



The effects of competition and competitiveness upon intrinsic motivation in exergames



Hayeon Song^a, Jihyun Kim^b, Kelly E. Tenzek^b, Kwan Min Lee^{c,d,*}

^a Department of Communication, University of Wisconsin-Milwaukee, P.O. Box 413, Milwaukee, WI 53201, USA

^b Department of Communication Studies, Bloomsburg University of Pennsylvania, 400 E. Second Street, Bloomsburg, PA 17815, USA

^c Annenberg School for Communication & Journalism, University of Southern California, 3502 Watt Way, Suite 326A, Los Angeles, CA 90089-0281, USA

^d Department of Interaction Science, Sungkyunkwan University, Seoul, South Korea

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ABSTRACT

This study examined the role of competition in exercise video games to promote intrinsic motivation for exercise. The experiment was a 2 (Competitive exercise context: Competition vs. No competition) × 2 (Individual competitiveness: High vs. Low) between-subjects design. The results showed significant interaction effects of the independent variables on intrinsic motivation, mood, and evaluation of the exergame. That is, the competitive context provided positive exergame experiences to competitive individuals, whereas it had detrimental effects for less competitive participants. Implications and future directions are discussed.

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1. Introduction

Competition is one of the main elements of video games. As most games are goal directed, competitive situations or competition factors are commonly present in game-play contexts (Frederick-Recascino & Schuster-Smith, 2003). Vorderer, Klimmt, and Ritterfeld (2004) argued that, unlike traditional media users, video game users are driven by competition and achievement. Empirical evidence shows that players experience stronger enjoyment when competition factors are present in game contexts (Vorderer, Hartmann, & Klimmt, 2003). Further, the level of competition also affects players' preferences for the games they choose (Gajadhar, de Kort, & IJsselstein, 2008; Williams & Clippinger, 2002).

What has been less studied in video game research is the role of individual differences with regard to competitive contexts. Although some studies have investigated gender differences in preferences for competitive games (Chan, 2008; Lucas & Sherry, 2004), the current literature does not clearly answer how competition affects game-play motivations differently in various populations. For example, it is not clear if individuals with a competitive disposition would enjoy competitive games more than those who are less competitive. Moreover, research has yet to explore the consequences of playing a game in a competitive context for players who do not enjoy competition. In this regard, the present study

explores how competition as a contextual factor influences players' experiences depending upon individuals' competitive dispositions.

Exergames (exercise video games) provide an interesting venue to test the role of competition for various reasons. First, exergames are fairly easy to play even for the first-time players. Prior knowledge or skills in using a game controller are unnecessary, especially for exercise games such as *Nintendo Wii*, as players use their bodies instead of a complicated controller to play the game. For this reason, the exergame may provide an effective way to examine the true effects of competition while not being heavily affected by game-play skills or history. Additionally, competition in sports and exercise plays a vital role in increasing intrinsic motivation (Deci & Ryan, 1985). As exergames are known as a tool for increasing exercise motivation (Mhurchu et al., 2008; Rankin, Gooch, & Perkins, 2008; Ridley & Olds, 2001; Song, Peng, & Lee, 2011; Tan, Aziz, Chua, & Teh, 2002; Unnithan, Houser, & Fernhall, 2006; Yang, Smith, & Graham, 2008), further investigations on competition may reveal effective strategies for facilitating optimal exergame experiences. Thus, the current study examines how competition factors influence exergame players' motivations for engaging in exergame experiences.

2. Theoretical framework: Competition and intrinsic motivation

Intrinsic motivation, defined as enjoyment of or interest in an activity for its own sake (Deci & Ryan, 1985), has been known to be one of the strongest determinants of exercise adherence (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997). As such, scholars have rigorously examined ways to increase intrinsic motivation for more effective exercise behaviors.

* Corresponding author at: Annenberg School for Communication & Journalism, University of Southern California, 3502 Watt Way, Suite 326A, Los Angeles, CA 90089-0281, USA. Tel.: +1 213 740 3935; fax: +1 213 740 3913.

E-mail addresses: hayeon.song@gmail.com (H. Song), jihyunkim218@gmail.com (J. Kim), ktenzek@bloomu.edu (K.E. Tenzek), kwanmin.lee@usc.edu (K.M. Lee).

Cognitive Evaluation Theory (CET), a sub theory of Self-Determination Theory (SDT), explains how external factors such as competition affect intrinsic motivation (Deci & Ryan, 1985; Ryan & Deci, 2000). According to the theory, levels of intrinsic motivation change depending upon levels of autonomy and competence (Deci & Ryan, 1985; Frederick-Recascino & Schuster-Smith, 2003; Ryan & Deci, 2000). Autonomy is determined by an individual's perceived locus of causality. For example, exercising for an external reason such as rewards does not meet the need for autonomy. In this case, the individual perceives the locus of causality to be more external than internal. The theory predicts that the loss of perceived autonomy undermines intrinsic motivation as individual's actions are not self-determined. Further, competence also influences intrinsic motivation through social-contextual events (e.g., feedback, winning or losing). If the individual does not know how or fails to complete the exercise, he or she is less likely to feel motivated to do it. Empirical research indicates that winners report higher levels of intrinsic motivation than do losers (Vallerand, Gauvin, & Halliwell, 1986a).

A large number of studies have found detrimental effects of competition on intrinsic motivation (Deci, Betley, Kahle, Abrams, & Porac, 1981; Deci & Ryan, 1991; Reeve & Deci, 1996; Rummel & Feinberg, 1988; Tripathi, 2001; Vallerand, Gauvin, & Halliwell, 1986b). For example, Vallerand et al. (1986b) tested the effect of a competitive exercise setting with children aged 10–12. Participants assigned to the competition condition were told to try to beat the other participants in a balancing task using a stabilometer, whereas those in the non-competition condition were not told anything about a competition. After completing the requested task, the young participants were given 5 min of free time to do whatever they wanted to do. It was presumed that voluntarily spending more time on the stabilometer would indicate intrinsic motivation. The research found that children in the non-competition condition spent significantly more time on the balancing task compared to those in the competition condition, suggesting that competition had a detrimental effect on intrinsic motivation.

More recent studies have utilized more advanced technology such as digital games to test the effect of competition on motivation. For example, Ryan and colleagues (Ryan, Rigby, & Przybylski, 2006) tested how well SDT applies to game-playing motivation; results of both an experiment and online survey suggested that competence and autonomy were significantly associated with game enjoyment. In the same vein, Peng, Lin, Pfeiffer, and Winn (2012) investigated how game features influence players' need satisfaction, as postulated by SDT. They found main effects of autonomy and competence on most of the dependent variables associated with motivation and engagement, suggesting that SDT can be useful to explain motivation in entertainment media. However, the effect of competition upon intrinsic motivation may not work the same manner for all populations (see Locke & Latham, 1990 for review). Harackiewicz and Sansone (1991), for example, compared individuals with high-achievement motivations (HAMs) to individuals with low-achievement motivations (LAMs), where achievement motivations were defined as motivations to outdo others and to seek challenge. Results indicated that LAMs did not favor competition factors and avoided them, suggesting that these individuals disliked and tried to avoid the competitive setting.

Further, Epstein and Harackiewicz (1992) compared HAMs and LAMs in competitive and non-competitive conditions and found the opposite pattern: competition undermined task enjoyment for LAMs but promoted it for HAMs. The study's manipulation, however, was such that everyone experienced winning; thus, it was not clear whether HAMs had experienced enjoyment due to the nature of winning or competition. It could be possible that the experience of winning may have increased competence, which promoted intrinsic motivation. Later, Tauer and Harackiewicz

(2004) extended Epstein and Harackiewicz's (1992) study and found an interaction effect between competition and individual differences in achievement motivation both in positive (i.e., winning) and negative outcome feedback (i.e., losing) conditions. What is largely unknown whether the moderating effect of achievement motivation or competitiveness is still valid in a mediated game environment.

In the current study, we utilize an exergame to investigate the effects of a *competitive exercise setting* as a contextual factor and *competitiveness* as an individual characteristic upon intrinsic motivation. The study predicts that competitive individuals would be more motivated in a competitive exercise environment compared to a less competitive environment. On the other hand, the study predicts that less competitive individuals may feel discouraged when they exercise in competitive exercise context. Therefore, the study proposes interaction effects of these two competition-related independent variables upon intrinsic motivation. In addition, we investigated if the proposed independent variables would affect other factors, such as mood and heart rate, because previous studies have shown that feelings of autonomy and competence can lead to changes in mood, vitality, physical symptoms, confidence, and self esteem (Ryan & Deci, 2000; Sheldon, Reis, & Ryan, 1996). We also hypothesized that intrinsically motivated individuals who enjoyed the game would be more likely to evaluate the exergame positively and develop higher exercise self-efficacy.

H1. There is a significant interaction effect between competition and competitiveness on intrinsic motivation.

H2. There is a significant interaction effect between competition and competitiveness on mood.

H3. There is a significant interaction effect between competition and competitiveness on exercise self-efficacy.

H4. There is a significant interaction effect between competition and competitiveness on evaluation of the game.

H5. There is a significant interaction effect between competition and competitiveness on heart rate.

3. Methods

3.1. Participants

The experiment was a 2 (Competitive exercise context: Competition vs. Non-competition) \times 2 (Individual competitiveness: High vs. Low) between-subjects design. Participants were recruited from a large public Midwestern university in the US, and a total of 72 undergraduate students (36 men and 36 women) participated in the study. Individuals were divided into two competitive groups, either high or low, based on the median split of reported competitiveness scores of individuals. Half of each group was randomly assigned to either a competition or non-competition condition. As a result, 18 participants were assigned to each of the four conditions. Most participants ($n = 63$) reported that they had never played Wii or Wii Fit before, and even those who had played reported that they had played only few times.

3.2. Procedure

Individuals who agreed to participate in the experiment were first tested on their competitiveness level before the experiment.

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