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Psychosocial factors mediating the relationship between childhood emotional trauma and internet gaming disorder: a pilot study

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ABSTRACT

Internet gaming disorder (IGD) has been related to a wide range of detrimental psychological and health consequences. The purpose of the present pilot study was to test the direct and indirect relationships between IGD and emotional trauma, body image dissatisfaction, social anxiety, loneliness, depression, and self-esteem. A total of 242 online gamers completed a survey comprising a comprehensive battery of psychometric self-report scales concerning aforementioned variables. Results indicated that IGD was significantly correlated with all the variables except for body image dissatisfaction. Path analysis indicated an indirect relationship between childhood emotional trauma and IGD through depressive symptoms, while adjusting for gender, age, and number of hours gaming. The findings of the present study indicate that online gamers with a history of emotional abuse and/or neglect have higher levels of depressive symptoms, and that depressive symptoms are important risk factors of IGD.

Factores psicosociales que median la relación entre trauma emocional en la infancia ytrastorno del juego en internet: Un estudio piloto

El trastorno del juego en internet (IGD por sus siglas en inglés) se ha relacionado con una amplia gama de consecuencias psicológicas y de salud perjudiciales. El propósito del presente estudio piloto fue probar las relaciones directas e indirectas entre el IGD y el trauma emocional, la insatisfacción de la imagen corporal, la ansiedad social, soledad, depresión y autoestima. Un total de 242 jugadores en línea completaron una encuesta que comprende una batería completa de escalas de auto-reporte, incluyendo la Prueba del Trastorno del Juego en internet de 10 ítems (IGDT-10), el Cuestionario de trauma infantil (CTQ), la Escala de Insatisfacción de la Imagen Corporal (BIDS), la Escala breve de Depresión y Felicidad (SDHS), la Escala de Autoestima de un ítem (SISE), la Escala de Soledad de la UCLA (ULS-4), y la Escala de Ansiedad Social para Adolescentes abreviada (SAS-A). Los resultados indicaron que el IGD estuvo correlacionado significativamente con todas las variables exceptuando la insatisfacción de la imagen corporal. El análisis de trayectoria indicó una relación indirecta entre trauma infantil emocional e IGD a través de los síntomas depresivos, ajustando género, edad y número de horas de juego. Los hallazgos del presente estudio indican que los jugadores en línea con historial de abuso emocional y/o negligencia tienen mayores niveles de síntomas depresivos, y que los síntomas depresivos son importantes factores de riesgo para el IGD.

中介儿童情绪创伤与网络游戏障碍之间关系的社会心理因素：一项试研究

网络游戏障碍（IGD）与各种有害的心理和健康问题有关。这个试研究的目的是测试IGD与情绪创伤、身体形象不满、社交焦虑、孤独，抑郁和自尊之间的直接和间接关系。共有242名在线游戏玩家完成了一项调查，其中包括一系列全面的心理测量自我报告量表，包括10题互联网游戏障碍测试（IGDT-10）、童年创伤问卷（CTQ）、身体形象不满量表（BIDS）、简版抑郁和幸福量表（SDHS）、单项自尊量表（SISE）、加州大学洛杉矶分校孤独量表（ULS-4）和简版青少年社交焦虑量表（SAS-A）。结果表明，除身体形象不满外，IGD与所有变量显著相关。路径分析表明，控制性别、年龄和游戏时数后，儿童情绪创伤与IGD通过抑郁症状中介的间接关系。本研究的结果表明，有情绪虐待和/或忽视历史的在线游戏玩家有较高的抑郁症状，抑郁症状是IGD的重要危险因素。

HIGHLIGHTS
• Depression was directly associated with internet gaming disorder (IGD).
• Emotional trauma was indirectly associated with IGD via depression.
• Number of hours spent gaming was associated with IGD.
• Body image dissatisfaction was not associated with IGD.
• Self-esteem, loneliness, and social anxiety were not associated with IGD.

1. Introduction

Although video gaming is not problematic for most people, research from the past two decades has emphasized that the excessive playing of video games may engender functional impairment and psychological distress in a minority of gamers (Billieux et al., 2017; Saunders et al., 2017). The latest (fifth) edition of the Diagnostic and Statistical Manual of Mental Disorders

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(DSM-5; American Psychiatric Association, 2013) includes internet gaming disorder (IGD) in the 'Emerging Measures and Models' section. Additionally, gaming disorder has been included in 11th edition of the International Classification of Diseases (ICD-11; World Health Organization, 2018) in the section 'Disorders Due to Substance Use or Addictive Behaviours'. Since its initial inclusion into the DSM-5 in 2013, despite important methodological differences between existing studies, it has consistently been found that a minority of gamers present with addiction-like symptoms and are negatively affected by their gaming behaviours (Kuss, Griffiths, & Pontes, 2017). Therefore, investigating the factors that may contribute to explain the onset and perpetuation of IGD, and their complex interaction, is warranted.

Empirical evidence suggests that specific personality traits (Gervasi et al., 2017) and psychosocial factors (Kuss & Griffiths, 2012; Laconi, Pirès, & Chabrol, 2017; Sioni, Burleson, & Bekerian, 2017) are associated with IGD. Thus, individuals presenting with maladaptive personality features (e.g. high impulsivity and schizotypy, low self-esteem) and psychopathological symptoms (depression, anxiety) are at higher risk of developing problematic video-game playing. Similarly, research also suggests that individuals with a history of traumatic experiences have a higher likelihood of developing problematic internet use (Dalbudak, Evren, Aldemir, & Evren, 2014).

In recent years, two of the most influential models in the gaming studies field are the Interaction of Person-Affect-Cognition-Execution (I-PACE) model (Brand, Young, Laier, Wölfling, & Potenza, 2016) and the Compensatory Internet Use (CIU) model (Kardefelt-Winther, 2014). The I-PACE model provides an integrative theoretical framework concerning internet-related disorders (Brand et al., 2016) and posits that an individual's core characteristics, including personality (e.g. low self-esteem), biopsychological constitution (e.g. early childhood experiences), social cognitions (e.g. loneliness, perceived social support), psychopathology (e.g. depression, social anxiety), and other specific motives related to an online behaviour (e.g. gaming to escape), constitute aetiological factors involved in the development, maintenance, and relapse of different types of internet-use disorders (e.g. excessive use of video games, cybersex, and social networking sites). The CIU model (Kardefelt-Winther, 2014) proposed that addictive use of the internet can compensate unmet (offline) needs (e.g. achievement, social affiliation) or help cope with psychological suffering in (for example) depressive, anxious, and traumatized individuals. According to Kardefelt-Winther (2014), research is necessary to better disentangle the processes mediating the direct relations observed between risk factors (e.g. a trauma) and addictive use of online applications.

The I-PACE and CIU models are complimentary in the sense that I-PACE conceptualizes IGD as an addictive disorder, whereas the CIU conceptualizes IGD as a maladaptive coping strategy to counteract negative life events and/or psychopathological symptoms. Consequently, the present study aimed to disentangle the psychosocial factors susceptible to influencing the relationship between childhood emotional trauma and IGD, utilizing a mediation model in which emotional trauma was the independent variable and IGD was the dependent variable, as well as a number of candidated mediators (i.e. body image dissatisfaction, social anxiety, loneliness, depressive symptoms, and self-esteem).

1.1. Childhood emotional trauma and internet gaming disorder

Childhood trauma, which is established as the primary predictor of lifetime DSM-IV disorders (Kessler et al., 2010), generally refers to five distinct dimensions, namely (i) sexual, (ii) physical, and (iii) emotional abuse on the one side, and (iv) emotional and (v) physical neglect on the other (Bernstein et al., 2003). Childhood maltreatment leads to negative consequences including feelings of shame and guilt, poor social relationships, depressive symptoms, lower self-esteem, and increased risky behaviours (e.g. Runyan, Wattam, Ikeda, Hassan, & Ramiro, 2002). Despite emotional abuse and neglect being associated with a variety of clinical outcomes (Didie et al., 2006; Sansone, Sansone, & Wiederman, 1995), such types of trauma have received much less attention in psychopathology research than sexual and physical abuse (Hagborg, Tidefors, & Fahlke, 2017; Mills, Newman, Cossar, & Murray, 2015).

Emotional abuse has been defined as 'verbal assaults on a child's sense of worth or well-being or any humiliating or demeaning behaviour directed toward a child by an adult or older person' (Bernstein et al., 2003, p. 175), and has been related to the failure of caregivers to meet a child's basic needs (i.e. love, belonging, nurturance, support). Past research has indicated that emotional abuse is associated with various social, emotional, and behaviour problems (Maguire et al., 2015).

Both I-PACE and CIU models support the view that (emotional) trauma might play a pivotal role in the onset of these disorders, and that gaming to regulate adverse mood is a proposed diagnostic criterion for IGD (American Psychiatric Association, 2013). Moreover, numerous studies have emphasized that escapism-related motives predict addictive use of online games (e.g. Billieux et al., 2013; Demetrovics et al., 2011; Kuss, Louws, & Wiers, 2012), and that traumatic history is associated with problematic and addictive internet use (Dalbudak et al., 2014;

Schimmenti et al., 2017). This is compatible with the view that the excessive playing of video games provides an outlet for traumatized individuals to dissociate from unbearable psychological states (Schimmenti & Caretti, 2010). In support for this hypothesis, it has been shown that individuals with a history of emotional maltreatment develop different personality disorders (Grover et al., 2007; Johnson, Cohen, Brown, Smailes, & Bernstein, 1999; Sansone et al., 1995) that are related with IGD (Gervasi et al., 2017). Based on the aforementioned theoretical background and empirical evidence, it is hypothesized that childhood emotional trauma will be directly associated with IGD.

1.2. The mediating role of body image dissatisfaction

Body image dissatisfaction has been defined as 'the discrepancy between identification of one's own figure (actual) and the figure one chose as the desirable self image (ideal)' (Forrest & Stuhldreher, 2007, p. 18). Furthermore, it is determined by internal thought processes and notably influenced by interpersonal feedbacks, personal values, and/or societal and media influences (Furnham & Greaves, 1994; Grogan, 2016). To the present authors' knowledge, only one previous study has directly associated body image dissatisfaction with problematic internet use (i.e. Koronczai et al., 2013), and no study (to date) has focused on its specific relationship with IGD. Focusing on video gaming is worthwhile because individuals with body image dissatisfaction may ease their negative feelings by choosing fantasy-based characters that are deemed physically strong, or help dissociate/escape from their negative feelings through immersion in a virtual environment or through in-game achievement. Accordingly, it is hypothesized that body image dissatisfaction will be directly associated with IGD. Emotional trauma is known to negatively impact upon body image satisfaction (Dunkley, Masheb, & Grilo, 2010; Glassman, Weierich, Hooley, Deliberto, & Nock, 2007; Maguire et al., 2015) and, based on the CIU theory (Kardefelt-Winther, 2014), it is hypothesized by the present authors that body image dissatisfaction may act as a mediator between emotional trauma and IGD.

1.3. The mediating role of depressive symptoms, self-esteem, loneliness, and social anxiety

Depressive symptoms, self-esteem, loneliness, and social anxiety are strongly inter-related constructs (Leary, 1990; Orth & Robins, 2013). Furthermore, they are known to predict lack of psychological well-being and mental health (Argyle, 2013; Cheng & Furnham, 2002). Previous studies have found that higher depressive symptoms, lower self-esteem, higher loneliness, and elevated social anxiety to be highly associated with both childhood emotional trauma (Finzi-Dottan & Karu, 2006; Heim et al., 2009; Norton & Abbott, 2017; Runyan et al., 2002; Saleh et al., 2017) and body image dissatisfaction (Junne et al., 2016; Wang et al., 2018). Additionally, depressive symptoms, low self-esteem, loneliness, and high social anxiety have frequently been associated with IGD (Andreassen et al., 2016; Bargeron & Hormes, 2017; Beard & Wickham, 2016; Griffiths, Király, Pontes, & Demetrovics, 2015; Laconi et al., 2017; Lemmens, Valkenburg, & Gentile, 2015; Sioni et al., 2017). At a theoretical level, the I-PACE model assumes these factors to have a mediating role between an individual's biopsychological constitution and the development and maintenance of specific internet-use disorders (Brand et al., 2016). The CIU model conceptualizes addictive internet use as a coping mechanism to help alleviate psychopathological symptoms and/or adverse emotional states (Kardefelt-Winther, 2014). Although numerous studies have demonstrated an association between depressive symptoms and low self-esteem with IGD (e.g. Andreassen et al., 2016; Lemmens et al., 2015; Wang et al., 2017), available data concerning the influence of loneliness and social anxiety are more scarce. However, preliminary findings indicate that online gamers might experience less loneliness and social discomfort when in virtual environments (Martončik & Lokša, 2016), and could benefit from enhanced self-esteem when online because of a strong identification with a powerful or skilled avatar (Bessière, Seay, & Kiesler, 2007; Sioni et al., 2017). Based on the evidence reviewed, it is hypothesized that depressive symptoms, self-esteem, loneliness, and social anxiety will be associated with IGD and will account for the relationships of childhood emotional trauma and body image dissatisfaction with IGD.

1.4. Objectives of the present study

The present study aims to disentangle the psychological processes underlying the relationship between childhood emotional trauma and IGD in a community sample of regular online gamers. As depicted in Figure 1, it is hypothesized that childhood emotional trauma is directly and indirectly associated with IGD via body image dissatisfaction, depressive symptoms, self-esteem, loneliness, and social anxiety. Also, since IGD has been consistently associated with gender (higher among males), age (higher among younger gamers), and number of hours spent gaming (Griffiths et al., 2015; Griffiths, Kuss, & Pontes, 2016), these variables were controlled for in the mediation model.
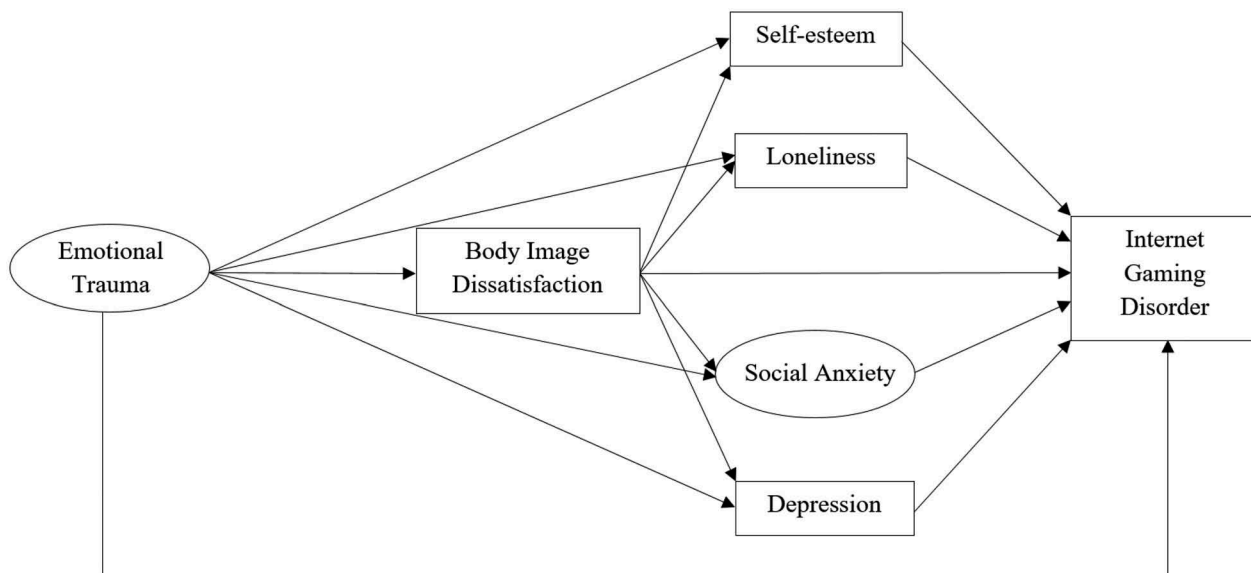
Figure 1. Hypothesized model.

For clarity, correlations between the mediator variables have not been depicted in the figure.

2. Method

2.1. Participants

A total of 242 Turkish online gamers, aged between 13 and 38 years (M = 18.87, SD = 4.57, 93% men) participated anonymously and voluntarily in an online survey. Participants were recruited from several online gaming social media group forums (*World of Warcraft, Dota, Dota 2, Hearthstone, Playerunknown's Battlegrounds, Counter Strike,* and *League of Legends*) that have approximately 5000–6000 active members. Details for participating in the study were announced and promoted in these social media forums, and all of the participants were informed about the details of the study and gave their informed consent. Participation for the study was only open for a three-day period and participants were not offered any remuneration to take part in the study. Although, sample size of the present study was relatively small, it was very close to the recommended thresholds (n = 250) for obtaining stable correlation estimates (Schönbrodt & Perugini, 2013) and above the recommended thresholds (n = 200) for running a path analysis (Boomsma, 1985; Sideridis, Simos, Papanicolaou, & Fletcher, 2014). Nevertheless, sample size power and required sample size for the applied statistics were checked using a priori sample size calculator for structural equation models and the sample size was sufficient for valid results (statistical power > .90, effect size f^2 = .05) (Soper, 2018; Westland, 2010).

2.2. Measures

2.2.1. Demographics and gaming use

Participants were asked about their gender, age, most intensely played online game genre (choosing one option from MOBA [Multiplayer Online Battle Arena], MMORPGs [Massively Multiplayer Online Role-Playing Games], MOFPS [Multiplayer Online First-Person Shooter], and MMORTS [Massively Multiplayer Online Real-Time Strategy]) and their time devoted to gaming on a weekly basis (less than 7 hours, between 7 and 14 hours, between 15 and 28 hours, between 29 and 42 hours, and more than 42 hours). Weekly gaming time was chosen over daily gaming time because time spent playing on weekend days is typically longer than time spent playing on week days.

2.2.2. Ten-item internet gaming disorder test (IGDT-10)

The IGDT-10 (Kiraly et al., 2017) comprises 10 items assessing the nine criteria of IGD outlined in the DSM-5 (with two items examining a single criterion) and scored on a 3-point Likert scale ('never', 'sometimes' and 'often'). These three options were offered in order to have more realistic and accurate responses from the participants (Kiraly et al., 2017). As following guidelines of scoring provided by the scale developers, 'never' and 'sometimes' options were recoded as 0 and 'often' as 1. Also, since Items 9 and 10 belonged to the same criterion, scoring of these items was recoded accordingly. Each criterion is endorsed if one of the two items has an 'often' answer. The scores of the scale ranged between 0 and 9, and the scale was used as a dimensional assessment of IGD symptoms in the present study. Cut-off score for disordered internet gaming is endorsing five or more of the nine criteria. In the current sample, 40 participants (16% of the sample) were above the cut-off score. The original scale (Kiraly et al., 2017) and the Turkish translation (Kircaburun et al., 2018a)

have demonstrated high validity and reliability. In the present sample, Cronbach's alpha for the scale was .73 when dichotomized.

2.2.3. Short depression-happiness scale (SDHS)

The original SDHS (Joseph, Linley, Harwood, Lewis, & McCollam, 2004) assesses depressive symptoms experienced over the past seven days. The Turkish form of the scale comprised two subscales and six items (three items for each subscale) on a 4-point Likert scale ranging from 'never' to 'often'. In the present study, only items in the depression subscale were used (e.g. *I felt that life was meaningless*). Former studies with the Turkish form reported adequate validity and reliability for the scale (Kircaburun et al., 2018b). In the present sample, Cronbach's alpha for the scale was .83.

2.2.4. Childhood trauma questionnaire (CTQ)

The CTQ (Bernstein, Ahluvalia, Pogge, & Handelsman, 1997; Bernstein et al., 1994) comprises 28 items on a 5-point Likert scale from 'never true' to 'very often true', and consists of five factors (five items for each factor): emotional neglect (e.g. *Felt loved*), emotional abuse (e.g. *Called names by family*), physical neglect, physical abuse, and sexual abuse. In the present study, only items relating to emotional abuse and neglect factors were used. Former studies have reported adequate validity and reliability of the scale (Sar, Öztürk, & İkikardeş, 2012). In the present sample, Cronbach's alpha for the scale was .87.

Body Image Dissatisfaction Scale (BIDS): The BIDS was developed using the Physical Appearance Self-Competence subscale of the Self-Perception Profile for Adolescents (Harter, 2012) and comprises three items (e.g. *I am not pleased with my physical appearance*, *I wish my physical appearance was different*) on a 4-point Likert scale from 'absolutely disagree' to 'very true'. Exploratory factor analysis (communalities ranged from .78 to .87, explaining 69% of the variance) and confirmatory factor analyses (standardized regression weights ranged from .62 to .85) indicated that the three-item structure of the Turkish form was valid and reliable for assessing adolescents' body image dissatisfaction. CFA indicated perfect fit to the data. In the present sample, Cronbach's alpha for the scale was .78.

2.2.5. Single item self-esteem scale (SISES)

The SISES (Robins, Hendin, & Trzesniewski, 2001) comprises one item (*I have high self-esteem*) on a 9-point Likert scale from 'absolutely disagree' to 'absolutely agree'. Former studies have reported adequate validity (Kircaburun et al., 2018b) and it has been used by many researchers internationally in order to assess individual self-esteem.

2.2.6. Social anxiety scale for adolescents short form (SAS-A)

The SAS-A (Nelemans et al., 2017) comprises 12 items on a 5-point Likert scale from 'never' to 'always', with three factors: fear of negative evaluation (e.g. *I worry about what others think of me*), social avoidance and distress-new (e.g. *I get nervous when I meet new people*), and social avoidance and distress-general (e.g. *I'm afraid to invite others to do things with me because they might say no*). Former studies with the Turkish form reported optimal validity and reliability for the scale (Aydın & Sütcü, 2007). In the present sample, Cronbach's alpha for the scale was .89.

2.2.7. UCLA loneliness scale-short form (ULS-4)

The ULS-4 (Hays & DiMatteo, 1987) comprises four items (e.g. *People are around me but not with me*) on a 4-point Likert scale (from 'never' to 'often') that assesses individual's levels of loneliness. Former studies have reported adequate validity and reliability of the Turkish form (Eskin, 2001). In the present sample, Cronbach's alpha for the scale was .68.

2.3. Statistical analysis

In order to analyse the data frequency and descriptive statistics, Pearson's correlation tests, *t*-tests, and path analysis were applied using SPSS 23.0 and AMOS 23.0 software. In the path analysis, goodness of fit criteria proposed by Hu and Bentler (1999) were used in order to assess model fit. Accordingly, thresholds for good and acceptable fit values are as follows: Root Mean Square Residuals (RMSEA) < .05, Comparative Fit Index (CFI) > .95, and Goodness of Fit Index (GFI) > .95 represent a good fit to the data, whereas RMSEA < .08, CFI > .90, and GFI > .90 represent an acceptable fit to the data. Total, direct, and indirect effects of independent and mediator variables on outcome variable were calculated by using bootstrapping method with 5000 bootstrap samples and 95% bias-corrected confidence intervals. Finally, gender, age, and number of hours spent gaming were also controlled for in the model.

3. Results

Participants' most preferred online videogame types were battle arena (MOBA) games (41%), role-playing games (MMORPGs) (28%), real-time strategy (MMORTS) games (16%), and first person-shooter (MOFPS) games (15%) ($\chi^2_{(4)}$ = 42.93, p < .001). The number of hours spent gaming was also provided by participants and included into the model as a control variable (see Table 1). Mean scores, standard deviations, and minimum-maximum scores are shown in Table 2, and the correlation coefficients of the variables are shown in Table 3. All independent and mediator variables except for body image

Table 1. Demographic characteristics of the participants (N = 242).

	% (n)
Gender	
Male	93 (224)
Female	7 (18)
Weekly Gaming Time	
Less Than 7 Hours	12 (29)
7–14 hours	26 (63)
15–28 hours	23 (55)
29–42 hours	18 (43)
More Than 42 Hours	21 (52)
Game Types Most Played	
MOBA (Multiplayer Online Battle Arena Games)	41 (99)
MMORPG (Massively Multiplayer Online Role-Playing Games)	28 (68)
MMORTS (Massively Multiplayer Online Real-Time Strategy)	16 (38)
MOFPS (Multiplayer Online First Person Shooter)	15 (37)

Table 2. Mean scores, standard deviations, and minimum and maximum scores on the variables.

	M	SD	Min	Max
IGD Symptoms	.26	.24	0	1
Emotional Trauma	3.60	1.52	2	8
Body Image Dissatisfaction	2.17	.66	1	4
Depression	2.34	.92	1	4
Loneliness	2.04	.72	1	4
Self-Esteem	7.02	1.77	1	9
Social Anxiety	7.07	2.44	3	14

Table 3. Pearson correlation coefficients of the study variables.

	1	2	3	4	5	6	7
1. IGD Symptoms	–						
2. Emotional Trauma	.27*	–					
3. Body Image Dissatisfaction	.13	.26*	–				
4. Depression	.35*	.30*	.31*	–			
5. Loneliness	.34*	.46*	.30*	.48*	–		
6. Self-Esteem	-.26*	-.35*	-.33*	-.34*	-.32*	–	
7. Social Anxiety	.24*	.29*	.32*	.35*	.45*	-.36*	–

*$p < .001$.

dissatisfaction ($r = .13$; $p = .05$) were correlated with IGD symptoms (small or moderate effect, see Table 3).

In order to test the hypothesized model, a path analysis was applied. The computed model is depicted in Figure 2. This model indicated good fit to the data ($\chi^2/df = 1.96$, RMSEA = .06 [CI 90% (.04, .09)], CFI = .96, GFI = .97). Emotional trauma ($\beta = .28$, $p < .01$; 95% CI [.11, .44]) was indirectly associated with IGD symptoms via depressive symptoms, while depressive symptoms ($\beta = .20$, $p < .05$; 95% CI [.04, .35]) were directly associated with IGD symptoms. Body image dissatisfaction, loneliness, self-esteem, and social anxiety did not significantly associate with IGD in the model. The mediation model explained 26% of the variance of IGD symptoms.

4. Discussion

The present study was designed to investigate the potential interactions between childhood emotional trauma and IGD via the computation of a mediation model in which body image dissatisfaction, depressive symptoms, self-esteem, loneliness, and social anxiety were conceptualized as mediator variables. The results demonstrated that depressive symptoms were the unique mediator between childhood emotional trauma and IGD, and that the computed model emphasized this effect being a full mediation (i.e. the direct relationship between emotional trauma and IGD is no more significant when taking into account depressive symptoms).

Although previous evidence suggests that depressive symptoms have an important mediating effect between emotional trauma and IGD (Brand et al., 2016; Laconi et al., 2017; Runyan et al., 2002), this is the first study to empirically evidence such an effect. The findings of the present study accord with the view that addictive use of video games can constitute maladaptive coping in traumatized individuals having developed emotional distress (reflected by depressive symptoms in the present study), and is in line with the CIU model (Kardefelt-Winther, 2014). The results also confirmed that depressive symptoms are directly associated with IGD, a finding which was found in previous studies (e.g. Andreassen et al., 2016; Laconi et al., 2017).

In contrast to previous studies (e.g. Beard & Wickham, 2016; Sioni et al., 2017), the present study failed to identify a relationship between self-esteem, loneliness, and social anxiety as risk factors for IGD. This finding may be explained by the fact that previous studies reported significant effects for these factors mainly by using simple correlational analysis or linear regressions, whereas the approach of the present study is based on a path analysis allowing for testing of the influence for each of these factors while controlling their reciprocal influence and the influence of other potential confounding factors (i.e. gender, age, time spent playing). Indeed, although the present study reproduces the significant correlations found in previous studies (see Table 2), these associations are no longer significant when computing the hypothesized model (see Figure 2). More precisely, the study demonstrated that the effect of depressive symptoms overrides the influence of other psychosocial variables and fully mediated the relation between emotional trauma and IGD. This specific finding emphasizes the crucial role of depressive symptoms in the development of IGD, and calls for further consideration of depression-related factors (e.g. maladaptive cognitions; see Forrest, King, & Delfabbro, 2017; Marino & Spada, 2017) in the study of dysfunctional video game involvement. At a more applied level, the findings support prevention and intervention programmes targeting depression-related factors (e.g. improvement of emotion regulation skills) that may mitigate IGD symptoms.
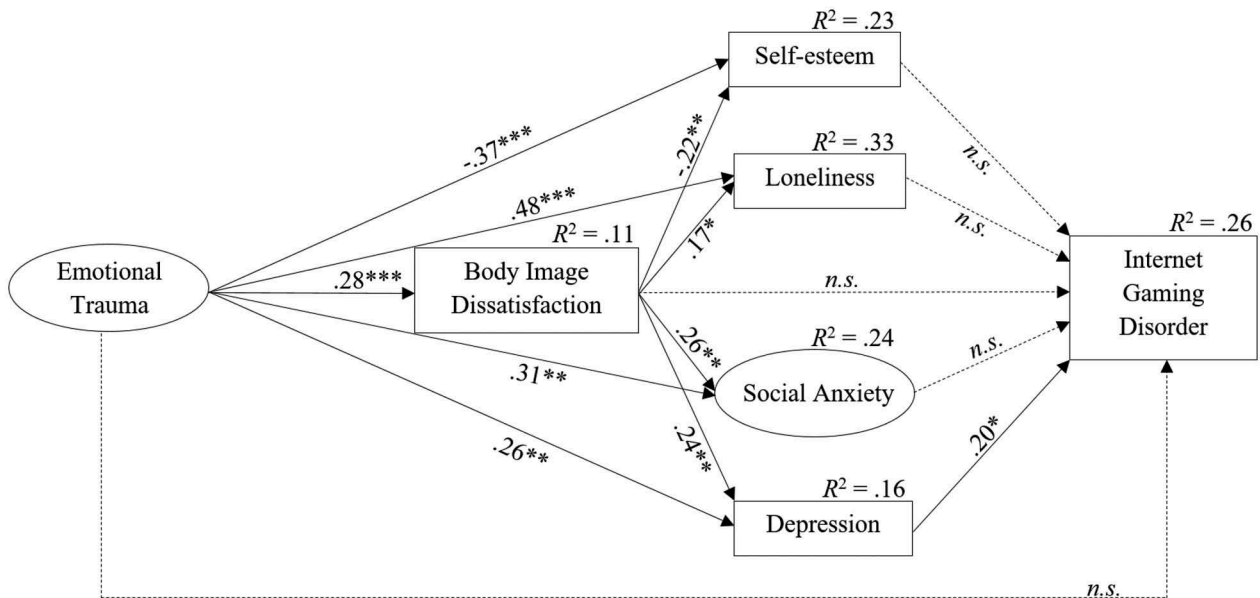
Figure 2. Final model of the significant path coefficients between variables.

For clarity, correlations between mediator variables, insignificant path coefficients, sub-scales of Emotional Trauma (Emotional Abuse, Emotional Neglect), and Social Anxiety (Social Anxiety Scale – Fear of Negative Evaluation, Social Anxiety Scale – New, Social Anxiety Scale – General) and control variables (number of hours gaming, gender, and age) have not been depicted in the figure. Number of hours gaming ($\beta = .22$, $p < .001$; 95% CI [.12, .32]) was significantly associated with internet gaming disorder while gender ($\beta = -.09$, $p > .05$; 95% CI [-.24, .05]) and age were not ($\beta = .10$, $p > .05$; 95% CI [-.08, .26]). *$p < .05$, **$p < .01$, ***$p < .001$.

Contrary to the hypothesis and findings from a previous study (i.e. Koronczai et al., 2013), body image dissatisfaction was not associated with IGD in the present study. However, it is worth noting that the study by Koronczai et al. (2013) focused on general internet use (and not gaming in particular), which could imply that body image dissatisfaction is associated with the over-involvement in online activities not assessed in the present study, such as social media use or cybersex. Such an explanation is also aligned with the assumption of the I-PACE model (Brand et al., 2016) which asserts that different risk factors result in distinct types of internet-use disorders. Consequently, further studies are required to investigate the influence of body image dissatisfaction on other types of internet-related disorders.

The present pilot study is not without limitations. Firstly, the sample was modestly sized, and of a cross-sectional nature. Therefore, the results do not provide any insight about potential causality between variables. Longitudinal studies are needed in order to reinforce further explore the results of the present study. Secondly, the data comprised self-report items, which are known to be influenced by response biases. Thirdly, a large proportion of the participants were men. Future studies may attempt to use more balanced samples although online gaming (and problematic gaming) is a male-dominated activity (Kuss & Griffiths, 2012). Indeed, due to the predominantly male sample, it was not possible to test whether BID might mediate the association between emotional trauma and IGD in females only. Finally, the sample

comprised a self-selecting non-representative Turkish online gamers, therefore, generalizability of the results is limited. Future studies employing representative samples from both Turkey and other countries are therefore needed. Moreover, further studies should also focus on other types of problematic technology-mediated problematic behaviours, such as excessive involvement in online sexual activities or social networking.

Despite these limitations, the present study is the first to examine the direct and indirect relationships between childhood emotional trauma and IGD via the consideration of relevant mediator variables. The findings of the present study indicate that online gamers with a history of emotional abuse and/or neglect have higher levels of depressive symptoms and, in turn, depressive symptoms are an important risk factor for IGD. This finding is in accordance with both the I-PACE and the CIU models, and supports the development of prevention and treatment interventions considering IGD as a potential maladaptive coping mechanism in facing emotional disorders and/or traumatic life events. For instance, mindfulness-based intervention studies have been shown to successfully reduce IGD symptoms (Li et al., 2017). Another promising approach is to capitalize on specific components of unified and trans-diagnostic protocol developed for the treatment of emotional disorders (e.g. motivation enhancement, emotion awareness training, emotion driven behaviours, and emotional avoidance) (Wilamowska et al., 2010).

Disclosure statement

No potential conflict of interest was reported by the authors.

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