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## Attachment style, stressful events, and Internet gaming addiction in Korean university students

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## ABSTRACT

The framework of addiction as an attachment disorder has been used widely in recent years to explain various technological addictions. However, research that explores the association between attachment and Internet gaming disorder is still limited. The purpose of this study was to investigate the potential mediating effects of stressful events on the relationship between attachment styles and Internet gaming addiction. Three hundred and thirty-seven Korean university students in provincial South Korea participated in the study. The hypothesized model was tested using structural equation modeling. Results indicated that the relationships between attachment styles (both attachment anxiety and avoidance) and Internet gaming addiction were fully mediated by stressful events. These results contribute to understanding the etiology of gaming addiction and may guide development and delivery of treatment for problematic gaming behaviors.

## 1. Introduction

Internet gaming addiction refers to involvement with computer or video games that is excessive and cannot be controlled, despite associated problems (American Psychiatric Association, 2013; World Health Organization, 2018; Lemmens, Valkenburg & Peter, 2009). Internet gaming addiction is considered a type of behavioral addiction and a mental illness (Gentile, 2009; Grüsser, Thalemann & Griffiths, 2007; Young, 2009). The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders has placed internet gaming disorder in Section 3 for further research (American Psychiatric Association, 2013). The World Health Organization has included 'gaming disorder' as a new mental health condition in the newest edition of the International Classification of Diseases (World Health Organization, 2018). A considerable amount of research has also shown the harmful effects of Internet gaming addiction on the addict's psychological and physical well-being, including depression (Kim et al., 2017), anxiety (Loton, Borkoles, Lubman & Polman, 2016), academic achievement (Schmitt & Livingston, 2015), aggression (Ferguson, San Miguel, Garza, & Jerabeck, 2012; Lemmens, Valkenburg & Peter, 2011), sleep problems (Lam, 2014), and seizures (Chuang, 2006).

Internet gaming addiction has been a public mental health concern among many industrialized countries including South Korea. According to a survey by the Korea Creative Content Agency (2018), 70% of

Koreans aged between 10 and 65 play online games and approximately 15% of them play games for more than 3 h a day, which is comparable to pathological game users who play games for approximately 3.5 h a day (Gentile, 2009). Although excessive use of games itself is not equivalent to maladjustment, the amount of gaming is a risk factor for developing internet gaming addiction (Ferguson, San Miguel, Garza, & Jerabeck, 2012).

According to attachment theory, infants develop mental representations of the self and others or internal working models as a result of repeated attachment-related experiences (Bowlby, 1969/1982, 1988). The internal working models affect infants' anticipation of their caregiver's availability and responsiveness, along with their view of the self as being worthy. Researchers extended attachment theory on infant-caregiver relationships to explain adult attachment style (Bartholomew & Horowitz, 1991; Hazan & Shaver, 1987; Mikulincer & Shaver, 2016). Attachment style refers to "patterns of expectations, needs, emotions, and social behaviors" shaped by internalization of a particular history of attachment experiences (Mikulincer & Shaver, 2016, p. 23). Hazan and Shaver (1987) conceptualized attachment style by using two distinctive dimensions, i.e., attachment anxiety and attachment avoidance. Attachment anxiety is characterized by a fear of abandonment and rejection and excessive desire for approval from others. Attachment avoidance is described as a fear of intimacy and difficulty with trusting others. Individuals with low levels of

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one or both of these dimensions are assumed to have an insecure secure attachment style.

Addiction is often viewed as an attachment disorder (Coffey, 2018; Flores, 2004; Gill, 2014; Walant, 1995). Individuals with insecure attachment tend to have deficits in regulating emotions (Mikulincer, Orbach & Iavnieli, 1998; Shaver & Mikulincer, 2013) and developing and maintaining close interpersonal relationships (Bartholomew, 1990). Consequently, they are likely to resort to addictions to meet their attachment needs, rather than expressing and fulfilling their needs in real-life relationships. The theory of addiction as an attachment disorder, which originally developed for understanding alcohol and substance addictions, has been used widely in recent years to explain technological addictions, such as smartphone addiction (Kim, Cho, & Kim et al., 2017; Jin, Sun, An & Li, 2017), internet addiction (Shin, Kim & Jang, 2011), and social media addiction (Blackwell, Leaman, Tramosch, Osborne & Liss, 2017). However, research that explores gaming addiction from an attachment perspective is still limited. Suárez, Thio and Singh (2012) found that players with anxious and avoidant attachment styles had more problematic online gaming use than those with a secure attachment style, but the study used a categorical approach to conceptualize attachment styles, assigning participants into one of the three categories (secure, anxious, and avoidant style). Given emerging evidence on better suitability of dimensional models to conceptualize and assess attachment style (Fraleay & Spieker, 2003; Fraley, Hudson, Heffernan & Segal, 2015), more research is needed to determine whether the findings of Suárez et al. (2012) can be replicable when using a dimensional approach to represent attachment style.

Identifying mediating factors between attachment styles and gaming addiction would advance understanding of the mechanisms of how attachment affects Internet gaming addiction. Previous research has found associations between stressful events and attachment style and between stressful events and Internet gaming addiction, so the experience of stressful events may explain how attachment insecurity leads to problematic gaming behaviors.

The extent to which an event in college life is stressful or causes stress reactions can be affected by individuals' attachment style. Whereas some stresses simply occur, others can be the results of a person's behavior (Hammen, 1991; Ingram & Luxton, 2005; Lazarus, 1999). Two sets of factors can explain how attachment insecurity can influence individual differences in people's experience of stress. First, attachment insecurity may bias one's appraisal of events in a way that confirms one's internal working model (Mikulincer & Florian, 1995; Shaver & Hazan, 1993). Insecurely attached individuals are more likely than securely attached people to perceive themselves as incompetent and others as inadequately supportive due to their negative representations of the self and others, and thus may perceive life events as more stressful. Second, consistent with the stress-generation hypothesis (Hammen, 1991), attachment insecurity may contribute to the increased likelihood of creating additional stressful life events (Bottonari, Roberts, Kelly, Kashdan & Ciesla, 2007; Hankin, Kassel & Abela, 2005). For instance, a college student with anxious attachment may seek excessive reassurance and comfort in romantic relationships that result in their dissolutions. A student with avoidant anxiety may withdraw from seeking help and detach themselves from emotional experiences, which may lead to additional stresses. Empirical studies demonstrated the importance of attachment style in experience of stress. Hankin et al. (2005) showed that attachment style is associated with dysfunctional attitudes about self-worth and these attitudes in turn predict elevated emotional distress. They also found insecure attachment predicts additional interpersonal stresses over time. Additionally, Pieglage, Gerlsma and Schaap (2000) found stressful events mediates the association between attachment style and psychopathology.

Stress is also associated with problematic gaming. College students encounter many challenges that can be stressful, such as academics, family and romantic relationships, career concerns, lack of time and

money, and loneliness (Hurst, Baranik & Daniel, 2013). Internet video gaming is one of the easiest ways for many college students to cope with stress (Grüsser et al., 2007; Hussain & Griffiths, 2009; Kardefelt-Winther, 2014). Many studies provide evidence to support that stress is a significant risk factor for the development of Internet gaming addiction (Li, Zou, Wang & Yang, 2016; Plante, Gentile, Groves, Modlin & Blanco-Herrera, 2018; Yu, Mao & Wu, 2018). For instance, Plante et al. (2018) showed that people who use video games as a coping mechanism tend to exhibit more symptoms of video game addiction, while controlling for the frequency of video game play and the use of other negative coping strategies (e.g., distraction, avoidant actions, aggression).

Theory and research findings provide support for relationships between attachment insecurity and both stress and Internet gaming addiction, but the interrelationships among the three variables have not been examined. The goal of the present study was to extend the literature on Internet gaming addiction by examining associations among attachment insecurity, stressful events, and Internet gaming addiction, and to explore whether the relationship between attachment insecurity and Internet gaming addiction was mediated by stressful events. We follow a dimensional model of attachment style (Hazan & Shaver, 1987), and conceptualize attachment insecurity by using attachment avoidance and attachment anxiety. We hypothesized that attachment anxiety and attachment avoidance would be positively associated with Internet gaming addiction, and that the level of stressful events would mediate the relationships between these constructs and Internet gaming addiction.

## 2. Method

### 2.1. Participants and procedure

The sample consisted of 337 undergraduate and graduate Korean students (204 males, 133 females) who are attending a prestigious private university of science and technology in South Korea. The average age of the participants was 24.90 years ( $SD = 3.71$ ). The study was reviewed and approved by the university IRB. Students were recruited by posts on a school website and school email lists. Participation was voluntary, and the participants were given a dining ticket worth about US\$ 5 as compensation. An Internet survey tool was used to present questionnaires and collect data.

### 2.2. Measures

#### 2.2.1. Adult attachment

Adult attachment was assessed by using a Korean version (Kim, 2004) of the Experiences in Close Relationships-Revised questionnaire (ECRR-K; Fraley, Waller & Brennan, 2000). The ECRR-K consists of 36 items: 18 that assess attachment anxiety, and 18 that assess attachment avoidance. Examples of anxiety items are "I'm afraid that I will lose others' love" and "I often worry that others won't care about me as much as I care about them." Examples of avoidance items are "I prefer not to be too close to others" and "I get uncomfortable when others want to be very close." Each item is rated on a 7-point scale from 1 (strongly disagree) to 7 (strongly agree). The Cronbach's alphas for attachment anxiety and attachment avoidance were 0.93 and 0.89 respectively in the sample of this study.

#### 2.2.2. Stressful events

The level of stressful events was assessed using the College Life Stress Scale-Revised (CLSS, Chon, Kim & Yi, 2000). The CLSS-R has 50 items that assess individuals' stress levels regarding eight aspects of college life (academics, finance, career, value, peer relationship, romantic relationship, family, and relationship with faculty). Participants were asked to rate the degree to which they had experienced stress in given situations during the previous 12 months on a 5-point Likert scale

ranging from 0 (*never*) to 4 (*very often*). Examples of items are: "I have been worried I may not be able to find a job after school," "It has been hard to keep up with my friends financially," and "Relationship with my romantic partner has gotten worse." The Cronbach's alphas for the eight subscales ranged between 0.83 and 0.92. The Cronbach's alpha for the total set of items was 0.94.

### 2.2.3. Internet gaming addiction

Internet gaming addiction was assessed using the Computer Game Addiction Scale (CGAS; Lee, 2000), which was adapted from Young's Internet Addiction Test (Young, 1998). CGAS consists of 20 items that measure the degree to which individuals' Internet game use affects their daily routine, social life, productivity, sleeping pattern, and feelings. Participants were asked to rate the degree to which each item represented themselves on a 5-point Likert scale ranging from 1 ("Very untrue of me") to 5 ("Very true of me"). Examples are "I have played games longer than I intended" and "I have had people complain to me that I play too much game." The Cronbach's alpha in this study was 0.96.

## 2.3. Data analysis

Structural Equation Modeling (SEM) was conducted to test our hypothesized model. SEM tests a hypothesized model statistically in simultaneous analysis of the entire system of variables to determine the extent to which it is consistent with the data (Byrne, 2001). The maximum likelihood method in the Mplus7.4 program was used to examine the measurement and structural model. In addition to chi-square statistics, which is sensitive to sample size, we also used the comparative fit index (CFI), the Tucker-Lewis index (TLI), the standardized root-mean-square residual (SRMR), and the root-mean-square-error of approximation (RMSEA) to evaluate goodness of fit. We used criteria that indicate the potential for acceptable fit ( $\chi^2/df < 3.00$ , CFI, TLI > 0.90, SRMR < 0.10, RMSEA < 0.08) and excellent fit ( $\chi^2/df < 2.00$ , CFI, TLI > 0.95, SRMR < 0.08, RMSEA < 0.06; Marsh, Hau, & Wen, 2004). For attachment anxiety, attachment avoidance, and Internet gaming addiction, three observed indicators (or parcels) were created to improve model fit by reducing the number of parameters (Russell, Kahn, Spoth & Altmaier, 1998). Items were assigned to parcels to equalize average loadings of each parcel on its corresponding latent variable (Little, Rhemtulla, Gibson, & Schoemann, 2013). For stressful events, the average scores of the eight subscales were used as observed indicators.

## 3. Results

### 3.1. Preliminary analyses

Data were examined for normality of distribution. Skewness and kurtosis ranged between  $\pm 0.97$ , so the data were assumed to be normally distributed (Kline, 2005). All bivariate correlations were  $-0.386 \leq r \leq 0.386$ , indicating no evidence of multicollinearity. Descriptive statistics and intercorrelations of the study variables are presented in Table 1. Males reported significantly greater levels of Internet gaming addiction than females,  $t(313.81) = -6.003, p < 0.001$ , so we included gender as a control variable in the subsequent analyses. No significant gender differences were found for attachment anxiety,

avoidance, or stress.

### 3.2. Measurement model

An important preliminary step in the analysis of a full latent variable model is to test for the validity of the measurement model. Thus, we conducted a confirmatory factor analysis to evaluate the fit of the measurement model for each of the hypothesized models. For our hypothesized model, goodness of fit statistics indicated that the model fit the data adequately,  $\chi^2(113, N = 337) = 334.417, p < 0.001, \chi^2/df = 2.95, CFI = 0.942, TLI = 0.930, SRMR = 0.053, RMSEA = 0.076, 90\% CI = [0.067, -0.086]$ . The factor loadings of all 17 measured variables on their corresponding latent variables ( $0.495 \leq \beta \leq 0.954$ ), were statistically significant ( $p < 0.001$ ), suggesting all latent variables were adequately measured by their respective indicators.

### 3.3. Structural model

Analysis of the hypothesized structural model also demonstrated an acceptable fit to the data,  $\chi^2(129, N = 337) = 352.123, p < 0.001, \chi^2/df = 2.73, CFI = 0.942, TLI = 0.931, SRMR = 0.053, RMSEA = 0.072, 90\% CI = [0.063, -0.081]$ . The model with standardized paths is displayed in Fig. 1. Several direct links were significant: from attachment anxiety to stress ( $p < 0.001$ ), from attachment avoidance to stress ( $p < 0.01$ ), from stress to gaming addiction ( $p < 0.001$ ).

Mediation effects were tested using the bootstrap procedure (Shrout & Bolger, 2002). 10,000 bootstrap data samples were created from the original data set ( $N = 337$ ) by random sampling with replacement. Attachment anxiety had a significant indirect effect on gaming addiction through the mediating role of stress,  $\beta = 0.106, 95\% CI [0.038, 0.210]$ . The indirect relation of attachment avoidance with gaming addiction through stress was also significant,  $\beta = 0.043, 95\% CI [0.015, 0.092]$ . The direct effects from attachment anxiety and attachment avoidance to Internet gaming addiction were insignificant, indicating the relationships between attachment styles (attachment anxiety, attachment avoidance) and gaming addiction were fully mediated by stressful events. The two mediational effects did not differ significantly (Wald- $\chi$ -square (1) = 2.609,  $p = 0.106$ ).

## 4. Discussion

The purpose of this study was to examine the relationships among attachment styles, stressful events, and Internet gaming disorder, and the mediational effects of stressful events on the relationships between attachment styles and Internet gaming addiction.

At the level of correlational analyses, both attachment anxiety and attachment avoidance were significantly associated with symptoms of Internet gaming addiction, suggesting insecurely attached college students are likely to engage in more problematic gaming. This is consistent with a prior study that examined the relationship between attachment styles and problematic game use by using a categorical model to assess attachment style (Suárez et al., 2012). Our study using a dimensional model for attachment style provides further evidence for these links.

The relationships between both attachment styles and Internet gaming addiction were fully mediated by stressful events. These results

**Table 1**  
Means, Standard deviations, and partial correlations among the study variables.

	1	2	3	Mean	SD	Skew	Kurtosis
1. Anxiety	-			56.56	18.62	0.27	-0.28
2. Avoidance	0.336***	-		66.36	15.21	0.11	-0.28
3. Stress	0.386***	0.253***	-	56.25	29.88	0.51	0.77
4. Gaming Addiction	0.211***	0.131*	0.253***	34.39	15.96	0.97	0.10

\*\*\* $p < 0.001$ , \* $p < 0.05$ .

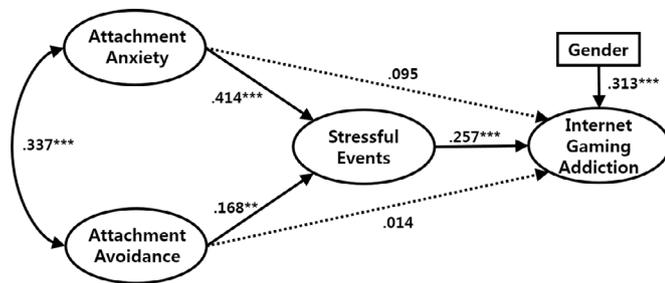


Fig 1. The structural model ( $N = 337$ ). All path coefficients are standardized.

are congruent with previous research that found a mediational effect of stressful events on the relationship between attachment and psychopathology (Pieglage et al., 2000). The results of this study are also in line with previous studies that found that attachment insecurity is associated with increased levels of stressful events (Hankin et al., 2005), and that experience of stressful events is related to increased symptoms of Internet gaming addiction (Li et al., 2016; Plante et al., 2018; Yu et al., 2018). The results of this study suggest that insecurely-attached individuals may tend to engage in Internet gaming addiction due to their heightened vulnerability to stress.

Both attachment anxiety and attachment avoidance were associated with internet gaming addiction by the mediation of stressful events, but the functions of video gaming may differ, given the distinctive qualities of the two constructs (Mikulincer, 1998; Shaver & Fraley, 2008). For instance, anxiously attached individuals may use games as part of a hyperactive strategy to deal with stress, and to meet their attachment needs by engaging in social connections in online video games. In contrast, people with a fear of intimacy and difficulty with depending on others may use video games as a way to suppress their emotions and deactivate their attachment needs. Future research that explores attachment styles in relation to preferred types of Internet video games and motives for gaming would elucidate possible differences in gaming motives between attachment avoidance and attachment anxiety.

#### 4.1. Limitations and directions for future research

Given the cross-section design of our study, neither causal relationships nor temporal mediational effects can be determined. Although we tested a model that proposed attachment style should predict stressful events, a bidirectional causality between adult attachment and stress is possible. Future research with longitudinal and experimental design will allow to explore this possibility. Whereas the stressful events were measured for stress over the past year, symptoms of Internet gaming addiction were assessed for daily behaviors. This time discrepancy may have confounded the results. Finally, our study used a nonclinical sample. Attachment and stress may operate differently for clinical populations, such as those with severe levels of video game addiction. For instance, research evidence suggests that with long-term engagement in addiction, addictive behavior becomes decreasingly impulsive, but increasingly compulsive (Everitt & Robbins, 2013). Thus, research should compare our results with clinical populations.

#### 5. Conclusion and clinical implications

This study further extends research on the mechanisms underlying attachment insecurity, stress, and Internet gaming addiction. Our results highlight the importance of stress management in preventing Internet gaming addiction especially for those with insecure adult attachment. When working with clients who struggle with excessive game use, mental health professionals should integrate assessments of clients' attachment quality, levels of stress, and stress management strategies. Given the link between attachment style and gaming addiction,

treatment for gaming addiction should consider helping clients develop secure attachment. Research evidence supports that changing of attachment quality is challenging, but possible (Taylor, Rietzschel, Danquah & Berry, 2015). Clinicians can integrate security priming techniques such as guided imagery and visualization in helping people with insecure attachment and problematic gaming behaviors (Gillath & Karantzias, 2019).

#### Authors' contribution

Dr. Yoonhee Sung was responsible for the study concept and design, interpretation of data, and writing and revising the manuscript. Tae-Hyun Nam was involved in the study concept and design, statistical analysis, and revising the manuscript. Dr. Mae Hyang Hwang participated in the study concept and the manuscript writing. All authors had full access to all data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

#### Declaration of Competing Interest

No financial support was received for this study. The authors declare no conflict of interest.

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