Self-Efficacy and Video Games: Translating Confidence Across Subjects
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While there has been extensive research into how and to what extent self-efficacy in academics can influence future academic performance, and there is budding research about how playing video games may affect self-efficacy and self-esteem, there is little research regarding how self-efficacy within games, may translate to the alteration of an academic self-concept. We looked through past research on academic self-efficacy and self-concept in the context of games to get a sense of how confidence, self-esteem, self-concept, and past performance can influence students’ predictions of their future academic performance.

One study we examined that addressed self-efficacy beliefs in academic settings (Parajes and Graham, 1999) explored the role of motivation constructs specifically in influencing mathematics performance in entering middle school students. They wanted to look at whether or not math self-efficacy influences predicted math performance, and why math self-judgments do not remain constant during the first year of middle school (grade 6). Their focus was on the gender of students, their program (gifted or regular), motivational variables, and preexisting math attitudes. In order to get a comprehensive view of the students’ self-efficacy and attitudes, the experimenters measured mathematics self-efficacy, mathematics anxiety, mathematics self-concept (using Academic Self-Description Questionnaire II- ASDQII), self-efficacy for self-regulated learning, attitudes toward math, engagement, previous academic achievement (via Iowa Test of Basic Skills- ITBS- and GPA), and mathematics performance. Pajares and Graham found that there was a high correlation between self-efficacy and performance, and that the correlation between self-efficacy and self-concept was especially high. Additionally, ITBS scores were predictive of performance, and gifted students outperformed
regular students. Gifted students not only performed better, but were less overconfident, more accurate in self-efficacy beliefs, and had higher self-efficacy and self-concept. This study is highly relevant to ours because it focuses on the importance of task specificity for self-efficacy influences, which we also employ in our study. This also takes into consideration past performance on predicted performance and self-efficacy, which is parallel to our initial survey of student performance via the online game.

Looking at self-efficacy from another perspective, Vancouver et al. (2002) conducted two studies looking at the potential negative effects of self-efficacy on performance. They looked at a potential negative relationship between self-efficacy and performance when using repeated measures. The experimenters also measured self-efficacy (a manipulation check), self-report measures (single question: how many rows will it take you to get the answer? Plus 10 questions asking item by item how likely one would be to find the solution to the next trail by each row), as well as performance (row number in which solution was found). Vancouver and colleagues found that the experimental group (high self-efficacy manipulation) had significantly higher self-efficacy for the two measures, and that self-efficacy was found to be negatively correlated with performance in both the control and manipulated conditions. Finally, they found that induced high self-efficacy led to overconfident performance judgments. From these findings, Vancouver et al. ultimately concluded that even though most research (and common belief) tells us that higher self-efficacy leads to better performance, this study found that manipulating higher self-efficacy had no significant result on performance between control and manipulated groups. Additionally, they concluded that the self-efficacy manipulation did show significant results, with the manipulation decreasing future performance when looking at the within-person level, indicating that it should be possible for us to manipulate self-efficacy. In an attempt to explain their data, Vancouver et al. argued that the difference between this study and previous literature results is likely due to the
repeated measures aspect of this study, and that it is possible that these results are due to accidental manipulation of more than just self-efficacy, e.g. reduced interest, focus, or perceived difficulty (Vancouver, 2002). This study is especially applicable to our research because it not only looks at manipulated self-efficacy but looks at it within the context of games and arbitrary positive or negative feedback. However, this study showed very different results than many other studies on a similar topic, so the results are not conclusive.

In terms of video games specifically, there has been limited research into how the experience of playing video games may influence or be indicative of general self-esteem or self-efficacy in specific areas. Meluso et al. (2012) found that specifically educational games have the potential to significantly increase academic self-efficacy in elementary school students. They found this to be true in both collaborative game playing settings as well as single-player games. This research is interesting to us because it is one of very few articles that draws a connection between the game-playing experience and increased self-efficacy. We, however, are more interested in how pre-existing video game self-efficacy, when brought to attention, can influence academic self-efficacy. The goal for our research is to examine how these findings may be affected by the introduction of non-academic video games into the system, and to see if bringing students’ attention to their game performance while also asking them about their future academic performance has a significant influence on their predictions about how well they will perform on a non-video game test given shortly after playing the game.

Finally, Kaye et al. (2017) examined psychosocial impacts of video games drawing from extant social identity theory literature. Looking at both online and offline players of the soccer video game FIFA, they found that overall there were positive associations between accepted social identity (as a gamer) and self-esteem. Additionally, looking at another game, Football Manager, Kaye et al. found positive associations between engaging in offline game play and depth of relationships. Kaye and
colleagues concluded that participating in video game playing can have a positive effect on self-esteem. Taking into account all of these results, indicating that video games can positively impact self-esteem (Kaye et al.), that games can increase academic self-efficacy (Meluso et al.), and that there is a positive correlation between academic self-efficacy and performance (Pajares and Graham), we were left to consider how artificially manipulating participants’ sense of self-efficacy with regards to video games may influence the same participants’ academic self-efficacy. Based on these results, we predicted that students with higher video game skill efficacy would have higher academic self-efficacy as well. Additionally, we hypothesized that if students were given randomized feedback informing them that they were better or worse than average, this would influence their self-efficacy. Finally, we predicted that participants with congruent feedback and self-perception would show more difference in their academic confidence ratings (i.e. negative congruent students who thought and were told they were worse than average would show a larger change in academic self-efficacy than their positive congruent counterparts), and that positive incongruent feedback (being told you were better than average when you thought you were worse) would lead to higher academic confidence ratings than negative incongruent feedback.

Method
Participants

For this study examining academic self-efficacy, we looked at data from 84 participants (21 men and 63 women). All participants were at least age 18 and were undergraduate students at Rice University enrolled at the time in at least one psychology class that required participation in Experimetrix studies through the university for class credit. Participants received one half credit of research participation for their time. The present study was completed remotely by all participants on their own time via the Experimetrix website. Participants were aware that the intended purpose of the study was to examine the relationship between
video game self-efficacy and academic confidence but were not informed that they would be receiving randomized feedback regarding their performance. Of the total 110 undergraduates that took our survey, we ultimately excluded 26 participants. We excluded 14 participants for failing to complete the survey, while the other 12 were excluded for completing the survey too quickly or too slowly for an effective manipulation. We set the minimum completion time cut off as four minutes, one minute longer than it took us on average to complete the survey, being already quite familiar with the questions. The maximum cut off time of 20 minutes was set after examining the sharp increase in completion time following the 20 minute mark, in contrast to steady incline up until this point, indicating to us that participants who took longer than 20 minutes were significantly less engaged.

**Materials**

Our survey was presented via Experimetrix. Once linked to our survey, participants were presented five subsections of questions: consent and demographics, game performance, priming, academic confidence, and Graduate Record Examination (GRE) samples. The consent form was only one question, asking for consent, while the demographic questions were all multiple choice answers, either yes/no or multiple options to select race, class standing, gender, and residential college membership. Additionally, the consent subsection informed participants that they could earn one half credit of research participation for applicable Rice University psychology classes. For the game performance questions, there were three blank spaces for participants to enter their scores followed by a five point multiple choice question, ranging from ‘Much Better’ to ‘Much Worse’ asking participants to estimate how their performance compared to the average Rice student. Later in the survey, participants were asked to describe their level of surprise regarding the feedback they received on their relative performance, selecting one of three options ranging from ‘Not Surprised’ to ‘Very Surprised.’ The priming questions were all
presented on a 0-10 scale, asking alternately for approximations of speed, confidence, and accuracy, with 10 being the highest rating. Finally, for the GRE questions, participants were informed they would be answering some standardized questions, and were asked to assess their confidence about answering the upcoming questions on a 0-10 scale, with zero being ‘Not at all Confident’ and ten being ‘Very Confident.’

**Design**

For this study, we primed participants to have video game competence at the front of their mind before introducing the manipulation. The first independent variable was game performance feedback, a two level between subjects variable for participants were given randomized feedback about their performance, indicating that their performance was either better or worse than the average Rice student. The second independent variable, also two levels and between subjects, was self-reported video game skill, also better or worse as compared to the average Rice student. We used a 2 x 2 between subjects design, in which half of participants belonged to one of two congruent levels, meaning they were given feedback that matched their reported video game skill confidence (better or worse than other Rice students), and half of participants were in one of the two incongruent levels, meaning they received feedback opposite to their reported skill confidence (told better/thought worse or told worse/thought better). The dependent variable was reported academic confidence regarding the short set of GED questions that participants were told they were about to have to answer.

**Procedure**

Following the demographic questions and consent form in Experimetrix, participants were given a link to an the online game Crossy Road and asked to play three rounds of the game, reporting each of their three scores. After reporting the scores, they were asked to rate how they felt their performance on Crossy Road would compare to the average Rice
student’s score (better or worse). There were then four priming questions in randomized order asking participants to rate themselves on a few skills related to playing video games, designed to temporarily increase the salience of video game ability in participants’ minds. Following the priming questions, participants were given the manipulation in the form of randomized feedback on how their Crossy Road performance compared to the average Rice student (better or worse), and asked if they were surprised by this result. This question about surprise was designed to distract from the purpose of the study by creating uncertainty about what we were interested in measuring. Participants were next informed that they would be given a short series of standardized test questions and were asked to rate their confidence in answering the questions on a 0-10 scale, zero being not at all confident and ten being very confident. After answering this key confidence question, participants were presented with four sample GRE questions and asked to select the best answer for each. Following the GRE questions, participants answered another decoy question regarding their confidence on a 0-10 scale in correctly answering the questions. Finally, participants were presented with the correct answers to the GRE questions (in case they were curious), thanked, and given a short debriefing form.

**Results**

The ANOVA data analysis was performed using SPSS software, while the independent t-tests were performed using Excel. The data were analyzed with a 2 (provided feedback: better or worse than average) x 2 (self-perception: better or worse than average) ANOVA on video game performance. Counter to our predictions, there was no significant main effect of feedback condition, \( F(1,84) = .297, p = .588 \). This indicates that the feedback we provided to participants did not have a significant influence on the academic confidence ratings that participants later provided. We found some evidence for the main effect of performance self-perception, but the results were not conclusive, \( F(1,84) = 3.385, p = .070 \). The
participants’ beliefs about their own video game performance abilities did not show a significant effect on their reported academic confidence in this study.

**Discussion**

This study found no evidence of a significant effect of either of our two variables, provided feedback or self-assessment. We concluded that in this study, there was no evidence of influence of providing randomized feedback about video game performance on participants’ academic self-beliefs, nor did we find evidence of an effect of participants’ own beliefs about their video game ability. Similarly, we were surprised not to find significant differences in the average academic confidence ratings when comparing the two congruent groups, the two incongruent groups, or the two incongruent groups to the two congruent groups. We anticipated that there would be a significant main effect of provided feedback, as we predicted based on our personal experiences that students at a competitive, elite institution such as Rice may be hypersensitive to influence from outside appraisal, even when baseless. We predicted that there would be a significantly different academic confidence average for the incongruent conditions than the congruent condition as we anticipated that contradictory feedback would have a greater effect on self-efficacy due to the feedback being unexpected, according to the reinforcement learning theory (Niv, 2009; Kaelbling, 1996). We also expected a greater average academic confidence score for participants in the positive incongruent condition than the negative incongruent condition as we predicted the latter participants would have lower self-efficacy as a result of the negative appraisal, and would therefore have lower achievement motivation (Yusuf, 2011).

Looking at our data, we saw that for the survey question asking about academic confidence and measuring our dependent variable, even though there were eleven response options (0-10) ranging from ‘Not at all Confident’ to ‘Very Confident,’ no participant responded anything outside
of the 1-3 range. Combined with the relatively small number of participants we received and were able to include in the study, this extremely narrow range of responses made it difficult to see any effect. Pondering exactly why we might have gotten such a pronounced ceiling effect, we considered the possibility that we observed a form of self-handicapping. Bailis (2001) describes this process as a way for individuals to “arrange unfavorable circumstances... so as to maintain esteem in case of failure, or enhance esteem in case of success.” We believe this may have been exactly what occurred with our participants, as perhaps no one wanted to claim to be overconfident for fear that the GRE questions would be difficult and they would find their own assessment of their solving ability was overzealous.

In the future, we think it may be more revealing to do a repeated measures within-subjects version of this design with freshmen at Rice University in which students are given the survey during O-Week and then again near the end of the semester. Our hope is that this would capture the transformation in academic self-confidence that appears to happen to Rice students during their first semester as they adjust to the difficulty of college. On the other hand, it could be informative to do the same study that we performed on students at a state school as opposed to an elite institution, to see if the handicapping effect is reduced in a less competitive environment. Finally, one additional future direction that we considered for this study was the possibility of rephrasing the question that asked about academic confidence to make it sound more like a ‘five’ on the scale represents an average level of confidence compared to other students, so that participants would be able to report a higher confidence rating without fear of appearing drastically overconfident compared to their peers.
References


Appendix A
Visual Representation of the 2x2 Design and Number of Participants by Condition

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number of Participants</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>Told Better / Thought Worse**</td>
<td>24</td>
</tr>
<tr>
<td>Told Worse / Thought Better**</td>
<td>17</td>
</tr>
<tr>
<td>Told Worse / Thought Worse*</td>
<td>33</td>
</tr>
<tr>
<td>Totals (N = 84)</td>
<td>84</td>
</tr>
</tbody>
</table>

*Congruent conditions
**Incongruent conditions

Appendix B
Mean Academic Confidence by Condition