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Original Articles

Exergaming, Exercise, and Gaming: Sharing Motivations

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Abstract

Health professionals view exergame technologies as an alternative tool in therapeutic treatments and the promotion of physical activity. There is a growing body of work addressing the health benefits of exergaming; however, there is limited knowledge concerning user experience in this new context. If we aim to encourage participation in exergaming, we must first understand why gamers currently play exergames. Exergaming refers to the computer games that require players to perform some level of physical exertion to play. For this reason, the present study compares the motivations that encourage participation in three contexts (exercise, computer games, and exergaming) to identify key elements that support such participation. Survey instruments were administered in each context, and motivational components were addressed within self-determination theory. Findings suggest perceptions of enjoyment and feeling better after a session and participation within a social context are key factors that encourage participation in the three contexts. Participation in exergaming is also encouraged by perceptions of performing mild exercise while playing videogames. Exergamers might not experience an optimal challenge while playing, and this may lower their motivation. Participation in exercise is also encouraged by perceptions of being healthier and, in some instances, driven to avoid feelings of guilt. Gamers also play computer games encouraged by perceptions being in a better mood after session, although some gamers might also participate aiming to gain social acceptance.

Introduction

Exergaming refers to those computer games that require players to perform some level of physical exertion in order to play. Although exergaming was conceived as a form of entertainment, researchers and health professionals are interested in adopting these technologies as tools to assist healthcare treatments and promote physical activity and well-being. Initial studies suggest exergames can be effective tools in combating obesity, inactivity, and health problems associated with sedentary lifestyles by their potential to increase energy expenditure and decrease body mass index,[1] reduce sedentary screen time,[2] enhance exercise effectiveness, and improve program compliance.[3–5] These studies indicate that children enjoy playing exergames, and this seemed to increase their motivation to keep playing. However, this motivation might be temporary as the interest to play exergames is likely to decrease after a short period of time.[6] Thus, this article aims to identify those motivational factors that encourage participation in exergaming. A study suggests there are two types of players in exergaming: Those who play to relax and those who play to achieve. When exergamers play to relax, they simulate the sports' movements, and their bodies are completely involved in the game. Body movements appear to help exergamers to enter in the fantasy world and consequently to have a broader emotional experience. When the motivation is to achieve, exergamers are less concerned with executing realistic movements. Movements are reduced to what is necessary.[7] This study identified behaviors during play time; however, the motivation to play remains unclear. Exergaming seen as a social activity might encourage participation. A longitudinal study regarding children's motivation to play dance games at home suggests multiplayer sessions can reduce dropout and may increase children's motivation to keep playing exergames. Motivation to play was assessed by play time and dropout.[8] However, if we are to address motivation in exergaming, it is appropriate to apply a psychological framework that helps us to understand why people choose to play exergames. Because exergaming shares components from physical exertion and computer games, the motivations behind exercising and playing computer games were also investigated to identify key factors that support such participation, all within the same theoretical framework. Our approach to determine why people participate in activities such as exercise, computer games, and exergaming is through self-determination theory (SDT),[9] which was developed to explain human behavior and concerns the motivations behind the choices that people make.

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SDT suggests that the perceived need satisfaction will lead to self-determined motivation and outlines three psychological environmental satisfactions that are responsible for self-determined motivation, that is, "Autonomy," "Competence," and "Relatedness." Autonomy reflects a desire to engage in activities by personal choice and can be an indicator of the willingness to perform a given activity (e.g., playing sports, roller coaster riding, going to the cinema). Competence concerns our desire to experience a sense of optimal challenge in a competitive environment (e.g., a sport competition, completing a level in a computer game). Relatedness involves a feeling that one is connected or related to a particular social context or group interaction leading to social bonding (e.g., friendships or teamwork activities). SDT also identifies three degrees of motivation that relate to the degree of internalization or acceptance of the value of the outcome. The degrees are "intrinsic," "extrinsic," and "amotivation." Intrinsic Motivation refers to engaging in an activity purely for the pleasure and satisfaction derived from doing the activity; intrinsic motivation is highly associated with enjoyment. Extrinsic Motivation is identified when an individual performs an activity based on the perceived value of the outcome, that is, rewards or social comparisons. Extrinsic motivation is divided into four regulations: "external," "introjected," "identified," and "integrated." Integrated Regulation is determined when regulations are evaluated and assimilated to one's values and needs. This behavior share qualities with Intrinsic Motivation, although it is still considered extrinsic because it is performed to achieve separate outcomes rather than for an individual's natural enjoyment. Identified Regulation reflects a conscious personal goal achievement, although the activity may not be enjoyable (e.g., an individual who exercises because she or he values the benefits of exercise). Introjected Regulation involves performing an activity but not fully accepting it as one's own, for example, prescribed exercise to avoid negative emotions such as anxiety or guilt. External Regulation indicates that behavior is controlled by external sources to satisfy an external demand or reward contingency (i.e., those who exercise because of pressure from friends or family). Finally, Amotivation is the third degree of motivation, which is defined as "the state of lacking the intention to act.[10] According to Ryan and Deci,[9] non-motivated individuals do not perceive contingencies between their actions and the outcomes of their actions.

Previous studies investigating motivation in exercise suggest people exercise because they enjoy it; however, participation can also be driven by health reasons or medical conditions. Perceived enjoyment (Intrinsic Motivation) and the awareness of being healthier (Identified Regulation) seem to be the primary reasons why people participate in exercise.[11] This survey study also indicates that the "Need for Autonomy" was the highest need satisfied followed by the "Need for Relatedness," a finding that suggests exercising is mainly perceived as a voluntary behavior and seen as a social activity by participants.[11] These findings are expected to be replicated in our study.

Multiple theories have been proposed to understand player motivation during gameplay. Some of these theories are based on game mechanisms,[12–14] player behaviors,[15,16] player emotions,[17,18] or player enjoyment.[19,20] Motivation in computer gaming can be studied with SDT because it has been applied to recreational contexts such as exercise and sports.[21] Studies were conducted assessing gamers' psychological need satisfactions. Findings suggest that the satisfaction of the Need for Autonomy and the Need for Competence in computer games can predict greater enjoyment and preference for future play.[21] Unfortunately, motivational regulations in videogame players remain unclear. Therefore, this study also aims to determine what types of motivational regulations encourage gamers to play computer games. One would assume that participation in computer games is driven by the enjoyment experienced during session, and that is why it is hypothesized that intrinsic motivation will be the main regulation encouraging people to experience computer games.

Exergaming is a relatively new field, and as such there is little understanding of its nature and potential in the games for health context. As reviewed, initial studies suggest that enjoyment can support motivation to play exergames, and this can positively impact upon treatment compliance. Motivation to play exergames seems to play a key role in the increase of exercise adherence or treatment compliance; however, this motivation has not been examined systematically. Accordingly, this study aims to fill this gap of knowledge by addressing the motivation to play exergames: Is it only the enjoyment of playing computer games, or is there something else? Lieberman[22] described exergaming as "highly appealing, motivating, fun, and they [exergames] offer compelling game challenges, a chance to perform athletically or expressively for others, and a way to meet and interact with others in friendships and in communities." These attributes might relate to SDT because it concerns Intrinsic Motivation (e.g., "appealing" and "fun"), Autonomy (e.g., "a chance to perform athletically or expressively"), and Relatedness (e.g., "a way to meet and interact with others"). Thus, it is hypothesized that Autonomy and Relatedness will be the highest psychological needs satisfied in exergaming because playing exergames is a chosen activity that is performed in a social context. It is also hypothesized that Intrinsic Motivation will be the main motivational regulation in exergaming as the enjoyment produced during a session will be the main factor that encourages participation. In summary, it is hypothesized that Autonomy will be the highest rated need satisfied in the three contexts (exercise, computer games, and exergaming) because participation in these activities is assumed to be by personal choice. It is also hypothesized that Intrinsic Motivation will be the highest rated motivational regulation in the three contexts as enjoyment appears to be the main factor that encourage such participation.

Subjects and Methods

Participants and procedure

Participants were recruited from the Glasgow Caledonian University (Glasgow, Scotland, UK) community and were asked to rate a series of statements to investigate their motivations and perceptions. Participants in the Exercise group were members of the Health and Sports Centre. In total, 43 participants (19 females and 24 males; mean age, 34.84 years; *SD*, 14.93) completed the survey. Participants in the Gaming group were undergraduate students from the School of Engineering and Computing who mainly play adventure and sport games. In total, 85 participants (11 females and 74 males; mean age, 21.2 years; *SD*, 4.09) completed the survey.

Table 1. Median Values of Need Satisfactions by Group

Group	*Autonomy*	*Competence*	*Relatedness*
Exercise	5.600	5.200	5.200
Gaming	5.600	5.000	5.200
Exergaming	5.600	**4.200**[a]	5.300

[a]Significant effect.

Finally, participants in the Exergaming group were undergraduate students from the School of Engineering and Computing who mainly play "Wii Sports" (Nintendo, Kyoto, Japan) and "Dance Dance Revolution" (Konami, Tokyo, Japan). In total, 42 participants (17 females and 25 males; mean age, 23.21 years; *SD*, 5.41) completed the survey. Participation was voluntary. Each questionnaire was modified to make it relevant to each of the three contexts: exercise, computer games, and exergaming.

Measures

Motivation was investigated with reference to SDT. First, the satisfaction of the three psychological needs (Autonomy, Competence, and Relatedness) was addressed by a 15-item "Basic Psychological Need Scale."[23] This 7-point Likert scale (from 1 = "Not true at all" to 7 "Very true") addresses the levels of satisfaction that individuals perceive in each psychological need. Five items addressed the Need for Autonomy (e.g., "I feel free to exercise for as long as I want"), five items addressed the Need for Competence (e.g., "People I play computer games with tell me I am good at it"), and five items addressed the Need for Relatedness (e.g., "I really like the people I exergame with"). Internal consistency for all three samples was 0.82, on average. Second, motivation regulations were addressed by a 12-item Self-Regulation Questionnaire.[24] This 7-point Likert scale (from 1 = "Not true at all" to 7 = "Very true") addresses the type of motivation (intrinsic or extrinsic) and regulations of a person in relation to a particular behaviour. Three items addressed Intrinsic Regulation (e.g., "I play computer games because I enjoy it"), three items addressed Identified Regulation (e.g., "I exercise because I believe I am in a better mood after"), three items addressed Introjected Regulation (e.g., "I exercise because I feel badly if I did not do it"), and three items addressed External Regulation (e.g., "I play exergames because I want others to know I do"). Internal consistency for all three samples was 0.78 on average.

Statistics

The Basic Psychological Need and Self-Regulation Questionnaire are based on Likert scales. Because ordinal data were collected, we considered appropriate to report median values and box plots.

Results

Basic need satisfactions

Table 1 shows median values of need satisfactions by group. Inferential data analysis was performed, and the Shapiro–Wilk test indicated normality could not be assumed; thus non-parametric tests were appropriate for hypothesis testing. Kruskal–Wallis one-way analyses of variance tests indicate a significant effect on Competence [$\chi^2(2) = 23.584$, $P < 0.001$]. Post hoc tests showed significant differences between the Exercise group and the Exergaming group (mean

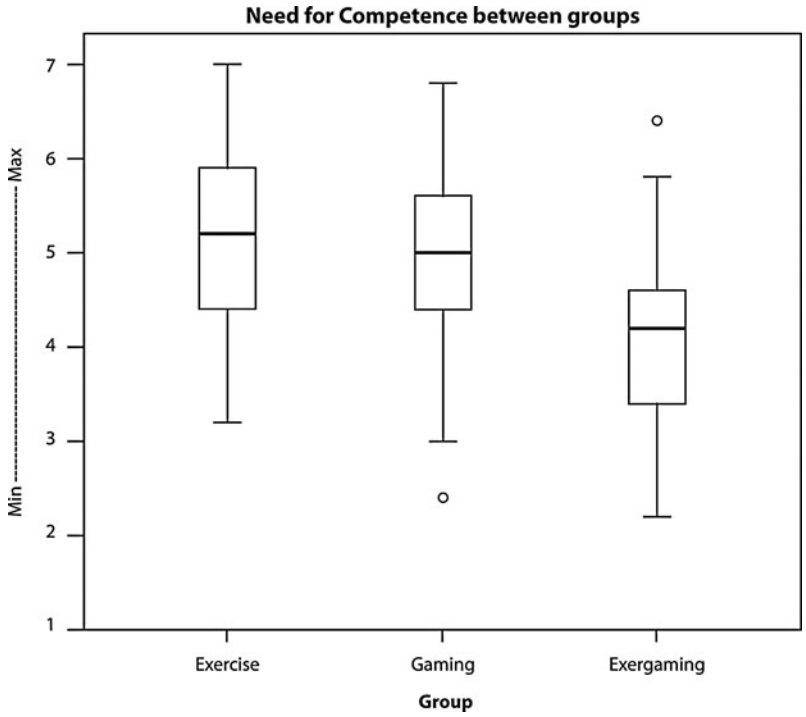

FIG. 1. Box plots of the Need for Competence between groups. Max, maximum; Min, minimum.

Table 2. Median Values of Motivational Regulations by Group

Group	*Intrinsic*	*Identified*	*Introjected*	*External*
Exercise	5.667	**6.667**[a]	**3.250**[a]	1.000
Gaming	**6.333**[a]	4.667	2.000	**1.667**[a]
Exergaming	5.333	4.000	1.667	1.000

[a]Significant effect.

difference = 1.033) (5.200 vs. 4.167) and between the Gaming group and the Exergaming group (mean difference = 0.779) (4.946 vs. 4.167). Figure 1 shows box plots of the Need for Competence between groups.

Motivational regulations between groups

Table 2 shows median values, and Figure 2 shows box plots, both of motivational regulations between groups. Inferential data analysis was performed, and the Shapiro–Wilk test indicated normality could not be assumed; thus nonparametric tests were appropriate for hypothesis testing. Kruskal–Wallis one-way analyses of variance tests reveal effects on all regulations: Intrinsic Regulation [$\chi^2(2) = 33.138$, $P < 0.001$], Identified Regulation [$\chi^2(2) = 53.290$, $P < 0.001$], Introjected Regulation [$\chi^2(2) = 35.059$, $P < 0.001$], and External Regulation [$\chi^2(2) = 14.119$, $P < 0.001$]. In Intrinsic Regulation, post hoc tests showed significant differences between the Gaming group and the Exercise group (mean difference = 0.0786) (6.298 vs. 5.512) and between the Gaming group and the Exergaming group (mean difference = 1.075) (6.298 vs. 5.222). In Identified Regulation, post hoc tests showed significant differences between the Exercise group and the Gaming group (mean difference = 1.499) (6.171 vs. 4.671), between the Exercise group and the Exergaming group (mean difference = 2.227) (6.171 vs. 3.944), and between the Gaming group and the Exergaming group (mean difference = 0.726) (4.671 vs. 3.944). In Introjected Regulation, post hoc tests showed significant differences between the Exercise group and the Gaming group (mean difference = 1.242) (3.250

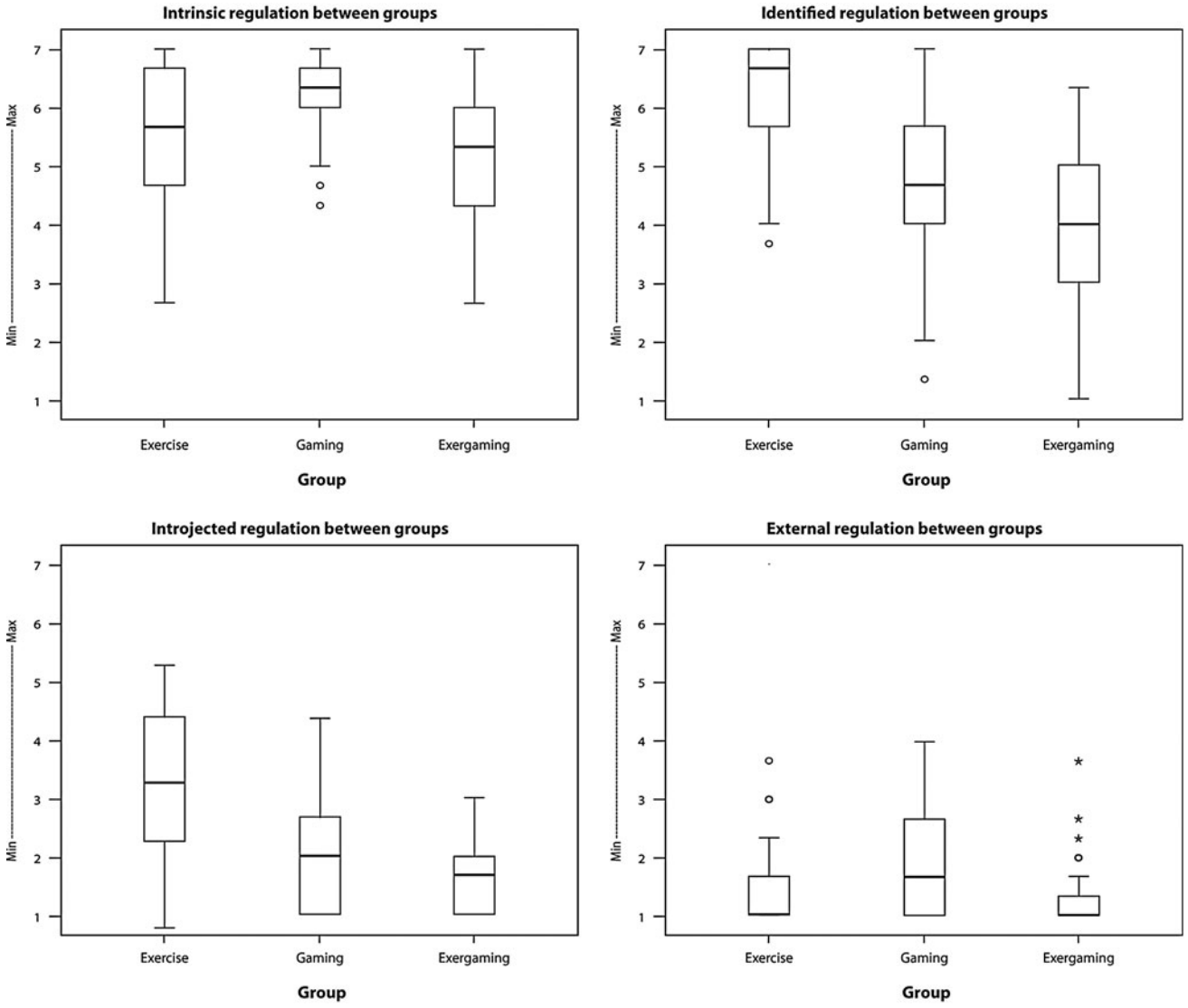

FIG. 2. Box plots of Motivational Regulations between groups. Max, maximum; Min, minimum. * = Outlier.

vs. 2.008) and between the Exercise group and the Exergaming group (mean difference = 1.536) (3.250 vs. 1.714). In External Regulation, post hoc tests showed significant differences between the Gaming group and the Exercise group (mean difference = 0.425) (1.882 vs. 1.457) and between the Gaming group and the Exergaming group (mean difference = 0.572) (1.882 vs. 1.309).

Discussion

This study investigated the motivations that encourage participation in exercise, computer games, and exergaming. Results indicate playing computer games and exergaming share similar motivations as Intrinsic Regulation was the highest regulation followed by Identified Regulation in both groups, which suggests enjoyment is a major factor that encourage participation in such activities followed by perceptions of feeling better and being in a better mood after playing. Rating Identified Regulation in the exergaming context also suggests that perceptions of performing mild exercise while playing computer games encourage participation. This might relate to previous studies that suggested exergamers simulate the sport's movements and their bodies are involved in the game to have a broader emotional experience.[7] External Regulation was significantly higher in the Gaming group, which suggest some gamers perhaps play computer games to gain acknowledgment or acceptance from a particular social circle. In addition, results indicate gamers also share similar types of motivations with exercisers as findings suggest participation in exercise is mainly driven by enjoyment and awareness of being healthier (Intrinsic and Identified Regulation, respectively). Exercisers indicated that a "feeling of guilt if not exercising" also encourages them to participate, which is associated with Introjected Regulation.

Autonomy was the highest psychological need rated by all groups, followed by Relatedness, which suggests exercisers, gamers, and exergamers share motivations that are driven by the desire to engage in these activities voluntarily and within a social context. These findings support early studies that suggested social interactions might increase motivation in exergaming.[8] The Need for Competence was the lowest need satisfied in exergaming. Exergamers might not experience an optimal challenge while playing, and this may lower their motivation, perhaps because exergames they play fail in providing challenges that match their skills. Participants reported "Wii Sports" was the most common game they play. In addition, a sense of challenge might not be priority for exergamers. Because exergaming is perceived as a social activity, participation might be driven by the enjoyment of social interactions rather than competition per se. Furthermore, previous studies in exergaming have assessed short-term motivation for therapeutic gaming in children.[3–5] In our study, participants from the three groups reported participating in their activity for more than 6 months. However, these findings should be taken with care, as the data collected are from small sample sizes; bigger sample sizes would provide stronger results. In conclusion, this study contributes to a better understanding on how we can promote participation in exergaming by identifying key motivational components that could potentially support participation. In the games for health context, this study also provides a platform for future studies investigating how exergaming technologies can increase treatment compliance, exercise adherence, and the promotion of physical activity, in particular by enhancing motivational components such as enjoyment and health awareness in competition and social contexts.

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Author Disclosure Statement

No competing financial interests exist.

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