



Adverse childhood experiences, dissociation, and anxious attachment style as risk factors of gaming disorder

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ABSTRACT

Introduction: The aim of this study was to explore the relationship between adverse childhood experiences (ACEs), attachment styles, dissociation, and symptoms of gaming disorder (GD). **Methods:** The total sample of the survey was 1288 gamers who completed a set of questionnaires via the Internet; they included questions on ACEs, attachment styles (anxious and avoidance styles in intimate relationships), symptoms of dissociation, and GD. Structural equation modeling (SEM) was performed to examine the detailed relationships between variables. **Results:** In the hypothesized model, ACEs, dissociation, and the scales of avoidance and anxiety were considered predictors of gaming disorder. Only the avoidance subscale proved to be statistically insignificant; the model without this variable fit the data and had good psychometric properties. **Conclusions:** To conclude, this study showed a link between adverse childhood experiences, dissociation, and anxiety experienced in relationships as significant risk factors for symptoms of gaming disorder.

1. Introduction

Computer games are becoming more and more popular due to constant technological development and greater availability of computers, game consoles, and smartphones. In response to global popularity, an increasing number of studies have attempted to explore the lives of gamers, paying particular attention to problems associated with excessive use of computer games. In the latest version of the DSM classification (DSM-5; American Psychiatric Association, 2013), a new nosological unit has been distinguished – Internet gaming disorder (IGD); however, due to a lack of sufficient evidence, it has not been included in the main manual, but rather described as a condition for further investigation. Nonetheless, the World Health Organization has included a new disorder – gaming disorder (GD) – in the International Statistical Classification of Diseases and Related Health Problems (ICD-11; World Health Organization, 2018). In the ICD-11, gaming disorder is defined as a pattern of gaming behavior characterized by impaired control over gaming, increasing priority given to gaming over other activities to the extent that gaming takes precedence over other interests and daily activities, and continuation or escalation of gaming despite the occurrence of negative consequences. The behavior pattern must be of sufficient severity to result in impairments in important areas of functioning and would normally need to have been evident for at least 12 months.

Poland is the second largest gaming market in Eastern Europe, with a total value of 546 million USD (Newzoo, 2018). Although at least 68% of Polish Internet users are gamers (Bobrowski, Rodzińska-Szary, Krampus-Sepielak, Śliwiński, & Rudnicki, 2017), there is a lack of studies on the prevalence of IGD. Research conducted in other countries on representative samples shows differences in the occurrence – e.g. it is 1.4% in Norway (Wittek et al., 2016), 2.5% in Slovenia (Pontes, Macur, & Griffiths, 2016), and the average for seven European countries is 1.6% (Müller et al., 2015). In studies which focus exclusively on groups of players, the results indicate more frequent diagnoses of IGD, e.g., 4.0% in South Korea (Park, Jeon, Son, Kim, & Hong, 2017) and 3.1% in Slovenia (Pontes et al., 2016). In Germany, 5.7% of Internet users were diagnosed with IGD (Wartberg, Kriston, & Thomasius, 2017).

2. Gaming disorder, childhood adversities, attachment, and dissociation

As for substance use disorders (SUD), several risk factors have also been identified for non-substance use addictive behaviors, including internet gaming disorder (for IGD see, e.g., Müller, Beutel, Egloff, & Wölfling, 2014; Cheng, Cheung, & Wang, 2018). Psychological trauma and adversity are commonly investigated factors hypothesized to increase vulnerability to the development of addictive disorders. In the recently revised Interaction of Person-Affect-Cognition-Execution (I-

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PACE) model, Brand et al. (2019) included early negative childhood experiences (i.e. childhood trauma and adversity) among the variables which are believed to predispose one towards different types of addictive behaviors. However, there are still relatively few studies in which the relationship between such experiences and IGD has been examined. Schneider, King, and Delfabbro (2017) conducted a systematic review of studies on family factors related to adolescent problematic Internet gaming. The authors evaluated 14 studies, but only some of them included potentially traumatic events, i.e. ACEs. However, they found that, in general, poorer quality relationships are associated with increased severity of problem gaming. Kircaburun, Griffiths, and Billieux (2019b) have recently shown a relationship between childhood trauma and IGD mediated by depressive symptoms. In this study, online gamers with a history of emotional abuse or neglect had higher levels of depressive symptoms; they were important risk factors for IGD.

These findings confirm the importance of the quality of family relationships in the development of problem gaming, which is in line with recent theoretical considerations on the role of attachment in addictive behaviors (Alvarez-Monjaras et al., 2018). King and Delfabbro (2019), in their meta-analysis, also indicated attachment styles as significant risk factors for GD. In one of the studies included in their meta-analysis, Worsley, McIntyre, Bentall, and Corcoran (2018) showed that anxious attachment was associated with more problematic social media use. However, it is worth noting that not all the studies on addictive behaviors and attachment confirm these findings – for example, in one study on problematic Internet use, bonding styles turned out to be irrelevant (Musetti, Terrone, & Schimmenti, 2018).

Schimmenti and Bifulco (2015) emphasize that early and frequent negative experiences in childhood, especially in the context of attachment relationships, can foster the onset of developmental trauma disorder. This disorder entails significant alterations in different domains of psychological functioning, including biology, affect regulation, behavioral control, attachment, and dissociation. This last phenomenon in the context of childhood trauma is an adaptive defense mechanism which can aid survival and can also become a non-adaptive coping mechanism in later stages of life (e.g. van der Hart, Nijenhuis, & Solomon, 2010; van der Kolk, 2014). Researchers have demonstrated that dissociation can play an important role also in Internet addiction (Canan, Ataoglu, Ozcetin, & Icmeli, 2012; Craparo, 2011; De Berardis et al., 2009). Similarly to other symptoms of psychopathology, such as depression and anxiety, dissociation may be seen as a predisposing factor for GD; however, it can be also understood as a mediating psychological mechanism enabling coping with psychological suffering. This is in line with recent models of problem Internet use which emphasize not only the role of previous psychopathology, but also maladaptive coping and deficient self-regulation (e.g. Kardefelt-Winther, 2014; Cheng et al., 2018). As dissociation is a nonspecific mechanism related to dysfunctional self-regulation, it can be also seen as a transdiagnostic factor in the formation of addictive behaviors. Moreover, taking into account the results of research showing that over 2/3 of Polish Internet users also play games on the Internet (Bobrowski et al., 2017), there are additional grounds to assume that dissociation may also play an important role in gaming disorder.

On the basis of a literature review, it can be stated that there is still little research examining the associations between ACEs, attachment styles, dissociation, and problem gaming. In order to better understand the possible risk factors that may contribute to the development of gaming disorder, the aim of our study was to examine the relationship between these variables. We assumed that childhood adverse experiences, negative attachment styles, and dissociation would predict symptoms of IGD. However, we were also interested in testing specific links between different types of ACEs and the other variables included, and we tested the hypothesized model assuming the mediating role of negative attachment styles and dissociation between the predicted association of ACEs and symptoms of GD.

3. Methods

3.1. Sample and procedure

The sample consisted of 1306 gamers. The analysis included 1288 individuals (435 females, 33.8%; 851 males, 66.1%), as 18 observations were excluded due to missing data. The age range was quite large: 15–67 ($M = 26.28$, $SD = 7.44$). For the purposes of the study, we define a gamer as anyone who plays computer games, regardless of how much time they devote to them or what genres they play. The average weekly time spent playing computer games (in hours) was $M = 13.14$ (Min. = 0.50, Max. = 90.0). Fig. 1 shows the frequency with which each genre was played. Due to the lack of an unambiguous way to demarcate game genres and the needs of the study (Eichenbaum, Kattner, Bradford, Gentile, & Choo, 2015), we categorized games on the basis of information from gaming websites and the authors' experience. Moreover, Apperley (2006), in his theoretical analysis of game genres, emphasizes that too rigid an approach to categorizing games and the underestimation of other factors can lead to an erroneous assessment of differences and similarities between genres. One game can also be assigned to several genres at once. In addition, it should be emphasized that the proposed division is a more detailed selection of games than the one proposed by Eichenbaum et al. (2015). However, the proposed division remains consistent with the meta-analysis made by Dale, Joessel, Bavelier, and Green (2020). Participants were recruited through articles in a tech magazine (PCLab), social magazine (aszdzienik.pl), and social media (Facebook). The project was approved by the Ethics Committee of [undisclosed].

3.2. Measures and instruments

In the first step, respondents answered questions on socio-demographic variables such as gender, age, education level, time spent on gaming, and marital status. Next, they were asked to answer questions included in four self-report questionnaires:

Internet Gaming Disorder (IGD; Lemmens, Valkenburg, & Gentile, 2015) is a recent and widely used scale with good psychometric properties which measures the intensity of GD symptoms. A modified version of the questionnaire was used in this study, adjusting the questions to the assumptions of the ICD-11. The nine-item scale with binary answers (0–1) was translated into Polish by Atroszko et al. In the current study, this version of the scale shows an appropriate fit of the model to the data and reliability at acceptable level of $\alpha = 0.69$, as Cronbach's alpha coefficient can take lower values on shorter scales (Graham, 2006).

Childhood Experiences Questionnaire (CEQ-58; Styła & Makoveychuk, 2018) originally consisted of seven subscales which measured: physical abuse (8 items, e.g. "I was beaten by a family member"), emotional abuse (8 items, e.g. "I was told by my family members that I was not needed"), physical neglect (8 items, e.g. "My clothes did not fit me, were scruffy or dirty"), emotional neglect (8 items, e.g. "My relatives were open in talking to me about my feelings"), sexual abuse (9 items, e.g. "I was sexually abused"), environmental instability (9 items, e.g. "I moved every 2 or 3 years"), and negative experiences with one's peers (8 items, e.g. "Kids laughed at me at school"). The 5-point response scale enables the measurement of total score and each subscale separately. The psychometric properties of the CEQ-58 were tested on Polish samples; Cronbach's alpha for the total score was $\alpha = 0.92$, and ranged from 0.81 to 0.91 for all subscales, except environmental instability, where it was poor ($\alpha = 0.54$). Due to this problem, an exploratory factor analysis was conducted with reference to the current sample. It revealed a new 5-factor structure: (1) physical and emotional abuse, (2) negative experiences with peers, (3) sexual abuse and parental maladjustment (substance abuse, often moving, no permanent residence, temporary stay in an orphanage), (4) emotional neglect, and (5) single-parent family and unstable family situation (single parent, economic adversity,

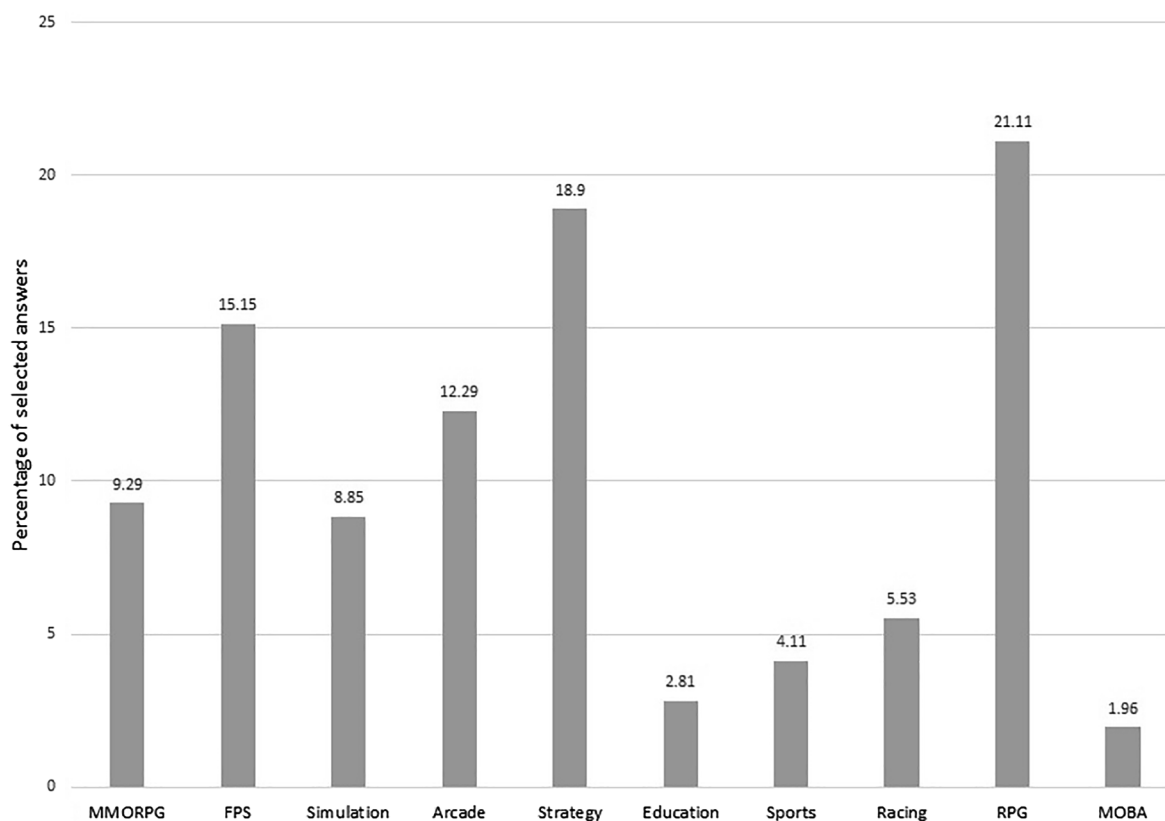


Fig. 1. Percentage comparison of game genres played by participants. MMORPG – massively multiplayer online role-playing game; FPS – first-person shooter; RPG – role-playing game; MOBA – multiplayer online battle arena. Participants could mark multiple genres.

parental mental disorder, separation from a parent). Cronbach's alphas for the new factors range from 0.73 to 0.92.

Experiences in Close Relationships-Revised (ECR-R) was designed to assess the two main dimensions of negative attachment styles, i.e. anxiety and avoidance experienced in close relationships (Fraley, Waller, & Brennan, 2000; Polish adaptation: Lubiewska et al., 2016). Each dimension is measured with 18 items on a 7-point response scale. According to the general theoretical assumptions, anxious individuals tend to fear rejection and abandonment, whereas avoidant individuals are uncomfortable with intimacy and seek independence. The psychometric characteristics of the questionnaire confirm the reliability of the Polish version: $\alpha = 0.92$ for the anxiety scale, and $\alpha = 0.88$ for the avoidance scale.

The Curious Experiences Survey (CES) consists of subscales aimed at measuring amnesia, absorption, and depersonalization (Goldberg, 1999; Polish version: Zdankiewicz-Ścigala & Ścigala, 2018). The CES is designed to assess 3 subscales on a 5-point response scale: absorption, amnesia, and depersonalization. This tool also measures each subscale separately as well as the total score. The psychometric properties of the original version are good, and the Cronbach's alpha for the Polish version in the current study is $\alpha = 0.92$ for the overall scale, $\alpha = 0.70$ for the amnesia scale, $\alpha = 0.84$ for absorption, and $\alpha = 0.89$ for depersonalization.

3.3. Analysis

In the first step, the collected data was analyzed by regression mediation using IBM's SPSS (IBM Corp., 2018). The total score of ACEs was an independent variable, the total score for gaming disorder was the dependent variable, and total scores for dissociation, anxiety, and avoidance were mediators. In the second step, a model was proposed to check the significance of pathways between ACEs, anxiety, avoidance, and dissociation as factors predicting GD. Because of the assumed

theoretical relationships between ACEs and the dimensions of attachment style, covariance between variables was introduced. In the third step, based on previous results, we included all tested items from questionnaires that proved to be statistically significant in analyses. The final model was analyzed using Mplus (Muthén & Muthén, 2017) and is shown in Fig. 2. Due to acceptable yet unsatisfying Cronbach's alpha values for the CEQ-58 and for better understanding the questionnaire's structure, new factors were identified using exploratory factor analysis (EFA).

4. Results

According to the IGD scale criteria, a minimum score of 5 points indicates gaming disorder (Lemmens et al., 2015). In our study, 152 subjects (11.80%) fit this diagnostic criterion: 118 men (13.87% of men sampled) and 34 women (7.72% of women sampled). Additionally, players whose activity indicates risky gameplay were identified; they had increased scores, but did not meet the GD diagnostic criteria ($n = 302$, 23.45%). Thus, more than one third of the entire sample (35.25%) reported increased scores on the IGD scale indicating symptoms of risky gameplay or GD. Descriptive statistics with gender differences and identified factors are shown in Table 1. The correlation between total scores on the IGD scale, CEQ-58, CES, and ECR-R with anxiety and avoidance subscales was significant and positive (see Table 1). Analysis of the age distribution and intensity of GD symptoms showed no differences dependent on age.

In the first regression analysis, intensity of GD symptoms (IGD total score) was regressed on general intensity of ACEs (CEQ-58 total score). This equation was significant with negative childhood experiences predicting gaming disorder ($\beta = 0.20$, $t(1286) = 7.30$, $p = < .001$). Then, a general index of dissociation (CES total score) was regressed on ACEs ($\beta = 0.32$, $t(1286) = 11.99$, $p = < .001$). In the third analysis, GD was regressed on both dissociation and negative experiences in

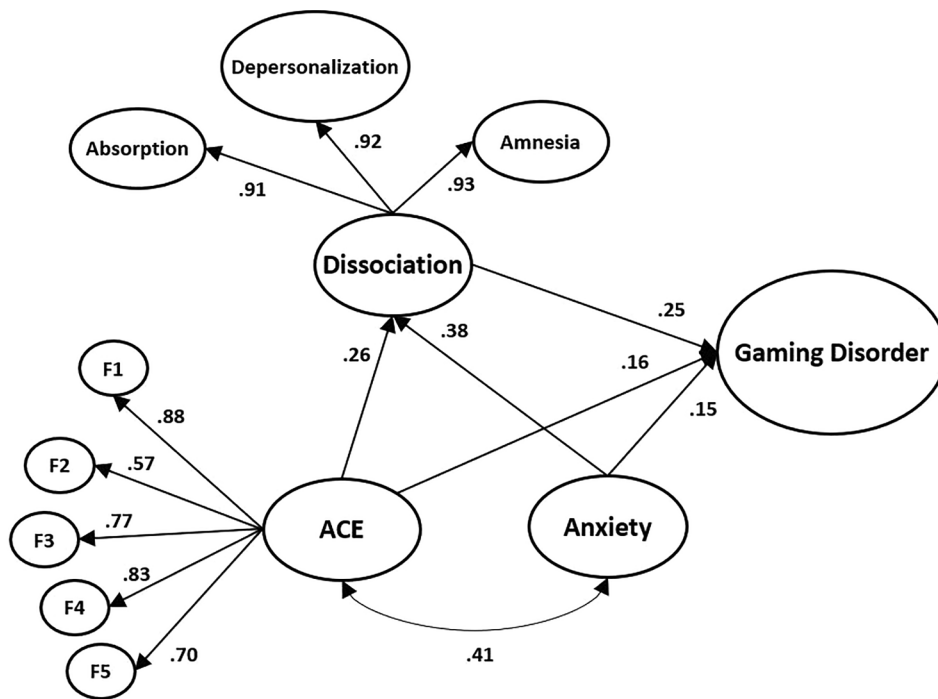


Fig. 2. Structural equating model with standardized effects. All paths have $p < 0.001$. Error terms and observed variables (all items from questionnaires) are omitted for clarity. F1 – physical and emotional abuse; F2 – negative experiences with peers; F3 – sexual abuse and parental maladjustment (substance abuse, often moving, no permanent residence, temporary stay in an orphanage); F4 – emotional neglect; F5 – single-parent family and unstable family situation (single parent, economic adversity, parental mental disorder, separation from a parent); ACE – adverse childhood experiences.

childhood simultaneously. This equation was significant for both dissociation ($\beta = 0.23, t(1286) = 8.28, p = < .001$) and ACEs ($\beta = 0.13, t(1286) = 4.48, p = < .001$). Finally, the relation between ACEs and GD was reduced ($\beta = 0.20$ versus $\beta = 0.13$) by the inclusion of dissociation in the model. Sobel's test demonstrated that the mediator significantly carried the effects of negative childhood experiences

($z = 6.81, p < .001$).

In the second regression analysis, intensity of GD symptoms (IGD total score) was regressed on general intensity of ACEs (CEQ-58 total score). This equation was significant with negative childhood experiences predicting gaming disorder ($\beta = 0.20, t(1286) = 7.30, p = < .001$). Then, anxiety in intimate relationships (ECR-R) was

Table 1

Descriptive statistics for each questionnaire with subscales and gender differences analyzed with the Mann-Whitney *U* test and correlation analyzed using IBM SPSS.

Characteristics of the sample	<i>M</i> (<i>SD</i>)		Mann-Withney <i>U</i> test	Cohen's <i>d</i>
IGD	Women (<i>n</i> = 435)	Men (<i>n</i> = 851)		
Symptoms of gaming disorder	6.18 (1.09)	6.06 (1.26)	$U = 179322.5^{***}$	0.05
Risky gamers	3.37 (0.49)	3.40 (0.49)	–	–
CEQ-58				
Total score	1.78 (0.51)	1.73 (0.40)	$U = 180701.0^{ns}$	–
F1 (physical and emotional abuse)	1.64 (0.68)	1.53 (0.55)	$U = 175311.0^{ns}$	–
F2 (negative experiences with peers)	2.77 (0.50)	2.79 (0.51)	$U = 183108.5^{ns}$	–
F3 (sexual abuse with and parental maladjustment)	1.17 (0.27)	1.11 (0.19)	$U = 168788.0^{**}$	0.15
F4 (emotional neglect)	2.37 (0.83)	2.40 (0.77)	$U = 181870.0^{ns}$	–
F5 (single-parent family and unstable family situation)	1.87 (0.82)	1.76 (0.73)	$U = 173947.0^{ns}$	–
CES				
Total score	52.92 (16.07)	48.13 (12.66)	$U = 149848.5^{***}$	0.32
Absorption	26.08 (7.65)	23.82 (7.09)	$U = 151388.5^{***}$	0.30
Amnesia	11.04 (3.35)	10.54 (2.90)	$U = 166967.5^{**}$	0.16
Depersonalization	15.80 (6.75)	13.78 (4.51)	$U = 147013.5^{***}$	0.34
ECR-R				
Anxiety	60.08 (24.95)	53.98 (23.08)	$U = 160037.0^{***}$	0.22
Avoidance	57.47 (21.68)	61.41 (19.55)	$U = 210148.0^{***}$	0.22
Average weekly time spent playing computer games (in hours)	9.04 (9.92)	15.22 (13.19)	$U = 116203.5^{***}$	0.64

Type of analysis	Description					
Correlations between total scores of IGD, CEQ-58, CES, and subscales from ECR-R.	IGD TOT	–	0.20	0.27	0.14	0.25
	CEQ TOT	0.20	–	0.32	0.18	0.31
	CES TOT	0.27	0.32	–	0.16	0.40
	Avoidance	0.14	0.18	0.16	–	0.29
	Anxiety	0.25	0.31	0.40	0.29	–
	All correlations have $p < .001$, two-tailed.					

Notes: ** – $p < 0.01$, two-tailed; *** – $p < 0.001$, two-tailed; ^{ns} – non-significant. IGD – Internet Gaming Disorder Scale; CEQ-58 – Childhood Experiences Questionnaire; CES – Curious Experiences Survey; ECR-R – Experiences in Close Relationships-Revised; TOT – total score.

regressed on ACEs ($\beta = 0.31$, $t(1286) = 11.85$, $p < .001$). In the third analysis, GD was regressed on both anxiety and negative experiences in childhood simultaneously. This equation was significant for both anxiety ($\beta = 0.21$, $t(1286) = 7.35$, $p < .001$) and ACE's ($\beta = 0.13$, $t(1286) = 4.77$, $p < .001$). Finally, the relation between ACEs and GD was reduced ($\beta = 0.20$ versus $\beta = 0.13$) by the inclusion of anxiety in the model. Sobel's test demonstrated that the mediator significantly carried the effects of negative childhood experiences ($z = 6.25$, $p < .001$).

In the third regression analysis, intensity of GD symptoms (IGD total score) was regressed on general intensity of ACEs (CEQ-58 total score). This equation was significant with negative childhood experiences predicting gaming disorder ($\beta = 0.20$, $t(1286) = 7.30$, $p < .001$). Then, avoidance in intimate relationships (ECR-R) was regressed on ACEs ($\beta = 0.18$, $t(1286) = 6.57$, $p < .001$). In the third analysis, GD was regressed on both avoidance and negative experiences in childhood simultaneously. This equation was significant for both avoidance ($\beta = 0.10$, $t(1286) = 3.77$, $p < .001$) and ACEs ($\beta = 0.18$, $t(1286) = 6.54$, $p < .001$). Finally, the relation between ACEs and GD was reduced ($\beta = 0.20$ versus $\beta = 0.18$) by the inclusion of avoidance in the model. Sobel's test demonstrated that the mediator significantly carried the effects of negative childhood experiences ($z = 3.27$, $p = .001$).

All regression models with mediators were statistically significant with Sobel test correction. However, SEM analysis showed that the avoidance scale was statistically insignificant. The SEM model with the total scores of ACEs, dissociation, anxiety and avoidance attachment, and total score of gaming disorder scale fits the data. Avoidant attachment was not a statistically significant predictor of gaming disorder, $p > .05$. ACEs had $p < .01$ and other variables $p < .001$.

The final model ($N = 1288$) used ACEs (all new five factors) as well as absorption, depersonalization, amnesia, and anxiety as predictors of gaming disorder. It was estimated in Mplus by WLSMV (weighted least square mean and variance adjusted), because it includes categorical and binary data (Muthén, Muthén, & Asparouhov, 2015). The model did not fit the data $\chi^2(6540) = 15451.30$; $p < 0.001$. Other goodness-of-fit indicators were also insufficient, RMSEA (Root Mean Square Error of Approximation) = 0.3; CFI (Comparative Fit Index) = 0.90; TLI (Tucker-Lewis index) = 0.90. Thus, the model was changed on the basis of the value of modification indices with the co-occurrence of individual variables. Every introduced amendment was tested for statistical significance using diffest. Every modification of the final model was statistically significant with $p < 0.001$. To get the best fit, correlations were allowed between measurement variables. The model's fit indicators were as follows: $\chi^2(6670) = 97553.74$; $p < 0.001$; RMSEA = 0.02; CFI = 0.95; TLI = 0.95. Generally, the fit indices show that the final model fits the data. The model with standardized estimators is shown in Fig. 2. All paths and correlations were statistically significant with $p < 0.001$.

According to the final model, the anxiety dimension correlates positively with ACE. The number of ACEs turned out to be a statistically significant, positive predictor of both the tendency to dissociate and gaming disorder. The anxiety scale is a statistically significant, positive predictor of both dissociation and symptoms of GD. The analysis shows that in addition to the direct path of the relationship between the number of ACEs and anxiety and GD, there is a non-direct path mediated by the tendency to dissociate.

5. Discussion

The study revealed that a significant percentage of gamers, i.e. more than one third of the entire sample, may be at risk of GD as they reported increased scores on the IGD scale. These results confirm that there is an urgent need to identify the crucial risk factors. The main goal of our study was to examine possible associations between problem gaming and selected factors: ACEs, dissociation, and dimensions of

attachment styles. Recent studies, although there are still few, have indicated an important role of these factors in the prediction of addictions. Findings of our study are consistent with them. Participants who score higher on ACEs, dissociation, and anxiety experienced in relationships scales also score higher on the GD scale.

The results of our study confirm the general assumption that ACEs play a significant role in the development of GD (Brand et al., 2019). Structural modeling showed that the most relevant experiences concern physical and emotional abuse (0.88) and emotional neglect (0.83). This is in line with the results of a systematic review of research on adolescent problem gamers done by Schneider et al. (2017) and a recent study on online gamers (Kircaburun et al., 2019b). They have shown that a history of emotional abuse and/or neglect is a risk factor for psychopathology, which in turn is an important risk factor for IGD. Similar results were obtained for social media users (Kircaburun, Griffiths, & Billieux, 2019a). This may be seen as confirmation of the thesis that knowledge about traumatic experiences will play a particularly important role in understanding Internet addiction (Schimmenti et al., 2017).

Apart from general conclusions about the significant role of trauma, the results obtained in this study can be interpreted with reference to the dilution effect hypothesis (Cheng et al., 2018), which states that gaming disorder is related to deficient self-regulation, with the underlying motive being to restore psychosocial well-being. According to this hypothesis, frequent engagement in gaming may be viewed as an attempt to gratify fundamental psychological needs or as motivated by a desire to escape into the cyber world to avoid tackling distressing real-life problems. Given the results of our study, physical and emotional laxity, inadequate housing, or unfavorable financial conditions in the family may prompt the individual to search for a safe alternative life. An individual may seek a way to forget about their hostile or neglecting environment. Computer games, by their very nature, are an opportunity to create a virtual reality without limitations. Some games emulate real life activities e.g. building a house, establishing relationships with other characters, or even starting a family. Moreover, users can realize dreams that cannot be easily achieved in reality, like piloting an airliner. The games then function as a substitute for reality. Games also present an imaginary luxury that is easily obtainable. Therefore, people experiencing violence or emotional and physical neglect can escape into the world of games to compensate for all the negative experiences of reality.

The second statistically significant factor in the obtained model in this study is anxiety experienced in close relationships. Apart from supporting the general hypothesis that negative, insecure attachment styles affect the risk of problematic use of Internet games, the results of this study indicate that this effect is related only to specific difficulties experienced in relationships, i.e. fear of rejection and abandonment.

Anxiety experienced in close relationships is understood as a hyperactivation strategy related to lack of trust and negative self-image, combined with a strong need for closeness (Fraley & Shaver, 2000). Such ambivalence in seeking proximity in gamers can be resolved by establishing relationships with other gamers. Cooperation to achieve common goals can give players a sense of satisfying the need for closeness in a secure way. In addition, this agrees with the results of current research on complex trauma and traumatic development (e.g. van der Kolk, 2014). According to these findings, individuals who have experienced ACEs and have insecure attachment style more often react with non-adaptive dissociation, and the hyperactivation can support this process. Individuals who tend to overreact emotionally and who experience strong feelings may not fully process their emotions. Consequently, non-adaptive dissociation may be triggered as a protective mechanism against unprocessed emotions.

Interestingly, in the obtained final model, it was dissociation acting as a mediator that proved to be the strongest factor in the formation of GD. Amnesia, depersonalization, and absorption were all involved in understanding the tendency to dissociate (> 0.90). In general,

dissociation, understood as a cognitive cut-off, may contribute to a proper understanding of the phenomenon of playing games. Current research (e.g. Maroney, Williams, Thomas, Skues, & Moulding, 2018) suggests that escape is a significant function of playing games (i.e. the player cuts themselves off from their surrounding reality by entering the virtual world). Becoming an avatar, finding a new reality requires fully focusing on the presented images. This requires commitment and deceleration of one's own personality.

These phenomena are closely related to ACEs, where people often want to escape the reality that surrounds them. Foa and Hearst-Ikeda (1996) indicated that the dissociation associated with trauma, being an immediate cognitive strategy for dealing with intense emotions, can continue later on in life as a mechanism of avoidance. Interestingly, some researchers conducting studies on substance abuse postulate that the use of substances may compensate for inadequate dissociative capabilities. Klanecky, McChargue, and Bruggeman (2012) even hypothesized that alcohol use may be prompted by a desire to dissociate after trauma, rather than inadequate dissociative tendencies alone. It can be assumed that playing games may perform a similar function, as in our study dissociation, being the most important factor predicting GD, was also, simultaneously, predicted by ACEs and the anxious attachment style (and this effect was even stronger than in the case of direct ACEs and the anxiety predictions of GD).

The results of this study can also be understood in the context of models emphasizing the role of self-regulation (Cheng et al., 2018). When a gamer has a history of ACEs and currently experiences interpersonal difficulties due to anxious tendencies, they can seek escape in virtual reality. Negative emotions associated with childhood trauma and relationship problems resulting from insecure attachment can be too difficult to bear without the appropriate skills to regulate them. Problematic gaming can then end up being a maladaptive self-regulation strategy that helps to break away from psychological suffering.

Finally, similarly to the results of other research, our study confirms that playing games is more popular among men (e.g. Maroney et al., 2018); therefore, they are at higher risk of GD. Moreover, in our study, symptoms of GD were more intense and GD was more frequently diagnosed in men than in women, which implies that men may be more susceptible to becoming problem gamers. The fact that men spend more time playing games can also contribute to this problem.

6. Limitations

This study has several limitations. The most important being that it is cross-sectional and correlational in nature. This means that the observed associations can be interpreted as operating in the opposite direction, simply as a consequence of excessive gaming. It is possible that regularly playing games reinforces the tendency to dissociate. Another problem is related to the general lack of tools to measure GD. Although the IGD scale – the measure used in our study – has been widely used in recent studies on gaming disorder, it is quite new and has only recently been adapted for use in Poland. Another limitation is that the groups of men and women were unequal in size. Thus, it did not allow the testing of a multiple-groups model using SEM. Future research should focus on gender differences as well to fully understand their role in the development of the disorder.

Compliance with ethical standards

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5). Informed consent was obtained from all participants for being included in the study.

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Author contributions

PG and MD contributed to the conception and design of the work. All authors contributed to the acquisition, analysis, and interpretation of data. PG drafted the work. All authors revised the work critically in terms of important intellectual content. All authors approved the final version and are accountable for all aspects of the work in terms of ensuring that questions related to the accuracy or integrity of any part of the work were appropriately investigated and resolved.

Declaration of Competing Interest

The authors declare that this research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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