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ORIGINAL ARTICLE

Gaming Disorder in Individuals Experiencing Stress: Cognitive Attentional Syndrome and Metacognitions as Mediators

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Main Points

- Individuals with high levels of stress and negative metacognitions about online gaming were more likely to have gaming disorder.
- Cognitive attentional syndrome and metacognitions about online gaming mediated the relationship between perceived stress and gaming disorder.
- Perceived stress directly predicted negative metacognitions about online gaming.

Abstract

The present study examined the mediator roles of cognitive attentional syndrome and metacognitions about online gaming on the relationship between perceived stress and gaming disorder. A total of 1459 participants (M_{age} = 23.97; SD = 5.00, from 18 to 54) were recruited through social media and asked to fill out the Perceived Stress Scale, Cognitive Attentional Syndrome 1 Scale, Metacognitions about Online Gaming Scale, and Internet Gaming Disorder Scale—Short Form. Path analysis was carried out via AMOS 24 to test the proposed model. The findings revealed that there was a significant indirect effect of perceived stress on gaming disorder through negative metacognitions about online gaming, through cognitive attentional syndrome and positive metacognitions about online gaming, and through cognitive attentional syndrome and negative metacognitions about online gaming. In addition, results were discussed while taking into account the underlying mechanisms of metacognitive processes for addictive behaviors and limitations, suggestions for future studies, and clinical implications were considered. In conclusion, this study contributed to the literature with its findings that fit the theoretical model of The Self-Regulatory Executive Function concerning gaming disorder.

Keywords: Cognitive attentional syndrome, gaming disorder, metacognitions, perceived stress

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Introduction

The prevalence of individuals engaging in gaming has witnessed a noticeable increase in recent years, as supported by statistical data from Asia, Western Europe, and North America (Palma-Ruiz et al., 2022). Reflecting this trend in the scientific domain, gaming disorder (GD) has emerged as a focal point of research within behavioral addictions, acknowledged as an official diagnosis in the International Statistical Classification of Diseases and Related Health Problems (ICD-11; World Health Organization, 2019), due to its adverse consequences (Gupta et al., 2023). Additionally, it has been recognized as Internet Gaming Disorder in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-5*) (American Psychiatric Association, 2013). However, the diagnostic criteria are still under development for the forthcoming version to attain formal disorder status.

Empirical studies (e.g., Andreetta et al., 2020) and systematic reviews (e.g., Gao et al., 2022) argue

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stress as a risk factor for GD. Individuals experience stress if they perceive the demands of their environment as challenging or surpassing their adaptive capacity (Cohen et al., 2007). Moreover, it has been shown that acute stress occurs when faced with instant and time-limited stressors, while chronic stress happens when faced with continuing stressors (Ter Kuile et al., 2007). Research has highlighted that both chronic and acute stress may serve as risk factors for GD, with the negative affective stress responses of gamers intensifying in correlation with the severity of their gaming involvement (Kaess et al., 2017).

Intriguingly, GD exhibits a reciprocal relationship with perceived stress which is defined as the degree to which people find their lives stressful (Cohen et al., 1983). While individuals may initially turn to online games as a means of escaping the stress of daily life, problematic gaming can, in turn, contribute to an accumulation of stress over time (Snodgrass et al. 2014). A recent study also revealed that heightened levels of perceived stress and depression were observed in individuals with GD, attributing these outcomes to a propensity for managing stress through maladaptive coping mechanisms and excessive gaming, coupled with a decreased inclination to employ problem-focused coping strategies (Lin et al., 2021). Additionally, Koban et al. (2022) stated that perceived stress strengthened the association between participants' playing duration and negative gaming outcomes such as sleep deprivation, loss of relationships, or job opportunities. Canale et al. (2019) also found that higher perceived stress and lower psychological resilience to stress together were associated with higher problematic gaming behavior.

The concept of metacognition entails cognitive monitoring based on knowledge, experiences, and goals of personal strategies (Flavell, 1979). It could be a crucial aspect to explore when explaining why players believe that playing video games helps them relieve their stress even though it is not a long-term fix for their problems. Wells and Matthews (1996) were the first to apply metacognition to psychological problems and conceptualize them in a model they called "The Self-Regulatory Executive Function" (S-REF). That is, S-REF refers to the ability of a person to successfully control and regulate their thoughts and cognitive processes (Wells, 2009). In this model, self-knowledge evaluates any intrusion into consciousness, and an appropriate strategy (i.e., the specific methods used to manage cognitive functions, such as devising plans for task execution, overseeing comprehension, and assessing progress and performance) is applied. However, maladaptive cognitive strategies like worry, rumination, constant threat monitoring, thought suppression, and avoidance, collectively referred to as cognitive attentional syndrome (CAS), hinder an individual's capacity to regulate their thoughts and emotions effectively. Cognitive attentional syndrome represents inflexible and repeated styles of thinking. It is often expressed through extended verbal thought chains focused on hypothetical scenarios and the interpretation of experiences (Wells, 2009). Maladaptive cognitive processes in CAS contribute to the development of both positive (i.e., thinking about the advantages of using a certain regulation strategy, "Worrying will help me avoid problems") and negative (i.e., believing in the uncontrollable nature of that regulation strategy, "I cannot control my worry") metacognitions, and reciprocally, these metacognitions play a role in reinforcing and sustaining CAS (Wells, 2009; Wells, 2013). Therefore, when a person is in distress, choosing a coping strategy is based on the person's metacognitive beliefs about a particular strategy, and because the CAS system consists of maladaptive coping strategies, that certain problem is never resolved, creating a cycle (Spada et al., 2015).

Spada and colleagues (2015) adapted metacognition theory to addictive behaviors to explain precipitating and maintaining factors. For instance, Spada et al. (2007) suggested that the low level of metacognitive confidence and longing to predict problems through worrying could add to smoking dependence since smoking could decrease metacognitive uneasiness. For instance, problematic gambling is another behavior that is found to be related to metacognitions (Lindberg et al., 2011). Negative beliefs about uncontrollability and danger and beliefs on the need to control thoughts were found to predict gambling. They explained that negative thoughts and emotions such as thinking about and wanting to gamble, and decreased mood, could be experienced by problematic gamblers, as well as a notable decrease in self-control. They in turn may increase the psychological distress by ruminating, worrying, monitoring, or suppressing them and in the long run turning to gambling once again to gain some mental control. Furthermore, problematic internet use and negative emotions were found to be mediated with metacognitions in another study (Spada et al., 2008). They elaborated that positive beliefs about worry and cognitive confidence are regarded as metacognitive knowledge on the practicality of perseveration to cope with problems and the uselessness of recollection or judgment on problems. All of them together could show decreased trust to cope and lead to longing for prediction of problems through worry and rumination. People could then turn into problematic internet users; they could use the internet to gather information that could decrease metacognitive discomfort such as seeking ways to cope with a current problem or seeking proof for thoughts since they are incapable of trusting their abilities.

Regarding GD, Marino and Spada (2017) emphasized the differences between dysfunctional cognitions and dysfunctional metacognitions in online gaming. They argued that dysfunctional cognitions include beliefs about social benefits (e.g., as a foundation for a feeling of acceptance and recognition), beliefs about individual benefits (e.g., increasing one's sense of self-worth and feeling more secure online), beliefs about gaming rewards/expectancies (e.g., immersion expectancy), and beliefs about behavioral rules (e.g., believing that the game is more important than other aspects of real life). On the other hand, two types of maladaptive metacognitions concerning gaming are associated with mental control. Spada and Caselli (2017) developed the Metacognitions about Online Gaming Scale to examine specific metacognitions about gaming behavior. Positive metacognitions (e.g., "Online gaming will stop my worry") signify beliefs that online gaming assists in controlling negative thoughts and helps as a stress-management strategy and feel more in control, involving constant contemplation of gaming. However, negative metacognitions (e.g., "Once I start online gaming it is difficult to stop") encompass the lack of control over thoughts and behaviors associated with online gaming with a feeling that playing is automatic, and the player cannot stop playing (Spada & Caselli, 2017). Testing a stress-coping model of GD, Zhou and colleagues (2023) found that when individuals with high stress had metacognitions of cognitive confidence, positive beliefs about worry, and

negative beliefs about thoughts concerning uncontrollability and danger, and this led to escapism, which resulted in GD tendency. Moreover, they revealed that there was no direct association between stress and GD tendency, highlighting the importance of metacognitions about online gaming. In a three-wave longitudinal study, it was evidenced that the association between depression and GD tendency was mediated by negative metacognitions about online gaming (Dang et al., 2024).

Taken together, the overuse of gaming can be seen as a manifestation of the "cognitive attentional syndrome" (CAS). This refers to an ineffective self-regulation style that is applied rigidly or excessively, displacing more adaptive internal self-directed mental regulation processes (Zhou et al., 2023). In the present study, the main aim was to investigate the mediator roles of CAS and metacognitions about online gaming on the relationship between perceived stress and GD. Accordingly, we hypothesized that perceived stress would be associated with GD through CAS and both positive and negative metacognitions about online gaming.

Material and Methods

Participants

Data were collected with the approval of the Yeditepe University Human and Social Research Ethics Committee through social media platforms (Twitter, Instagram, and WhatsApp) between January 2022 and March 2022 (approval no: No#E.50532705-302.14.01-1113; date: 13.01.2022). Gaming communities were targeted for the announcement of the study. Participants voluntarily filled out forms and scales using an online platform, namely, Qualtrics. Participants who approved the informed consent form were then presented with the demographic information form and the rest of the questionnaires (Internet Gaming Disorder Scale—Short Form, Metacognitions about Online Gaming Scale, Perceived Stress Scale, Cognitive Attentional Syndrome 1 Scale), which were randomized. Written informed consent was obtained from the participants who agreed to take part in the study. The demographic information form consisted of two parts: general characteristics and game-related characteristics. Simple randomization was used for the rest of the questionnaire, which means participants filled out questionnaires out in different sequences. After the completion, which took approximately 15 – 20 minutes, they were introduced to a debriefing form that included information about the study and contact information for psychological help.

In this study, there were initially 2527 participants; but 1045 of the participants did not fill out the survey completely and were removed. The inclusion criteria were to be above 18 years of age and they needed to play video games at least one time a week. Therefore, 16 participants were removed because they were under 18. Seven participants who have been playing video games for 0 to 1 year were also removed from the data since DSM-5 proposes that symptoms should persist for 12-month periods to be considered problematic (APA, 2013). Totally, 1459 participants remained. Participants' mean age was 23.97 (SD = 5.00) and their ages ranged from 18 to 54 years old. Among the participants, 1263 were male (86.2%), 186 were female (12.7%), and 17 identified themselves as "other" (1.2%).

Frequency and descriptive analyses were run for participants' characteristics. Participants were also asked to provide recent stress factors if there were any. Of the participants, 1257 gave answers, and 595 of the answers (47.33%) were in some way or other related to economy-related stress factors (i.e., economy, finance, money, dollar, euro, lira, inflation, debt, insufficient livelihood, inoccupation, costliness, rent, purchasing power, minimum wage, exchange rate). Detailed information about demographics can be seen in Tables 1 and 2.

Table 1.
General Demographic Characteristics of the Participants

Variables	Frequency	Percentage (%)
Gender		
Men	1260	86.4
Women	182	12.5
Other	17	1.2
Education Level		
Literate	1	.1
Elementary school graduate	2	.1
Middle school graduate	7	.5
High school graduate	131	9
University student	697	47.8
University graduate	454	31.1
Postgraduate student	65	4.5
Postgraduate	66	4.5
Other	36	2.5
Grade, if university student		
First grade	106	7.3
Second grade	128	8.8
Third grade	101	6.9
Fourth grade	115	7.8
Fifth grade	11	.8
Sixth grade	5	.3
Other	1	.1
Employment status		
Full-time working	448	30.7
Part-time working	126	8.6
Non-working	885	60.7

We also evaluated the prevalence of possible GD in our participants. Pontes and Griffiths (2015) proposed in their scale (Internet Gaming Disorder Scale-SF) that a score of 36 out of 45 (answering all nine items at least "often") is disordered gaming. However, they also proposed using this criterion for research purposes only, and further evaluations should occur to diagnose someone with GD. We evaluated our data both according to the writers' proposed criteria and the monothetic model which requires all criteria must be met. In our case, this means answering all items at least as "sometimes" (Baysak et al., 2016). In this current study, we found that 3.1% of the participants scored 36 and higher on the Internet Gaming Disorder Scale—Short Form and showed disordered gaming. According to the monothetic method, 18.4% of the participants were found to be disordered gamers.

Instruments

Demographic Information Form

A demographic information form was used to collect the participants' sociodemographic characteristics, which included age, gender, education level, grade, Grade Points Average (GPA),

Table 2.
Gaming-Related Characteristics of Participants

Variables	Frequency	Percentage (%)
Playing video games since		
1 – 3 years	31	2.1
3 – 5 years	69	4.7
5 – 10 years	231	15.8
10+ years	1128	76.9
Preferred gaming type		
Online games	68	4.6
Offline games	210	14.4
Both	1181	80.9
Gamer type		
Professional e-sports player	6	.4
Amateur e-sport player	22	1.5
Hobby player	1431	98.1
Amount of gaming day per week		
1 day	33	2.3
2 days	104	7.1
3 days	159	10.9
4 days	231	15.8
5 days	253	17.3
6 days	126	8.6
7 days	555	38

employment status, gaming longevity in terms of hours in a day, and gaming frequency in terms of days per week.

Perceived Stress Scale

Perceived Stress Scale was developed by Cohen et al. (1983) and was adapted into Turkish by Eskin et al. (2013). The scale was designed to measure the degree to which a person experiences certain stressful situations (Cohen et al., 1983). The scale has 14 items and is scored on a 5-point Likert type (0: Never; 1: Almost never; 2: Sometimes; 3: Quite often; 4: Very often). Participants can score between 0 and 56 and higher scores show higher perceived stress. No sub-dimension was specified in the original version; however, there are two sub-dimensions in the Turkish adaptation: Insufficient self-efficacy perception (i.e., feeling like not being able to cope with everyday situations) and stress/discomfort perception (i.e., feeling stressed and angry). The Cronbach's alpha values of the original scale from the three sample groups vary between .84 and .86. For the Turkish version, the internal consistencies were .81 and .76 for the sub-dimensions, respectively, and it was .84 for the total scale. In the present study, the total score was used to assess participants' stress levels, and its Cronbach's alpha was .88.

Cognitive Attentional Syndrome 1 Scale

The Cognitive Attentional Syndrome 1 (CAS-1) scale was formed by Wells (2009) and the scale was adapted into Turkish by Gündüz et al. (2019). The scale measuring the activation of CAS and the usage of certain coping strategies has 16 items (Wells, 2009). While the first eight items are scored on a 9-point Likert model (0 = Never, 4 = Half of the time, 8 = The whole time), the last eight items are scored on a 10-point Likert model (0 = I do notcompletely believe, 100 = I completely believe that this is correct). A higher score means a higher level of activation on the CAS system. The Cronbach's alpha was .86 for the original scale (Fergus, Bardeen & Orcutt, 2012) and .77 for the Turkish adaptation (Gündüz et al., 2019). In the present study, Cronbach's alpha was found as .76.

Metacognitions About Online Gaming Scale

Metacognitions about Online Gaming Scale was created by Spada and Caselli (2017) and the psychometric study in Turkish was conducted by Nazlıgül and Süsen (2021). The scale has 12 items, and it is scored on a 4-point Likert type (1: I do not agree; 2: I agree very little; 3: I somewhat agree; 4: I completely agree). While the original scale has three sub-dimensions (positive metacognitions about online gaming, negative metacognitions about the uncontrollability of online gaming, and metacognitions about the dangers of online gaming), the Turkish version has only two sub-dimensions: Positive metacognitions about online gaming (first six items) and negative metacognitions about online gaming (last six items). The higher scores show higher levels of metacognition. Cronbach's alpha levels were acceptable for both the original study (.84, .86, and .79, respectively) and the Turkish adaptation (.88 and .86, respectively). In the present study, the internal consistency of the positive metacognitions subscale was .92 and the negative metacognitions subscale was .82.

Internet Gaming Disorder Scale—Short Form

Internet Gaming Disorder Scale—Short Form was developed by Pontes and Griffiths (2015) and translated into Turkish by Arıcak et al. (2018). It included items regarding proposed diagnostic criteria for gaming addiction in DSM-5 to screen gaming addiction (Pontes & Griffiths, 2015). The scale has nine items and is scored in a 5-point Likert type (1: Never; 2: Rarely; 3: Sometimes; 4: Often; 5: Very often) with a single dimension. Participants can score between 9 and 45. Additionally, a score of 36 out of 45 shows an increased risk of addiction, and higher scores show higher degrees of GD (Aricak et al. 2018; Pontes & Griffiths, 2015). Cronbach's alpha values for the original scale, Turkish adaptation, and the present study were .87, .82, and .80, respectively.

Data Analysis

The data analysis for descriptive statistics, correlations among study variables, and multicollinearity tests was carried out via IBM SPSS Statistics for Windows, version 23.0 (IBM SPSS Corp.; Armonk, NY, USA). In addition, factor structures of the instruments and main hypothesis testing were analyzed using AMOS 24.

Results

Correlations

Spearman correlation analysis was carried out among study variables. The findings revealed that there was a significant correlation between GD and other study variables. All correlations among study variables and descriptive statistics are summarized in Table 3.

Testing Multicollinearity and Factor Structures of the Instruments

Before path analysis, the inner variance inflation factors (VIFs) and tolerance values were calculated to test multicollinearity (see Table 4). To identify the multicollinearity, predetermined cutoff VIFs (Kock, 2015) and tolerance values (Cohen et al., 2013)

Table 3.
Spearman Correlation Matrix and Descriptives for Study Variables

Variables	1	2	3	4	5
1. IGDS9-SF	-				
2. PSS	.300**				
3. CAS-1	.280**	.170**			
4. MOGS-PM	.261**	.084**	.522**		
5. MOGS-NM	.540**	.216**	.163**	.166**	
Mean	20.72	31.52	860.59	14.50	9.80
SD	6.58	9.31	217.06	5.34	3.82
Min – Max	9 – 44	3 – 55	0 – 1475	6 – 24	6 – 24

Note: CAS = Cognitive Attentional Syndrome 1 Scale; IGDS9-SF = Internet Gaming Disorder Scale—Short Form; MOGS-NM = Metacognitions about Online Gaming Scale-Negative Metacognitions; MOGS-PM = Metacognitions about Online Gaming Scale-Positive Metacognition; PSS = Perceived Stress Scale.
*$p < .05$.
**$p < .01$ (two-tailed).

Table 4.
Inner Variance Inflation Factor Values

	1	2	3	4	5
1. PS	–	1.120	1.451	1.452	1.421
2. CAS	1.103	–	1.412	1.435	1.420
3. PMOG	1.082	1.069	–	1.087	1.050
4. NMOG	1.452	1.457	1.457	–	1.076
5. IGD	1.584	1.607	1.569	1.200	–

Note: CAS = Cognitive attentional syndrome; IGD, Internet Gaming Disorder; NMOGS = Negative Metacognitions About Online Gaming; PMOGS = Positive Metacognitions About Online Gaming; PSS = Perceived Stress Scale.

were considered. Since the inner VIF values were lower than 3.3 and tolerance values were higher than 0.10 (between 0.622 and 0.952), it was concluded that there was no multicollinearity among variables.

A series of confirmatory factor analyses (CFAs) was performed to validate the study instruments for the present sample and CFA findings were interpreted using specific fit indices. Based on the literature, the chi-square/*df*-ratio is expected to be less than five (Wheaton et al., 1977) and a value of root mean square error of approximation (RMSEA) to be less than 0.06 (Hu & Bentler, 1999) to demonstrate the fit of present data to the population. Moreover, the goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), Bentler comparative fit index (CFI), and Tucker – Lewis index (TLI) values which are above 0.95 indicate the perfect fit (Kline, 2005). Considering these criteria, all CFA fit statistics for our sample showed a perfect fit to the data (see Table 5).

Path Analysis

To examine the multiple mediation model suggested in the present study, path analysis using the maximum likelihood technique was carried out using IBM AMOS 24.0 (Arbuckle, 2009). Because positive metacognitions and negative metacognitions about online gaming were correlated with one another, their error terms were covaried. Following corrections based on modification indices, our model showing the mediator roles of CAS and metacognitions about online gaming (i.e., both positive and negative metacognitions) on the relationship between perceived stress and GD had an acceptable fit to data ($\chi^2(13) = 37.046$, $\chi^2/df = 18.523$, $p < .001$, RMSEA = .110, GFI = .990, AGFI = .990, CFI = .973, TLI = .867), explaining 37% of the variance in GD ($R^2 = .369$). Standardized regression estimates among the study variables are demonstrated in Figure 2.

First, our results revealed that perceived stress was positively associated with CAS ($\beta = .526$, $p < .001$, CI (.494, .558)). In addition, it was found that perceived stress directly and positively predicted negative metacognitions about online gaming ($\beta = .189$, $p < .001$, CI(.143, .243)). Moreover, CAS was positively associated with positive metacognitions about online gaming ($\beta = .176$, $p < .001$, CI (.131, .218)), negative metacognitions about online gaming ($\beta = .072$, $p < .05$, CI (.018, .123)), and GD ($\beta = .173$, $p < .001$, CI (.138, .208)). Furthermore, both positive metacognitions about online gaming ($\beta = .146$, $p < .001$, CI (.107, .181)) and negative metacognitions about online gaming ($\beta = .506$, $p < .001$, CI (.469, .539)) had significant positive direct effects on GD.

The current study used a bias-corrected bootstrapping method with 5000 resamples and a 95% confidence (MacKinnon et al., 2004) range to evaluate the indirect effects of the study variables on GD. Each indirect effect was computed using the AMOS 24.0 estimand and plugin (Gaskin & Lim, 2018). We hypothesized that the relationship between perceived stress and GD would be significantly mediated by CAS and metacognitions about online gaming (i.e., both positive and negative metacognitions). Our hypothesis was confirmed (see Figure 1). The significant indirect effect of perceived stress on GD was observed through negative

Table 5.
Summary of the Model Fit Indices for the Study Instruments

Instruments	χ^2/df	*p*	RMSEA	GFI	CFI	TLI	AGFI
PSS	4.382	<.001	.048	.983	.983	.963	.957
CAS-1	3.514	<.001	.042	.980	.967	.942	.960
MOGS	5.282	<.001	.054	.978	.982	.969	.956
IGDS9-SF	1.514	.118	.019	.997	.998	.993	.990

Note: CAS = Cognitive Attentional Syndrome 1 Scale; IGDS9-SF = Internet Gaming Disorder Scale—Short Form; MOGS = Metacognitions about Online Gaming Scale; PSS = Perceived Stress Scale.

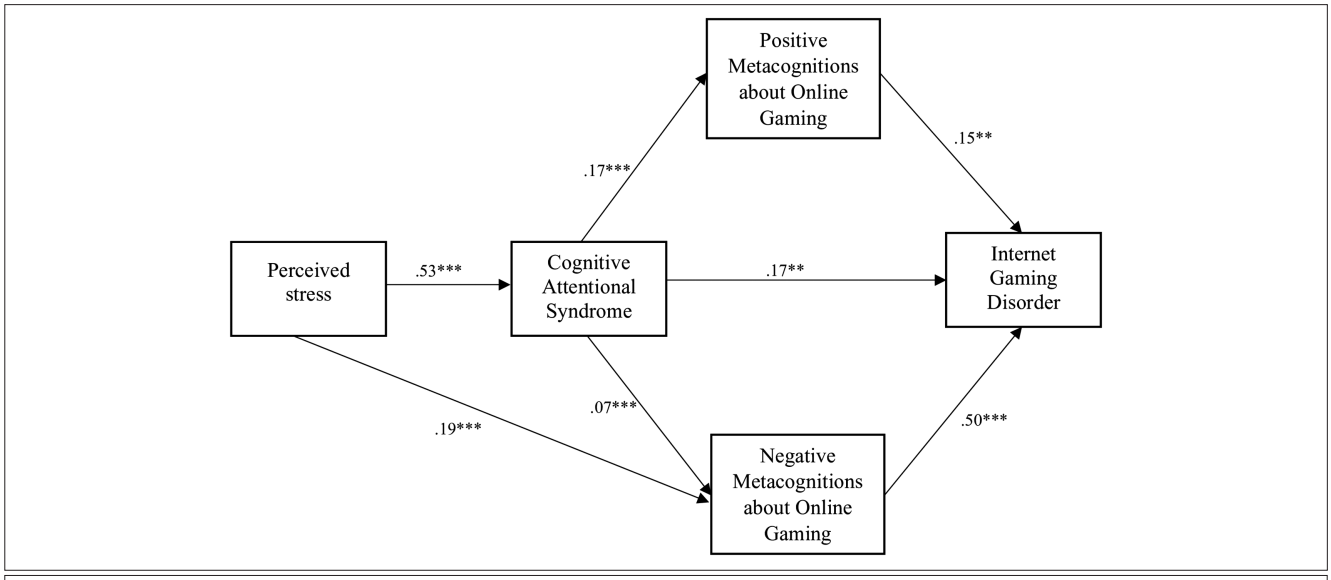

Figure 1. Standardized parameter estimates among study variables for the proposed model.

metacognitions about online gaming (β = .096, p < .001, CI (.050, .090)), through CAS and positive metacognitions about online gaming (β = .093, p < .001, CI (.006, .013)), and through CAS and negative metacognitions about online gaming (β = .038, p < .001, CI (.004, .024)).

Discussion

This study aimed to investigate if CAS and metacognitions about online gaming mediated the relationship between perceived stress and GD. Our findings pointed out some significant direct and indirect links among study variables. Concerning direct relationships, our results showed that perceived stress positively predicted CAS. This result was not surprising because the activation of the CAS system begins with distress since its purpose is to deal with negative emotions, beliefs, and thoughts (Wells, 2013). Therefore, when people perceive their stress level as high, they might seek ways to cope, which alarms the CAS system (Spada et al., 2015). Moreover, the findings of the present study revealed that gamers with high levels of stress had increased levels of negative metacognitions about online gaming, in line with the existing studies examining the positive link between stress and metacognitions (Spada et al., 2008). In their longitudinal study, Ramos-Cejudo and Salguero (2017) stated that participants with higher levels of perceived stress experienced low levels of anxiety if they had low negative metacognitive beliefs. Similarly, an experimental study conducted by Reyes and colleagues (2015) showed that individuals experiencing stress had impaired metacognitive accuracy.

We also found that CAS predicted positive metacognitions about online gaming, negative metacognitions about online gaming, and GD. Wells (2013) explained that there are positive and negative metacognitions about CAS strategies. When a distressed person chooses a maladaptive CAS strategy, it might lead them to develop certain metacognitions about the usefulness and uncontrollability/danger of that coping strategy. Therefore, it is understandable that people who tend to choose maladaptive coping strategies might choose gaming to cope and have certain metacognitions about that strategy afterward, which include beliefs that gaming could solve their problems and it is hard to stop gaming. In addition, both positive metacognitions about online gaming and negative metacognitions about online gaming predicted GD. It supported the idea that positive and negative metacognitions regarding a particular behavior carry a judgment about the usefulness or danger of that behavior and that these beliefs are ultimately effective in choosing that behavior to cope with a particular situation (Spada et al., 2015).

With respect to the indirect association between perceived stress and GD, it was mediated through only negative metacognitions about online gaming, through CAS and positive metacognitions about online gaming, and through CAS and negative metacognitions about online gaming. Since CAS coping strategies and their evaluations through metacognitions are involved in the beginning and continuation of psychological problems (Wells, 2013), tendency to choose gaming as a coping mechanism and maladaptive evaluation of the strategy with positive and negative metacognitions might lead them to choose gaming over and over without solving their problems, leading them to have GD. In their systematic review, Hamonniere and Varescon's (2018) similarly explained the concept that metacognitions contribute to addictive behaviors because they impact addictive behavior's initiation (through positive metacognition) and continuation (through negative metacognitions). The relationship between the tendency to use maladaptive coping strategies and GD was also reported in the literature (Lin et al., 2021). Additionally, our results both confirmed the findings of Zhou et al.'s (2023) study showing the mediator roles of positive and negative metacognitions about online gaming on the relationship between stress and GD. Furthermore, this study also added the importance of CAS as a preceding factor for metacognitions and highlighted the place in the S-REF model to understand the mechanisms of GD.

In terms of clinical implications, metacognitive therapy, which challenges metacognitions and maladaptive coping mechanisms and helps patients notice problematic reactions to their beliefs and thoughts and develop methods to challenge maladaptive coping strategies (Wells, 2013), might be useful as an intervention

method. Moreover, cognitive behavioral therapy could also be considered as treatment since its focus is on the reduction of symptoms and improvement of functionality through challenging dysfunctional cognitions and behaviors (Hoffman et al., 2012). Evidence supported its effectiveness as a treatment for perceived stress (Shahrokhian et al., 2021) avoidance coping (Hamdan-Mansour et al., 2009), and GD (Hofstedt et al., 2023; Stevens et al., 2019).

The present study is not without limitations. Participants mostly consisted of men (1260 men, 182 women), which could affect the generalizability of the study since the women population among gamers is increasing (Lopez-Fernandez et al., 2019). Further research should aim to gather more data from female participants to make the study more generalizable. A considerable number of participants reported economy as a common stress factor. Since perceived stress is one of the variables, this collective stress factor might have implications for levels of perceived stress. Additionally, data were gathered during the end tail of the coronavirus disease 2019 pandemic, and studies show that gaming has increased during this period (King et al., 2020), which can affect our data. Additionally, future studies could replicate the current study in other cultures with more ethnically diverse participants since the participants of the current study are only Turkish gamers. Last, participants were not categorized as clinically diagnosed with game addiction or not in our study. Future research could specifically focus on this specific group and examine group differences. To conclude, this study showed the significance of gamers' metacognitive components in influencing their gaming behavior, particularly when they are under stress. To our knowledge, this is a novel study that examines all these variables together.

Ethics Committee Approval: This study was approved by Ethics Committee of Yeditepe University (approval no: No#E.50532705-302.14.01-1113; date: 13.01.2022).

Informed Consent: Written informed consent was obtained from the participants who agreed to take part in the study.

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