounds, which makes the music slower or faster.
158 However, it also changes the frequency of the music, which makes it a non-optimal solution [14]. Instead, we use the
159 time stretch effect of Wwise to change the music tempo without changing the frequencies of the music, as done in prior
160 studies[11, 21]. Since we want to figure out which impact continuously increasing or decreasing music tempo has on
161 player experience and performance, there are four versions, one for each condition, of the game. In the first version,
162 music tempo begins slow with 40 beats per minute (bpm) and increases continuously such that the music arrives at 190
163 bpm at the end of the game. In the second version, the music begins with 190 bpm and ends with 40 bpm. The third
164 version has no music and the fourth one has a constant music tempo of 90 bpm.
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167 3 RESEARCH DESIGN

168 We conducted a within-subjects laboratory study to investigate the following hypotheses:
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170 **H1:** Player Performance differs between increasing bpm, decreasing bpm, constant bpm and no background music
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172 **H2:** Player Experience differs between increasing bpm, decreasing bpm, constant bpm and no background music
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174 **H3:** Game difficulty differs between increasing bpm, decreasing bpm, constant bpm and no background music
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176 **H1** is motivated by Cassidy et al.'s racing game study [7], where they found that higher performance came at the
177 cost of less precision in constant faster music tempo compared to constant slow music tempo, and by the Tetris game
178 study by Hufschmitt et al. [11], which shows lower performance with continuously increasing music tempo. Therefore,
179 we want to figure out whether differences in player performances by changing music tempo are also visible for an
180 Endless Runner. **H2** is motivated by the study by Rogers et al. [21], and by the Tetris game study by Hufschmitt et
181 al. [11]. Rogers et al. [21] could find differences in immersion between constant fast and constant slow music tempo
182 during a playthrough, in which slow music tempo resulted in a more intense feeling of immersion in comparison to
183 fast music tempo. Moreover, participants in the study by Hufschmitt et al. [11] reported more stress in the playing
184 condition with continuously increasing music tempo in comparison to other conditions. Therefore, it is interesting
185 to find out, which differences in player experiences could occur in case of an Endless Runner. Since Rogers et al. [21]
186 and Hufschmitt et al. [11] reported different results, we keep the hypotheses open in terms of their direction. **H3** is
187 motivated by the Tetris game study by Hufschmitt et al. [11]. They measured player performance and player experience
188 in terms of stress to define game difficulty. They could find significantly worse results in player performance in the
189 condition with continuously increasing music tempo in comparison to the other conditions. Moreover, participants
190 reported more stress in the condition with continuously increasing music tempo. As a consequence, we also use those
191 parameters and extend the survey with questions related to game difficulty to figure out, whether the difficulty is
192 affected by music tempo in Endless Runner games.
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198 3.1 Method

199 To investigate the hypotheses, we created four different conditions. In the first condition of the study, the music tempo
200 starts slowly and increases continuously ("Increasing Music"). In the second condition, the background music starts
201 with high tempo and decreases ("Decreasing Music"). In the third condition, participants play the game with a constant
202 music tempo [5] ("Constant Music") and no background music is being played in the fourth condition ("No Music").
203 Consequently, whether and how background music is being played is our independent variable. The continuously
204 increasing and decreasing music was tied to making progress in the game round such that it changed by 25 bpm for
205 each round. Performance (**H1**) is measured by considering the number of hits when playing the game. The player
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209 must avoid the obstacles in the game such that a low number of hits is mandatory to perform good. The higher the
210 number of hits is, the lower is the performance. In addition to the general hits, we also measured the hits for each of the
211 six rounds of the study, since the music tempo of the increasing and decreasing music tempo differs at the beginning
212 and at the end with slow or fast music tempo. Therefore, it could be interesting to see the single rounds, since slow
213 and fast music tempo can also bring differences in terms of player performance [7]. Besides, we want to investigate
214 potential differences in player experience (H2), especially in terms of the feeling of difficulty. For this, we used the
215 German version of the Player Experience Inventory (PXI) [1, 10] to assess player experience and compare it between
216 the four conditions. Moreover, studies like Hufschmitt et al. [11] or Rogers et al. [21] show differences in terms of player
217 experience and performance within music conditions. Therefore, we extended the survey with self-created questions to
218 assess perceived game difficulty and the perception of audio (“extended survey”). In this survey, we asked questions
219 about how motivating, stressful, entertaining, and helpful the current background music was perceived and how much
220 participants liked the music. Besides, we asked questions about how difficult participants considered the game at the
221 beginning, the feeling of increasing/decreasing difficulty at the end of the round and the general difficulty (H3). With
222 increasing difficulty is meant, whether the participants felt an increase of the difficulty at the end of the condition.
223 With decreasing difficulty is meant, whether the participants felt a decrease of the difficulty at the end of the condition.
224 Each question was answered on a seven point Likert agreement scale (-3=“Strongly Disagree”, 3=“Strongly Agree”).
225 We used the same midi soundtrack in all music conditions, which can be found in the supplementary materials. We
226 used this midi soundtrack because of its bpm rate. With 90 bpm in its unchanged form, it has appropriate bpm for the
227 standardized normal music tempo, which is also figured out by a survey from Miliman et al. [17]. The general difficulty,
228 however, means that they have to answer the question “The level was easy for me in general”. Besides, we also gathered
229 the general evaluation of the level. In the evaluation of the level, participants had to evaluate the difficulty of a level
230 from 1 (easy) to 10 (hard). We did this to get another parameter to check the difficulty of a condition. Besides, another
231 study successfully used this to define the difficulty of a level for each condition [27].

238 3.2 Procedure

239 First, participants answered a general survey, in which they were asked about demographic data and questions regarding
240 game experience with Endless Runners and taste of music. Afterwards, the participants were instructed to complete
241 the tutorial level. While playing the tutorial level, the game was explained to them by the instructor and they had the
242 opportunity to ask questions. The study followed a within-subjects design, i.e. participants completed each of the four
243 conditions after the tutorial. The order of conditions was counterbalanced by using a latin square design. After each
244 condition, participants were asked to fill out the PXI and the extended survey (see Section 3.1).

247 3.3 Participants

248 We recruited 32 participants, of which 23 self-identified as male and nine as female. The average age was 22.8 years,
249 whereby the oldest person was 26 years old and the youngest 19 years old. In the general survey, 20 out of 32 participants
250 responded that they had some prior experiences with endless runner games. That means, that those participants answered
251 the question “I have experiences in Endless Runner games” with an approval ≥ 1 on the Likert scale. Besides, 18 out of
252 32 participants also reported that they like the kind of music genre which was used in the study. The study has been
253 reviewed and received ethics clearance through an institutional Research Ethics Committee¹.

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259 ¹<https://erb.cs.uni-saarland.de/>, last accessed August 16, 2023

4 RESULTS

In this section, we report the results of our experiment regarding performance and player experience, as well as perceived game difficulty. When relevant assumptions were met, we used a repeated measures ANOVA and Bonferroni-corrected post-hoc comparisons. Otherwise, non-parametric Friedman tests were used and the Durbin-Conover procedure was followed for post-hoc comparisons.

		Increasing Music	Decreasing Music	No Music	Constant Music
	No. of hits	54.1 / 37.0	55.9 / 36.5	54.6 / 37.6	53.7 / 32.3
	No. of hits in Round 1	11.5 / 8.02	11.4 / 7.95	11.3 / 9.03	10.9 / 7.58
	No. of hits in Round 6	7.44 / 4.41	8.69 / 5.99	7.44 / 5.58	7.09 / 4.64
	Ease of Control	2.07 / 0.83	2.19 / 1.26	2.07 / 0.96	1.96 / 1.02
	Goals and Rules	2.64 / 0.64	2.54 / 0.61	2.57 / 0.65	2.64 / 0.61
	Challenge	0.43 / 1.47	0.38 / 1.47	0.53 / 1.56	0.37 / 1.37
	Progress Feedback	1.54 / 1.2	1.36 / 1.37	1.38 / 1.41	1.45 / 1.33
PXI	Audiovisual Appeal	0.28 / 1.5	0.17 / 1.47	0.39 / 1.35	0.41 / 1.44
	Meaning	-0.64 / 1.74	-0.81 / 1.54	-0.72 / 1.52	-0.64 / 1.75
	Curiosity	0.3 / 1.82	-0.19 / 1.57	-0.04 / 1.74	0.32 / 1.77
	Mastery	-0.04 / 1.67	-0.25 / 1.69	0.17 / 1.97	-0.11 / 1.67
	Autonomy	-0.15 / 1.65	-0.2 / 1.48	-0.05 / 1.54	-2.15 / 11.9
	Immersion	1.39 / 1.1	1.01 / 1.24	0.79 / 1.64	1.29 / 1.42
	General feeling of difficulty	0.14 / 1.07	0.04 / 1.16	0.35 / 1.2	0.25 / 1.19
Extended Survey	General perception of music	0.34 / 1.41	-0.21 / 1.38	- / -	0.49 / 1.38
	Stress by music	-0.09 / 2.01	-0.16 / 1.94	- / -	-1.78 / 1.41
	Motivation by music	0.66 / 1.81	-0.72 / 1.65	- / -	0 / 1.78
	Entertainment by music	0.56 / 1.78	-0.63 / 1.96	- / -	-0.09 / 1.87
	feeling of increasing difficulty	-0.78 / 1.72	-0.94 / 1.68	-1.06 / 1.41	-1.47 / 1.54
	easiness at the end of the condition	-0.03 / 1.93	0.03 / 1.93	0.38 / 1.56	0.25 / 1.93
	general evaluation of the level	5.63 / 2.14	5.63 / 2.34	5.38 / 2.56	5.5 / 2.29

Table 1. Mean and standard deviations of the dependent variables: Performance (No. of hits), Player Experience Inventory (PXI) and Extended Survey across conditions. PXI and Extended Survey were measured on 7-point Likert scales ranging from -3 to 3 (besides general evaluation of the level, which was measured on a 10-point scale ranging from 1 to 10).

4.1 Performance

Descriptive results can be found in Table 1. For the comparison of the general performance in all four conditions for each participant, we used a repeated measures ANOVA. We found no significant difference in terms of general performance ($F(31,3)=0.0476, p=0.986$). Within the single rounds of the study level, there is also no difference between the conditions. Neither in the first round ($F(31,3)=0.0330, p=0.992$) nor in the last round ($F(31,3)=1.5, p=0.219$).

4.2 Player Experience

To compare the player experience across conditions, we used a Friedman test. Regarding PXI, we could not find effects on any of its subscales between conditions (Ease of Control: $\chi_F^2(3) = 2.28, p = 0.516$, Goals and Rules: $\chi_F^2(3) = 2.16, p = 0.540$, Challenge: $\chi_F^2(3) = 3.06, p = 0.383$, Progress Feedback: $\chi_F^2(3) = 0.135, p = 0.987$, Audiovisual Appeal: $\chi_F^2(3) = 3.6, p = 0.308$, Meaning: $\chi_F^2(3) = 0.585, p = 0.900$, Curiosity: $\chi_F^2(3) = 0.639, p = 0.887$, Mastery: $\chi_F^2(3) = 0.585, p = 0.900$, Immersion: $\chi_F^2(3) = 4.28, p = 0.233$, Autonomy: $\chi_F^2(3) = 0.565, p = 0.904$). Next, we report results from the self-created

extended survey. Neither the general feeling of difficulty shows differences within the four conditions ($\chi_F^2(2) = 5.78$, $p = 0.123$), nor the general perception of music within the three conditions constant, increasing music tempo and decreasing music tempo ($\chi_F^2(2) = 5.28$, $p = 0.071$). However, we found significant differences regarding music-induced stress, motivation, and entertainment. Since these questions were presented in music conditions only, we conducted a Friedman test between the constant music tempo, increasing music tempo and decreasing music tempo conditions. In terms of music-induced subjective stress, we found differences ($\chi_F^2(2) = 18$, $p < .001$). The pairwise comparisons (Durbin-Conover) showed that self-reported music induced stress differs between both increasing tempo to constant as well as between decreasing music tempo and constant music tempo, (each $p < .001$). As a consequence, we establish result **R1: Constant music tempo causes lower subjective stress as opposed to increasing and decreasing music tempo**. Regarding music-induced subjective motivation, we also found significant differences ($\chi_F^2(2) = 10.6$, $p = 0.005$). The pairwise comparisons showed effects between increasing and decreasing music tempo ($p < .001$). Thus, we establish **R2: Increasing music tempo is subjectively perceived as more motivating than decreasing music tempo**. Similar results occur in terms of entertainment by music, i.e. the question whether the participant had fun with the current music in the game ($\chi_F^2(2) = 11.8$, $p = 0.003$), leading to **R3: Increasing music tempo is subjectively associated with more fun than decreasing music tempo**. We also analyzed general perceived difficulty between all four conditions, feeling of increasing difficulty, decreasing difficulty and general evaluation of the level. With regards to these measures, only the feeling of increasing difficulty shows significant differences between the conditions ($\chi_F^2(3) = 8.52$, $p = 0.036$). The pairwise comparisons reveal **R4: Increasing music (p = 0.004) and decreasing music tempo (p = 0.039) cause a more intense subjective feeling of increased difficulty than constant music tempo**. For the easiness at the end of the condition ($\chi_F^2(3) = 1.2$, $p = 0.754$) and general evaluation of the level ($\chi_F^2(3) = 1.31$, $p = 0.727$), no significant effects across the four conditions were found.

5 DISCUSSION

Regarding **H1**, we compared the overall number of hits as well as the number of hits in the first and last round of all participants within all conditions. However, we could not find any significant results. Neither in complete sum of hits nor in the single rounds. Thus, we found no support for **H1**. This is different to the findings of Hufschmitt et al. and Cassidy et al., who found a significant effect of music tempo in games [7, 11]. Despite these previous findings, there is also past research which could not show that background music had an influence on performance [20, 21]. Thus, other factors such as the genre and type of games being investigated could play a role in this regard and should be investigated in future work. It is also possible that visual dominance could explain why we could find no effects on performance, similar to other studies in the past [2, 24]. It means that visual aspects outweigh other aspects like acoustic or tactile ones [2, 24]. Therefore, music could be less important for games, because the visuals of the games are more dominant. To evaluate **H2**, we compared the results of the PXI and the extended survey. Although we could not find any significant results in the PXI, we found significant differences in the extended survey. For instance, we found that subjective stress was lower with constant music tempo, compared to increasing and decreasing music tempo (**R1**). Constant music tempo may provide a stable and predictable auditory cue for the player, which can help to reduce stress by creating a sense of predictability and control. On the other hand, increasing and decreasing music tempo may create a sense of uncertainty and unpredictability, which can contribute to feelings of stress. Additionally, the constant tempo may have provided a sense of pace and timing for the player, which may have helped the player to perform in a more controlled manner in the game. In addition, we found that increasing music tempo is subjectively perceived as more motivating and more fun than decreasing music tempo (**R2, R3**). Potentially, because of the fact that

365 the game got increasingly faster, the increasing music speed might have been perceived as more cohesive, i.e. the faster
366 the music was playing, the faster and harder the game became. Building upon the results by Ribeiro et al. [20], this
367 increased audiovisual cohesion could have led to an increased positive affect, which might explain our results. Another
368 possible explanation for this result is that increasing music tempo may be associated with feelings of excitement, which
369 can be motivating and enjoyable. The fast-paced tempo may also create a sense of urgency and challenge, which can
370 add to the excitement and fun of the game. Additionally, increasing music tempo may be associated with a sense of
371 progression or accomplishment, which can also contribute to feelings of motivation and enjoyment. On the other
372 hand, decreasing music tempo may be associated with feelings of slowing down or losing momentum, which may be
373 perceived as less motivating and less fun. Taking the results **R1–R3** together and considering that we could not find
374 any effects on the factors of the PXI, we consider **H2** as partially supported. Regarding **H3**, we analyzed respective PXI
375 factors, player performance as well as respective items of the extended survey. We found that increasing and decreasing
376 music tempo caused a more intense subjective feeling of increased difficulty than constant music tempo (**R4**). This
377 might be explainable by the changing tempo creating a sense of disorientation and confusion, which can make it more
378 difficult for the player to focus and perform well. Additionally, the changing tempo might have been distracting, which
379 can make it more difficult for the player to pay attention to important cues and information in the game. Furthermore,
380 the effect of the changing tempo on the players' attention and cognitive resources could have made the game more
381 difficult to play, potentially leading to a more intense subjective feeling of increased difficulty. However, although we
382 found significant effects in terms of perceived difficulty, we did not find any effects on the respective PXI scales nor on
383 player performance. Thus, we conclude that **H3** is partially supported.
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391 6 CONCLUSION AND FUTURE WORK

392 In this paper, we investigated the effects of increasing, decreasing, and constant background music speed as well as no
393 background music in an endless runner game on player performance, perceived difficulty and general player experience.
394 We implemented the endless runner game "City Escape" and conducted a within-subjects laboratory study with 32
395 participants, in which participants played the game with either increasing, decreasing or constant music tempo as well
396 as with no music at all. Our study found no significant effect of music tempo on player performance. We also found
397 no significant impact on player experience as measured by the Player Experience Inventory. However, participants
398 reported that constant music tempo led to less stress compared to both increasing and decreasing tempo. Additionally,
399 increasing tempo was perceived as more motivating and enjoyable, while both increasing and decreasing tempo were
400 associated with a heightened sense of difficulty. These findings provide implications for game design and opportunities
401 for future work: Game designers may want to consider using a constant music tempo or increasing tempo in certain
402 sections of the game to help create an enjoyable and motivating experience for the players. They may also want to be
403 aware that both increasing and decreasing tempo may be perceived as making the game more difficult and may want to
404 use them in more challenging sections of the game or as a way of signalling a change in difficulty level to the players.
405 Researchers may want to further investigate the relationship between music tempo and player experience in different
406 types of games and with different populations of players to see if these results can be replicated and expanded upon.
407 Additionally, the study could be extended by using different methods of measuring the player experience and stress,
408 such as physiological measures. Also, future work could investigate whether players adapt their gameplay to music
409 attributes as was shown previously, e.g. in the sports domain [15].
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