Do coping mechanisms and being an esport player moderate the relationship between psychiatric symptoms and gaming disorder?

Fanni Bányai, Ágnes Zsila, Gyöngyi Kökönyei, Mark D. Griffiths, Zsolt Demetrovics, Orsolya Király

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Abstract

Background: The emerging popularity of videogame playing ('gaming') as a hobby and as a professional sport raises awareness about both the benefits and possible downsides of the activity. Although a healthy and passionate hobby for most, a minority of gamers experiences addiction-like symptoms and are considered to have gaming disorder (GD). GD was previously found to be related to aversive conditions, such as depression or anxiety, as well as putatively maladaptive coping strategies.

Objective: The aim of the present study was twofold, to explore the (i) moderating effect of different coping strategies and (ii) type of videogame usage (professional [esport] or recreational) on the relationship between psychiatric symptoms and GD.

Methods: A sample of 3,476 gamers (90.1% males; mean age = 23.20 years, SD = 6.48) was recruited via the website and social networking site of the most popular gaming magazine in Hungary (GameStar).

Results: It was found that the main effect of psychiatric symptoms was moderate-to-large in all models, while the moderation effects were significant for four out of eight coping strategies (i.e., self-blame/self-distraction, denial, emotional/social support, active coping). However, the explained variance of the models only increased negligibly (from 0.3 to 0.5%) due to the moderation effect. The direction of the moderations was as expected (i.e., putatively maladaptive strategies were associated with more GD symptoms when the level of psychiatric symptoms was high, while putatively adaptive strategies were associated with less). Furthermore, no considerable moderation effect of the player type (recreational vs. professional players) was found on the association between psychiatric symptoms and GD.

Conclusions: Future studies should be designed to understand coping-related mechanisms in the background of video gaming and GD better.

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Introduction

Videogame playing ('gaming') has become one of the most popular leisure activities worldwide irrespective of age and gender [1]. Its great popularity has led to the phenomenon of 'electronic sports' ('esports'), which refers to professional competitive gaming where teams or individuals compete against each other in a videogame [2-5]. There are now organized and sanctioned esports competitions all over the world, hosted by sponsors, featuring live sport-commentary. These are watched by largescale audiences (both at scene and via online streaming platforms, like *Twitch.tv, YouTube*), and big money prizes for the winners [6].

Although the overwhelming majority of gamers worldwide play in a healthy manner, a small minority experiences addiction-like symptoms accompanied by marked psychological distress and significant impairment in personal, family, social, educational, occupational and/or other important areas of functioning [7]. The severity of the problem is acknowledged by the inclusion of Internet Gaming Disorder (IGD) in Section 3 ('Emerging Measures and Models') of the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders in 2013 as a condition warranting further research [8] and by the inclusion of Gaming Disorder (GD) in the eleventh revised edition of the International Classification of Diseases in 2019 as an official diagnosis [9]. Furthermore, there is a wide variety of terms used for problematic or addictive video gaming. The present paper uses the term 'gaming disorder' given that it is the official term proposed by the World Health Organization.

Similar to substance use or alcohol use disorders, GD has been found to be related to psychiatric symptoms such as depression and anxiety according to numerous epidemiological survey studies [e.g., 10, 11, 12]. One important issue regarding these findings is whether there are factors that moderate these associations. More specifically, the negative effects of emotional or psychiatric distress on an individual's life may depend on the individual's ability to cope with it [13]. Coping can be defined as the cognitive and behavioral responses made by individuals in an attempt to manage stressful situations and emotions associated with them [14]. Taking into account that context and goals of the individual strongly determine the effectiveness of the strategies [15, 16], the adaptive-maladaptive classification could arguably be criticized. However, some strategies may be labeled as putatively maladaptive, if they – especially on the long-term – are associated with poor outcomes. For instance, dispositional rumination – defined as the tendency to dwell on distress-related thoughts passively and repetitively [17] – and avoidance are consistently associated with psychopathology [18]. Similarly, some strategies might be considered as putatively adaptive since they are generally associated with good adjustment. For instance, acceptance of mental experiences is related to better psychological health [19].

Several studies have investigated the association between coping strategies and GD. According to such findings, GD is associated with putatively maladaptive or dysfunctional coping styles [20] such as denial, behavioral disengagement [21], media-related coping, self-distraction, self-blame [e.g., 22, 23, 24], catastrophizing, or rumination [e.g., 25]. Additionally, putatively adaptive coping styles such as active coping, positive reframing, and positive reappraisal, have been applied less frequently in the case of gamers at risk of GD or have been negatively related to GD [22, 25]. Effect sizes range from weak to strong in the case of putatively maladaptive strategies, and weak to moderate in the case of putatively adaptive coping styles.

Furthermore, several studies have tested more complex models, where coping styles have been assumed to mediate between psychiatric symptoms or stress and GD. According to such models, higher rates of stress or specific psychiatric problems such as depression have been associated with or predicted the use of dysfunctional coping styles (e.g., avoidance, media-focused coping). This, in turn, have been associated with (or predicted higher rates of) GD or general problematic internet use.

Effect sizes for the psychiatric symptoms/coping style associations have been moderate or moderate-to-strong, while for coping style/GD association have been weak or weak-to-moderate [26-28].

Even though it is plausible to think that increased psychiatric symptoms (e.g., depression) may increase the risk for using dysfunctional coping strategies [29], it is also plausible to assume that dispositional coping styles may act as moderators between symptoms and GD. This means they can influence the association between psychiatric symptoms and GD. It is logical to hypothesize that among individuals who frequently use putatively maladaptive or dysfunctional coping styles when encountering stressful situations in their lives, the relationship between psychiatric symptoms and GD will be stronger than among those who use putatively adaptive coping strategies in general. Findings reporting that escapism (i.e., playing videogames to avoid problems and difficulties) is the motive most consistently related to GD [e.g., 30, 31, 32] supports such a hypothesis. Therefore, instead of mediation models, the present study aimed to test whether coping styles (both putatively adaptive and maladaptive) moderate the psychiatric symptoms/GD relationship in the aforementioned way.

The present study also had a second aim which was to test whether player type (recreational vs. esport players) moderated the association between psychiatric symptoms and GD. The large amount of time and energy that esport players spend training to improve their gaming skills and be successful in competitions, raises the question whether esport players may be at higher risk of developing GD than recreational gamers [33]. To date, there are very few studies investigating this risk even though it affects a high number of aspiring esport players globally. According to the few previous studies, esport players do not report considerably higher GD scores than recreational gamers and GD-related mechanisms also appear to be similar among esports players and highly engaged recreational players [30, 31, 34]. Therefore, a second assumption was that esport players will not significantly differ from highly engaged recreational players in the psychiatric symptoms/GD association.

Methods

Participants and procedure

Participants were recruited via the website and social networking site (i.e., *Facebook*) of the most popular gaming magazine in Hungary (*GameStar*). Data were collected with an online questionnaire that focused on both the healthy and problematic (i.e., addictive) use of videogames. Participation was voluntary and anonymous. Gamers younger than 18 years (14-17 years of age) were allowed to participate in the survey after providing parental consent to participate. Two shopping vouchers (60,000 HUF, approximately €200 each) were used as incentives, and raffled among gamers who participated in the survey. A contact email address was asked from the participants who joined the raffle. The email addresses were used only to inform the winners and all contacts were deleted afterwards.

A total of 7,815 participants started the survey. According to the aim of the present study, participants who provided data for all study-relevant variables (i.e., psychiatric symptoms, coping strategies, and symptoms of gaming disorder) were included in the data analysis. Consequently, the final sample comprised 3,476 gamers (90.1% males; mean age = 23.20 years, *SD* = 6.48). The study was approved by the Institutional Review Board of the research team's university and was carried out in accordance with the Declaration of Helsinki.

Measures

Sociodemographic variables

Major socio-demographic data were collected including age, gender, the number of years spent in education and working, and marital status.

Variables relating to videogame use

Data related to general videogame usage were also collected. Participants were asked to report their approximate game time in average hours/weekday and average hours/weekend day. The approximate game time hours/day were calculated, as (5*week day + 2*weekend day)/7. The average gaming time hours/week were calculated as 5*week day + 2*weekend day. To identify esport gamers and recreational gamers in the sample, participants were asked to indicate the types of competitions (i.e., online or offline [LAN] competitions) and the frequency of esport events they attended in the previous year (response options: 'I did not participate in such competitions in the past year'; '1-2 times in the past year'; '3-5 times in the past year'; '6-11 times in the past year'; 'several times a month'; and 'weekly or more frequently'). Following the classification method of Bányai, Griffiths [34], and taking into consideration the theoretical concept [2, 3, 6] and the methods how esport tournaments are organized, gamers who participated in esport tournaments at least 6-11 times in the previous year were defined as 'esport gamers'. Gamers who participated in such tournaments only five times or fewer in the previous year were defined as 'recreational gamers'.

Coping strategies

Coping strategies were assessed using the Brief COPE scale [35]. The Brief COPE is a self-report scale assessing 14 different coping strategies (i.e., self-distraction, active coping, denial, substance use, use of emotional support, use of instrumental support, behavioral disengagement, venting, positive reframing, planning, humor, acceptance, religion, and self-blame). Each coping strategy is represented by two items that are rated on a four-point Likert scale (ranging from 1 = "I haven't been doing this at all" to 4 = "I've been doing this a lot"). Several factors in the Brief COPE scale showed poor internal consistencies in the current study: self-distraction (α=.55), venting (α=.58), behavioral disengagement (α=.61), acceptance (α=.66) and the planning (α=.69). Previous studies, which also found that the original factors of the Brief COPE questionnaire had low internal consistencies, explored alternative factor structures that yielded similar coping strategies but with better psychometric properties [36-38]. Following this conceptual framework, an exploratory factor analysis (EFA) was carried out to find an alternative factor structure of the Brief COPE. According to the EFA, eight factors were identified, including emotional/social support, active coping, self-blame/ self-distraction, humor, substance use, denial, religion and acceptance. According to the aforementioned broad categorization, emotional/social support, active coping, humor, religion, and acceptance were considered as putatively adaptive coping strategies, while self-blame/self-distraction, substance use, and denial were considered as putatively maladaptive or dysfunctional coping strategies. The newly reconstructed factors showed better internal consistencies ranging between 0.78 and 0.92, except for the acceptance (α=.66) and self-blame/self-distraction factors (α=.68), which had alphas below the .70 threshold (see Table 1).

Psychiatric symptoms

Psychiatric symptoms were assessed using the Hungarian version of the Brief Symptom Inventory [BSI; 39, 40]. The scale comprises 53 items on a five-point Likert scale (from 'not at all' = 0 to 'extremely' = 4), assessing nine symptoms (i.e., somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism). In the present study, three subscales of the BSI were used: depression (six items), anxiety (six items), and psychoticism (five items). From the three BSI subscales a summarized index named 'Psychiatric Symptoms' was calculated to determine the intensity of general distress which showed a strong relationship with gaming disorder in previous studies [e.g., 11, 30, 31, 34]. The 'Psychiatric Symptoms' index with its respective 17 items showed good internal consistency in the present study. Cronbach's alpha was .93.

Gaming Disorder

The symptoms of gaming disorder were assessed using the Hungarian version of the Ten-Item Internet Gaming Disorder Test [IGDT-10; 41]. The IGDT-10 was developed to assess the nine criteria of internet gaming disorder (IGD) as proposed in the DSM-5. Each item of the IGDT-10 assesses one DSM-5 criterion, except for the final criterion (e.g., "*jeopardy or losing a significant relationship, job, or educational or career opportunity because of participation in Internet games*"), which was operationalized via two items to avoid double-barreled questioning. The IGDT-10 has three response options ('never' = 0, 'sometimes' = 1 and 'often' = 2). To follow the dichotomous structure of the DSM-5, response options were re-coded in the following way: 'never' and 'sometimes' options were recoded as 'no' (0), while 'often' responses as 'yes' (1). The ninth and tenth items were recoded into a single item (i.e., if any of the two original items had an 'often' response, the new item was coded as 'yes') to resemble the original structure of the IGD. The 10-item IGDT-10's Cronbach alpha was .76, while the nine-item binary version's alpha was .63. However, following the ICD-11 [9] classification of gaming disorder, the IGDT-10 scores specified in the current study are used as the indicator of gaming disorder (GD).

Statistical analysis

Data analysis was conducted using SPSS version 22.0 [42] with PROCESS modeling tool version 2.16.3 [43]. To explore the alternative factor structure of the Brief COPE, exploratory factor analysis (EFA) was conducted with principal component analysis with Promax rotation [44]. In the moderation models, the variable of psychiatric symptoms was the independent variable, while gaming disorder was the outcome variable. Coping strategies and player type (i.e., recreational player or professional esports player) were the moderators. Player type was coded as 1 = recreational player and 2 = professional esports player. All variables in the regression models were continuous variables except for player type. Age and gender were added to the models as covariates. Given the high number of moderation analyses in the case of the coping styles, Bonferroni correction was applied. More specifically, the significance level (*P* < .05) was divided by the number of tests (n=8 different coping styles). Consequently, a *P*-value of .00625 was used as an indicator of statistical significance.

Results

Descriptive statistics

Most of the gamers in the sample were male (90.1%), and their age ranged from 14 to 58 years. The average age was 23.2 years (SD=6.48). The years they spent in education was approximately 13.2 years (SD=3.04). Findings indicated that 57.3% were single (*n* = 1993), 35.7% were in relationship (*n* = 1238), 5.7% were married (*n* = 201), 0.5% divorced (*n* = 17), 0.1% widowed (*n* = 2) and 0.7% did not provide information regarding their marital status (*n* = 25). Over half of the gamers in the sample were still studying (57%; *n* = 1981) and 57.4% worked, part-time or full-time (*n* = 1992), and 30.7% of the gamers who were still studying in the educational system also worked (*n* = 609). On an average day, the participants played videogames for 2.6 hours/day (SD=1.31) and 18.2 hours/week (SD=9.20). Approximately one in 20 gamers (4.6%; *n* = 161) identified as esport gamers, based on their esports tournament participation (i.e., they participated in esport tournaments at least 6-11 times in the past year).

Factor analyses

First, a confirmatory factor analysis (CFA) was conducted on the current sample to test the model fit of the 14-factor structure of the Brief COPE scale. The model had an acceptable fit to the data (χ^2=45551.730, *P* < .001; CFI .963; TLI .947; RMSEA .036 (0.035±0.038); SRMR 0.030). However, many of the originally proposed factors had low internal consistencies such as self-distraction (.55), venting (.58), behavioral disengagement (.61), acceptance (.66) and planning (.69). Because of this and following previous studies' approach, an exploratory factor analysis (EFA) was performed to identify an alternative factor structure of the Brief COPE. A principal component analysis (PCA) with Promax rotation was carried out. The following items had high cross-loadings, therefore were excluded from further analyses: Items 6, 12, 16, 17, 19, and 21. A new EFA was performed then with Promax rotation. The Kaiser-Meyer-Olkin (KMO) index was also calculated to measure sample size adequacy. In the current sample, EFA produced a good KMO value (0.74) [45]. Bartlett's test of sphericity was χ^2 (253)=31803.68, *P* < .001, indicating that the correlation structure was adequate for factor analyses. Based on the scree plot, the proportion of total variance, the eigenvalue-one criterion, and the interpretability of the factors, an eight-factor solution appeared to best fit the data, accounting

for 72.75% of the variance. Results of the EFA analysis are presented in Tables 1 and 2.

Table 1. Factors obtained using exploratory factor analysis with Promax rotation

	1	2	3	4	5	6	7	8
COPE10 - I've been getting help and advice from other people.	.88							
COPE5 - I've been getting emotional support from others.	.85							
COPE15 - I've been getting comfort and understanding from someone.	.85							
COPE23 - I've been trying to get advice or help from other people about what to do.	.79							
COPE9 - I've been saying things to let my unpleasant feelings escape.	.63							
COPE7 - I've been taking action to try to make the situation better.		.82						
COPE2 - I've been concentrating my efforts on doing something about the situation I'm in.		.82						
COPE14 - I've been trying to come up with a strategy about what to do.		.79						
COPE25 - I've been thinking hard about what steps to take.		.69						
COPE13 - I've been criticizing myself.			.86					
COPE26 - I've been blaming myself for things that happened.			.85					
COPE1 - I've been turning to work or other activities to take my mind off things.			.58					
COPE28 - I've been making fun of the situation.				.96				
COPE18 - I've been making jokes about it.				.96				
COPE4 - I've been using alcohol or other drugs to make myself feel better.					.95			
COPE11 - I've been using alcohol or other drugs to help me get through it.					.95			
COPE3 - I've been saying to myself "this isn't real".						.90		
COPE8 - I've been refusing to believe that it has happened.						.89		
COPE27 - I've been praying or meditating.							.90	
COPE22 - I've been trying to find comfort in my religion or spiritual beliefs.							.90	
COPE20 - I've been accepting the reality of the fact that it has happened.								.87
COPE24 - I've been learning to live with it.								.86
Factor names	**Emotional / social**	**Active coping**	**Self-blame/ Self-**	**Humor**	**Substance use**	**Denial**	**Religion**	**Acceptance**

	support		distractio n					
Cronbach's alpha	.86	.79	.68	.92	.92	.78	.78	.66

Table 2. Correlation matrix of the study's variables

Variables	BSI	IGD	Emotional / social support	Active coping	Self-blame/ self-distraction	Humor	Substance use	Denial	Religion	Acceptance
BSI	1.00									
IGD	.41**	1.00								
Emotional/ social support	-.06**	-.04*	1.00							
Active coping	-.18**	-.14**	.39**	1.00						
Self-blame/ self-distraction	.60**	.30**	.14**	.03	1.00					
Humor	-.01	.00	.16**	.22**	.10**	1.00				
Substance use	.22**	.10**	.10**	-.01	.24**	.12**	1.00			
Denial	.41**	.24**	.12**	.00	.40**	.06**	.18**	1.00		
Religion	.10**	.06**	.15**	.11**	.10**	.06**	.07**	.10**	1.00	
Acceptance	.15**	.10**	.08**	.11**	.22**	.21**	.08**	.11**	.04*	1.00

***P < 0.001; **P < 0.01; *P < 0.05; †P = 0.05
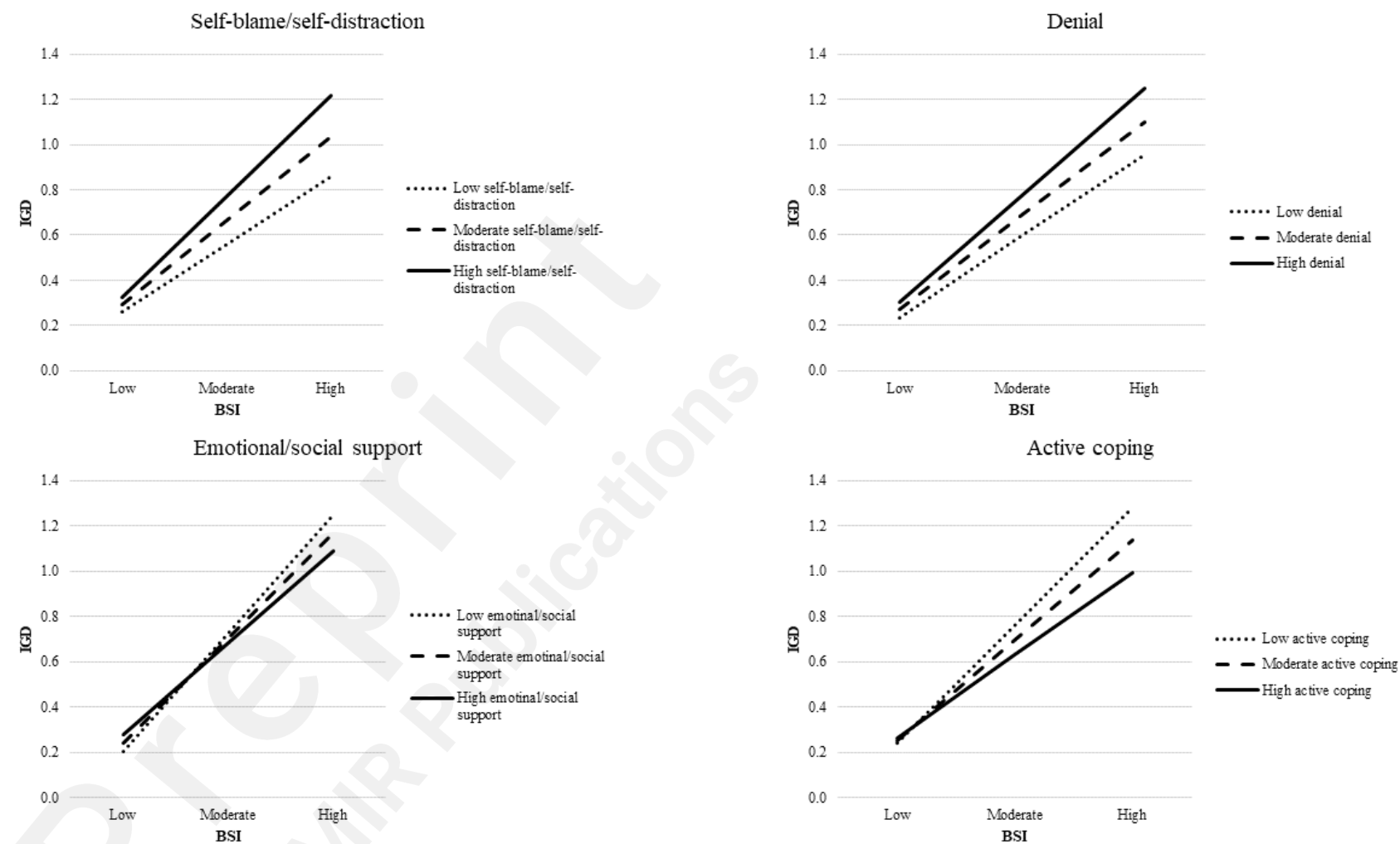
The moderation models

To investigate the moderating effect of coping strategies on the association between psychiatric symptoms and the symptoms of gaming disorder, eight moderation models were tested. The variable of psychiatric symptoms was entered as the independent variable, gaming disorder was the outcome variable, and coping strategies were the moderators. Gender and age were treated as control variables and were added to the models as covariates.

The main effect of psychiatric symptoms was moderate-to-large (ranging from .35 to .40) in all eight models. The interaction terms (i.e., the moderation effects) were significant for four out of eight coping strategies. However, these did not increase the explained variance of the models considerably (R^2 change ranged from .003 to .005 or 0.3 to 0.5% change in the variance) (see Table 3). More specifically, the moderator effects of self-blame/self-distraction (β = .07; *P* < .001) and denial (β = .05; *P* = .001) strategies on the association between psychiatric symptoms and the symptoms of gaming disorder were significant. When the level of psychiatric symptoms was low, the level of GD symptoms was also low irrespective of the levels of these coping styles. However, when the level of psychiatric symptoms was high, the level of GD symptoms varied based on the level of coping styles the players applied. Those who use self-blame/self-distraction and denial coping styles more, experience significantly more GD symptoms than those who use these coping styles less (see Figure 1). Moreover, the moderating effect of emotional/social support (β = -.05; *P* = .001) and active coping (β = -.06; *P* < .001) on the relationship between psychiatric symptoms and gaming disorder was also significant. More specifically, when the level of psychiatric symptoms was low, the level of GD symptoms was also low irrespective of the levels of these coping styles. However, when the level of psychiatric symptoms was high, the level of GD symptoms varied based on the level of coping styles the players applied. Those who use emotional/social support and active coping more, experience significantly less GD symptoms than those who use these coping styles more (see Figure 1). However, the moderating effect of coping strategies on the association between psychiatric symptoms and symptoms of gaming disorder was generally weak in all these models. Furthermore, the moderating effects of the other coping strategies, namely acceptance (β = .04; *P* = .022), substance use (β = -.04; *P* = .019), humor (β = -.02; *P* = .208) and religion (β = .00; *P* = .977) were not significant after Bonferroni correction was applied (see the 'Statistical analysis' section).

Table 3. Moderation analyses of eight coping styles on the association between psychiatric symptoms and symptoms of gaming disorder

		β	P	R^2	R^2 change due to the interaction	P
Model 1				**.179**	**.003**	**.031**
	BSI	.394	<.001			
	Emotional/social support	-.018	.251			
	BSI x Emotional/social support	-.052	.001			
Model 2				**.184**	**.005**	**.002**
	BSI	.377	<.001			
	Active coping	-.056	<.001			
	BSI x Active coping	-.071	<.001			
Model 3				**.185**	**.004**	**.004**
	BSI	.316	<.001			
	Self-blame/Self-distraction	.090	<.001			
	BSI x Self-blame/Self-distraction	.069	<.001			
Model 4				**.177**	**.000**	**.397**
	BSI	.400	<.001			
	Humor	.003	.823			
	BSI x Humor	-.019	.208			
Model 5				**.178**	**.001**	**.093**
	BSI	.399	<.001			
	Substance use	.030	.072			
	BSI x Substance use	-.039	.019			
Model 6				**.184**	**.003**	**.021**
	BSI	.353	<.001			
	Denial	.076	<.001			
	BSI x Denial	.053	.001			
Model 7				**.177**	**.000**	**.985**
	BSI	.399	<.001			
	Religion	.019	.228			
	BSI x Religion	.000	.977			
Model 8				**.179**	**.001**	**.111**
	BSI	.391	<.001			
	Acceptance	.047	.003			
	BSI x Acceptance	.036	.022			

Figure 1. Two-way interaction effect between coping strategies and psychiatric symptoms on gaming disorder

Notes: GD: gaming disorder; represents the scores of the Ten-Item Internet Gaming Disorder Test (IGDT-10);
BSI: represents the scores of Brief Symptom Inventory of psychiatric symptoms

Finally, the moderating role of player type (recreational vs. esport players) was investigated in the association between psychiatric symptoms and symptoms of gaming disorder. The main effect of psychiatric symptoms was also moderate-to-large (β = .39) in this model. Furthermore, although the interaction term was significant (β = .04; P = .016), the R^2 change due to the interaction was negligible (.001 or 0.1% change in the explained variance) and non-significant (see Table 4). Therefore, the results suggest that esports players with more severe psychiatric symptoms are not at a considerably higher risk of encountering symptoms of gaming disorder compared to recreational players.

Table 4. Moderation analyses of player style on the association between psychiatric symptoms and symptoms of gaming disorder

		β	P	R^2	R^2 change due to the interaction	P
Model				**.178**	**.001**	**.109**
	BSI	.394	<.001			
	Esport	.035	.027			
	BSI x Esport	.038	.016			

Discussion

The present study explored the moderation effect of a wide range of different coping strategies and player type (recreational vs. esport players) on the association between psychiatric symptoms and gaming disorder. It was assumed that individuals who frequently used putatively maladaptive or dysfunctional coping styles when encountering stressful situations in their lives would have a stronger psychiatric symptoms/GD bond than those who used putatively adaptive coping strategies in general. Additionally, it was assumed that esport players would not significantly differ from recreational players in their psychiatric symptoms/ GD association. According to the results regarding the coping strategies, the main effect of psychiatric symptoms was moderate-to-large in all models, which is in line with previous research findings [46-50]. The interaction terms (i.e., the moderation effects) were significant for four out of eight coping strategies (i.e., self-blame/self-distraction, denial, emotional/social support, and active coping). However, the explained variance of the models only increased negligibly (from 0.3 to 0.5%). The direction of the moderations was as expected (i.e., putatively maladaptive strategies were associated with more GD symptoms when the level of psychiatric symptoms was high, while putatively adaptive strategies were associated with less).

However, the negligible effect sizes of these moderations make the results more comparable to those reported by Brand, Laier [29]. They tested whether dysfunctional coping styles, namely denial, substance use, and disengagement, moderate the association between psychopathological aspects (i.e., depression and social anxiety) and general internet addiction (including online gaming) but found no considerable moderation effect. On the other hand, they found that dysfunctional coping styles mediated between psychopathological aspects and general internet addiction. According to their explanation, higher symptoms of depression and social anxiety can increase the risk of dysfunctional coping strategies, which is associated with higher internet addiction rates. Similarly, a lot of other studies have reported that specific coping styles (e.g., avoidance, media-focused coping) mediate between psychiatric symptoms or stress and GD. Given that specific coping styles (especially putatively maladaptive ones as aforementioned) are associated with psychiatric symptoms at moderate or moderate-to-strong levels, and with GD at weak or weak-to-moderate levels [e.g., 26, 27, 28] (and also in the present study; see Table 2), it was expected that they would have a

mediating effect. A mediating effect suggests that when experiencing high levels of psychiatric symptoms, individuals are prone to use specific putatively maladaptive coping styles more often. For instance, in a naturalistic study, a high level of depressive symptoms was associated with increased use of experiential avoidance on a daily basis [51].

Nevertheless, as raised in the 'Introduction', it is also plausible to think that individuals who frequently (i.e., habitually) use putatively maladaptive or dysfunctional coping styles when encountering stressful situations in their lives have stronger psychiatric symptoms/GD bond than those who use putatively adaptive coping strategies in general. However, it was also suggested that in concrete situations, numerous factors influence the coping/emotion regulation strategy selection applied by an individual [52]. This would explain why no considerable moderation effects were found even if coping strategies are dispositional or trait-like at certain degree. Overall, it can be claimed that additional studies are necessary to confirm these findings and longitudinal studies and experiments should be designed to explore the causal relations in the etiology of GD and to understand these crucial coping-related mechanisms better.

Finally, the assumption regarding the effect of player type (recreational vs. esport players) on the association between psychiatric symptoms and GD was met because the change in explained variance of the moderation model was negligible (0.1%). To date, there are still very few empirical studies that have investigated whether esport players are at higher risk of developing GD than recreational gamers. The studies that compared esport players and recreational players found significant differences in motivation [34, 53] but reported no significant differences in GD and GD-related mechanisms (e.g., the mediation effect of gaming motives between psychiatric symptoms and GD) (Bányai et al., 2019). This is also in line with findings here suggesting that increased time spent gaming is not associated with psychiatric problems, and in itself is not a good predictor of GD [54]. These results suggest that esport players are not necessarily at higher risk of developing GD than highly engaged recreational gamers. This is also plausible knowing how goal-oriented and structured esport training is [6]. Players have a tight daily schedule, including proper time for eating healthily, sleeping properly, and doing physical exercise. Moreover, they often train in teams, therefore cultivating social bonds while playing as well. Nevertheless, it is important to conduct more research in this field of esports and to investigate the risk of GD among esport players [33, 55].

The present study has several limitations that are worth noting when interpreting the findings. Although the sample of the present study was large, because of its self-selected nature, results should be generalized with caution. Furthermore, biases of self-report surveys (e.g., memory recall, social desirability) should also be considered when interpreting the results. The categorization of esport and recreational gamers was based on the number of self-reported gaming competitions engaged in (i.e., frequency of esport competitions). Future studies should use more standardized ways for such a categorization. Coping strategies were assessed generally and did not take into account how individuals cope with different types of stressors. However, it is worth noting that habitually used maladaptive emotion regulation strategies are associated with increased negative affect and atypical cortisol response to psychosocial stressors in laboratory studies [56]. This suggests that frequent use of these strategies in different situations may create a vulnerability to mental health problems. Finally, due to the cross-sectional design of the study, causal explanations could not be drawn. Longitudinal and experimental studies should be conducted to address this limitation.

Despite these limitations, the present study investigated important questions using a large sample of highly engaged videogame players and a subsample of esport players. Relationships between psychiatric symptoms and GD have been consistently confirmed. Therefore understanding factors that attenuate or aggravate this relationship helps planning

better intervention programs. Strategies individuals routinely use to cope with stress and to regulate their negative affect can be considered such factors. Understanding why a given individual uses specific affect regulation strategies in a given situation or across situations and the emotional or behavioral consequences of the ways of affect regulation [57] could be an essential component of personalized treatments targeting mental health problems including GD. Furthermore, in relation to prevention and intervention programs, experts should focus on both the coping strategies of the individuals and their style of videogame usage. Playing videogames can itself be viewed as a coping strategy. As a media-focused coping style, videogame playing could have similar outcomes as self-distraction and behavioral disengagement among some problematic gamers or players diagnosed with GD [22, 58, 59] when they play games to avoid aversive, stressful situations [60]. Gaming is a recreational activity, which primarily serves pleasure, relaxation and/or stress-relief purposes. However, gamers can also play to avoid discomfort and escape from their problems in real life. Taking this into account, future research should focus on the style of videogame playing, and how this activity is integrated into gamers' lives (e.g., recreation, esport or problematic gaming, or an escape option from reality). Individual coping styles and emotion regulation strategies also play a role in this, therefore should be considered in prevention and treatment processes.

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Conflict of interest

The authors declare that they do not have any interests that could constitute a real, potential or apparent conflict of interest with respect to their involvement in the publication. The authors also declare that they do not have any financial or other relations (e.g. directorship, consultancy or speaker fee) with companies, trade associations, unions or groups (including civic associations and public interest groups) that may gain or lose financially from the results or conclusions in the study. Sources of funding are acknowledged.

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Abbreviations
BSI – Brief Symptom Inventory
GD – Gaming Disorder
IGDT-10 – Ten-Item Internet Gaming Disorder Test

Supplementary Files

Figures