# Player Performance, Satisfaction, and Video Game Enjoyment*

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**Abstract.** An experiment ($N$ = 74) was conducted to investigate the impact of game difficulty and player performance on game enjoyment. Participants played a First Person Shooter game with systematically varied levels of difficulty. Satisfaction with performance and game enjoyment were assessed after playing. Results are not fully in line with predictions derived from flow and attribution theory and suggest players to (1) change their view on their own performance with its implications for enjoyment with increasing game experience and (2) to switch strategically between different sources of fun, thus maintaining a (somewhat) positive experience even when performance-based enjoyment is low.

**Keywords:** Video games, entertainment, enjoyment, performance, flow, attribution theory.

## 1 Introduction

Many forms of contemporary entertainment computing, most importantly, video games, apply their interactivity to present tasks and challenges to users. A great diversity of task types and challenge levels can be found in modern video games, for instance, tasks that require dexterity and precise timing of control inputs (such as in first person shooters), tasks that demand logical thinking and problem solving (e.g., adventure games, brain trainers), or tasks related to strategic planning and management of complexity (such as strategy games and business simulations). While social research on the motivational appeal of video games is still sparse [1], there is some indication that resolving game tasks and mastering game challenges is closely connected to game enjoyment. Ryan, Rigby and Pryzybylski [2] demonstrated experimentally that feelings of competence are

* This research was funded by the European Commission, project "FUGA: The fun of gaming" (NEST-PATH-IMP 28765). We thankfully acknowledge the Commission"s support.

S. Natkin and J. Dupire (Eds.): ICEC 5709, pp. 1–12, 2009.

an important dimension of the motivational appeal of digital games. Two surveys identified competition as driver of playing motivation [3] [4]. Both competence and competition are inherently connected to tasks and challenges presented by games – mastering challenges thus is probably linked to game enjoyment [5].

The present study addresses the issue of task resolution, mastery of game challenges, and game enjoyment in more detail. Specifically, the paper attempts to shed more light on the complexity that is involved in the connection between player performance and game enjoyment. This complexity stems primarily from the common understanding that good performance can only occur when the task resolved is not too easy. Accomplishing an easy task does not hold much merit, and performance is only valued if it is perceived as mastery of a significant challenge. Building on concepts from motivational psychology, especially attribution theory [6], this paper takes an explanatory stance on player performance and video game enjoyment by examining player responses to and enjoyment of systematically varied challenge levels.

## 2 Performance, Attribution, Satisfaction, and Game Enjoyment

Research in the psychology of motivation has found consistently that human individuals respond to good own performance (success) with positive emotions such as pride and joy. Weiner [6] has emphasized that such positive emotions occur if the individual identifies her-/himself as origin of the event interpreted as success. Only if the positive event can be attributed to oneself (e.g., to one's talent or one's hard effort), strong positive emotions will arise; if the individual perceives external factors (e.g., somebody else's effort or simple luck) responsible for the event, the resulting emotions may still be positive, but will not reach the same level of intensity. Conceptually, the emotion of "pride" will only occur in the case of self-attribution of the success event, whereas the emotion of "joy" may also occur in the case of external attribution of the (positive, appreciated) event. Similarly, self-determination theory [7] argues for the importance of feelings of one's own competence for positive emotions: It is thus the perception that oneself has done something 'good' or has achieved a great success that makes the difference in emotional experience.

An important underlying mechanism that connects satisfaction with one's performance to game enjoyment is self-esteem [8]. In general, increases in self-esteem go along with positive emotions such as pride and joy, and positive performance feedback or direct experience of competence rise the individual's self-esteem level [9]. Therefore, successful task resolution is theorized to level up self-esteem, and the increase of self-esteem is experienced as highly enjoyable.

Thus, in the context of video games, the challenges that players are confronted with represent opportunities to experience own competence by attributing the success events in the game to one's own skill and efforts [10]. Resolving the game tasks would then be a key to game enjoyment: As most games introduce new tasks and challenges at high frequencies, players receive ample opportunities to feel competent and successful, lift their state self-esteem, and thus generate positive self-emotions continuously throughout game play. The permanent pride of mastering ever-new game challenges would then constitute an important part of game enjoyment.

However, the link between one's own performance, self-esteem and positive emotions is more complicated, for two important moderators affect the performance-enjoyment

process. One is the difficulty of the task(s) mastered, and the other is the performance expectation that the individual holds before and during task resolution. Concerning task difficulty, attribution theory [6] suggests that players cannot derive pride from the mastery of (very) easy tasks, because in this case, there is no chance to demonstrate skill or invest serious effort. Without skill demonstration and/or efforts invested, there is no reason to be proud of: The challenge is simply no challenge. In the context of video gaming, easy tasks (e.g., enemies that are easy to kill and do not cause serious damage to the player character) would rather evoke boredom than enjoyment. In contrast, (very) difficult tasks do not facilitate positive feelings either [6]. One reason is that difficult tasks are not resolved with high probability, so experiences of failure and insufficient performance arise more frequently under high difficulty conditions. Such experiences undermine self-esteem and lead to frustration and sadness – the opposite of pride, and, when applied to game situations, also the opposite of game enjoyment. A second important reason for hard tasks interrupting the effect of success on enjoyment is that if players manage to resolve very heavy game tasks, there is a often a reasonable chance that their skill and effort alone did not cause the success, but that additional external factors (e.g., luck) co-occurred, which would question the self-attribution of the success. The enjoyment value of mastering very difficult tasks is thus not as 'secure' as the fun that players can generate from mastering moderately difficult tasks. For the solution of such tasks, they can claim full responsibility, with a secure impact on positive emotions.

This consideration converges with flow theory that postulates most positive experiences resulting from mastering tasks that are not too easy and not too difficult [11]. Flow theory has also been applied to video game enjoyment [12]. Consequently, the contribution of success experiences to video game enjoyment is argued to depend on the difficulty of the game played. Neither very easy nor very hard games should elicit success-based game enjoyment to a substantial extent; rather, moderately difficult games should facilitate the highest level of enjoyment.

The link between player performance and game enjoyment is likely to be affected also by the performance expectations players hold [13]. Expert players will be convinced of their capacity to master highly difficult challenges and will thus expect themselves to be quite successful with any given new game. Novice players, in contrast, will accept the possibility of failure and underperformance in many new games. Because they are 'prepared' for failures, they should not suffer from severe reductions in game enjoyment when they face difficult tasks, as they can still meet their low performance expectations and need not be disappointed about their achievements in the game. Expert players, however, may feel frustration more frequently, as failure to accomplish (seemingly) easy or moderate tasks would imply a violation of their own high performance expectation and thus reduce their (high) self-esteem level significantly [13]. On the other hand, expert players hold an objectively better chance to master any given game task, while novice players will fail with much greater probability at any given game task. So expert players will succeed frequently but be disappointed about their few failures, whereas novice players will fail frequently but will not feel much frustration about it. It is theoretically plausible, then, to argue that good performance and achievement is virtually irrelevant for the game enjoyment of novice players, whereas for expert players, performance would be extremely important, because their self-expectations are high, and they seem to perceive video games in general as a domain to demonstrate skill and superior performance [4]. For the present

study, we thus focused on expert players to examine the interplay of performance, satisfaction and game enjoyment.

From these considerations, the actual enjoyment experience during game play can be modelled. Players begin a gaming session with a self-expectation concerning their skills and performance capabilities (i.e., they define themselves as rather novice or rather expert players). The tasks that the game offers – enemies, puzzles, etc. – will lead to performance-based fun to the extent that (A) players find the tasks challenging (not too easy, not too difficult) and (B) players find their accomplishments matching their self-expectations. Because task difficulty and self-expectations are interrelated – heavy gamers find other game tasks 'hard' than novice players –, it is difficult to predict the specific level of optimal performance satisfaction that leads to increase in self-esteem, pride emotions, and thus achievement-based game enjoyment.

Moreover, recent contributions to entertainment theory [5] suggest that media users actively 'work' on their enjoyment experience, for instance, by suspending disbelief in an implausible drama plot for the purpose of maintaining a suspenseful movie experience. Because the link between player performance and game enjoyment is established through players' own evaluation of their performance (which uses perceived task difficulty and self-expectations as indicators), it is possible that players use the inherent complexity of the task-performance-satisfaction-fun connex instrumentally to preserve a maximum enjoyment even if they do not perform optimally in the game. For instance, a player who fails to kill a monster in a first-person-shooter may attribute his failure to an 'unfair' game setting that rendered the task extremely difficult or 'impossible to do'. By justifying one's own failure through external conditions (i.e., the game was unfair), the negative impact of the failure on self-esteem and the accompanying frustration and loss of fun can be buffered. So blaming the game for being unfairly difficult may be a strategy to maintain game enjoyment in spite of underperformance. Vice versa, a player who surprisingly manages to accomplish a really difficult game task may not acknowledge that luck was responsible for this success, but rather assign the great victory to his own skill, thus 'creating' a reason to be proud, with accompanying positive emotions and performance-based game enjoyment. In other words, players' evaluation of their own performance, may be biased instrumentally by players in order to maximize fun given successful game events or to preserve as much enjoyment as possible in the case of failures in gameplay. More failure may thus not necessarily lead to less enjoyment, and more success will not automatically facilitate more enjoyment.

The theoretical elaboration so far suggests that there is considerable variability in player responses to a specified game difficulty level. In order to explore the complex relationship between game difficulty, player performance and satisfaction as well as game enjoyment in more detail and to gain empirical evidence for a more accurate model of performance-based game enjoyment, the following research questions were derived.

**RQ1.** How does video game difficulty affect satisfaction with one's own performance in expert players?

**RQ2.** How does video game difficulty affect game enjoyment in expert players?

**RQ3.** Is the effect of game difficulty on satisfaction stronger than its effect on game enjoyment?

RQ3 explicitly addresses players' (possible) instrumental interpretation of their own performance: If players actively shape their entertainment experience, they will protect it against threats from underperformance and according frustration, and will also derive more enjoyment from mastering easy tasks than it would be appropriate from an 'objective' viewpoint (i.e., as a fair estimate of task difficulty within the attribution process would suggest). Thus, game difficulty may affect game enjoyment to a smaller degree than it affects player satisfaction: Players may not want satisfaction to dominate their fun and thus actively work against such an influence.

## 3 Method

To answer the research questions, an experiment with the first person shooter (FPS) "Unreal Tournament 2" © was conducted. Overall, 74 voluntary male university students aged between 18 and 32 years (M = 21.84, SD = 2.73) participated in the study. All participants said that they played at least "sometimes" computer games, and they all had at least "some" experience with FPS. Before the students were invited to the laboratory, they rated their FPS expertise on a 10-point-scale (with "1" meaning being a novice with almost no experience, "10" meaning being an absolute expert). Only individuals who rated themselves at "5" or higher were asked to participate in the study. The reason for this limitation of access was to focus on game experts (see previous section). Individuals with sufficient FPS experience were then randomly assigned to play a "duel mode" map of "Unreal Tournament 2" with either "easy", "medium" or "very hard" difficulty settings. In the "easy" condition, it was almost impossible that the player character would get hurt or died, and enemies were very easy to kill. The version with medium difficulty was supposed to provide the players with some success and the feeling of competence while a significant level of challenge was present. At last, the very difficult level was virtually impossible to win. Players necessarily got killed several times in this condition – independent from their skills. Everything aside of the difficulty level – appearance of the enemies to be dueled, map and geographical structure of the game environment etc. – was held constant across difficulty conditions. Consequently, experimental groups were confronted with systematically varying levels of game difficulty.

The participants were individually invited to a quiet room with controlled lighting conditions and were asked to sign a letter of consent to participate in the subsequent procedure. Before playing, some reaction time data were collected that are not relevant to the present analysis. Consequently, participants played their FPS level for 10 minutes. They were then requested to complete another reaction-time task and were handed a questionnaire afterwards. Players' objective performance was recorded from game statistics; for this purpose, the number of enemies killed within the 10 minute play time ("kills") and the number of times the player character was killed ("deaths") were noted by the experimenter.

Analysis of these statistics revealed that the manipulation of difficulty was highly effective (see table 1). With increasing difficulty, the average number of enemies that players managed to kill went down sharply, whereas the number of the player character's "deaths" increased substantially. These group differences were highly significant both for "kills" and "deaths".

**Table 1.** Average number of "kills" and own "deaths" across experimental groups of different game difficulty (n=71)

| | Enemies killed | | Deaths of player character | |
|---|---|---|---|---|
| Game difficulty | Mean | Standard Deviation | Mean | Standard Deviation |
| Easy (n = 25) | 24 | 7.58 | 1.72 | 4.52 |
| Moderate (n = 23) | 8.96 | 5.77 | 15.09 | 5.59 |
| very difficult (n=23) | 2.65 | 2.81 | 25.74 | 4.85 |

Main effect of game difficulty on enemies killed: $F(2,68) = 86.63$, $p < .0001$; $\eta^2 = .72$.
Main effect of game difficulty on own deaths: $F(2,68) = 139.52$, $p < .0001$; $\eta^2 = .80$.

**Table 2.** Average ratings for game difficulty across experimental groups (n=71)

| | Perceived difficulty of game | |
|---|---|---|
| Game difficulty (experimental factor) | Mean | Standard Deviation |
| Easy (n = 25) | 1.58 | 0.61 |
| Moderate (n = 23) | 2.98 | 0.71 |
| very difficult (n = 23) | 3.85 | 0.75 |

Main effect of experimental variation in difficulty: $F(2,68) = 66.45$, $p < .0001$; $\eta^2 = .66$

The post-play questionnaire assessed game enjoyment (with 4 items like "the game was entertaining", scaled from "1" meaning "I do not agree at all" to "5" meaning "I fully agree", Cronbach's $\alpha = .93$), satisfaction with one's own performance (4 items like "I am proud of my performance in the game", scaled again from "1" to "5", Cronbach's $\alpha = .80$), and perceived difficulty of the game (two items on a 5 point semantic differential such as "the game was… not manageable vs. no challenge", Cronbach's $\alpha = .91$). Finally, some additional information (including demographics) was requested from participants. After responding to the questionnaire, participants were debriefed and dismissed. Each person received 5 EUR as compensation.

The postplay questions on perceived game difficulty again demonstrated the effectiveness of the experimental variation in challenge level (table 2). Players rated the difficulty level of the game level in the way the experimental manipulation had been designed; this finding also indicates that players were aware of specific objective difficulty of their game task when evaluating their performance.

## 4 Results

Results indicate that in general, players evaluate their performance worse if they have been confronted with harder game difficulty. Obviously, self-assessment of playing performance was made under the impression of the number of kills (and deaths) without taking the objective difficulty of the game into account. The many kills that virtually all players achieved in the easy game version seem to have caused players to rate their performance as very good in spite of the low challenge that this game version imposed. Vice versa, the many own deaths in the hardest condition obviously caused players to evaluate their performance negatively in spite of the objective difficulty level. However, overall performance ratings did not differ as strongly between players of the moderate and the hard game version, which suggests that players begin to 'defend' or 'justify' their performance when confronted with extremely difficult tasks and are not ready to accept any negative gaming outcome as consequence of their insufficient performance (table 3).

A similar analysis was conducted to examine the impact of game difficulty on game enjoyment (see table 4). Overall, the easy game version that facilitated the highest number of success experiences (enemies killed) together with the lowest number of failures (deaths of the player character) generated the most intensive game enjoyment. Enjoyment of the harder game versions was lower, with the mean difference between the moderate and the highly difficult version being smaller than the difference between the easy and the moderate condition. The greater satisfaction with one's own performance in the easier difficulty conditions thus comes along with greater enjoyment, which contradicts the assumption elaborated earlier that the moderate difficulty condition would generate more fun than the easy and the hard condition. The difference in effect sizes should be noted, as they are important for the interpretation of findings. While the effect of the manipulated game difficulty was very strong on actual performance (kills/deaths), it was a little lower but still strong ($\eta^2 = .66$) for the game difficulty rating, again substantially lower for players satisfaction ($\eta^2 = .46$), and went down to a moderate effect size for game enjoyment ($\eta^2 = .17$)

**Table 3.** Satisfaction with playing performance across experimental groups of different game difficulty (n=71)

| Game difficulty | Mean | Standard Deviation |
|---|---|---|
| Easy (n = 25) | 4.06 | 0.63 |
| Moderate (n = 23) | 2.89 | 0.69 |
| very difficult (n = 23) | 2.51 | 0.81 |

Main effect of game difficulty level: $F(5,65) = 28.17$, $p < .0001$; $\eta^2 = .46$

**Table 4.** Game enjoyment across experimental groups of different game difficulty (n=71)

| Game difficulty | Mean | Standard Deviation |
|---|---|---|
| Easy (n = 25) | 4.29 | 0.59 |
| Moderate (n = 23) | 3.84 | 0.83 |
| very difficult (n = 23) | 3.53 | 0.86 |

Main effect of game difficulty level: $F(5,65) = 6.49$, $p < .01$; $\eta^2 = .17$

## 5 Discussion

The experimental variation of game difficulty produced patterns of game enjoyment (RQ1 and RQ2) that are not fully in line with flow theory [12] and attribution theory of motivation [6]. From these frameworks, maximum enjoyment would be predicted for moderate game difficulty, because under such conditions, players can perceive their own skills and efforts, and attribute occurring success events to themselves. Too easy and too hard difficulty levels would either lead to boredom (or no reason to be proud on one's performance) or frustration (or the suspicion that luck helped to overcome the extreme challenges). Interestingly, our experiment found that players enjoyed the FPS the most when they were given a very easy condition with many success events (enemies killed) and very few (if any) failures (own deaths). With increasing difficulty, the number of success events went down and the number of failures events went up, and both satisfaction with the own performance and overall game enjoyment were lower than in the easy condition.

Some methodological issues need to be addressed before a conceptual discussion. First, the results may be caused by a misinterpretation of objective difficulty levels. Maybe players found the condition that the investigators labeled "easy" actually challenging, which would suggest to reconsider if the findings do in fact match with attribution and flow theory. However, players' own ratings of game difficulty were in line with the experimental manipulation: So players enjoyed the game condition the most for which they admitted a low difficulty level, which suggests that the according results are no artifact of unrealistic experimental manipulation. Second, players used the game in a laboratory setting, which may have reframed participants' situation perception in a way that made performance requirements more salient than in conventional home use situations. Reports of satisfaction and enjoyment may thus be biased due to players' intentions to impress the experimenter; however, there is no evidence for the type of bias that may have occurred. Field replications of the study may illuminate this possible problem in the future.

From a theoretical perspective, there is a need to reconcile the present results with previous studies who found evidence for flow experiences to be connected to video game enjoyment [14] and for expert players' preference for extremely difficult over simple tasks [15] – findings that seem to be just the opposite of what the present study revealed.

Our attempt to integrate these findings with previous research is focused on the issue of playing time. We suggest that the relationship between game difficulty, success rate, internal attribution of success, satisfaction with own performance, and overall game enjoyment changes over the time of using a given game. Our findings picture the situation of players beginning an unfamiliar game. In this early stage, enjoyment seems to be driven by 'quick success', that is, a high number of explicit positive feedbacks fuels game enjoyment. The fact that this fast stream of success experiences is caused by low difficulty seems to be 'ignored actively' by players: They know that the game 'makes it easy' for them, but still they have fun with being successful, although they 'objectively' did nothing to be really proud of [6]. In turn, high numbers of failure events reduce game enjoyment in the beginning stage of game use, although players know that it was an 'objectively' hard task. So our interpretation of the found link between game difficulty and game enjoyment is that during the early stage of getting acquainted to a new game, players heavily depend on visible success and positive feedback provided by the game. Internal performance evaluations such as "I was good, but the game was really hard" seem to be less important at this stage. Without such cognitive rationalization of failure, game enjoyment cannot be preserved at harder difficulty levels and goes down. Overall, players starting an unfamiliar game depend on the game's feedback of good performance; only if the game delivers such success feedback (regardless of objective difficulty), the beginning stage of game use is notably enjoyable.

These patterns of game difficulty and game enjoyment may change with increasing playing time. After eight more hours of experience with the same game, for instance, the experimental levels with easy, moderate, and difficult challenge would have different meanings for players. More importantly, players would hold more knowledge to judge their own performance independently of the game's direct success feedback. That is, with more knowledge about the game and one's own skill level, players can evaluate their performance without relying on the game's performance feedback alone. Such an experience-based interpretation of performance may then lead to a shifting pattern of performance and game enjoyment. At a later playing stage, the fact that there was no challenge involved in achieving many kills may hold more weight in the generation of game enjoyment. In turn, with more game experience, players learn to value really good performance in objectively difficult circumstances. Their experience provides the arguments to defend enjoyment even when confronted with many failures. Vice versa, their experience also enables the state of boredom when confronted with too easy tasks – the many wins that are demonstrably fun at the early playing stage become boring with increased experience.

In sum, we argue that players who are more familiar with a given game would display the pattern of game difficulty, satisfaction with own performance, and game enjoyment that is predictable from attribution theory and flow theory (see above): Game events and knowledge-based interpretation of performance jointly render moderately difficult tasks more enjoyable and create circumstances of less enjoyment for too easy and too difficult game tasks. For players who are at the beginning to using a new game, however, the pattern of game difficulty and enjoyment seems to be mostly driven by the explicit feedback given by the game, regardless of players' internal evaluations of difficulty levels. For players starting a new game, the fun of gaming thus seems to arise from what the game offers in terms of positive and negative

feedback, whereas for players who are very familiar with a game, their own interpretation of the game's feedback (in terms of "how difficult was that situation?") plays a greater role in the generation of game enjoyment. This difference of patterns between early and later stages of game familiarity is thus the conceptual resolution that comes out of the present findings that seem to contradict patters reported in earlier work [6] [12].

In addition to the experimental group *mean differences* in average satisfaction and enjoyment, the *effect sizes* observed in the current experiment deserve conceptual attention. In the easy game condition, players did not 'die' very often; in the 'very hard' condition, players got killed very frequently. Effect sizes were substantially lower for players' satisfaction with their performance, and still lower for enjoyment rating, however. This means that strong group differences in objective performance led to smaller (yet massive) group differences in satisfaction with performance and to rather small (actually moderate) group differences in game enjoyment.

Concerning RQ3, this pattern of effect sizes indeed suggests that players actively manage and protect their enjoyment experience. Following arguments from general entertainment theory [5], we argue that players' strategy to maximize game enjoyment is to switch between different origins of fun instrumentally. Research on video game enjoyment has identified various sources of fun beyond 'performance – self-esteem – enjoyment', for instance, identification with the game character, or curiosity and surprise (see, for instance, [16] [17]). This means that the game experience does not fully depend on performance issues but that other factors can also affect enjoyment.

Our conclusion is thus that players do not allow performance to dominate their experience, but that they attend also to other 'fun factors' in order to maintain a positive play experience. Instrumental use of a game's fun factors would then imply to focus in performance-based enjoyment when performance is good and satisfaction is high (i.e., pride as dominating mode of game enjoyment) and to focus on other fun factors when performance is bad and satisfaction is low (i.e., curiosity or suspense as dominating mode of game enjoyment). Players seem to 'intelligently handle' the various types of fun that video games have to offer, and they seem to be able to take the most fun out of the game even if one important factor (performance) does not reach optimal values. Thus, the effect size of difficulty on enjoyment was much lower than the effect size of difficulty on actual performance. However, game difficulty and performance still have an impact on game enjoyment in spite of players' active management and protection of their fun experience (i.e., players in the high-failure condition did not report exactly the same enjoyment as players in the medium-failure condition). We thus argue that players cannot fully override game-based determinants of fun, but that they can only partly buffer the impact of fun factors on their experience.

From the perspective of game development, finally, our results provide support to the common techniques of adapting the way a game operates difficulty management to the player's current stage. For players who have just begun a new game, it is important to offer a high number of positive events (success experiences) in order to facilitate enjoyment right from the start. This can be achieved by reducing difficulty levels to the absolute minimum. Examples from successful games and their 'tutorials' for beginning players illustrate the viability of this design strategy. With ongoing game use, the difficulty level should rise stepwise in order to offer more and more

information that players can use for their own individual assessment of their performance, which will contribute to sustained game enjoyment in later stages of game use. Another related strategy of game developers is to adapt the difficulty automatically and dynamically in order to adjust the game to individual performance and provide 'credible' success experiences in any stage of game exposure. The interpretation of the present results implies that such automatic difficulty adaptation should not attempt to maintain a similar level of success experiences for beginners and advanced players alike, but rather increase difficulty disproportionately fast with increasing player performance. This way, players reaching a higher game-related expertise level would be confronted with a much greater frequency of failure than early-stage players, and this change of the game's requirement profile would better fit to advanced players' expectations (because advanced players expect to run into extremely heavy game challenges and are resilient against much of the frustration that comes along with them). The present study thus suggests to compare different logics of dynamic difficulty adaptation systematically to determine their impact on game enjoyment over playing time. In general, however, the present results are nicely in line with what is widely practiced in game design concerning difficulty management and adaptation.

Finally, the findings on different effect sizes of game difficulty on player performance versus game enjoyment open interesting theoretical and applied perspectives on the video game experience. We have suggested an interpretation of the multi-causality of game enjoyment [13], which has implications for future research on user experiences in entertainment computing (i.e., to observe multiple dimensions of enjoyment simultaneously in one study and to compare expert and novice players) and for game design (i.e., orchestrate different fun factors to support players' instrumental switching between modes of fun). The overall conclusion is thus that games do facilitate fun because they are task-based environments and allow self-experiences of competence and pride, but that players are also 'smart' in construing their entertainment experience and can handle the different fun factors of video games instrumentally to maximize their emotional benefits.

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