Pleasure to Play, Arousal to Stay: The Effect of Player Emotions on Digital Game Preferences and Playing Time

Karolien Poels, Ph.D.,1 Wouter van den Hoogen, Ph.D.,2 Wijnand Ijsselsteijn, Ph.D.,2 and Yvonne de Kort, Ph.D.2

Abstract

This study investigated how player emotions during game-play, measured through self-report and physiological recordings, predict playing time and game preferences. We distinguished between short-term (immediately after game-play) and long-term (after 3 weeks) playing time and game preferences. While pleasure was most predictive for short-term playing time and game preferences, arousal, particularly for game preferences, was most predictive on the longer term. This result was found through both self-report and physiological emotion measures. This study initiates theorizing about digital gaming as a hedonic consumer product and sketches future research endeavors of this topic.

Introduction

Playing digital games is mostly an intentional activity people engage to enjoy themselves.1 Malone2 described digital games as “a new kind of intrinsically motivating activity.” Intrinsic motivation is situated within the game-play itself (e.g., being immersed in a fantasy world), or on the level of achievement in the game (e.g., feelings of mastery).3 Consequences from outside the game (e.g., monetary rewards), resulting from extrinsic motivations, are less important for the majority of players.3 Intrinsic motivation can be linked to “hedonic consumption”.3,4 In contrast to goal-directed utilitarian consumption, hedonic consumption involves experiencing the product, for its own sake, because the product itself is enjoyable.5 Digital games are typically multi-sensoric,6 and relate to elements of fantasy,7 or escapism.8 Further, digital games have the potential to trigger strong emotions9 and lead to high levels of enjoyment.10 In other words, choosing, buying, and playing a digital game involves consuming a hedonic product.

Within marketing, hedonic consumption has already been widely studied.5,11,12 Research has shown that, for hedonic products, emotional responses during product trials have a significant influence on both subsequent product attitude formation,13 and future consumption duration.14 Despite the massive success of digital games, it remains largely unknown how players actually select games, and how game preferences are established. Given the multitude of studies addressing player emotions as a fundamental part of the digital game experience,7,15,16 it seems particularly relevant to study how emotional experiences relate to consumption related variables like play duration and game preferences. We focus on the emotional dimensions of pleasure, arousal, and dominance (referred to as PAD-dimensions).17 The pleasure dimension refers to the pleasantness or enjoyment of a certain experience. The arousal dimension indicates the level of physical and mental activation associated with the experience. Dominance concerns feelings of control and influence over others and surroundings. These types of emotions make up a fundamental part of the player’s emotional experiences during game-play.18–20

The relation between player emotions and consumption of digital games has only received scant attention. Kempi13 found that pleasure and arousal reactions during the trial of a computer game positively influenced on trial evaluations, whereas for a functional grammar checker these emotions were of minor influence. An earlier study,21 focusing on player emotions and preferences for games in arcade halls, showed that higher feelings of both pleasure and arousal resulted in more favorable preferences. This study only included game preferences measured immediately after a play session, however. Besides preferences, which reside on an attitudinal level, actual playing behavior is of additional importance when studying consumer behavior. Further, playing digital games has largely shifted from arcade halls to the home. This makes it particularly relevant to examine how player emotions affect playing behavior at home and how game preferences develop over time. Further, a crucial issue

1Department of Communication Studies, University of Antwerp, Antwerpen, Belgium.
Hypotheses and Research Questions

Hedonic consumption literature has shown that the amount of pleasure experienced during consumption was predictive for later consumption. In the context of gaming, previous studies indicated the importance of pleasure on later game evaluations. Therefore, we formulate the following hypothesis:

H1: Pleasure experienced while playing a digital game will be predictive for later playing behavior in a positive way.

In general emotion and consumer literature, arousal is considered as a trigger of behavior. In the context of gaming, arousal is one of the main reasons why people play. This leads us to formulate the following hypothesis:

H2: Arousal experienced while playing a digital game will be predictive for later playing behavior in a positive way.

Dominance can be considered as the perceived ability to manipulate the game flow to one’s goals. This control has been linked to overall game enjoyment and, for male players, related to game preference. We expect that:

H3: Dominance experienced while playing a digital game will be predictive for later playing behavior in a positive way.

There are several issues that, although not investigated in previous studies, are crucial to get a fuller understanding of player emotions and the prediction of playing behavior. Therefore, we formulate following research questions:

RQ1: What is the unique predictive contribution of the different emotional dimensions of pleasure, arousal, and dominance?

RQ2: Are there differences related to the preference time frame (short-term vs. long-term playing behavior)?

RQ3: Are there differences related to the emotion measure type (retrospective self-report vs. real-time physiological emotion measures)?

Method

Participants

Nineteen participants (7 females) aged between 18 and 42 (M_\text{age} = 23.47 \text{ years}, SD = 7.24) took part in the experiment. Game-play frequency ranged from “a couple of times a year” (n = 4), “monthly” (n = 4), “weekly” (n = 5) to “daily” (n = 6). The study had a within subject design, and involved two lab sessions: the first lasting 90 minutes for which participants received 15€, the second lasting 20 minutes for which participants received 5€.

Experimental setting, measures, and procedure

We used four PC games: two First Person Shooter games (Battlefield 1942, Hitman Contracts) and two race games (Colin McRae, Trackmania), providing variation in genre and realism (realistic: Battlefield and Colin McRae, fictional: Hitman Contracts and Trackmania). All four games were highly rated, relatively cheap, and had reasonable system requirements.

After introduction (session one) to the experiment, participants were connected to physiological sensors, using a TMSi Mobi 6 Bluetooth device. The measures included Skin Conductance Level (SCL), as an indicator of arousal, and zygomaticus major and corrugator supercilius electromyography (EMG) measures, as indicators of (dis)pleasure. Recordings were taken at 1,024 Hz. After data collection, values were filtered following suggestions from Tassinary and Cioppo. After filtering, the values were log transformed and baseline corrected to cope with individual differences in skin conductivity and EMG activation.

Participants played each of the four games for 10 minutes in a counterbalanced order. After each play session, participants rated their experiences on the Self-Assessment Manikin (SAM-scale), a visual self-report scale based on the PAD-dimensions of Mehrabian and Russell and includes three nine-point visual scales on which participants have to indicate how much pleasure, dominance, and arousal they felt while playing the computer game. The SAM-scale is frequently used to measure emotions in general emotion studies and in consumer and gaming research.

Next, participants were invited to another lab room in which each of the four games was installed on different PC’s. They were instructed to freely choose which game they played, and switch between different games, for 30 minutes. A camera in the corner of the room allowed us to observe playing time for each of the games. Although we aimed to fix the time at 30 minutes, this was not always practically feasible. The exact playing time varied between participants (Min: 23 minutes 35 seconds; Max: 31 minutes 35 seconds). For the main analysis we therefore created a relative measure, dividing the time played on each game by the total time played (DV1: short-term playing time). After the 30 minutes free-play session, participants ranked all four games according to three parameters, asking which game they (1) liked most, (2) wanted to keep, and (3) wanted to buy. For every parameter, score 1 was given to the most preferred game and then in ascending order a score of 2, 3, or 4 to the other games according to their relative preference on the different parameters. For our analysis, we averaged the scores on these three parameters (Chronbach’s α = 0.94) and recoded the scores such that a score of 4 represented maximum preference and a score of 1 the lowest preference. This led to a general “game preference” variable (DV2: short-term game preference). Participants were then briefed about the second stage of the experiment in which they had to take the four games home and were requested to play these games during 3 weeks and keep a diary of their playing behavior. Total time spent playing the four games varied considerably among participants (Min: 114 minutes, Max: 4,342 minutes). Therefore, we
employ relative playing time in our analysis, dividing the playing time for each game by the total time spent playing the four games under study (DV3: long-term playing time). After 3 weeks, the second lab session took place. Again, we asked participants to rank which game they liked most, wanted to keep, and wanted to buy. These scores and recoded them to compose a second ‘game preference’ variable (Chronbach’s $\alpha = 0.96$) (DV4: long-term game preference).

Results

Descriptive statistics

We first report a general overview of the main descriptive statistics for all four games on each criterion and dependent variable employed in this study (see Table 1). Although Trackmania was—on average—most liked and played, there was considerable variation between participants. None of the four games was really disliked or left unplayed.

Core analysis

We used four different games with the aim of inducing a wide variety in player emotions. Therefore, in the remainder of our analysis, we aggregated data across games, with the goal of maximizing the variance in our data. We first restructured our data file such that the scores for the different games were treated as separate cases, creating four rows of data for each participant. Since our data were now “nested within participants,” we applied a Linear Mixed Model (LMM) analyses including participant number as a random factor in our analyses, allowing us to control for differences in variance that solely reside at the level of participants. We ran a total of eight LMM analyses divided in two sets. In the first set, we ran four LMM analyses containing one of the dependent variables (DV1–DV4) as criterion and the self-report measures (pleasure, arousal, and dominance) as predictors. In the second set, we ran four LMM analyses containing one of the dependent variables (DV1–DV4) as criterion and the physiological measures (EMG: zygomaticus major, corrugator supercilii, and SCL) as predictors. Before analyses, the criterion and dependent variables were standardized. Regression coefficients were calculated indicating the direction and strength of the relation between the predictor and criterion variables.

Short-term playing time

For the self-reported player emotions, only pleasure had a positive effect on short-term playing time ($\beta = 0.31$, $t(72) = 2.61; p = 0.011$). Physiological measures did reveal a similar, although marginally significant effect, of zygomaticus major activity ($\beta = 0.20$, $t(72) = 1.69; p = 0.096$) on short-term playing time.

Long-term playing time

Pleasure ($\beta = 0.26$, $t(64) = 2.13; p = 0.037$) showed a positive effect for long-term playing time. The analysis of the physiological measures showed a significant effect of zygomaticus major activity ($\beta = 0.23$, $t(64) = 2.05; p = 0.045$), and a positive, yet only marginally significant, effect of SCL ($\beta = 0.22$, $t(67) = 1.83; p = 0.072$) on long-term playing time.

| Table 1. Descriptive Statistics for Criterion and Dependent Variables on the Four Digital Games |
|-----------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Game | Playing time | Self-report | Psychophysiology | Playing time |
| Min/Max | Mean (SD) | Min/Max | Mean (SD) | Min/Max | Mean (SD) |
| Battlefield | Min/Max Mean (SD) | 6 (1.89) | 4.63 (2.43) | 5.11 (2.83) | 0.28/0.4 | 0.26/0.4 | 0.26/0.4 |
| Hitman | Min/Max Mean (SD) | 5.28 (2.66) | 4.88 (2.01) | 6.05 (2.19) | 0.48/0.15 | 0.42/0.25 | 0.42/0.25 |
| ColinMcRae | Min/Max Mean (SD) | 5.27 (1.5) | 4.52 (1.46) | 5.16 (1.69) | 0.18/0.06 | 0.15 (0.26) | 0.15 (0.26) |
| Trackmania | Min/Max Mean (SD) | 7.26 (1.41) | 5.84 (1.92) | 5.89 (2.05) | 0.047/0.17 | 0.05 (0.047) | 0.05 (0.047) |

$^{a}$Relative playing time. $^{b}$After averaging and recoding.
Short-term game preferences

For the self-reported player emotions, pleasure ($\beta=0.36$, $t(72)=3.16; p=0.002$) had a significant positive effect on short-term game preference. Results with the physiological measures showed a similar pattern in which zygomaticus major activity showed a positive significant effect ($\beta=0.31$, $t(72)=2.77; p=0.007$) on short-term game preferences.

Long-term game preferences

For long-term game preference, self-reported pleasure ($\beta=0.21$, $t(72)=1.78; p=0.079$) was only marginally significant, yet self-reported arousal ($\beta=0.27$, $t(72)=1.26; p=0.023$) revealed a significant effect. The latter was also found in the analysis with the physiological measures: SCL had a positive effect on long-term game preference ($\beta=0.35$, $t(72)=3.1; p=0.003$), whereas zygomaticus major results were not significant.

Table 2 below summarizes the results found. Self-reported dominance and corrugator supercilii activity did not show significant predictive relationships with the playing behavior variables.

Discussion and Conclusion

The results confirm our expectation that player emotions during initial game-play have the potential to predict playing behavior at a later stage. We focused on two parameters of playing behavior: game preferences and playing time. For game preferences, a clear pattern emerged. While pleasure during initial game-play influenced short-term game preference, arousal contributed to long-term game preference. This finding surfaced through both self-report as physiological measures. For playing time, we found that pleasure experienced at the initial play session was strongly related to playing time, both in the lab and during a 3-week period at home. Again, this pattern was consistent for both the self-report and the physiological measures. Arousal, on the other hand, did not predict any short-term playing time and added only marginally to long-term playing time.

The hypothesis that dominance, as a player emotion, is predictive for later playing behavior was not supported. The arcade hall study of Mehrabian and Wixen did, however, reveal that dominance experienced while playing an arcade game was positively related to game preferences. Dominance, as a sense of control, refers to a player’s sense of mastery of the game and ability to anticipate and influence the game flow. This is typically the result of frequent practice and game expertise. In an arcade context, games were relatively easy and could thus induce feelings of dominance quite rapidly. In the current experiment, we let people play four more complex PC games for only 10 minutes and previous experience with the games was nonexistent or very low. Our research design might not have been suited well enough to cater for dominance as a player emotion. Although, in consumer studies, dominance is generally given less attention compared to pleasure and arousal, future studies should be able to manipulate arousal levels more explicitly and further unravel the predictive role of dominance in playing behavior.

Theoretically, it was to be expected that corrugator supercilii activation, as an indicator of displeasure, would yield opposite relations with playing behavior compared to zygomaticus major activation. However, results did not reveal any significant relation between corrugator supercilii activation and the playing variables. Playing games is in itself not an unpleasant activity and the games included in our study were all highly rated games. As such, the games might not have been able to generate (extreme enough) negative emotions. Future studies could focus on (dis)pleasure in relation to specific game events (e.g., failures or successes on specific points in the game) and how these predict later playing behavior.

Two, seemingly ambivalent findings, deserve further exploration. First, arousal was found to significantly predict long-term game preferences yet contributed little to short-term game preferences. The opposite was found for pleasure. This finding indicates that the time frame is an important aspect to take into account when studying game preferences. The unique contribution of pleasure and arousal clearly differs according to the time frame under consideration. Although only speculative, it could be that on the short-term, after the lab session, players opted for the most pleasurable games. When playing at home, they further took the time to get to know the games that posed more challenges (and were more arousing), leading to a preference for these games in the longer run. Second, results were not always consistent between game preferences and actual playing time. Arousal positively predicted long-term game preferences, but not long-term playing time: Pleasure, on the other hand, positively predicted long-term playing time but showed no significant relation to long-term game preferences. These

| Table 2. Linear Mixed Model Results for Short-Term and Long-Term Playing Time and Game Preference as a Function of Player Emotions |
|-------------|----------------|----------------|----------------|----------------|
|             | Short-term     |               | Long-term      |               |
|             | Pleasure       | Arousal       | Pleasure       | Arousal       |
| Playing time|                |               |                |               |
| Self-report | 0.31*          | 0.12          | 0.26*          | 0.19          |
| Physiology  | 0.20*          | -0.03         | 0.23*          | 0.22*         |
| Game preference |          |               |                |               |
| Self-report | 0.36**         | 0.17          | 0.21*          | 0.27*         |
| Physiology  | 0.31**         | 0.04          | 0.04           | 0.35**        |

All LMM analyses included 3 predictors (self-report; SAM Pleasure, Arousal, and Dominance; physiology: EMG zygomaticus major, EMG corrugator supercilii, SCL). Since Dominance, and EMG corrugator supercilii did not show any significant results, we do not report their values in the table.

*p<0.05, *p<0.1, **p<0.01.

LMM, Linear Mixed Model; SAM, Self Assessment Manikin; SCL, Skin Conductance Level.
findings show the importance of considering both evaluative and behavioral parameters of gaming. In (social) psychology, there is a long line of research on the (in)consistency between attitudes and behavior.\(^{35}\) It is yet unclear what explains the inconsistencies in predictive relationships of player emotions between the two parameters of playing behavior. We must acknowledge that the measurement of long-term playing time at home was (partly) beyond our control and some participants mentioned that other responsibilities like school, work, and family, had interfered with their (preferred) gameplay intensity. As such, actual long-term playing behavior might have been different if it were measured on another (more convenient) time span. Future studies are needed to shed a light on the underlying decisional process for and the (in)consistencies between both parameters of playing behavior.

The current study already sets a first step toward theorizing about the hedonic consumption of digital games some limitations need to be considered, however. First, the current set up does not allow to fully claim causality between player emotions and playing behavior. Our stimuli consisted of four different games that were not a priori expected to yield specific (intensities in) emotions in our participants. Our aim was to induce enough variance in emotions within each participant, so we could link these variables to their later playing behavior. Also, other variables that we could not control for could possibly interfere with the predictive relations found. For example, game reviews, word-of-mouth, personal interests, and social setting are expected to have an impact on what kind of games players prefer and play. Further, given the time intensive nature of our study, our sample size was rather small. Although we strived for variation in age, gender, and gaming frequencies, we cannot claim representativeness for the general gaming population. Finally, we only investigated the predictive potential of emotional dimensions as player emotions. We did not include specific game experiences that have been identified as contributing to the intrinsic motivational qualities of digital games, for example, immersion,\(^{36}\) control,\(^{27}\) and flow.\(^{37}\) Future studies should unravel how these factors interact with player emotions and which unique contribution they have for the study of playing behavior.

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No competing financial interests exist.

References


Address correspondence to:
Dr. Karolien Poels
Department of Communication Studies
University of Antwerp
Sint Jacobstraat 2
2000 Antwerpen
Belgium

E-mail: karolien.poels@ua.ac.be