Validity and Reliability Assessment of the Game Addiction Scale: An Empirical Finding from Indonesia

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ABSTRACT

The game addiction scale (GAS) by Lemmens, Valkenburg, and Peter is a popular tool that is frequently used to evaluate game playing by adolescents. The scale that showed high reliabilities was tested on 644 gamers in the Netherlands. The GAS consists of 21 items that are divided into seven criteria, i.e., salience, tolerance, mood modification, relapse, withdrawal, conflict, and problems. This research attempted to investigate the scale in gamers in Indonesia in order to validate and to make a generalization of the GAS. A total of 360 respondents who are gamers have been chosen to participate in this study. They have to play the game for the last six months. Note that the massively multiplayer online role-playing game is chosen for this research since this type of game is very popular among the gamers in Indonesia. Results showed that the GAS demonstrated excellent internal consistency (Cronbach's alpha scores for all variables are more than 0.6). Furthermore, the factor analysis revealed good psychometric properties and fit the data well. These indicate that the GAS can be used to assess game addiction for Indonesian gamers due to its demonstrated psychometric validity.

CCS Concepts

Applied computing→ Law, social and behavioral sciences →Psychology

Keywords

Adolescents; confirmatory factor analysis; game addiction scale; gaming; psychometrics properties.

1. INTRODUCTION

In this competitive global market era, the internet has grown so fast to serve millions of users and a huge number of purposes in all parts of the world. With more than 3 billion of internet users or more than 40% of the world population [1], the internet has recognized to give global dimension to the world and become the universal source of information for tons of people. It also has become an indispensable part of basic areas of life in the whole world such as education, business, communication, entertainment, as well as industry.

The internet also has affected people's lifestyle [2]. People could be able to do everything on the internet, such as chatting and emailing, browsing, shopping, working, playing game, and many more. However, despite the benefits gained from the internet, there are also some negative consequences of spreading internet use. One of the negative consequences is internet addiction, i.e., when people put too much attention and spend most of their time on the internet.

One of many types of addictive issues nowadays is being addicted to an online gaming. Excessive gaming has been identified as a specific subtype of internet addiction [3]. This online game addiction is considered to be a behavioral addictive disorder than an impulse control disorder [4], [5]. The browser-based games, especially massively multiplayer online role-playing games (MMORPGs) which are played over the browser simultaneously by multiple gamers are very popular among online gamers. Every day, there are 20 million people who spend their time playing MMORPGs. The average age of MMORPG players is about 26 years old and spends 22 hours per week [6]. This type of game that could be played by many different levels of age nowadays, has caused several addictive issues.

There are several reasons why people get addicted to playing the MMORPG. First, they could interact with different players from different backgrounds. This is considered as reasonable since human is by nature a social animal. Next, when people play the game, they seem to escape from their daily problems by venturing it through such a fight in the fantasy world. When one wins the game, he/she is considered to solve his/her problems. In addition, when people are playing games, there is a possibility of positive

events (wins) as well as negative events (loses). It is considered as an addictive potential for inducing player conditions through variable-ratio reinforcement schedules, or it is called an effective conditioning [7].

Game addiction is currently one of the most discussed psycho-social aspects. Being addicted to the game is an excessive and compulsive behavior and it could affect the social life or even emotion of the players and obviously, the players cannot control the excessive use of the game [8]. Recently, some researchers have studied and briefly concluded that the addiction number is growing with the aid of the internet, such as in Italy [9], Pakistan [10], and Czech Republic [11]. More serious condition happened in China, where more than 30 million of internet gamers were said to be addicted. To eradicate this epidemic condition, the Chinese authorities had to take an action to shut down some internet cafes regularly and set up laws to limit the number of hours for adolescents to play the online games [5].

In order to measure game addiction, some studies have been conducted to accomplish this issue. Among those, the game addiction scale (GAS) by [8] is considered as a popular measurement to assess game addiction. In addition, it is the only instrument that covered the highest number of factors mentioned in the literature concerning game addiction [12]. The scale comprises seven criteria in which each criterion has three item questions. The original GAS was first used in May 2007 and was applied to 644 adolescents from six secondary schools in the Netherlands. The scale showed high internal consistency and reliability; thus, it has been translated and adopted in measuring game addiction in Norway [13], French [14], China [15], Brazil [16], and Turkey [17].

We sought to investigate the psychometric properties of the GAS in Indonesia because new instruments are needed to successfully and accurately assess game addiction in this population. Validating a tool that serves this purpose will assist mental health professionals in evaluating game addiction. This study assessed the construct and convergent validity as well as reliability of the GAS according to measures of internal consistency.

2. MATERIALS AND METHODS
2.1 Participants
The study sample included 360 gamers who were between 5 and 40 years of age from Indonesia. The inclusion criteria were a current game user of MMORPGs over the last six months—addiction is present when a person meets the specific criteria during a period of six months [18]. We chose MMORPG since this type of games is very popular among gamers in Indonesia. The participants of this research were first approached and asked if they agree to participate in the survey. The participants then provided their demographic information, such as age, sex, occupation, residence; their informed consent, such as frequency and type of game played. Note that there is no compensation was given for their participation.

2.2 Instruments and Procedure
This research used the GAS by [8] that consists of 21 items that are divided into seven criteria. Each criterion comprises of three items. The first criterion is salience. A game addicted person feels that playing a game is the most important activity in his/her life and dominates his/her thinking, feelings, and behavior. The next criterion is tolerance. It means that while person starts playing games more often, it is gradually building up the amount of time spent of games. The next criterion is mood modification. It is

subjective experience that person reports as a result of engagement in games. It may also include tranquilizing and/or relaxing feelings related to escapism. Fourth criterion is withdrawal. It is unpleasant emotions and/or physical effects that occur when game play is suddenly reduced or discontinued. It consists of moodiness, irritability, as well as shaking as physiological symptom. The next criterion is relapse. It is a tendency to repeatedly revert to earlier patterns of game play. Sixth criterion is conflict. It refers to all interpersonal conflicts resulting from excessive gaming. It may include arguments, neglects, lies, as well as deceptions. The last criterion is problems. This refers to problems caused by excessive game play. It mainly concerns displacement problems as the object of addiction takes preference over activities, such as school, work, and socializing. It may arise within the individual, such as intrapsychic conflict and subjective feelings of loss of control.

The participants are given an online questionnaire that comprises those all criteria. Every item was preceded by the statement: "How often during the last six months …?" All items were scored on a 5-point Likert scale ranging from 1 (never), 2 (rarely), 3 (sometimes), 4 (often), and 5 (very often). This 5-point rating scale offers sufficient distribution of responses [19]. Note that we used the Indonesian translation rather than the original GAS to make the respondents easier to understand.

Descriptive statistics were used to access sociodemographic characteristics and the data are presented as a number and percentage or a mean and standard deviation. This data analysis was performed using the Statistical Package for the Social Sciences (SPSS 16.0, SPSS Inc., Chicago). A confirmatory factor analysis (CFA) was performed to assess the construct validity. The SPSS Analysis of Moment Structures (SPSS AMOS v20, AMOS Development Corporation) was employed to accomplish this task. This CFA was computed using the maximum likelihood estimator. We calculated the chi-square value (χ^2), which should be low or nonsignificant in order to consider the fit as acceptable [20]. The following fit indexes were used to evaluate the model's goodness of fit. The Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI) indicate a very good fit if they are close to 1, and an acceptable fit if they are greater than 0.90. The Root Mean Square Error of Approximation (RMSEA) with a 90% confidence interval (90% CI) indicates an acceptable fit if less than 0.08 and a good fit if less than 0.05 [20], [21]. Cronbach's alpha [22] was used to measure internal consistency as an indicator of scale reliability; it should be greater than 0.60 [23].

3. RESULTS AND DISCUSSION
A total of 474 respondents participated in this survey. However, only 360 respondents who completed in submitting the questionnaire. Profile of the 360 respondents is given in Table 1. Note that male respondents dominate female respondents with 71.11% over 28.89%. More than 90% of the participants were in the range of 17 to 25 years old, indicated that most of the online game players are teenagers. Mobile legend is the most popular MMORPG among others with more than half of the respondents frequently play this game.

The reliability in terms of internal consistency was good (see Table 2 for the Cronbach's alpha scores of each criterion). The CFA model of the Indonesian version of the GAS is shown in Figure 1. The model revealed a factor loading for every item that was greater than 0.50 (see Table 3). Furthermore, the CFA model showed a χ^2 (163) = 311.394; p-value = 0.000 (CFI = 0.952; TLI = 0.940; RMSEA = 0.049). The ovals in Figure 1 indicate latent

constructs, i.e., the criteria, and the rectangles represent the observed items, i.e., the 21-item questions. The results indicated that the model of the 21-item GAS had good psychometric properties and fit the data well. These results are similar to those obtained by [8] in their original study.

Table 1. Profile of the Respondents

Information		Percentage
Gender:	Male	71.11
	Female	28.89
Age:	5 – 17	4.73
	17 – 25	94.72
	26 – 35	0.28
	> 35	0.27
Type of game played*:	Mobile legend	54.17
	Arena of valor	1.39
	Dota 2	7.22
	Counter strike	6.67
	Point blank	2.22
	Paladins	1.11
	Vainglory	1.11
	Others	26.11
Employment status:	Student	95.56
	Employee	2.5
	Freelance	1.11
	Others	0.83
Frequency of game played:	Every day	53.33
	Every three days	23.89
	Once a week	10.28
	Twice a week	2.78
	Once a month	3.33
	Less than once a month	6.39

Note: *the participants could choose more than one.

One of the interesting questions could be how to determine whether someone is addicted to games or not. Based on arguments by [24] and also adapted by [8], there are two formats to determine that condition, i.e., monothetic format and polythetic format. In the first format, all item questions must be endorsed in order to be identified as a game addict. On the other hand, in the second format, one could be classified as a game addict if at least half of the total item questions are endorsed.

In this research, we used two types of cut-off point as item question is labeled as endorsed: a) when a person answered 3 (sometimes), 4 (often), or 5 (very often) and b) when one answered 4 or 5 on the 21 item questions. The polythetic format resulted in 61.94% of the gamers were classified as problematic gamers using the first cut-off point and 19.44% using the second cut-off point. With a monothetic format (validation of all items) only 4.17% and none of the respondents were classified as game addicts using the first and second cut-off point respectively, which could be an under-estimation [25]. This might raise a question of which format is best to be applied.

There are two arguments why the monothetic approach would lead to a better estimate of addicted gamers. First, the polythetic format is likely to lead to over-estimation of the frequency of addicted gamers; see for example 9.4% in [8], 39% in [24], 16% in [26], and 20% in [27]. On the other hand, when [24] applied a monothetic format, they found that 1.8% of their respondents could be labeled as addicted, which is proportionate to the estimated percentage of pathological gamblers [28]. Second, some researchers stated that the occurrence of negative life

consequences is a vital element in distinguishing addiction from habits (e.g., [29]). By their definition, the criteria conflict, withdrawal, and problems as well indicate negative life consequences and pathological tendencies [30]. Because the monothetic format requires all criteria have to be met, this format automatically incorporates the endorsement of the criteria for negative life consequences, thus, allowing a more accurate distinction between habitual behavior and addiction.
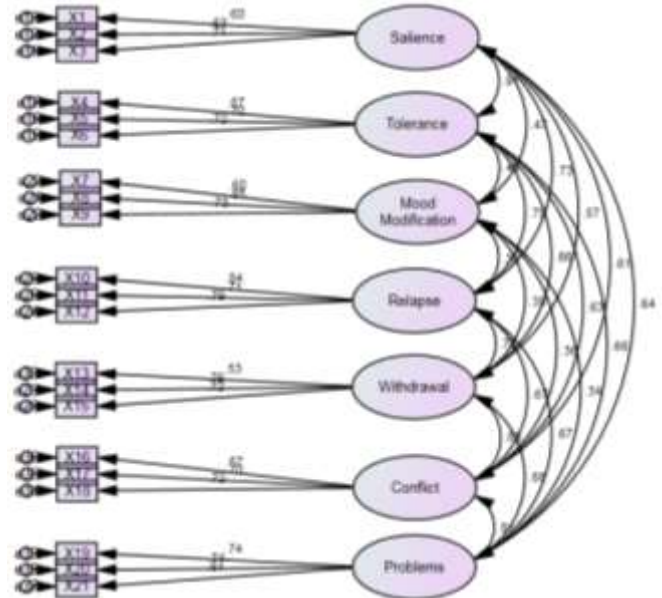

Figure 1. The Confirmatory Factor Analysis of the Game Addiction Scale

Table 2. Cronbach's Alpha for Each Criterion of Game Addiction Scale

Criteria	Cronbach's Alpha
Salience	0.681
Tolerance	0.740
Mood modification	0.760
Relapse	0.822
Withdrawal	0.702
Conflict	0.741
Problems	0.738

Whichever format is applied, these self-reported outcomes should currently only be used to provide an indication of the prevalence of game addiction. Before it is used as a diagnostic tool, clinical psychologists should decide whether game addiction can be considered a legitimate pathology. For the majority of game players, their game addiction scores merely reflect enthusiasm for games or a relatively harmless displacement from other activities. However, for a small minority of gamers, their scores indicated more serious problems arising from compulsive use. It is an important issue that should be addressed.

4. CONCLUSION

This study aimed to evaluate the psychometric properties of the Indonesian version of the GAS. The scale comprises seven criteria, namely, salience, mood modification, tolerance, withdrawal, relapse, conflict, and problems. On each of those criteria, there are three item questions as indicators, so that the scale covers a total of 21 item questions to measure game addiction.

The scale used in this research was considered reliable, had good internal consistency, as well as good temporal stability. The CFA model that was generated also indicated that the 21-item scale is

Table 3. Measurement Loadings of the Game Addiction Scale

How often during the last six months …	Loading	Mean	Standard Deviation
Salience			
X1 Did you think about playing a game all day long?	0.60	2.00	1.00
X2 Did you spend much free time on games?	0.63	4.00	1.00
X3 Have you felt addicted to a game?	0.71	3.00	1.00
Tolerance			
X4 Did you play longer than intended?	0.67	3.00	1.00
X5 Did you spend increasing amounts of time on games?	0.70	3.00	1.00
X6 Were you unable to stop once you started playing?	0.72	3.00	1.00
Mood Modification			
X7 Did you play games to forget about real life?	0.60	3.00	1.00
X8 Have you played games to release stress?	0.85	4.00	1.00
X9 Have you played games to feel better?	0.73	4.00	1.00
Relapse			
X10 Were you unable to reduce your game time?	0.84	2.40	1.20
X11 Have others unsuccessfully tried to reduce your game use?	0.71	2.80	1.30
X12 Have you failed when trying to reduce game time?	0.79	2.50	1.20
Withdrawal			
X13 Have you felt bad when you were unable to play?	0.53	2.80	1.10
X14 Have you become angry when unable to play?	0.76	2.40	1.20
X15 Have you become stressed when unable to play?	0.72	1.90	1.00
Conflict			
X16 Did you have fights with others (e.g., family, friends) over your time spent on games?	0.67	2.00	1.20
X17 Have you neglected others (e.g., family, friends) because you were playing games?	0.70	2.60	1.20
X18 Have you lied about time spent on games?	0.72	2.10	1.20
Problems			
X19 Has your time on games caused sleep deprivation?	0.74	2.90	1.30
X20 Have you neglected other important activities (e.g., school, work, sports) to play games?	0.74	2.50	1.20
X21 Did you feel bad after playing for a long time?	0.61	3.10	1.30

appropriate for the population assessed here. It seems that the cultural differences or differences in age have no effect in this research (note the original version of GAS was assessed on Dutch adolescence gamers). It is quite interesting since the GAS scale has faced different result when it adopted in other populations, see for example: [14] who adapted the GAS in France; [16] in Brazil; and [17] in Turkey. It concludes that the Indonesian version of the 21-item scale of GAS exhibits acceptable psychometric properties that confirm its theoretical and concurrent validity. It seems that the scale is considered as reliable assessment tool for identifying and capturing the problematic use of games and should be useful in future research.

5. REFERENCES

[1] Internet Live Stats 2018. *Internet Users*. available at: http://www.internetlivestats.com/internet-users/ (accessed: 5 June 2018).

[2] Young, K. 2009. Understanding online gaming addiction and treatment issues for adolescent. *Am. J. Family Therapy* 37, 355-372.

[3] Block, J. J. 2008. Issues for DSM-V: internet addiction. *Am. J. Psychiat.* 165, 306–307.

[4] Pezoa-Jares, R. E, Espinoza-Luna, I. L., and Vasquez-Medina, J. A. 2012. Internet addiction: a review. *J. Addict. Res. Ther.* 6, 004.

[5] Kuss, D. J. and Griffiths, M. D. 2012. Online gaming addiction in children and adolescents: a review of empirical research. *J. Behav. Addict.* 1, 3-22.

[6] Yee, N. 2006. Motivations for play in online games. *Cyberpsychol. Behav.* 9, 772-775.

[7] Wallace, P. M. 1999. *The Psychology of the Internet*. Cambridge University Press, New York.

[8] Lemmens, J. S., Valkenburg, P. M., and Peter J. 2009. Development and validation of a game addiction scale for adolescents. *Media Psychol.* 12, 77-95.

[9] Ferraro, G., Caci, B., D'Amico, A., and Di Biasi, M. 2007. Internet addiction disorder: an Italian study. *Cyberpsychol. Behav.* 10, 170-175.

[10] Suhail, K. and Bargees, Z. 2006. Effects of excessive internet use on undergraduate students in Pakistan. *Cyberpsychol. Behav*. 9, 297-307.

[11] Simkova, B. and Cincera, J. 2004. Internet addiction disorder and chatting in the Czech Republic. *Cyberpsychol. Behav.* 7, 536-539.

[12] King, D. L., Haagsma, M. C., Delfabbro, P. H., Gradisar, M., and Griffiths, M. D. 2014. Toward a consensus definition of pathological video-gaming: a systematic review of psychometric assessment tools. *Clin. Psychol. Rev.* 33, 331-42.

[13] Mentzoni, R. A., Brunborg, G. S., Molde, H., Myrseth, H., Skouverøe, K. J., Hetland, J., and Pallesen, S. 2011. Problematic video game use: estimated prevalence and associations with mental and physical health. *Cyberpsychol. Behav. Soc. Netw.* 14, 591-596.

[14] Gaetan, S., Bonnet, A., Brejard, V., and Cury, F. 2014. French validation of the 7-item game addiction scale for adolescents. *Revue Européenne de Psychologie Appliquée* 64, 161–168.

[15] Wang, C. W., Chan, C. L. W., Mak, K. K., Ho, S. Y., Wong, P. W. C., and Ho, R. T. H. 2014. Prevalence and correlates of video and internet gaming addiction among Hong Kong adolescents: a pilot study. *Sci. World J*. 2014.

[16] Lemos, I. L., Cardoso, A., and Sougey, E. B. 2016. Validity and reliability assessment of the Brazilian version of the game addiction scale (GAS). *Compr. Psychiat.* 67, 19-25.

[17] Baysak, E., Kaya, F. D., Dalgar, I., and Candansayar, S. 2016. Online game addiction in a sample from Turkey: development and validation of the Turkish version of game addiction scale. *Klinik Psikofarmakoloji Bulteni* 26, 21–31.

[18] Young, K. S. 1998. *Caught in the Net: How to Recognize Internet Addiction and a Winning Strategy for Recovery*. John Wiley & Sons, Inc., New York.

[19] Comrey, A. L. 1988. Factor-analytic methods of scale development in personality and clinical psychology. *J. Consul. Clin. Psych.* 56, 754-761.

[20] Brown, T. A. 2006. *Confirmatory Factor Analysis for Applied Research*. The Guilford Press, New York.

[21] Schermelleh-Engel, K. M. 2003. Evaluating the fit of structural equation models: tests of significance and descriptive goodness-of-fit measures. *Methods Psychol. Res.* 8, 23–74.

[22] Cronbach, L. J. 1951. Coefficient alpha and the internal structure of tests. *Psychometrika* 16, pp. 297–334.

[23] Nagpal, J., Kumar, A., Kakar, S., and Bhartia, A. 2010. The development of Quality of Life Instrument for Indian Diabetes patients (QOLID): a validation and reliability study in middle and higher income groups. *J. Assoc. Physicians India* 58, 295–304.

[24] Charlton, J. P. and Danforth, I. D. W. 2007. Distinguishing addiction and high engagement in the context of online game playing. *Comput. Hum. Behav.* 23, 1531-1548.

[25] Van Rooij, A. J., Schoenmakers, T. M., Vermulst, A., Van den Eijnden, R., and Van de Mheen, D. 2010. Online video game addiction: identification of addicted adolescents gamers. *Addiction* 106, 205–212.

[26] Griffiths, M. D. 1997. Computer game playing in early adolescence. *Youth Soc.* 29, 223–238.

[27] Griffiths, M. D. and Hunt, N. 1998. Dependence on computer games by adolescents. *Psychol. Rep.* 82, 475–480.

[28] Walker, M. B. and Dickerson., M. G. 1996. The prevalence of problem and pathological gambling: A critical analysis. *J. Gambl. Stud.* 12, 233–249.

[29] LaRose, R., Lin, C. A., and Eastin, M. S. 2003. Unregulated internet usage: addiction, habit, or deficient self-regulation. *Media Psychol.* 5, 225–253.

[30] Seay, A. F. and Kraut, R. E. 2007. Project massive: self-regulation and problematic use of online gaming. In *Proceedings of the ACM Conference on Human Factors in Computing Systems* (San Jose, CA, April 30 – May 03, 2007). CHI '07. ACM, New York, NY, 829–838.