Personality and Individual Differences 53 (2012) 827–831

Contents lists available at SciVerse ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Development and validation of the Gaming Motivation Scale (GAMS)

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ARTICLE INFO

Article history:
Received 2 February 2012
Received in revised form 11 June 2012
Accepted 13 June 2012
Available online 9 July 2012

Keywords:
Gaming motivation
Video games
Self-determination theory
Intrinsic motivation
Extrinsic motivation

ABSTRACT

The purpose of the present research was to develop and validate a measure of gaming motivation. In line with Self-Determination Theory, the Gaming Motivation Scale (GAMS) is designed to assess intrinsic motivation, integrated, identified, introjected, and external regulation, as well as amotivation. Results confirmed the internal consistency of the six subscales. In addition, the six-factor structure of the GAMS was confirmed, as was the presence of a simplex-like structure underlying the GAMS subscales. Finally, the construct validity of the GAMS was supported by correlations with need satisfaction as postulated by Self-Determination Theory. The importance of this new multidimensional scale for the development of research programs on gaming motivation is discussed.

1. Introduction

Despite the fact that gaming motivation is an important topic, few formal theories of motivation have been applied to video games (Demetrovics et al., 2011; King & Delfabbro, 2009; Wan & Chiou, 2006; Yee, 2006). A theoretical framework that appears pertinent to research on gaming motivation is Self-Determination Theory (SDT; Deci & Ryan, 1985, 2000). SDT offers a multidimensional conceptualization of motivation that allows the assessment of level of motivation and type of motivation. This theoretical approach has generated a considerable amount of research and has been applied to several domains, such as education (Deci, Vallerand, Pelletier, & Ryan, 1991), health care (Ryan, Patrick, Deci, & Williams, 2008), sport (Vallerand, 2007), and work (Gagné & Deci, 2005). In these fields, validated measures of motivation already exist, but a measure of gaming motivation that follows the tradition of SDT is not yet available. The goal of the present research was thus to develop and validate a scale assessing gaming motivation based on the framework of SDT.

1.1. Intrinsic and extrinsic motivation

SDT proposed two overarching types of motivation: intrinsic and extrinsic. *Intrinsic motivation* refers to the desire to perform an activity for itself (Deci & Ryan, 1985, 2000). Players who play because they enjoy exploring the game universe and improving their skill levels or because they like the thrill and strong sensation the game provides are representative of individuals who are intrinsically motivated. In comparison with intrinsic motivation, extrinsic motivation refers to engaging in an activity as a means to an end and not for its own sake. Thus, when extrinsically motivated, individuals do not participate in an activity for the inherent pleasure they may experience while performing it, but rather in order to receive something positive or to avoid something negative that is separate from the activity (Deci, 1975; Kruglanski, 1978). Players who play to obtain in-game awards, such as rare items, virtual currency, experience points, or to gain admiration and recognition from other players represent individuals who are extrinsically motivated.

It was originally believed that extrinsic motivation pertained only to behaviors that were prompted by external sources of control and were performed largely in the absence of volition. Based on SDT, extrinsic motivation has been considered from a multidimensional perspective varying on the degree of internalization. Internalization refers to the process through which individuals transform regulation that was initially regulated by external factors into personally endorsed ones (Ryan, 1995). Internalization can thus vary in terms of how well it is integrated in the person's self. Furthermore, the degree to which a regulation is internalized gives rise to different types of regulation.

Four types of extrinsic motivation have been proposed. *External regulation* refers to behavior regulated through external means such as rewards. This type of motivation corresponds to extrinsic motivation as it generally appears in the literature. Next, *introjected regulation* refers to the regulation of behavior through internal

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0191-8869/$ - see front matter
http://dx.doi.org/10.1016/j.paid.2012.06.013

pressures such as anxiety and guilt, and thus implies partial internalization. For example, players who play because if they did not they would be irritable or restless, display introjected regulation. It is only with the third type of extrinsic motivation, namely, *identified regulation* that behavior is emitted out of choice. With identified motivation, people engage in a behavior based on its perceived meaning or its relation to personal goals (Koestner & Losier, 2002) even if the activity is not pleasant in itself. For example, players might play because it has personal meaning or in order to help achieve other personal goals, such as developing/maintaining friendships. Finally, the fourth and final type of extrinsic motivation, *integrated regulation*, also entails engaging in an activity out of choice. However, such choice is not simply limited at the activity level, but is now a coherent part of the organization of the self. That is, the regulation becomes part of a person's habitual functioning and part of the person's sense of self. Thus, players who play because it is aligned with other life goals, such as becoming a game designer, display integrated regulation.

It should be noted that Deci and Ryan (1985) have also proposed a third construct, namely *amotivation*. This concept is similar to that of learned helplessness (Abramson, Seligman, & Teasdale, 1978) and refers to the relative absence of motivation either intrinsic or extrinsic (Vallerand, 1997). When amotivated, individuals do not perceive contingencies between their actions and the outcomes of their actions. For example, players may have had good reasons to play but now persist despite not perceiving any reasons for doing so.

SDT posits that these types of extrinsic regulation vary in terms of the level of self-determination inherent to each one. Thus, they can be ordered along a self-determination continuum. From lower to higher levels of self-determination, they are: external, introjection, identification, and integrated regulation. In addition, intrinsic motivation is hypothesized to have the higher level of self-determination and amotivation the lowest level of all. Research has supported the validity of the self-determination continuum in a variety of contexts (e.g., Li & Harmer, 1996) by demonstrating that adjacent constructs on the self-determination continuum are more strongly related to one another compared with distal constructs. Other research also reveals that consequences are decreasingly positive as motivations move from intrinsic motivation to amotivation on the self-determination continuum (Vallerand, 1997). Furthermore, research has demonstrated that events and conditions that support the satisfaction of peoples' need for autonomy (a sense of personal volition), competence (interacting effectively with the environment), and relatedness (a positive reciprocal connection with others) promote more self-determined (i.e., intrinsic motivation, integrated regulation, and identified regulation) than non self-determined (i.e., introjected regulation, external regulation, and amotivation) forms of motivation (Deci & Ryan, 2000).

1.2. The present research

The general aim of the present research was to develop and validate a scale assessing gaming motivation based on the SDT framework. In addition, the specific goals of the present research were threefold. First, we sought to develop items assessing intrinsic motivation, integrated identified, introjected, and external regulation, as well as amotivation. The second goal was to test the six-factor structure of the GAMS, using confirmatory factor analysis (CFA), as well as to assess the internal reliability of the subscales. The final goal consisted in examining the construct validity of the GAMS. Evidence of the construct validity would be supported by a simplex-like model of structural relations among the six subscales. This pattern is based on the self-determination continuum described previously. More precisely, adjacent constructs on the self-determination continuum should be more strongly related to one another compared with distal constructs. In addition, the construct validity of the GAMS was assessed through correlations between the subscales of the GAMS and a scale assessing need satisfaction (i.e., autonomy, competence, relatedness) and gaming frequency. In line with SDT, we posited that self-determined forms of motivation should be more positively related to need satisfaction than non self-determined forms of motivation. Furthermore, all types of motivation except amotivation should be positively related to gaming frequency as they all reflect strength of one's motivation toward gaming, either intrinsic or extrinsic. On the other hand, amotivation should be either unrelated or negatively related to gaming frequency as it reflects a relative absence of motivation toward gaming (Vallerand, 1997).

2. Methods

2.1. Scale development

We generated items that reflect Deci and Ryan's (1985, 2000) conceptual definition of motivation, and based on similar scales in other domains (e.g., Chantal, Vallerand, & Vallières, 1995; Pelletier et al., 1995; Vallerand et al., 1992). Items represented reasons for playing video games. Participants were asked the following question: "Why do you play video games?" Items represented potential answers to this question. We created a total of 24 items (i.e., four items for each subscale; see Table 1 for the final item set). Each item was rated on a 7-point Likert scale ranging from 1 ("*do not agree at all*") to 7 ("*very strongly agree*").

2.2. Participants

Participants were 276 video game players (193 males and 83 females; M_{age} = 26.15 years, SD_{age} = 8.26 years). Overall, participants engaged in over 25 different video games (e.g., Call of Duty, Starcraft 2, World of Warcraft, NHL 11). On average, participants played video games for 12.38 h (SD = 15.82) per week. The present sample was representative of people playing video games based on age and game frequency (Griffiths, Davies, & Chappell, 2003, 2004).

2.3. Procedure

Participation was voluntary. No incentive was given in exchange for participation. Participants completed the questionnaire through an online survey. A call for voluntary participation was posted on online forums dedicated to video games. IP addresses were checked to detect potential duplicate responders. No such duplicates were identified.

2.4. Measures

The questionnaire comprised the experimental version of the GAMS and a measure of need satisfaction.

2.4.1. Need satisfaction

Participants' need satisfaction was assessed using the Player Experience of Need Satisfaction scale (Ryan, Rigby, & Przybylski, 2006). This instrument includes three 3-item subscales assessing perceived in-game autonomy (sample item: "I experience a lot of freedom in video games", α = .80), competence (sample item: "I feel very capable and effective when playing video games", α = .76), and relatedness (sample item: "I find the relationships I form with other players important", α = .72). Each item was rated on a 7-point Likert scale ranging from 1 ("*do not agree at all*") to 7 ("*very strongly agree*").

Table 1
Item and factor loadings of the GAMS (N = 138).

Scale items	Factor loading
Intrinsic motivation	
1. Because it is stimulating to play	.73*
2. For the pleasure of trying/experiencing new game options (e.g., classes, characters, teams, races, equipment)	.57*
3. For the feeling of efficacy I experience when I play	.90*
Integrated regulation	
1. Because it is an extension of me	.85*
2. Because it is an integral part of my life	.92*
3. Because it is aligned with my personal values	.86*
Identified regulation	
1. Because it is a good way to develop important aspects of myself	.78*
2. Because it is a good way to develop social and intellectual abilities that are useful to me	.70*
3. Because it has personal significance to me	.89*
Introjected regulation	
1. Because I feel that I must play regularly	.78*
2. Because I must play to feel good about myself	.96*
3. Because otherwise I would feel bad about myself	.89*
External regulation	
1. To acquire powerful and rare items (e.g., armors, weapons) and virtual currency (e.g., gold pieces, gems) or to unlock hidden/restricted elements of the game (e.g., new characters, equipment, maps)	.85*
2. For the prestige of being a good player	.58*
3. To gain in-game awards and trophies or character/avatar's levels and experiences points	.74*
Amotivation	
1. It is not clear anymore; I sometimes ask myself if it is good for me	.79*
2. I used to have good reasons, but now I am asking myself if I should continue	.92*
3. Honestly, I don't know; I have the impression that I'm wasting my time	.87*

Note: Factor loadings correspond to standardized parameter estimates between items and their corresponding latent factor from the CFA conducted with the second group.
* $p < .05$.

3. Results

3.1. Preliminary analyses

There was no missing value in the present research because the online survey required that participants answer all items of a given variable. Inspection of the skewness indices for all variables proved adequately normal (values ranged from −0.82 to 1.41). Data screening revealed no value higher than three standard deviations from the mean. Additionally, in order to screen for multivariate outliers, we computed Mahalanobis distance values for all participants. No participant exceeded the critical chi-square value at the p = .001 level. Means, standard deviations, alpha coefficients, and Pearson correlations are presented in Table 2.

3.2. Main analyses

All structural equation modeling analyses in the present study were performed on a raw data file using maximum likelihood estimation procedure with EQS 6.1 (Bentler, 1993). We employed several indices to assess the model fit (Hu & Bentler, 1999). First, fit of the model to the data was examined using the chi-square test. A non significant chi-square indicates that the model was able to replicate suitably the sample covariance matrix. However, there are problems with relying solely on the chi-square test because this statistic is sensitive to the size of the correlations, to model complexity, and to sample size (Boomsma, 1982). The following fit indices were thus given priority in model evaluation: comparative fit index (CFI), non-normed fit index (NNFI), and root mean square error of approximation (RMSEA). According to Kline (2005) and Tabachnick and Fidell (2007), the CFI and NNFI should be .90 or higher for acceptable model fit. Moreover, the RMSEA should be .08 or lower and the 90% confidence interval should not exceed .10 for acceptable model fit (Kline, 2005).

3.2.1. Factorial structure

To test the factorial validity of the GAMS, participants were randomly divided in two groups. A first group (N = 138) was used to develop an initial version of the GAMS while the second group (N = 138) was used to confirm the factorial structure of the scale. The second analysis was conducted in order to palliate for the exploratory nature of the first analysis.

Preliminary model testing employed CFA and involved three stages, as recommended by Jöreskog (1993). In the first stage, each subscale was examined individually in order to identify items that had a low factor loading on its underlying latent factor. All items loaded adequately on their respective factor and thus no item was removed. In the second stage, each subscale was paired with all other subscales in a single CFA in order to identify any cross-loading items (as suggested by significant Lagrange Multiplier tests). Six cross-loading items, one from each subscale, were identified and thus removed, resulting in six three-item subscales representing intrinsic motivation, integrated, identified, introjected, and external regulation, as well as amotivation. Finally, in the third stage, we tested whether the six-factor model of the GAMS, following item deletion, fitted the data adequately. The six factors were made up of the three corresponding items for each subscale. No cross-loadings were hypothesized and all covariance paths among latent factors were estimated. The normalized Mardia's coefficient of multivariate normality was 18.09. Assuming the multivariate nonnormality of the data, the Satorra-Bentler rescaled χ^2, the robust CFI, NNFI, and RMSEA, and the robust standard errors of parameter estimates were used in all analyses. The hypothesized model did fit the data adequately, S-B χ^2 (df = 120, N = 138) = 219.10, p = .001, CFI = .94, NNFI = .93, RMSEA = .07 (.04–.09).

A CFA was then conducted using the second random group to confirm the factorial structure of the GAMS. We tested whether the six-factor model of the GAMS fitted the data adequately. This

Table 2
Means, standard deviations, alpha coefficients, and Pearson correlations ($N = 276$).

	M	*SD*	α	2	3	4	5	6	7	8	9	10
Intrinsic motivation (1)	4.38	1.34	.75	.44*	.48*	.23*	.42*	.07	.56*	.47*	.18*	.19*
Integrated regulation (2)	2.56	1.57	.88		.83*	.72*	.44*	.40*	.25*	.21*	.19*	.31*
Identified regulation (3)	2.81	1.50	.82			.66*	.48*	.31*	.32*	.24*	.21*	.25*
Introjected regulation (4)	2.08	1.48	.88				.49*	.65*	.05	.00	.04	.29*
External regulation (5)	3.54	1.61	.75					.36*	.29*	.21*	.07	.28*
Amotivation (6)	2.22	1.57	.89						−.16*	−.13*	−.08	.12
Autonomy (7)	5.21	1.33	.80							.63*	.28*	.14*
Competence (8)	5.16	1.36	.76								.31*	.13*
Relatedness (9)	4.37	1.99	.72									.04
Gaming frequency (10)	12.38	15.82	–									

Note: Each scale was rated on a 7-point Likert scale.
* $p < .05$.

was done to palliate for the exploratory nature of the initial group of analyses. The six factors were made up of the three corresponding items for each subscale. No cross-loadings were hypothesized and all covariance paths among latent factors were estimated. The normalized Mardia's coefficient of multivariate normality was 20.95. Assuming the multivariate nonnormality of the data, the Satorra-Bentler rescaled χ^2, the robust CFI, NNFI, and RMSEA, and the robust standard errors of parameter estimates were used in all analyses. The hypothesized model did fit the data adequately, S-B χ^2 (df = 120, $N = 138$) = 208.34, $p = .001$, CFI = .91, NNFI = .93, RMSEA = .07 (.05–.09). Moreover, all factor loadings specified were significant and reasonably substantial in size (see Table 1). Covariance paths among latent factors suggested that the GAMS subscales represented interrelated but discrete facets of motivation. The exception was the sizable correlation between integrated and identified regulation ($\beta = .95$), which suggested a considerable degree of overlap between these two subscales. We thus tested a second model where the integrated regulation and identified regulation items loaded on a single factor. The model did fit the data adequately, S-B χ^2 (df = 125, $N = 138$) = 211.48, $p = .001$, CFI = .91, NNFI = .93, RMSEA = .07 (.05–.09). However, a χ^2 difference test revealed that the original six-factor model did fit the data better, $\Delta\chi^2$ (df = 5) = 3.14, $p = .67$. The present findings thus validated the six-factor structure of the GAMS.

The subscales alpha coefficients were all above .75 ($M_\alpha = .83$; see Table 2). Nunnally (1978) has suggested that self-report scales with internal reliabilities above .70 are acceptable for research purposes. The GAMS subscales thus met this criterion.

3.2.2. Construct validity

Following the procedures outlined by Li and Harmer (1996), we specified and tested a simplex-like model for the GAMS using the complete sample. The six factors were made up of the three corresponding items for each subscale and factors were connected by direct paths between adjacent motivational constructs. Results revealed that the hypothesized model could be improved, S-B χ^2 (df = 130, $N = 276$) = 417.12, $p = .001$, CFI = .90, NNFI = .88, RMSEA = .09 (.08–.10). Lagrange multiplier tests suggested the addition of an error covariance path between introjected regulation and amotivation. A second model, incorporating the proposed additional path, did fit the data adequately, S-B χ^2 (df = 129, $N = 276$) = 355.22, $p = .001$, CFI = .92, NNFI = .90, RMSEA = .08 (.07–.09). Results were thus consistent with our hypotheses, suggesting that each construct was related to the next in a linear sequence conforming to a simplex-like pattern.

The relations between the GAMS subscales and need satisfaction (see Table 2) supported the major tenets of SDT. Consistent with our hypotheses, perceived in-game autonomy, competence, and relatedness were more positively correlated with intrinsic motivation, integrated regulation, and identified regulation ($M_r = .29$) than with introjected regulation, external regulation, and amotivation ($M_r = .03$). Furthermore, the construct validity of the GAMS was also supported by correlations between the GAMS subscales and gaming frequency. Results (see Table 2) revealed that all types of motivation ($M_r = .26$), with the exception of amotivation ($r = .12$), were positively related to gaming frequency.

4. Discussion

The purpose of the present research was to develop and validate a scale assessing gaming motivation based on the framework of SDT. Results from CFA supported the six-factor structure of the GAMS. Furthermore, all subscales had adequate levels of internal consistency. Results also supported the presence of a simplex-like structure underlying the GAMS subscales in line with SDT. In addition, correlations between the GAMS subscale, need satisfaction, and gaming frequency led to a pattern in line with theoretical predictions. Overall, results thus revealed that the GAMS has adequate levels of validity and reliability.

These results thus provide preliminary support for the GAMS. Additional research will thus be necessary to further establish the psychometric properties of the GAMS. For example, research on the relations between the GAMS subscales and other related constructs is needed to further test the construct validity of the GAMS. Furthermore, future research using the GAMS could also focus on theoretical and applied issues. From a theoretical perspective, it now becomes possible to test some hypotheses derived from SDT. In this respect, SDT has proposed that motivation can be enhanced or undermined by the social context. That is, the degree to which the environment supports satisfaction of peoples' need for autonomy, competence, and relatedness should influence the quality of motivation. Along these lines, future research would do well to assess how specific features of video games (i.e., graphic quality, game control, immersion, game options, and storyline; Wood, Griffiths, Chappell, & Davies, 2004) support need satisfaction and shape motivation. From an applied perspective, motivation has been linked to important outcomes. More precisely, research based on SDT has revealed that self-determined forms of motivation lead to more adaptive consequences, such as enjoyment, perseverance, performance, and well-being (Vallerand, 1997). Given their diversity and complexity, it seems evident that video games have the potential to yield both positive and negative outcomes to players. In line with SDT, it is also reasonable to suggest that the different types of motivation underlying gaming should greatly influence the end result. Consequently, future research should explore the relationships between the GAMS subscales and outcome relevant to gaming literature, such as aggressive behaviors, problematic gaming, physical symptoms, game enjoyment, and customer loyalty.

Some limitations should be kept in mind when interpreting the current findings. First, all data were collected using self-reports, which could lead to common method variance issues. Further validation work should test the GAMS with multiple reports (i.e., spouse, friends, and family) or with behavioral and objective measures. Second, the sample contained a larger proportion of men ($N = 193$) than women ($N = 83$). This drawback did not permit us to investigate the issue of gender differences. Future research should look into this issue. Third, the results cannot be unequivocally applied to all populations. More effort should thus be invested in validation studies of the GAMS across other languages and cultures. Finally, it should be noted that the GAMS assesses exclusively the underlying motivations of gaming and not goal contents (i.e., what goals are pursued in gaming). Consequently, researchers need to be aware that other scales exist if their focus is on goal contents. For example, Demetrovics et al. (2011) developed the Motives for Online Gaming Questionnaire (MOGQ), a scale assessing seven distinct goals of gaming (i.e., social, escape, competition, coping, skill development, fantasy, and recreation). Future research would do well to explore the relationship between the GAMS and the MOGQ.

In sum, the present findings provide a coherent picture supporting the reliability and validity of the GAMS. Specifically, the results supported: the internal consistency of the six subscales, the six-factor structure of the GAMS, the presence of a simplex-like structure underlying the GAMS subscales, and the hypothesized relationships between need satisfaction and the self-determined forms of motivation (and the relative absence of relationships with the non self-determined forms of motivation). The findings from the present research thus suggest that the GAMS is a valid assessment of gaming motivation. Nevertheless, future research should continue to evaluate the psychometric properties of the GAMS, as scale validation is an ongoing process. We hope the GAMS will assist researchers in the development of research programs on gaming motivation using the SDT framework, which has yielded very useful results in other fields.

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