# Gaming addiction and exercise addiction: To what extent are they the same or different in terms of emotional abuse and/or emotional neglect etiologies?

Merve DENİZCİ NAZLIGÜL[a]

Adviye Esin YILMAZ[b]

Mark D. GRIFFITHS[c]

a. Corresponding Author: Merve Denizci Nazlıgül, Yeditepe University, Department of Psychology. İnönü Mah. Kayışdağı Cad. 26 Ağustos Yerleşimi Atasehir, 34755 Istanbul Turkey. E-mail: mervednzc@gmail.com, Tel: +9021657800-1880

b. Dokuz Eylül University, Department of Psychology, İzmir Turkey. E-mail: esin.yilmaz@deu.edu.tr

c. Nottingham Trent University, Psychology Department, Nottingham UK. E-mail: mark.griffiths@ntu.ac.uk

**Abstract**

The aim of the present study was to examine the mediating roles of negative beliefs about emotions (NBAEs) and avoidance on the relationship between emotional maltreatment (i.e., emotional abuse and emotional neglect) and two kinds of behavioral addiction (i.e., gaming addiction and exercise addiction). The study comprised 731 participants (431 videogame players; 300 exercisers) who completed a survey comprising the Childhood Trauma Questionnaire-Short Form, Leahy's Emotional Schemas Scale, Cognitive Behavioral Avoidance Scale, Game Addiction Scale, and Exercise Dependence Scale-21. The findings indicated that emotionally abused gamers had more NBAEs and was associated with greater behavioral social avoidance and cognitive non-social avoidance. These greater types of avoidance reflected in higher gaming addiction scores. However, exercisers who had suffered emotional abuse and neglect had more NBAEs and was associated with greater behavioral nonsocial avoidance. These greater types of behavioral nonsocial avoidance reflected in lower exercise dependence scores.

**Keywords:** Gaming addiction, exercise addiction, emotional abuse, emotional neglect, emotional schemas, avoidance.

## Introduction

Academic and clinical communities have frequently conceptualized addiction in different ways over the past decade. For instance, in the latest (fifth) edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), 'pathological gambling' was re-named as 'gambling disorder', and its classification was changed from an impulse control disorder to an addictive disorder (American Psychiatric Association, 2013). This was an important step in gaining acceptance of behavioral addictions (Billieux et al., 2015). Additionally, internet gaming disorder (IGD) was included in the 'Conditions for Further Study' section, which suggests future official recognition in an upcoming edition of the DSM if further recommended research emerges (Thege et al., 2015).

Since the construct of behavioral addiction was acknowledged in the DSM-5, some discussions have emerged as to whether a variety of activities such as internet use, videogame playing, shopping, work, and exercise could be included in such a group (Andreassen et al., 2013). Obviously, these moot addictions appear very different from each other. For example, individuals with gaming addiction lead a relatively sedentary lifestyle and are physically inactive, while individuals with exercise addiction spend many hours exercising and are physically overly active. The findings of a longitudinal study revealed that the participants with low level of sport and exercise reported more symptoms of gaming addiction as compared to those with a higher level (Henchoz et al., 2015).

Although both exercise and gaming have many psychological and therapeutic benefits (Griffiths, 2019; Nuyens et al., 2019), exercise is generally recognized as a behavior that offers physical benefits (Goodwin et al., 2014). However, individuals in both groups often feel an irresistible desire to excessive engage in their activity of interest. Despite idiosyncratic differences, these problematic behaviors have common features of addictive behaviors. According to the 'addiction components model', all behavioral addictions have shared

components comprising salience, mood modification, tolerance, withdrawal, conflict, and relapse (Griffiths, 2005). Therefore, recreational behavior has a risk of turning into addiction for both gamers and exercisers among a minority of individuals. Griffiths also stressed the importance of the interaction between the individual's (i) biological predisposition, (ii) psychological factors such as personality, attitudes and beliefs, (iii) social environment, and (iv) structural features of the activity itself.

During recent years, specific psychological factors have been investigated to understand distinct type of addictions. For instance, online game motivations, gender, self-control related traits, and self-esteem have been widely studied to understand the etiology of problematic online gaming (Billieux et al., 2015). Gender and age have been identified as risk factors for gaming addiction, suggesting that it is more likely to be common among young males (Hussain et al., 2015; Mentzoni et al., 2011). Similarly, young adult men report more exercise dependence symptoms than women (Costa et al., 2013). A recent study by Kaess et al. (2017) conducted with a group of young men showed that gaming may serve as a stress-regulation strategy.

Regarding emotion regulation, it has been suggested that regular exercise is maintained by both positive reinforcement (e.g., a sense of achievement, a sense of well-being) and negative reinforcement (e.g., removal of negative emotions) (Meyer et al., 2011). Moreover, family dysfunctions may play a significant role in the development of gaming addiction and exercise addiction. For instance, individuals who have experienced childhood abuse and/or neglect have reported higher levels of gaming addiction (Bussone et al., 2020; Kircaburun et al., 2019). Similarly, the history of addictive or dysfunctional behaviors between parents and their children has been associated with increased levels of problematic exercise (Manning & Morrison, 1994). Consequently, the question arises as to why some individuals show the characteristics of gaming addiction and others experience exercise addiction which on initial

examination is arguably very different than gaming. To answer this question, further research is needed on the similarities and differences in the underlying mechanisms of gaming addiction and exercise addiction. Relatively little is known about what different processes have an impact in terms of problematic use. Consequently, gaming addiction and exercise addiction were selected to further examine underlying emotion-related pathways in the present study.

***Emotional abuse and neglect: Effects on emotional processing***

'Emotional maltreatment' is a term that broadly conveys the meaning of adverse experiences that are commonly attributed to parental emotional abuse and neglect (Dutcher et al., 2017). Children raised in an abusive setting have been shown to be more likely to associate specific feelings such as anger with the risk of damage. They tend to show hypervigilance to these emotions, so they are prepared to notice situations that are more readily threatening and thus prevent abuse. However, children raised with negligent parents are subjected to little emotional expression and positive affective exchange. Such children have no opportunity to learn to comprehend their feelings within such a poor emotional setting (Masten et al., 2008).

A healthy emotional environment provides children with adequate skills for self-competence, a sense of trust, and unconditional acceptance, which in turn, they can feel safety and self-worth. Both neglect and abuse disrupt children's early perceptions of relationships and regulation of inner responses necessary for cooperation (Rees, 2008). Obviously, childhood abuse and neglect represent examples for invalidation of emotional experiences. Taken together, the experiences of emotional abuse and/or neglect can directly affect how children feel and think about their emotions as well as others' emotions, and how they experience them. In a neglectful and/or abusive home environment, displays of negative affect would not be tolerated by caregivers. Consequently, the child may assume that all other individuals would not approve of or be indifferent to the child's emotional experiences. Considering the aforementioned literature, the first hypothesis ($H_1$) of the present study was:

- *$H_1$*: Among gamers and exercisers, emotional abuse and emotional neglect will be significantly and directly associated with negative beliefs about emotions.

According to Leahy's (2002) emotional schema model, individuals react differently towards their own emotions for the same events, and this dissimilarity is likely to stem from the formation of personal emotional schema which is a set of beliefs as well as strategies that individuals have about their own or other's emotions. Since emotional schemas represent emotionally private events resulting in subsequent behaviors and action strategies in response to emotion, more adaptive emotional schemas are associated with reactions to emotions that contribute to rewarding movements towards valued aims. More specifically, it has been found that individuals who expect that their emotions will be invalidated, who blame themselves for having unpleasant emotions, who do not comprehend emotional experience and movement towards valued aims, and who experience their emotions as confusing and difficult to understand, tend to have experiential avoidance (Leahy et al., 2012). Consequently, the second hypothesis ($H_2$) of the present study was:

- *$H_2$*: Among gamers and exercisers, negative beliefs about emotions will be significantly and directly associated with avoidance reactions.

***Avoidance and its relationship with addictive behaviors***

The term 'avoidance' is a broad concept which can be generally defined as refraining from doing something or escaping from someone, something, or some situation (Ottenbreit & Dubson, 2004). Ottenbreit and Dubson (2004) have suggested that avoidance indicates a trait measure rather than a situational coping based on the construct validity of their scale. It consists of both modes of avoidance (i.e., cognitive vs. behavioral modes) and domains of avoidance (i.e., social vs. non-social domains). In terms of behavioral addictions, the relationship between gaming addiction and avoidance has consistently been investigated within the scope of coping

style or emotion regulation as a response to stressful or negative life events. For example, it has been found that individuals with gaming addiction use more avoidance-oriented coping and less approach coping (Loton et al., 2016). Additionally, individuals with gaming addiction often use video games to escape from problems (Billieux et al., 2015). Similarly, existing research has shown avoidance from negative mood states may be a contributory factor that helps to explain the maintenance of exercise dependence (Costa et al., 2013). Correspondingly, it has been widely accepted that exercise addiction has been associated with the regulation of negative emotions (Bratland-Sanda et al., 2010). Therefore, the third hypothesis ($H_3$) was:

- *$H_3$*: Avoidance reactions will be significantly and directly associated with risk of gaming addiction and risk exercise addiction.

In the light of the aforementioned literature, childhood experiences would probably affect the formation of an individual's beliefs about emotions. In turn, these negative beliefs would affect engaging in avoidance in some way (i.e., cognitive vs. behavioral; social vs. nonsocial), which increase the likelihood of some addictive behaviors. Consequently, the present study extended previous research by being the first to examine how emotional abuse and/or emotional neglect might relate to negative emotional schemas and particular avoidance styles across two different types of potential behavioral addiction (i.e., gaming addiction vs. exercise addiction). Based on the aforementioned literature, the final hypotheses of the present study ($H_4$ and $H_5$) were: *$H_4$*: Emotional abuse and emotional neglect will significantly and indirectly be associated with risk of gaming addiction and risk of exercise addiction via negative beliefs about emotions and avoidance variables (see Figures 1 and 2).

- *$H_5$*: There will be no significant difference in the relationships among emotional abuse, emotional neglect, negative beliefs about emotions, and avoidance variables across the two groups.

INSERT FIGURES 1 AND 2 ABOUT HERE

## Methods

### *Participants, procedure, and ethics*

The overall sample comprised 731 individuals (431 videogame players; 300 exercisers). The exclusion criterion was determined as being under the age of 18 years. The mean age of the participants was 24.07 years (*SD* = 5.64; ranged between 18 and 58 years) for gamers, and 32.93 years (*SD* = 9.24; ranged between 18 and 76 years) for exercisers. The participants who were the members of the two groups (i.e., gamers or exercisers) were asked to participate in the present study if they exercised or played video games at least 1-2 days per week. That is, criterion sampling (i.e., criterion of inclusion in a specific category) was used. Detailed demographic characteristics of the participants are shown in Table 1. Prior to data collection, ethical approval was sought by the research team's university ethics committee and the study was carried out according to the principles of the Helsinki declaration. The administration of the instruments with two questionnaire sets was carried out through an online survey tool on July-September 2018. Both online links to the survey sets were announced in social network sites such as Facebook, Instagram, and LinkedIn. Informed consent was provided by all participants who confirmed their voluntary participation to complete the survey. Participants were informed that all their data was anonymous and confidential.

### *Measures*

*Demographic information.* There were two versions of demographic information forms (a slightly different set of questions depending on whether the participant was an exerciser or a gamer) including generic questions such as age, gender, level of education, etc., as well as group-specific issues such as age at when they began playing videogames, and amount of playing/exercising hour per day in the past six months. "Considering the last six months, please

specify how many hours of games you play per day" and "Considering the last six months, please indicate how many days you exercise in a week" were some examples of the group-specific demographic questions.

*Childhood Trauma Questionnaire-Short Form (CTQ-SF).* To assess adverse experiences of childhood and adolescence, the 28-item CTQ-SF (Bernstein et al., 2003) was developed. The instrument has five subscales: emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. For instance, an item in the Emotional Abuse subscale is: "*People in my family called me things like "stupid", "lazy", or "ugly"*". Other items correspond to behaviors as specific examples of the type of emotional neglect: "*People in my family looked out for each other*" (reverse item). Only Emotional Abuse and Emotional Neglect subscales were used in the present study. Both of these two subscales comprise five items. Items are rated on a five-point Likert scale from 1 ('*never true'*) to 5 ('*very often true*'). The reliability and validity study of the Turkish version of the scale was conducted by Şar et al. (2012). In the present study, the internal reliability coefficients for total scale were found to be .90 for gamers and .86 for exercisers. For gamers, the internal consistency coefficients were found to be .83 for emotional abuse and .84 for emotional neglect. For the exercisers, they were .79 for emotional abuse and .82 for emotional neglect.

INSERT TABLE 1 ABOUT HERE

*Leahy's Emotional Schemas Scale (LESS).* The LESS is a self-report instrument that assesses individuals' conceptualization of their emotions (Leahy, 2002). Moreover, a composite score of the LESS can be used to assess negative beliefs about emotions (Leahy, 2002). The scale comprises 50 items assessing how participants deal with emotional experiences (e.g., "*Others understand and accept my feelings*", "*Some feelings are wrong to have*"). Each item is scored on a six-point response format from 1 ('*very untrue of me'*) to 6 ('*very true of me'*) (Leahy, 2002). Yavuz et al. (2011) studied the reliability and validity of the Turkish version of the scale.

The reliability coefficient was found as .86 for the overall scale. The correlations between the total scores of each dimension and each items of the scale (except Item 33) were statistically significant ($r$ = 0.48-0.87, $p < 0.01$). In the Turkish adaptation of the LESS, the structure of the scale was different to the originally validated scale (i.e., many items did not load in the same way as in the original study). When the factor content was analyzed, it was clear that the meanings in the Turkish version were different. Therefore, some subscales were discarded (i.e., numbness, values, simplistic view, blame, and expression), some subscales were retained and some subscales were changes (i.e., the Turkish version renamed the scales to avoidance from emotions, dissimilarity, weakness against emotions, neglecting emotions, and seeing emotions as dangerous). In the present study, the total score of the 50-item LESS was used to assess negative beliefs about emotions. The internal reliability coefficients for the total scale were found to be .89 for the gamers and .89 for the exercisers.

*Cognitive Behavioral Avoidance Scale (CBAS).* The CBAS was developed to assess a comprehensive and multidimensional model of avoidance (Ottenbreit & Dobson, 2004). The scale has 31 items comprising five dimensions: behavioral social avoidance (BSA), behavioral nonsocial avoidance (BNSA), cognitive social avoidance (CSA), and cognitive nonsocial avoidance (CNSA). Example cognitive social and nonsocial avoidance factor items include: "*I fail to do what is needed to follow through with achievement goals I have set for myself*" and "*There is nothing I can do to improve problems in my relationships*". Items are rated on a five-point Likert scale ranging from 1 ("*not at all true for me*") to 5 ("*extremely true for me*"). For the Turkish version, Çakır (2016) carried out the adaptation study of the CBAS. In the present study, the Cronbach's alphas of the CBAS were found to be .94 for the gamers and .91 for the exercisers. For the gamers, the behavioral social avoidance subscale had an internal consistency of .89, behavioral nonsocial avoidance subscale had a reliability of .74, cognitive social avoidance subscale had a reliability of .80, and cognitive nonsocial avoidance subscale had a

reliability of .88. For the exercisers, the behavioral social avoidance subscale had an internal consistency of .84, behavioral nonsocial avoidance subscale had a reliability of .68, cognitive social avoidance subscale had a reliability of .78, and cognitive nonsocial avoidance subscale had a reliability of .83.

*Game Addiction Scale (GAS).* The GAS is a 21-item self-report instrument based on seven DSM-related items that assesses game addiction (Lemmens et al., 2009). Example items include: "*Have you felt bad when you were unable to play?*" or "*Did you play longer than intended?*" Participants rate how often each item applied to them in the past six months using a five-point Likert scale ranging from 1 ("*never*") to 5 ("*very often*"). Lemmens et al. (2009) suggested that the scale can be used to determine addiction in two formats: (a) monothetic format (all items scoring above 3), (b) polythetic format (at least half of the items scoring 3 or above). Baysak et al. (2016) studied the Turkish adaptation study of the GAS. In the present study, the internal consistency of that scale was .91 among the gamers.

*Exercise Dependence Scale-21 (EDS-21).* The EDS-21 was developed by Hausenblas and Symons Downs (2002b) and assesses exercise dependence. Example items include: "*I continually increase my exercise intensity to achieve the desired effects/benefits*" and "*I exercise despite recurring physical problems*". Items are responded to on a six-point Likert type scale from 1 (*"never"*) to 6 (*"always"*) with higher scores indicating higher levels of exercise dependence. Yeltepe and İkizler (2007) studied the reliability and validity of the Turkish version of the EDS-21. In the present study, the internal reliability coefficient for total scale was found to be .92 among exercisers.

***Statistical analysis***

Prior to the analyses, the two sets of data were examined in terms of assumptions testing (missing data, sample size, outliers, normality, linearity, homoscedasticity, and

multicollinearity). Moreover, confirmatory factor analysis was conducted to confirm the validity of the Turkish study measures. To test main models, structural equation modeling, specifically two path analyses, were performed using AMOS 24 (Arbuckle, 2009). In addition, AMOS 24.0 estimands and plugins (Gaskin & Jim, 2018a; 2018b) were used to test the specific indirect effects and multigroup invariance.

## Results

### *Multicollinearity and factor structures of the scales*

Multicollinearity of the study variables was examined through the Variance Inflation Factor (VIF) and Tolerance values for both samples. According to Cohen et al. (2003), a VIF of 10 or more and Tolerance values of .10 or less are signs of multicollinearity problems. The VIF and Tolerance values of the present study variables are presented in Table 2, and indicate no violation in the assumption of multicollinearity.

INSERT TABLE 2 ABOUT HERE

Since the characteristics of the study samples were not same with the original studies and Turkish adaptations of the measurements, a set of confirmatory factor analysis (CFAs) were conducted to validate them for both samples. Particular fit indexes were used to interpret the results of CFA. Firstly, chi-square/df-ratio was suggested by Wheaton et al. (1977) to be less than 5, when sample size is small. Secondly, Hu and Bentler (1999) suggested that a good fit with a value of Root Mean Square of Error of Approximation (RMSEA) should be less than .06, showing the fit of current data to the population. The Goodness-Of-Fit Index (GFI), Bentler Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI) values range from 0 to 1 and .95 represent the perfect fit and .90 is acceptable fit for those indices (Kline, 2005). According to predetermined fit indices, all CFA fit statistics for both samples had acceptable fit to the data,

except the values of the LESS which were slightly less than the good fit values. The CFA fit statistics of the study instruments for both samples are summarized in Table 3.

INSERT TABLE 3 ABOUT HERE

***Prevalence of being at risk of addiction***

Both the GAS and the EDS-21 comprise distinct addiction criteria to determine whether someone is at risk of addiction to either games or exercise (see Hausenblas & Symons Downs, 2002b; Lemmens et al., 2009). According to the polythetic format, the findings of the present study showed that 45.3% of the players ($n$ = 195) were classified as being at risk of gaming addiction. Additionally, 7% of the players ($n$ = 30) endorsed all of the seven criteria (at least 'sometimes'). For exercise, 4.7% of the participants ($n$ = 14) were classified as being at risk for exercise dependence, 64% as nondependent–symptomatic ($n$ = 192), and 31.3% as nondependent–asymptomatic ($n$ = 94).

***Path analysis***

Path analysis with maximum likelihood method was performed utilizing IBM AMOS 24.0 (Arbuckle, 2009) to test the proposed models. Since four (of the five) dimensions of avoidance were correlated significantly and positively with each other, these error terms were allowed to covary. The proposed Model 1a in which negative beliefs about emotions (NBAE) and four dimensions of avoidance mediated the relationship between emotional abuse and/or neglect and gaming addiction provided good fit to the data ($\chi^2(11) = 40.18$, $\chi^2/df = 3.65$, $p <$ .001, RMSEA = .08, GFI = .98, CFI = .98, TLI = .95). It was found that emotional neglect also directly predicted BSA. Moreover, gaming addiction was directly predicted by NBAE. After corrections among variables based on modification indices, the findings demonstrated that the modified proposed Model 1a perfectly fitted the data ($\chi^2(9) = 16.39$, $\chi^2/df = 1.82$, p = .06, RMSEA = .04, GFI = .99, CFI = .99, TLI = .98). In addition, the result of squared multiple

correlation ($R^2$ = .243) showed that the predictors of being at risk of gaming addiction explained 24% of its variance. The proposed Model 1b in which negative beliefs about emotions and four dimensions of avoidance mediated the relationship between emotional abuse and risk of exercise addiction or between emotional neglect and risk of exercise addiction provided good fit to the data ($\chi^2(11) = 23.36$, $\chi^2/df = 2.12$, $p < .05$, RMSEA = .06, GFI = .99, CFI = .98, TLI = .96). However, it was also found that NBAE directly predicted risk of exercise addiction. After the corrections based on modification indices, the findings demonstrated that the modified proposed Model 1b perfectly fitted the data ($\chi^2(10) = 14.59$, $\chi^2/df = 1.46$, $p = .15$, RMSEA = .04, GFI = .99, CFI = .99, TLI = .98). Additionally, the result of squared multiple correlation ($R^2$ = .111) showed that the predictors of risk of exercise addiction explained 11% of its variance. Standardized regression estimates of the tested models were shown in Figure 3 and Figure 4, with continuous lines indicating the significant paths and dashed lines indicating the non-significant paths.

INSERT FIGURES 3 AND 4 ABOUT HERE

$H_1$ proposed that emotional abuse and emotional neglect would be significantly and directly associated with negative beliefs about emotions and was supported to some extent. For the gaming sample, emotional abuse had a positive significant direct effect on negative beliefs about emotions ($\beta = .22$, $p < .001$). However, the direct effect of emotional neglect on negative beliefs about emotions was not significant. Here, emotional neglect directly predicted BSA ($\beta = .10$, $p < .01$). For the exercise group, both emotional abuse and emotional neglect had positive significant direct effect on negative beliefs about emotions ($\beta = .20$, $p < .01$; $\beta = .17$, $p < .05$, respectively). $H_2$ which proposed that negative beliefs about emotions would significantly and directly be associated with avoidance variables was supported for both the gaming and exercise groups (for the gaming group, $\beta_{range}$ = from .37 to .41, $p < .001$; for the exercise group $\beta_{range}$ = from .48 to .55, $p < .001$. In addition, NBAE directly predicted risk of gaming addiction ($\beta$ =

.20, $p < .001$) and risk of exercise addiction ($\beta = .21$, $p < .05$). $H_3$ proposed a direct association between avoidance variables and gaming addiction or exercise addiction and was confirmed to some degree. More specifically, BSA ($\beta = .16$, $p < .01$) and CNSA ($\beta = .32$, $p < .001$) had significant positive direct effects on the risk of gaming addiction. For the exercise sample, BSA had significant positive direct effect on the risk of exercise addiction ($\beta = .20$, $p < .05$). However, BNSA had marginal negative direct effect on the risk of exercise addiction ($\beta = -.15$, $p = .05$). The results of hypothesized direct effects for the proposed models are summarized in Table 4.

INSERT TABLE 4 ABOUT HERE

According to MacKinnon et al. (2004), bootstrapping method, a procedure that comprises random subsamples of the same size as the major sample, is more powerful than other methods of mediation testing in examining indirect effects. In order to estimate indirect effects of the mediating variables for proposed models, bias-corrected bootstrapping method with 5000 resamples and 95% confidence interval was performed in the present study. In addition, each specific indirect effect was calculated by using AMOS 24.0 estimand and plugin (Gaskin & Jim, 2018a). $H_4$ proposed that emotional abuse and emotional neglect variables would be significantly and indirectly associated with risk of gaming addiction or risk of exercise addiction through negative emotional schemas and avoidance variables. This hypothesis was supported to some extent. More specifically, the significant indirect effect of emotional abuse on risk of gaming addiction was observed via NBAE and BSA ($B = .07$, $p < .01$), and via NBAE and CNSA ($B = .13$, $p < .01$). On the other hand, the significant indirect effect of emotional abuse on risk of exercise addiction was observed via NBAE and BSA ($B = .12$, $p < .05$), and via NBAE and BNSA ($B = -.09$, $p < .05$). In addition, emotional neglect had significant positive indirect effect on risk of gaming addiction via BSA ($\beta = .02$, $p < .01$). The significant indirect effect of emotional neglect on the risk of exercise addiction was also observed via NBAE and

BSA ($B$ = .07, $p$ < .05), and via NBAE and BNSA ($B$ = -.05, $p$ < .05). However, emotional neglect had significant positive indirect effect on risk of exercise addiction via NBAE ($\beta$ = .03, $p$ < .05). The results of hypothesized direct effects for the proposed models are summarized in Table 5.

INSERT TABLE 5 ABOUT HERE

In the present study, multigroup analysis was run for gamers and exercisers by using an AMOS plugin developed to easily perform such analysis (Gaskin & Lim, 2018b). In multigroup analysis, the type of behavioral addiction was used as a moderating variable in the model to test if the relationships among emotional abuse, emotional neglect, NBAE, and avoidance variables varied across the two groups (See Figure 5). Here, a global test calculates the significance level of difference between chi-squares of two groups, indicating the overall model difference. Additionally, local tests calculate standardized estimates for every path and the significance level of a path across different groups, indicating each path difference. $H_5$ which proposed that there would be no significant difference in the relationships among emotional abuse, emotional neglect, NBAE, and avoidance variables across two groups was confirmed. The findings of multigroup invariance analysis showed that there was no significant level of difference between chi-squares of the two groups. In addition, there was no significant difference among standardized estimates calculated for each path across the two different groups (see Table 6).

INSERT TABLE 6 AND FIGURE 5 ABOUT HERE

## Discussion

The present study examined the mediating roles of NBAE and avoidance on the relationship between emotional abuse and/or neglect and risk of addictions to gaming and exercise. The findings showed that NBAE and two dimensions of avoidance (i.e., BSA and CNSA) mediated the relationship between emotional abuse and gaming addiction, but not

between emotional neglect and gaming addiction. BSA mediated the relationship between emotional neglect and gaming addiction. From the finding, it may be inferred that when primary caregivers fail to give their children an emotional environment, neglected children are inclined to stand aloof from individuals in the real world without developing a consistent positive or negative thinking pattern for emotions. Instead, they appear to use gaming as a substitute for emotional stimulation. On the other hand, emotionally abused players having negative appraisals for emotions may keep away from self-disclosure which is a risk for their self-esteem with the use of BSA and CNSA. Many studies have shown that gamers mostly tend to have fragile self-esteem characteristics (Beard & Wickham, 2016). In a recent study, it was found that individuals with low core self-evaluations such as low self-esteem, lack of self-efficacy, and increased neuroticism were more likely to engage in pathological gaming behavior (Throuvala, et al., 2019). Consequently, these avoidance patterns may prevent individuals from changing NBAE shaped in their childhood since they will not engage in new compensatory activities and opportunities. Moreover, most individuals gaming excessively are isolated from real friends, situations, and problems. In this respect, gaming addiction accompanies BSA by its nature. But then, they are surrounded by a vivid but unreal environment including numerous friends. Obviously, these individuals meet their need of having social relationships in a more controllable way. Therefore, CSA may not be a matter for these gamers. On the one hand, CNSA involves using denial, minimization, or cognitive distraction for achievement-related issues. Consequently, such players are more likely to escape thinking about some achievement-related situations or problems in their life and distract their attention from unpleasant issues by focusing on playing videogames. Overall, these findings confirm those of many other studies showing the relationship between avoidance from unpleasant states and gaming addiction (for a comprehensive review, see Melodia et al., 2020).

For exercise addiction, the proposed mediation hypothesis was supported for only two dimensions of behavioral avoidance. More specifically, individuals with emotional abuse and/or neglect in childhood had increased NBAE and those beliefs lead to BSA or BNSA, which appears to result in exercise addiction. In the literature, it has been reported that individuals with a high degree of social physique anxiety (i.e., anxiety related to the public presentation of one's body), is positively correlated with exercise dependence (Cook et al., 2015). Therefore, the participants' anxieties about their physical appearance may be a factor in explaining BSA. Secondly, representative items from the BNSA factor consisted of items such as "I would like to achieve things at work/school, but I have to accept my limits", and "I avoid trying new activities that hold the potential for failure" (Ottenbreit & Dubson, 2004). It can be inferred from this information that the participants who exercised excessively were less likely to accept their limits and more likely to use their potential to achieve challenging tasks. This result may be explained by the perfectionism that exercisers have. In the literature, there are a number of studies showing that general perfectionism is associated with maladaptive exercise patterns (Hagan & Hausenblas, 2003). In addition, it has been found that exercise addiction is associated with psychological inflexibility (Alcaraz-Ibáñez et al., 2018). However, cognitive avoidance may be considered as 'letting things go' and may threaten exercisers' high standards. Consequently, they do not prefer to use this kind of avoidance.

The findings of the multi-group invariance analysis showed that the model did not differ across groups. Consequently, it can be inferred that the associations among the common study variables in proposed models 1a and 1b had equal importance in explaining risk of gaming addiction and exercise addiction. Furthermore, it can be said that the type of avoidance used by an individual may be important in determining which behavior is enacted. Indeed, such a finding may shed light on understanding why individuals chose to stay at home to play videogames for hours and why others chose to be excessively physically active. Further studies

may focus on more specific mechanisms such as rewarding systems, motivations, or personality traits to understand different tendencies related to various behavioral addictions.The present study has some limitations which could be ameliorated in further studies. Firstly, the study utilized a cross-sectional self-report design, therefore is open to many well-known method biases. Longitudinal or experimental studies are likely to provide better information about causal relationships among study variables investigated here. For instance, mood induction techniques can be useful to understand the relationships between emotions and specific avoidance behaviors. Secondly, although there are diagnostic criteria for internet gaming disorder in the DSM-5, there are no formal diagnostic criteria for exercise addiction. Therefore, the scales used in the present study may not be sensitive to the unique nature of the addictions investigated. Further studies are warranted to develop new assessment tools delineating idiosyncratic dimensions of specific addictions. It should also be noted that the risk of addiction was classified based on the polythetic-monothetic format criteria in the present study. However, applying a polythetic format or monothetic format is much debated in the literature. It is important to note that using polythetic format is likely to result in overestimation of the frequency of players at risk of addiction (Lemmens et al., 2009). Therefore, the use of multiple assessment systems may be important in the behavioral addiction-related research studies and clinical practice. Another limitation was that GAS was not administered to the exercisers and the EDS-21 was not administered to gamers. Although it is unlikely that participants would be addicted to both behaviors simultaneously, the possibility cannot be ruled out (especially if the games played are ‘exer-games’ such as sports or dancing videogames that rely on whole body movement rather than more sedentary actions). Also, a recent study (predictably) showed that exercise participation and substance use (i.e., alcohol, nicotine, and illicit drug use) were negatively associated (Szabo et al., 2019). Other studies have shown differences between exercise addicts and gaming addicts in terms of ‘big five’ personality traits (Andreassen et al.,

2013). Finally, substance-related addiction or other behavioral addiction comorbidities were not controlled in the current study because no other potentially addictive behaviors were asked about apart from gaming and exercise. It has been found that addicted individuals are likely to have multiple addictions (Hausenblas & Symons Downs, 2002a; Sussman et al., 2011), although as mentioned above, the co-occurrence of exercise addictions with heavy gaming or psychoactive substances is likely to be minimal. Future studies including overlapping addictions may give more comprehensive information about initiating and maintaining factors of these addictions. Behavioral addictions are perceived to be multifaceted problematic behaviors. Therefore, labeling individuals as having or not having such disorders may lead to overlooking other problematic issues such as emotional maturity and coping abilities. Therefore, future studies examining the potential mediator variables (e.g., personality, coping strategies, etc.) may be crucial in understanding differences and similarities in those addictions. Finally, investigating the role of moods rather than solely emotions may also be informative.

***Conclusion***

In the present study, multi-group invariance analysis showed that there was no statistical difference across the groups of gamers and exercisers. This means that there was no significant difference between the insignificant path (between emotional neglect and negative beliefs about emotions) in the gaming group and the significant path (between emotional neglect and negative beliefs about emotions) in the exercise group. This finding may indicate that emotional abuse can be considered more salient than emotional neglect as a risk factor for problematic gaming and exercise. Moreover, negative beliefs about emotions directly predicted all types of avoidance for both groups. As Starcevic (2016) argued, trying to understand the reasons for behavioral addictions and establishing accurate treatments based on such reasons might be more appropriate, rather than describing them solely as a behavioral addiction. Therefore, studies investigating the underlying mechanisms of behavioral addictions appear to have a crucial

importance in establishing an accurate understanding of such addictions. Instead of diagnostic approaches, delineating process-based explanations may contribute to the development of individualized trans-diagnostic treatment including cognitive, affective, motivational, or behavioral components (Spada, 2015). In this regard, the present study investigating differences and similarities in the development of gaming addiction and exercise addiction may contribute to such goals.

## References


Alcaraz-Ibáñez, M., Aguilar-Parra, J. M., & Álvarez-Hernández, J. F. (2018). Exercise addiction: Preliminary evidence on the role of psychological inflexibility. *International Journal of Mental Health and Addiction*, *16*(1), 199–206. https://doi.org/10.1007/s11469-018-9875-y

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing.

Andreassen, C. S., Griffiths, M. D., Gjertsen, S. R., Krossbakken, E., Kvam, S., & Pallesen, S. (2013). The relationships between behavioral addictions and the five-factor model of personality. *Journal of Behavioral Addictions, 2*(2), 90–99. https://doi.org/10.1556/JBA.2.2013.003

Arbuckle, J. L. (2009). *Amos 18.0 [Computer software]*. Small Waters.

Baysak, E., Kaya, F. D., Dalgar, I., & Candansayar, S. (2016). Online game addiction in a sample from Turkey: Development and validation of the Turkish version of game addiction scale. *Klinik Psikofarmakoloji Bülteni-Bulletin of Clinical Psychopharmacology, 26*(1), 21–31. https://doi.org/10.5455/bcp.20150502073016

Beard, C. L., & Wickham, R. E. (2016). Gaming-contingent self-worth, gaming motivation, and Internet Gaming Disorder. *Computers in Human Behavior, 61*, 507–515. http://dx.doi.org/10.1016/j.chb.2016.03.046

Bernstein, D. P., Stein, J. A., Newcomb, M. D., Walker, E., Pogge, D., Ahluvalia, T., Stokes, J., Handelsman, L., Medrano, M., Desmond, D., & Zule, W. (2003). Development and validation of a brief screening version of the Childhood Trauma Questionnaire. *Child Abuse & Neglect, 27*(2), 169–190. https://doi.org/10.1016/S0145-2134(02)00541-0

Billieux, J., Schimmenti, A., Khazaal, Y., Maurage, P., & Heeren, A. (2015). Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. *Journal of Behavioral Addictions, 4*(3), 119–123. https://doi.org/10.1556/2006.4.2015.009

Billieux, J., Thorens, G., Khazaal, Y., Zullino, D., Achab, S., & van der Linden, M. (2015). Problematic involvement in online games: A cluster analytic approach. *Computers in Human Behavior, 43*, 242–250. https://doi.org/10.1016/j.chb.2014.10.055

Bussone, S., Trentini, C., Tambelli, R., & Carola, V. (2020). Early-life interpersonal and affective risk factors for pathological gaming. *Frontiers in Psychiatry*, *11,* 423. https://doi.org/ 10.3389/fpsyt.2020.00423

Bratland-Sanda, S., Sundgot-Borgen, J., Ro, O., Rosenvinge, J. H., Hoffart, A., & Martinsen, E. W. (2010). “I'm not physically active – I only go for walks”: Physical activity in patients with longstanding eating disorders. *International Journal of Eating Disorders, 43*, 88–92. http://dx.doi.org/10.1002/eat.20753

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2013). *Applied multiple regression/correlation analysis for the behavioral sciences*. Routledge.

Cook, B., Karr, T. M., Zunker, C., Mitchell, J. E., Thompson, R., Sherman, R., Erickson, A., Cao, L., & Crosby, R. D. (2015). The influence of exercise identity and social physique anxiety on exercise dependence. *Journal of Behavioral Addictions, 4*(3), 195–199. https://doi.org/10.1556/2006.4.2015.020

Costa, S., Hausenblas, H. A., Oliva, P., Cuzzocrea, F., & Larcan, R. (2013). The role of age, gender, mood states and exercise frequency on exercise dependence. *Journal of Behavioral Addictions, 2*(4), 216–223. https://doi.org/10.1556/JBA.2.2013.014

Çakır, Z. (2013). *Kadın üniversite öğrencilerinde yeme tutumlarının mükemmeliyetçilik, sosyotropi-otonomi, üstbilişler, duygulara ilişkin inançlar, duygusal zorlanmaya toleranssızlıkve kaçınma ile ilişkisi: yatkınlaştırıcı ve sürdürücü faktörlere dayalı bir model önerisi.* Unpublished Dissertation, Hacettepe University, Ankara.

Dutcher, C. D., Vujanovic, A. A., Paulus, D. J., & Bartlett, B. A. (2017). Childhood maltreatment severity and alcohol use in adult psychiatric inpatients: The mediating role of emotion regulation difficulties. *General Hospital Psychiatry, 48*, 42–50. https://doi.org/10.1016/j.genhosppsych.2017.06.014

Gaskin, J. & Lim, J. (2018a), "Indirect Effects", AMOS Plugin. Gaskination's StatWiki. http://statwiki.kolobkreations.com

Gaskin, J. & Lim, J. (2018b), "Multigroup Analysis", AMOS Plugin. Gaskination's StatWiki. http://statwiki.kolobkreations.com

Goodwin, H., Haycraft, E., & Meyer, C. (2014). Emotion regulation styles as longitudinal predictors of compulsive exercise: A twelve-month prospective study. *Journal of Adolescence, 37*(8), 1399–1404. https://doi.org/10.1016/j.adolescence.2014.10.001

Griffiths, M. D. (2005). A “components” model of addiction within a biopsychosocial framework. *Journal of Substance Use, 10*(4), 191–197. https://doi.org/10.10801465989050011435 9

Griffiths, M.D. (2019). The therapeutic and health benefits of playing videogames. In: Attrill-Smith, A., Fullwood, C. Keep, M. & Kuss, D.J. (Eds.). *The Oxford Handbook of Cyberpsychology* (pp. 485-505). Oxford University Press.

Hagan, A. L., & Hausenblas, H. A. (2003). The relationship between exercise dependence symptoms and perfectionism. *American Journal of Health Studies, 18*(2/3), 133–137.

Hausenblas, H. A., & Symons Downs, D. (2002a). Exercise dependence: A systematic review. *Psychology of Sport and Exercise, 3*(2), 89–123. https://doi.org/10.1016/S1469-0292(00)00015-7

Hausenblas, H. A. & Symons Downs, D. (2002b). How much is too much? The development and validation of the exercise dependence scale. *Psychology & Health, 17*, 387–404. https://doi.org/10.1080/0887044022000004894

Henchoz, Y., Studer, J., Deline, S., N’Goran, A. A., Baggio, S., & Gmel, G. (2016). Video gaming disorder and sport and exercise in emerging adulthood: A longitudinal study. *Behavioral Medicine*, *42*(2), 105–111. https://doi.org/10.1080/08964289.2014.965127

Hu, L. T. & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1–55.

Hussain, Z., Williams, G. A., & Griffiths, M. D. (2015). An exploratory study of the association between online gaming addiction and enjoyment motivations for playing

massively multiplayer online role-playing games. *Computers in Human Behavior*, *50*, 221–230. https://doi.org/10.1016/j.chb.2015.03.075

Kaess, M., Parzer, P., Mehl, L., Weil, L., Strittmatter, E., Resch, F., & Koenig, J. (2017). Stress vulnerability in male youth with internet gaming disorder. *Psychoneuroendocrinology, 77*, 244–251. https://doi.org/10.1016/j.psyneuen.2017.01.008

Kircaburun, K., Griffiths, M. D., & Billieux, J. (2019). Psychosocial factors mediating the relationship between childhood emotional trauma and internet gaming disorder: a pilot study. *European Journal of Psychotraumatology*, *10*(1), 1565031. https://doi.org/10.1080/20008198.2018.1565031

Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). The Guilford Press.

Leahy, R. L. (2002). A model of emotional schemas. *Cognitive and Behavioral Practice, 9*(3), 177–190.

Leahy, R. L., Tirch, D. D., & Melwani, P. S. (2012). Processes underlying depression: Risk aversion, emotional schemas, and psychological flexibility. *International Journal of Cognitive Therapy, 5*(4), 362–379.

Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2009). Development and validation of a game addiction scale for adolescents. *Media Psychology, 12*(1), 77–95. https://doi.org/10.1080/15213260802669458

Loton, D., Borkoles, E., Lubman, D., & Polman, R. (2016). Video game addiction, engagement and symptoms of stress, depression and anxiety: The mediating role of

coping. *International Journal of Mental Health and Addiction, 14*(4), 565–578. https://doi.org/ 10.1007/s11469-015-9578-6

MacKinnon, D. P., Lockwood, C. M., & Williams, J. (2004). Confidence limits for the indirect effect: Distribution of the product and resampling methods. *Multivariate Behavioral Research, 39*(1), 99–128. https://doi.org/10.1207/s15327906mbr3901_4

Manning, T., & Morrison, C. (1994). Excessive exercise, family environment and perception of family environment. In F. I. Bell, & G. H. Van Gyn (Eds.), *Access to active living: Proceedings for the 10th Commonwealth & International Scientific Congress* (pp. 108-112). University of Victoria.

Masten, C. L., Guyer, A. E., Hodgdon, H. B., McClure, E. B., Charney, D. S., Ernst, M., Kaufman, J., Pine, D. S., & Monk, C. S. (2008). Recognition of facial emotions among maltreated children with high rates of post-traumatic stress disorder. *Child Abuse & Neglect, 32*, 139–153. https://doi.org/10.1016/j.chiabu.2007.09.006

Melodia, F., Canale, N., & Griffiths, M. D. (2020). The Role of Avoidance Coping and Escape Motives in Problematic Online Gaming: A Systematic Literature Review. *International Journal of Mental Health and Addiction*, 1–27. https://doi.org/10.1007/s11469-020-00422-w

Mentzoni, R. A., Brunborg, G. S., Molde, H., Myrseth, H., Skouverøe, K. J. M., Hetland, J., & Pallesen, S. (2011). Problematic video game use: estimated prevalence and associations with mental and physical health. *Cyberpsychology, Behavior, and Social Networking, 14*(10), 591–596. https://doi.org/10.1089/cyber.2010.0260

Meyer, C., Taranis, L., Goodwin, H., & Haycraft, E. (2011). Compulsive exercise and eating disorders. *European Eating Disorders Review, 19*(3), 174–189. https://doi.org/10.1002/erv.1122

Nuyens, F., Kuss, D. J., Lopez-Fernandez, O., & Griffiths, M. D. (2019). The experimental analysis of non-problematic video gaming and cognitive skills: A systematic review. *International Journal of Mental Health and Addiction, 17,* 389–414. https://doi.org/10.1007/s11469-018-9946-0

Ottenbreit, N. D., & Dobson, K. S. (2004). Avoidance and depression: the construction of the Cognitive–Behavioral Avoidance Scale. *Behaviour Research and Therapy, 42*(3), 293–313. https://doi.org/10.1016/S0005-7967(03)00140-2

Rees, C. (2008). The influence of emotional neglect on development. *Paediatrics and Child Health*, *18*(12), 527–534. https://doi.org/10.1016/j.paed.2008.09.003

Sussman, S., Lisha, N. & Griffiths, M. D. (2011). Prevalence of the addictions: A problem of the majority or the minority? *Evaluation and the Health Professions*, *34*, 3–56. https://doi.org/10.1177/0163278710380124

Spada, M. M. (2015). Commentary on: Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. *Journal of Behavioral Addictions*, *4*(3), 124–125. https://doi.org/10.1556/2006.4.2015.018

Starcevic, V. (2016). Behavioural addictions: A challenge for psychopathology and psychiatric nosology. *Australian & New Zealand Journal of Psychiatry*, *50*(8), 721–725. https://doi.org/10.1177/0004867416654009

Szabo, A., Griffiths, M. D., Høglid, R. A., Demetrovics, Z. (2018). Drug, nicotine, and alcohol use among exercisers: Does substance addiction co-occur with exercise addiction? *Addictive Behaviors Reports, 7*, 26–31. https://doi.org/10.1016/j.abrep.2017.12.001

Şar, V., Öztürk, E., & İkikardeş, E. (2012). Validity and reliability of the Turkish version of Childhood Trauma Questionnaire. *Turkiye Klinikleri Journal of Medical Sciences, 32*(4), 1054–1063. https://doi.org/10.5336/medsci.2011-26947

Thege, B. K., Woodin, E. M., Hodgins, D. C., & Williams, R. J. (2015). Natural course of behavioral addictions: A 5-year longitudinal study. *BMC Psychiatry, 15*, 1–14. https://doi.org/10.1186/s12888-015-0383-3

Throuvala, M. A., Janikian, M., Griffiths, M. D., Rennoldson, M., & Kuss, D. J. (2019). The role of family and personality traits in Internet gaming disorder: A mediation model combining cognitive and attachment perspectives. *Journal of Behavioral Addictions*, *8*(1), 48–62. https://doi.org/10.1556/2006.8.2019.05

Wheaton, B., Muthen, B., Alwin, D., F., & Summers, G. (1977). Assessing reliability and stability in panel models. *Sociological Methodology, 8*(1), 84–136.

Yavuz, K. F., Turkcapar, M. H., Demirel, B., & Karadere, E. (2011). Adaptation, validity and reliability of the Leahy Emotional Schema Scale Turkish version based on Turkish university students and workers. *Journal of Psychiatry and Neurological Sciences, 24*(4), 273–82. https://doi.org/10.5350/DAJPN2011240403

Yeltepe, H., & İkizler, C. (2007). Egzersiz bağımlılığı ölçeği-21'in Türkçe geçerlilik ve güvenilirlik çalışması. *Bağımlılık Dergisi, 8*(1), 29–35.

Table 1

Demographic information of the study sample (N=731)

| Variables | Gaming Sample ($N$ = 431) | | Exercising Sample ($N$ = 300) | |
|---|---|---|---|---|
| | *N* | % | *N* | % |
| Gender | | | | |
| Men | 384 | 89.1 | 177 | 59 |
| Women | 47 | 10.9 | 123 | 41 |
| Education level | | | | |
| Middle school graduate | 6 | 1.4 | 4 | 1.3 |
| High school student but aged18 years+ | 11 | 2.6 | - | |
| High school graduate | 44 | 10.2 | 21 | 7 |
| University student | 228 | 52.9 | 45 | 15 |
| University graduate | 95 | 22 | 148 | 49.3 |
| Postgraduate student | 26 | 6.0 | 24 | 8 |
| Postgraduate | 21 | 4.9 | 58 | 19.3 |
| Employment status | | | | |
| Full-time working | 122 | 28.3 | 203 | 67.7 |
| Part-time working | 37 | 8.6 | 25 | 8.3 |
| Student | 223 | 51.7 | 34 | 11.3 |
| Seeking employment | 34 | 7.9 | 12 | 4 |
| Unemployed | 61 | 14.2 | 26 | 8.7 |
| Amount of playing/exercising hour per day (in past six months) | | | | |
| Less than an hour | 34 | 7.2 | 82 | 27.3 |
| More than an hour, less than 3 hours | 128 | 29.7 | 192 | 64 |
| More than 3 hours, less than 6 hours | 147 | 34.1 | 18 | 6 |
| More than 6 hours, less than 9 hours | 80 | 18.6 | 3 | 1 |
| More than 9 hours | 42 | 9.7 | 5 | 7 |
| Amount of playing/exercising day per week | | | | |
| 1-2 days | 31 | 7.1 | 18 | 6 |
| 2-3 days | 43 | 10.0 | 83 | 27.7 |
| 4-5 days | 121 | 28.1 | 159 | 53 |
| Everyday | 236 | 54.8 | 40 | 13.3 |

Table 2

Tolerance and VIF values of study variables

| | Gaming Addiction | | Exercise Addiction | |
|---|---|---|---|---|
| | Tolerance | VIF | Tolerance | VIF |
| EA | .579 | 1.728 | .642 | 1.557 |
| EN | .580 | 1.725 | .647 | 1.545 |
| LESS | .741 | 1.350 | .576 | 1.735 |
| BSA | .519 | 1.927 | .602 | 1.661 |
| BNSA | .522 | 1.915 | .535 | 1.869 |
| CSA | .330 | 3.029 | .388 | 2.580 |
| CNSA | .338 | 2.962 | .380 | 2.631 |

*Note. N* = 431 for Gaming Addiction, N = 300 for Exercise Addiction. EA: Emotional Abuse; EN: Emotional Neglect; LESS: Leahy's Emotional Schemas Scale; BSA: Behavioral Social Avoidance; BNSA: Behavioral Nonsocial Avoidance; CSA: Cognitive Social Avoidance; CNSA: Cognitive Nonsocial Avoidance.

Table 3

*Summary of the model fit indices for the study instruments and mean scores*

| Instruments | Gaming Sample | | | | | | | Exercise Sample | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M (SD) | $\chi^2$/df | *p* | RMSEA | GFI | CFI | TLI | M (SD) | $\chi^2$/df | *p* | RMSEA | GFI | CFI | TLI |
| CTQ-SF | 37.83 (±12.56) | 2.662 | <.001*** | .062 | .897 | .993 | .918 | 35.74 (±9.88) | 1.915 | <.001*** | .055 | .895 | .937 | .923 |
| LESS | 163.06 (±31.90) | 2.448 | <.001*** | .058 | .797 | .779 | .748 | 147.12 (±29.44) | .277 | <.001*** | .065 | .766 | .740 | .703 |
| CBAS | 61.08 (±21.38) | 1.986 | <.001*** | .048 | .899 | .935 | .926 | 49.52 (±15.49) | 1.869 | <.001*** | .054 | .879 | .907 | .889 |
| GAS | 56.89 (±16) | 2.324 | <.001*** | .055 | .922 | .949 | .935 | - | - | - | - | - | - | - |
| EDS-21 | - | - | - | - | - | - | - | 53.29 (±17.31) | 1.907 | <.001*** | .055 | .912 | .963 | .951 |

*Note.* ***$p < .001$. $N = 431$ for Gaming Addiction, $N = 300$ for Exercise Addiction. CTQ-SF: Childhood Trauma Questionnaire – Short Form; LESS: Leahy's Emotional Schemas Scale; CBAS: Cognitive Behavioral Avoidance Scale; GAS: Gaming Addiction Scale; EDS-21: Exercise Dependence Scale-21.

Table 4

Summary of the direct effects for the proposed Model 1a and Model 1b

| Pathways | Gaming Sample | | | | | Exercising Sample | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *β* | *SE* | Lower | Upper | *p* | *β* | *SE* | Lower | Upper | *p* |
| EA → NBAE | .22 | .06 | .102 | .328 | .001** | .20 | .08 | .040 | .351 | .015* |
| EN → NBAE | .10 | .06 | -.021 | .227 | .101 | .17 | .07 | .026 | .314 | .017* |
| EN → BSA | .10 | .04 | .023 | .183 | .007** | | | | | |
| NBAE → BSA | .41 | .04 | .319 | .494 | .001** | .49 | .04 | .397 | .575 | .001** |
| NBAE → BNSA | .39 | .04 | .296 | .471 | .001** | .48 | .04 | .390 | .558 | .001** |
| NBAE → CSA | .37 | .05 | .276 | .455 | .001** | .55 | .04 | .462 | .630 | .001** |
| NBAE → CNSA | .40 | .04 | .309 | .476 | .001** | .55 | .04 | .459 | .626 | .001** |
| NBAE → GA | .20 | .05 | .105 | .297 | .001** | | | | | |
| NBAE → ExA | | | | | | .21 | .07 | .069 | .350 | .006** |
| BSA → GA | .16 | .06 | .042 | .273 | .007** | | | | | |
| BNSA → GA | -.02 | .06 | -.152 | .097 | .667 | | | | | |
| CSA → GA | -.06 | .07 | -.202 | .082 | .394 | | | | | |
| CNSA → GA | .32 | .07 | .173 | .450 | .001** | | | | | |
| BSA → ExA | | | | | | .20 | .08 | .033 | .337 | .013* |
| BNSA → ExA | | | | | | -.15 | .07 | -.289 | -.001 | .048* |
| CSA → ExA | | | | | | .08 | .09 | -.091 | .251 | .334 |
| CNSA → ExA | | | | | | -.02 | .08 | -.179 | .154 | .865 |

*Note.* *$p < .05$, **$p < .01$, ***$p < .001$. EA: Emotional Abuse; EN: Emotional Neglect; NBAE: Negative Beliefs About Emotions; BSA: Behavioral Social Avoidance; BNSA: Behavioral Nonsocial Avoidance; CSA: Cognitive Social Avoidance; CNSA: Cognitive Nonsocial Avoidance; GA: Gaming Addiction; ExA: Exercise Addiction.

Table 5

Summary of the indirect effects for the proposed Model 1a and Model 1b

| Pathways | Gaming Sample | | | | | | Exercising Sample | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *β* | *B* | *SE* | Lower | Upper | *p* | *β* | *B* | *SE* | Lower | Upper | *p* |
| EA → NBAE → BSA | .09 | | .01 | .013 | .036 | .001 | .10 | | .01 | .007 | .042 | .013 |
| EA → NBAE → BNSA | .08 | | .01 | .011 | .030 | .001 | .09 | | .01 | .007 | .040 | .013 |
| EA → NBAE → CSA | .08 | | .00 | .010 | .028 | .001 | .11 | | .01 | .007 | .042 | .015 |
| EA → NBAE → CNSA | .09 | | .01 | .012 | .033 | .001 | .11 | | .01 | .007 | .042 | .014 |
| EA → NBAE → GA | .04 | | .07 | .102 | .341 | .001 | | | | | | |
| EA → NBAE → ExA | | | | | | | .04 | | .14 | .072 | .559 | .011 |
| EN → NBAE → BSA | .04 | | .01 | .000 | .019 | .095 | .08 | | .01 | .004 | .022 | .014 |
| EN → NBAE → BNSA | .04 | | .00 | .000 | .015 | .090 | .08 | | .01 | .004 | .022 | .013 |
| EN → NBAE → CSA | .04 | | .00 | .000 | .015 | .094 | .09 | | .01 | .005 | .024 | .015 |
| EN → NBAE → CNSA | .04 | | .00 | .000 | .017 | .095 | .09 | | .01 | .004 | .023 | .014 |
| EN → NBAE → GA | .02 | | .05 | .005 | .164 | .081 | | | | | | |
| EN → NBAE → ExA | | | | | | | .08 | | .08 | .047 | .317 | .009 |
| EN → BSA → GA | .02 | | .03 | .013 | .129 | .009 | | | | | | |
| NBAE → BSA → GA | .07 | | .01 | .014 | .055 | .006 | | | | | | |
| NBAE → BNSA → GA | -.01 | | .01 | -.026 | .015 | .663 | | | | | | |
| NBAE → CSA → GA | -.02 | | .01 | -.036 | .011 | .390 | | | | | | |
| NBAE → CNSA → GA | .13 | | .02 | .041 | .091 | .001 | | | | | | |
| NBAE → BSA → ExA | | | | | | | .10 | | .02 | .018 | .095 | .012 |
| NBAE → BNSA → ExA | | | | | | | -.07 | | .02 | -.079 | -.007 | .042 |
| NBAE → CSA → ExA | | | | | | | .05 | | .03 | -.018 | .074 | .313 |
| NBAE → CNSA → ExA | | | | | | | -.01 | | .03 | -.051 | .040 | .867 |
| EA → NBAE → BSA → GA | | .06 | | .03 | .025 | .136 | .004 | | | | | |
| EA → NBAE → CNSA → GA | | .13 | | .05 | .065 | .215 | .001 | | | | | |
| EA → NBAE → BSA → ExA | | | | | | | | .12 | .03 | .014 | .333 | .014 |
| EA → NBAE → BNSA → ExA | | | | | | | | -.09 | .06 | -.223 | -.020 | .025 |
| EN → NBAE → BSA → ExA | | | | | | | | .07 | .04 | .018 | .154 | .013 |
| EN → NBAE → BNSA → ExA | | | | | | | | -.05 | .04 | -.135 | -.008 | .028 |

*Note.* $*p < .05$, $**p < .01$, $***p < .001$. EA: Emotional Abuse; EN: Emotional Neglect; BSA: Behavioral Social Avoidance; BNSA: Behavioral Nonsocial Avoidance; CSA: Cognitive Social Avoidance; CNSA: Cognitive Nonsocial Avoidance; NBAE: Negative Beliefs About Emotions; GA: Gaming Addiction; ExA: Exercise Addiction. *Unstandardized β values (B) were used for "EA-NBAE-BSA-ExA" pathway, "EA-NBAE-BNSA-ExA" pathway, "EN-NBAE-BSA-ExA" pathway, and "EN-NBAE-BNSA-ExA" pathway*

Table 6

Results of global test and local tests for the multi-group moderation model

| | $\chi 2$ | *df* | | | |
|---|---|---|---|---|---|
| Unsconstrained | 36.00 | 168 | | | |
| Constrained | 36.00 | 168 | | | |
| Difference | 0.00 | 0 | | | |
| p | 1.00 | | | | |
| Pathways | Game $\beta$ | Exercise $\beta$ | Difference in Betas | $p$ for difference | |
| EA → NBAE | .22*** | .20** | .02 | 1.00 | No difference |
| EN → NBAE | .10 | .17* | -.07 | 1.00 | No difference |
| NBAE → BSA | .41*** | .49*** | -.06 | 1.00 | No difference |
| NBAE → BNSA | .39*** | .48*** | -.09 | 1.00 | No difference |
| NBAE → CSA | .37*** | .55*** | -.18 | 1.00 | No difference |
| NBAE → CNSA | .40*** | .55*** | -.15 | 1.00 | No difference |

*Note. N* =731, *$p$ < .05, **$p$ <.01, ***$p$ <.001. *Note.* EA: Emotional Abuse; EN: Emotional Neglect; NBAE: Negative Beliefs About Emotions; BSA: Behavioral Social Avoidance; BNSA: Behavioral Nonsocial Avoidance; CSA: Cognitive Social Avoidance; CNSA: Cognitive Nonsocial Avoidance.