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Social Comparisons and Need Fulfillment: Interpreting Video Game Enjoyment in the Context of Leaderboards

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This study examines how social comparison information provided by video game leaderboards may influence players' retrospective judgments of autonomy, competence, and relatedness need fulfillment. Participants played a video game and were randomly assigned to receive no postgame feedback or were shown a leaderboard that placed them in the top or bottom quartile of players. Results indicate downward social comparisons increase enjoyment by increasing competence and relatedness perceptions. However, upward comparisons did not have an opposite effect, nor did either type of social comparison influence players' autonomy perceptions. Implications for applying Self-Determination Theory to video game enjoyment in the context of social comparison feedback is discussed.

Keywords: *Enjoyment; Self-Determination Theory; Social Comparison Theory; Video Games*

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Research suggests video games are appealing because they can satisfy lower-order needs such as hedonism (i.e., pleasure seeking) and higher-order needs such as self-perceptions of competence, autonomy, and relatedness (Ryan, Rigby, & Przybylski, 2006; Tamborini et al., 2011). Although research has examined how cooperative play can influence enjoyment via self-perceptions of relatedness, less research has explored how competitive social situations can influence self-perceptions of competence, autonomy, *and* relatedness. For instance, online players can easily learn social information about others through leaderboards, which provide summative information about players' performances. Research suggests that social information about others, particularly information about a skill, can influence people's self-perceptions and enjoyment of an activity by triggering social comparison processes (e.g., Boggiano & Barrett, 1985; Reeve & Deci, 1996; Weiner & Mandar, 1978). The current study examines how receiving information about other players' performances through leaderboards can influence video game players' self-perceptions and consequently their video game enjoyment.

Social Comparison Theories and Video Game Leaderboards

Social comparison theory (Festinger, 1954) posits that people have a drive to evaluate their opinions and abilities by comparing them to others. When presented with information about others, research suggests people automatically make social comparisons regardless of whether they were seeking such social information or not (Gilbert, Giesler, & Morris, 1995; see Djikic & Langer, 2007). Comparisons can occur in two forms: assessing one's performance relative to those doing better (upward comparison) or worse (downward comparison). More recently, downward social comparison theory (Wills, 1981) suggests that type of comparison can lead to different effects on players' self-perceptions; downward comparisons can increase players' mood, self-esteem, and self-perceptions of competence (Colwell, Grady, & Rhaiti, 1995), while upward comparisons can reduce motivation and perceptions of competence and skill (Boggiano & Barrett, 1985; Deci & Cascio, 1972). Leaderboards provide an excellent opportunity for social comparisons such that high and low leaderboard placement should facilitate downward and upward comparisons respectively.

Need Fulfillment and Social Comparison

Self-determination theory (SDT; Deci & Ryan, 2000) hypothesizes that three psychological needs are foundational for understanding human thriving. According to the theory, people thrive by seeking out experiences that facilitate their need to feel control over their behavior (autonomy), mastery over challenges (competence), and connection with others (relatedness). Due to their interactive nature and their ability to connect players, video games are an excellent way to fulfill these psychological needs (Ryan et al., 2006), and research shows that need fulfillment leads to increased

perceptions of enjoyment (Tamborini et al., 2011). Despite the need-fulfilling nature of video games in general, it is not clear how upward and downward social comparisons might affect self-perceptions connected to players' video game enjoyment. For example, video game enjoyment has been tied to in-game experiences such as receiving a variety of competence feedback (e.g., defeating enemies, earning coins), making autonomous decisions, and cooperating with other players (i.e., relatedness). However, leaderboards provide additional information, often immediately after game play, that may interrupt this process and recast players' retrospection of game play through the lens of upward and downward social comparisons. Although players may have experienced need fulfillment during game play, their self-perceptions of competence, autonomy, and relatedness after game play may be augmented and thereby influence their retrospection of the video game as enjoyable.

Competence

Regardless of a player's subjective performance, leaderboard feedback should have varying effects on autonomy, competence, and relatedness according to the downward or upward comparison it provides. Research has shown that downward comparisons can increase one's perceptions of competence and lead to increased enjoyment (Deci, 1971; Weiner & Mandar, 1978). High placement on a leaderboard is an affirmation by the game that the player is competent on a given measure compared to other players and thus should lead to greater feelings of competence. As feelings of competence increase, enjoyment of the game should increase.

> *H1: High leaderboard placement will increase players' enjoyment by increasing perceptions of competence compared to those who receive no leaderboard feedback.*

In contrast, low leaderboard position (i.e., upward comparison) is a form of feedback that may negatively affect competence (Boggiano & Barrett, 1985; Deci & Cascio, 1972) and ultimately decrease enjoyment.

> *H2: Low leaderboard placement will decrease players' enjoyment by decreasing perceptions of competence compared to those who receive no leaderboard feedback.*

Autonomy

The interactive nature of video games facilitates autonomy perceptions, but the presence of a subsequent leaderboard might do the opposite. Leaderboards may create an external motivation to increase or maintain one's standing relative to other players and recast their game play experience as a competition driven by other players (i.e., an external force) instead of an internal desire. External motivations such as competitions decrease autonomy (Deci, Betley, Kahle, Abrams, & Porac, 1981), and as a result, leaderboards may negatively affect enjoyment (through autonomy perceptions) regardless of downward or upward comparisons.

H3: Both high and low leaderboard placement will decrease players' enjoyment by decreasing perceptions of autonomy compared to those who receive no leaderboard feedback.

Relatedness

Video games are increasingly becoming a social activity (Jansz & Tanis, 2007), and playing with others provides an opportunity to fulfill relatedness needs and thereby increase enjoyment. However, it is not clear how leaderboard placement will affect relatedness perceptions. A leaderboard is indicative of a competitive, rather than cooperative, framework. By framing gameplay as a competition, the leaderboard may reduce feelings of connection with other players, which ultimately may negatively affect enjoyment.

A large body of literature suggests that social comparisons can increase positive self-appraisals (Wills, 1981) but also perceived social connections to valued others (Argyle, 1994; Hallowell, 1955). For example, receiving positive feedback in the form of downward social comparisons (e.g., scoring above average) has been shown to increase self-esteem, power, *and* perceived inclusion in various social groups (Fry, 1976). Therefore, it is possible that people feel a connection or at least perceive inclusion with social comparison targets, which contributes to their enjoyment.

RQ: How will leaderboard placement affect players' enjoyment by increasing or decreasing relatedness perceptions compared to those who receive no leaderboard feedback?

Method

Participants

Participants were 114 students (43.9% female, M_{age} = 20.9, SD = 2.69) from a large Midwestern university who participated for extra course credit.

Procedure

Participants were randomly assigned to downward comparison, upward comparison, or no feedback (control) conditions. Participants were told they would have their performance evaluated on a video game that had been validated as a measure of video game skills at other universities and was now being tested at the current university. Participants completed a pretest questionnaire measuring their video game playing habits and perceptions of their ability to perform well in video games. Participants then played a first-person shooter video game that was created by the researchers using the game development software FPS Creator. Players controlled a realistically rendered human character that fought a variety of enemies

(i.e., armed and unarmed human security forces and monsters) with multiple weapons (i.e., various guns and grenades) over four different levels for 15 minutes.

After playing, participants had one minute to view a graphic stating they scored in the 93 (downward) or 23 (upward) percentile[1] of all previous players from that university, accompanied by a smiling or frowning cartoon face. Participants in the control condition saw a "Game Over" screen. All participants were assigned the name "User 163" to indicate how many other players had previously played the game. Participants then completed a questionnaire measuring their perceived competence, autonomy, relatedness, and enjoyment. Finally, participants rated the difficulty of the video game on a 7-point bipolar item (*Not difficult—Difficult, M* = 4, *SD* = 1.79).

Measures

Actual performance

Each enemy within the game was assigned a difficulty value based on its ability to withstand and inflict damage in comparison to all other characters in the game. While participants were playing, the game summed the difficulty value scores of defeated enemies but did not show this score to participants (*M* = 58.51, *SD* = 19.90).

Enjoyment

Participants' enjoyment was measured with a seven-item subscale of the Intrinsic Motivation Inventory (Ryan, 1982). Statements were answered on a 7-point Likert-style scale ranging from (*not at all true*) to (*very true*), alpha = .90, and included items such as "This video game was fun to play" (*M* = 2.87, *SD* = 1.39).

Expertise

Participants perceived video game expertise was measured using a single 7-point bipolar item (*Rookie—Expert*) asking participants to "Rate your overall ability level at playing video games" (*M* = 3.41, *SD* = 1.73).

Need satisfaction

Competence, autonomy, and relatedness needs were measured using the Player Experience of Need Satisfaction (PENS) scale (Ryan et al., 2006). Each need was measured using three 7-point Likert-style questions (*strongly disagree—strongly agree*) and included "I feel very capable and effective when playing" (competence, alpha = .91; *M* = 3.82, *SD* = 1.63) and "The game provides me with interesting options and choices" (autonomy, alpha = .81; *M* = 3.13, *SD* = 1.37). One item from the measure of relatedness was dropped from the scale due to unacceptable reliability. This resulted in a two-item measure (e.g., "I find the connection I formed with other players who have played this game fulfilling," alpha = .82; *M* = 2.38, *SD* = 1.28).[2]

Results

A power analysis was conducted on all mediation pathways using a sample size of N = 114 and 5,000 Monte Carlo confidence interval replications (Schoemann, Boulton, & Short, 2017) with an alpha of .05. Results indicate insufficient power for indirect effects of upward comparison through relatedness (power = .24), and through autonomy (power = .38), raising the possibility that there is a significant indirect effect that might go undetected in those pathways.

A nonparametric case-resampling bootstrap approach (Hayes, 2017), using 20,000 bootstrap replications, was used to test the hypothesized indirect effects. Two dummy variables representing the hypothesized differences between conditions were created (i.e., downward comparison versus no feedback and upward versus no feedback). To ensure the current results are due to the feedback provided and not players' actual performance (Critcher & Dunning, 2009), their true score was added as a covariate. Players' subjective evaluations of their in-game performance is likely influenced by their perceived video game expertise such that expert players may expect positive feedback and disbelieve negative feedback, while novice players may exhibit the opposite (e.g., Klimmt, Blake, Hefner, Vorderer, & Roth, 2009). Therefore, players' self-reported expertise in video games was also added as a covariate. In addition, participants' gender was included as a covariate to account for possible gender differences in game genre preferences (and resulting difference on game enjoyment). Analyses were performed using *lavvan* package (Rosseel, 2012) in R statistical language and environment (R Core Team, 2018).

Hypotheses and Research Question

The indirect effects of downward and upward leaderboard comparison (separately) compared to no feedback on players' video game enjoyment through competence (H1/H2), autonomy (H3), and relatedness perceptions (RQ1/RQ2) were tested simultaneously using a parallel mediation model. In all of the analyses, the influence of mediators on other mediators are controlled for by allowing residuals of mediators to be correlated with one other.

The results suggest that receiving downward comparison feedback compared to receiving no feedback via a leaderboard heightened players' video game enjoyment by increasing their perceptions of competence (point estimate = 0.19, LLCI = 0.04 and ULCI = 0.46, based on 95% bias-corrected and accelerated CIs, partially standardized indirect effect ab_{ps} = 0.14) and relatedness (point estimate = 0.12, LLCI = 0.01 and ULCI = 0.34, ab_{ps} = 0.09). On the other hand, the results suggest that receiving upward comparison feedback compared to no feedback via a leaderboard did not reliably decrease players' video game enjoyment by decreasing perceptions of competence (point estimate = −0.07, LLCI = −0.30 and ULCI = 0.07, ab_{ps} = −0.05) or relatedness (point estimate = −.02, LLCI = −0.18 and ULCI = 0.10, ab_{ps} = 0.09, ab_{ps} = −0.02). Thus, H1 was supported, but H2 was not supported. The research question was answered.

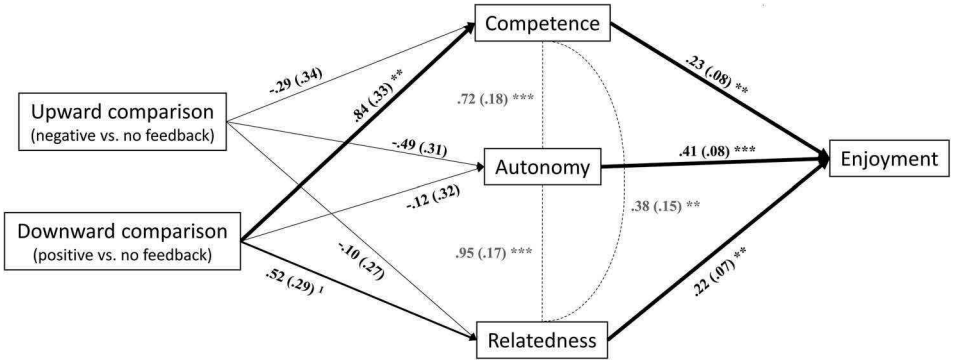

Figure 1 Multiple mediator model results.

Note: The analysis controls for expertise, actual score, and gender as covariates. Residuals of mediators are allowed to covary (denoted as dashed lines with gray colored estimates). Values are unstandardized point estimates for each direct path, and their standard errors in parentheses. Significant path estimates are denoted as bold lines. *** $p < .001$; ** $p < .01$; * $p < .05$. ^{1} $p < .10$. Results indicated that the model explained 46% of the variance in enjoyment, $R^2 = 0.46$.

Regarding autonomy perceptions, the results suggest that receiving downward or upward comparison leaderboard feedback compared to no feedback did not lower player's video game enjoyment by decreasing autonomy perceptions (for downward comparison, point estimate = −0.05, LLCI = −0.31 and ULCI = 0.23, ab_{ps} = −0.04; for upward comparison, point estimate = −0.20, LLCI = −0.50 and ULCI = 0.04, ab_{ps} = −0.14). Therefore, H3 was not supported (see Figure 1 for all direct paths).

Discussion

The current study provides an examination of how commonly available social comparisons for players via leaderboards can influence players' retrospection of in-game need fulfillment vital for enjoyment. Results indicated that high leaderboard placement increased enjoyment through competence and relatedness perceptions, although low leaderboard placement did not lead to significant decreases in enjoyment. Notably, the downward comparison findings held when controlling for actual game performance and self-assessments of expertise, suggesting that social comparison feedback, and leaderboards in particular, are an important part of the feedback process in video games. Specifically, players may be compelled to weigh their in-game experiences against social comparison feedback when leaderboards are injected after game play. Future research should examine when social comparison feedback is weighed more heavily than in-game experiences and how this hierarchy may influence self-perceptions and enjoyment. In the meantime, the current study suggests that players seeking to bolster perceptions of competence through competitive game play (Jansz & Tanis, 2007) may favor video games that provide comparative measures of their performance. Also, despite the competitive nature of downward social

comparisons, players may find such connections socially valuable and fulfilling, which contributes to their enjoyment.

Results also suggest that players may easily discount one poor score, especially if players perceive video game skills as malleable (Lockwood & Kunda, 1997). Indeed, research has identified specific situations in which upward comparisons may have positive effects such as hope and motivation (e.g., Taylor & Lobel, 1989). Playing a video game once may be another instance in which upward comparisons do not pose a threat to self-perceptions. Alternatively, research suggests that different goals for an activity can foster or deter intrinsic motivation (i.e., Trichotomous Achievement Goal Framework). If a player is determined to succeed in a video game (i.e., performance-approach or mastery goals), then a single setback (e.g., low placement on a leaderboard) is likely insufficient to deter or change the player's motivation (see Rawsthorne & Elliot, 1999). Future research should examine if competence and relatedness perceptions are influenced by repeated upward comparisons over multiple gaming sessions that may shift players' goals that are detrimental to intrinsic motivation such as performance avoidance.

Another potential explanation worthy of future research is that players may have processed the leaderboards differently. Although people automatically utilize social comparison information (Gilbert et al., 1995), research suggests that some players may have used the leaderboard for self-enhancement, congruent with downward social comparison theory, while others were truly interested in an objective evaluation of their performance, congruent with the original social comparison theory (e.g., see Suls, Martin, & Wheeler, 2002). Therefore, the current results could reflect players who used the leaderboard for self-evaluation and thereby found downward comparisons to be simply informative about their performance and found upward comparisons to be nonthreatening to the self.

Interestingly, social comparisons via leaderboards did not lower players' autonomy perceptions or enjoyment. Research suggests that if a person feels pressured to compete, then social comparison feedback can decrease intrinsic motivation through perceived self-determination (i.e., autonomy) even while simultaneously fostering intrinsic motivation via competence (Deci et al., 1981; Reeve & Deci, 1996). However, other research suggests that feedback must be perceived as controlling and applying pressure to continue an activity (e.g., "Good, you did just as you *should*") to cause decreases in intrinsic motivation. Perhaps social comparison information in the format of leaderboards is not perceived as externally motivating and must have a controlling aspect before influencing perceptions of autonomy. The current study is unable to assess the dual nature of leaderboards because external pressure to compete was not manipulated, a limitation future research should address.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes

1. Fein and Spencer (1997; Study 3) placed participants' score on a fake intelligence test at the 93rd or 47th percentile of previous participants. However, people are likely better predictors of their video game performance compared to their general intelligence, and thus the upward comparison feedback was lowered to the 23rd percentile to increase believability. It is worth noting the asymmetrical distribution of feedback in the current study (i.e., positive feedback was closer to 100 than the negative feedback was to 0) may have contributed to the null findings for the upward comparison condition.
2. The dropped item was reverse coded (i.e., "I don't feel close to other players who have played this game"), which often hinders scale reliability (Dalal & Carter, 2015).

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