Delay discounting and gaming severity in a non-clinical sample of gamers: the mediational role of emotional dysregulation

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Abstract

Internet Gaming Disorder (IGD) disproportionally affects young populations and has serious psychosocial consequences. Unfortunately, the identification of specific variables that account for IGD has been poorly addressed. This is the first study that assessed the relationship between Emotional Dysregulation (ED), sex, and impulsivity (Delay Discounting, DD) on IGD severity in young adult gamers. It also tested ED as a mediator of DD and IGD differentially by sex. 1,181 young adult gamers aged 18–25 (55.8% male) completed the Internet Gaming Disorder Scale (IGDS-9), the Difficulties in Emotion Regulation Scale (DERS-28) and the 21-item Monetary Choice Task. Three-step hierarchical linear regressions were performed to examine the unique contribution of ED, sex, and DD on gaming severity. Mediational models tested the indirect effect of DD on gaming severity through ED differently by sex. ED (DERS-28 total scale and subscales) and male sex were significantly associated with gaming severity (all *p* values <.001), while DD rates were not. ED significantly mediated the DD and IGD association only among males (all Confidence Intervals exclude 0). Although causality cannot be inferred due to the study's cross-sectional design, ED seems an important target of gaming prevention, particularly for males. Transdiagnostic approaches targeting emotional regulation may be effective for preventing emotion-drive impulsiveness that increases risk of gaming.

Keywords: Emotion Dysregulation; Gaming; Delay Discounting; Sex; Young Adults.

Public significance statement

The identification of specific variables accounting for the delay discounting-gaming dyad has been poorly addressed. One of such variables is emotional dysregulation. We found that the delay discounting-gaming association is only present in male gamers. Such association is dependent on emotional dysregulation as a mediator. This research might be

useful to both researchers and practitioners, for the development of preventive and treatment protocols for gaming disorder focused under a gender perspective.

1. Introduction

Internet gaming (both online and offline) has unequivocal benefits, as it improves visuospatial, motor and social skills (Milani et al., 2019; Ren & Wu, 2019; Sundberg, 2018), along with an increasing sense of community and well-being (Nguyen et al., 2022). Nonetheless, among those who are overexposed, gaming behavior can lead to worsened mental health, significant decreases in perceived life satisfaction and peer support (Lan et al., 2022; Musetti et al., 2019; Park et al., 2024; Van Der Neut et al., 2023), as well as in academic (Van Den Eijnden et al., 2018) or in-person social networking domains (Prochnow et al., 2023), while increasing the risk for Internet Gaming Disorder (IGD). In accordance with the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013), IGD is characterized by the persistent and recurrent use of the internet to engage in games, often with other players, leading to clinically significant impairment or distress. IGD comprises nine diagnostic criteria, for example, spending an increasing amount of time playing so as to sustain the same levels of satisfaction (tolerance) and gaming to get away from or alleviate unpleasant emotions (escape). While the DSM-5 classifies it as a tentative disorder awaiting for further research, the latest version of the International Classification of Diseases (ICD-11; World Health Organization, 2018) officially considers IGD, both online and offline, as a non-substance addictive behavior.

A meta-analysis of pooled IGD estimates informed of prevalence rates ranging from 8.8% to 10.4% among adolescents and young adults, respectively (Gao et al., 2022). Males from this age range have 2-3 times greater risk of IGD than females (Bonnaire & Baptista, 2019; Fumero et al., 2020). IGD prevalence rates are especially high in Spanish adolescents and young adults, as confirmed by an international meta-analysis including 33 countries (Gao et al., 2022). Specifically, Spanish IGD prevalence has shown to range between 3.1% (Nogueira-López et al., 2023) and 8.3% (Buiza-Aguado et al., 2018).

Despite the general use of the impulsivity term being a topic of current scientific debate (see Strickland & Johnson, 2021), this construct is considered as one relevant risk factor for IGD, as it is involved in its initiation, development and relapse (Gentile et al., 2011; Mihara & Higuchi, 2017; Mun, 2023; Şalvarlı & Griffiths, 2022; Zhuang et al., 2023). Regardless of the lack of consensus in its definition, impulsivity is commonly conceptualized as multidimensional, including impulsive personality traits, impulsive motor response and impaired decision making (MacKillop et al., 2016). Given it is a multifaceted construct, a variety of measures exists to assess subcomponents of impulsivity in human subjects (Paasche et al., 2019). Delay discounting (DD) (de Wit, 2009; Mitchell & Potenza, 2014; Weafer et al., 2014) is a well-defined and empirically supported behavioral economic measure of preference for smaller immediate rewards over larger delayed rewards (Bickel et al., 2012), and is commonly used to assess impulsive choice or impaired decision making (MacKillop et al., 2016).

Several addiction models, such as the Interaction of Person–Affect–Cognition–Execution (I-PACE) model (Brand et al., 2016, 2019) and the cognitive behavioral model of IGD (Dong & Potenza, 2014), assume that impaired decision making is a core mechanism involved in IGD, meaning immediate gratification by gaming is overvalued at the cost of long-term health, social and educational benefits. Nowadays, DD is established as a solid transdiagnostic risk factor for addictive behaviors and other mental health disorders (Amlung et al., 2019; Bickel et al., 2014), as it identifies individuals either at risk or with addictive behaviors, correlates with all stages of addiction development and modifies with effective treatment (Bickel et al., 2014).

To date, only few studies have explored the association between DD and IGD (online and/or offline) in young adults (Buono et al., 2017; Irvine et al., 2013; Wang et al., 2017). These studies showed IGD populations have higher DD rates when compared to matched

control groups, thus supporting the notion that DD is a defining feature of addictive behavior which extends to other non-substance related addictive behaviors, such as gambling (Mena-Moreno et al., 2022) or binge eating (Carr et al., 2021). As DD rates have shown to predict the onset of addictive behaviors (Kim-Spoon et al., 2015), they may be used as a behavioral marker of impulsive decision making for those adolescent and young adults that may be at risk of developing IGD, who may require interventions for lowering DD (Scholten et al., 2019). However, the small sample sizes of the studies that explored the DD and IGD association (Buono et al., 2017; Wang et al., 2017), and their sex-biased composition [i.e., mainly males; (Buono et al., 2017; Wang et al., 2017)] or the use of instruments not originally designed for assessing IGD (Irvine et al., 2013) limit the generalizability of such findings.

One important gap of existing research is the identification of specific variables accounting for the DD and gaming dyad. One potential candidate is emotional dysregulation (ED), that refers to difficulty in identifying one's own emotions, regulating emotional responses and/or implementing appropriate strategies (Gross & Muñoz, 1995; McRae & Gross, 2020). Despite increasing evidence existing on the positive association between ED and IGD (Amendola et al., 2019; Estévez et al., 2014, 2017; Estupiñá et al., 2024; Kökönyei et al., 2019; Lin et al., 2023; Müller & Bonnaire, 2021; Uçur & Dönmez, 2021), it remains unknown whether ED may account the relationship between DD and IGD severity. We are only aware of one study that examined the mediating role of ED between impulsivity and gaming severity, showing that children and adolescents' lower levels of self-regulation in distressing situations mediated the association between higher impulsivity and gaming severity (Liau et al., 2015). Nevertheless, the use of assessment tools that do not specifically assess IGD and the use of the Barratt Impulsiveness Scale, instead of a measure of DD that

overcomes social desirability or participants' limited insight to rate personality constructs (Martínez-Loredo et al., 2017).

Sex has been previously tested as a moderator on the relationship between distress, self-reported impulsivity and IGD in an nation-wide online gaming sample, showing that impulsivity mediated the association between distress and IGD, but only in males (Su et al., 2019). Nevertheless, findings from Liau et al.(2015) did not account for the potential effect of sex on the interaction between impulsivity, ED and IGD. Moreover, given that previous research has shown that ED dimensions associated with IGD differed by sex in adolescent and young gamers (Müller & Bonnaire, 2021), it seems crucial to consider sex when addressing the interplay between impulsivity, ED and IGD. This would provide a more comprehensive picture of the IGD phenomenon and contribute to tailoring its prevention and treatment.

Given the adverse consequences of IGD, delving into the intricate relationships between the individual variables that may account for its etiology seems crucial. Thus, the aims of this study were to assess the role of ED as a mediator of DD and IGD and to examine sex-dependent differences in a sample of young adults.

2. Method

2.1. Participants and procedure

Below, we report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study**.** Participants were 1,181 undergraduate young gamers aged 18–25 (55.8% male) recruited from three communities in Spain (*blinded*) during September-November 2021. All the students completed a web-based assessment battery (i.e., https://metajovenes.es/) that lasted 45 minutes approximately. The assessments were conducted both online and in-person. Recruitment was performed in university colleges and

vocational schools. Specifically, professors were contacted to request their cooperation by conducting assessments in the classroom during teaching hours using tablets (Lenovo® Tab M7). Participants were also invited to participate in the study through posters, flyers, and media advertisements. After completing the evaluation, each participant entered a raffle for an electronic voucher worth €100 that could be spent in an e-commerce platform for online shopping. This raffle was held independently at each university.

Inclusion criteria for this study were: 1) being between 18 and 25 years old; 2) being a student at college/university or a vocational center; 3) willingness to participate in subsequent assessments; and 4) reporting past-year gaming (online and/or offline). Of the 2,980 individuals that completed the evaluation battery, 1,799 were excluded due to the following reasons: (1) they were aged over 25 (n = 121), (2) they failed attentional control checks (n = 22) (see subsection 2.2), (3) they were duplicated cases (n = 75), (4) they had not gamed within the previous year (n = 1,576) and (5) they showed overall consistency rates below 75% (Kaplan et al., 2016) in the 21-item Monetary Choice Task (Kirby & Marakovic, 1996; n = 5; see the measures subsection for further details). This resulted in a sample of 1,181 gamers (see Table 1 for participants' descriptive characteristics).

Please insert Table 1 here

All participants provided written informed consent prior to participating in the study, and the local Research Ethics Committee of the (*blinded*) approved the study protocol (no. 191CER21).

2.2. Measures

2.2.1. Sociodemographic characteristics

Participants provided information on sex at birth (male, female), date of birth, course year, money available for weekly personal expenses, and employment status (i.e., no employment, part/full-time).

2.2.2. Gaming behavior

Past-year (yes/no) gaming behavior was assessed in the previous 12 months. Information on the types of videogames played within the last year (adventure-action, role playing, massively multiplayer online role-playing, multiplayer online battle arena, shooting-fighting, sports simulation, platformer, graphic adventure, strategy, races, life simulation, mobile-tablet) was collected as well. Students responded to the Internet Gaming Disorder Scale (IGDS-9; (Beranuy et al., 2020). This questionnaire covers several gaming related problems over the previous 12 months, including: worrying about gaming, irritability, lack of control, loss of meaningful life interests, deceit, coping with negative affect, worsening of interpersonal relationships due to gaming. It comprises 9 items in a 5-point Likert-scale (1 = never, 2 = rarely, 3 = occasionally, 4 = often, 5 = very often). A confirmatory factor analysis yielded a one-dimensional model, meaning a total score ranging from 9 to 45 can be calculated. Higher scores indicate higher IGD symptom severity. According to the IGDS-9 scoring, participants obtaining a score of 4 or 5 in three or fewer items are considered non-disordered gamers, those with a score of 4 or 5 in four items, are deemed at-risk disordered gamers, and those with a score of 4 or 5 in more than five items are considered disordered gamers. Reliability from both the Spanish validation (α = .88; Beranuy et al., 2020) and the current sample (α = .87) was excellent.

2.2.3. Emotion Dysregulation (ED)

ED was assessed using the Difficulties in Emotion Regulation Scale-28 (DERS-28;Gratz & Roemer, 2004). The Spanish DERS-28 (González-Roz, Postigo, et al., 2024;

Hervás & Jódar, 2008) consists of 28 items and has five subscales: non-acceptance of emotional responses (tendency to experience negative emotions in response to one's own emotional reactions; 6 items); Interference (difficulties in concentrating and accomplishing tasks when experiencing negative emotions; 5 items); Lack of emotional control (feeling of both overflow due to emotional intensity and persistence of negative emotional states; 6 items); Inattention (inability to attend to and acknowledge emotions; 6 items); and Confusion (difficulties in knowing and being clear about the emotions that are being experienced; 5 items). Participants responded on a Likert scale from 1 (almost never) to 5 (almost always). Higher scores reflect greater ED. The DERS-28 has demonstrated adequate reliability in Spanish adults in the community (α =.93) and validity in relation to other related variables such as emotional intelligence, depression, and anxiety (Hervás & Jódar, 2008). Reliability in the current sample was α = .90.

2.2.4. Delay discounting

The 21-item Monetary Choice Task (MCT: (González-Roz, Martínez-Loredo, et al., 2024; Kirby & Marakovic, 1996; Strickland et al., 2023) was used in the current study. Participants completed the MCT as part of the computerized battery and were requested to choose between a fixed set of 21 binary choice presentations (i.e., a smaller monetary amount available immediately or a relatively larger delayed one). Delays ranged between 10 and 75 days, immediate monetary amounts ranged between €15-€83, and delayed monetary amounts ranged between €30-€86. The Spanish validation of the MCT conducted in young adults yielded excellent reliability (α = .94; (González-Roz, Martínez-Loredo, et al., 2024), yielding the same figure in the current sample.

2.2.5. Attentional control

To control for lack of effort and dishonest responses, the survey included four questions that were randomly presented within the battery assessment (e.g., "for this item, please choose half of the time"). To be eligible, participants were required to answer 2/4 of the items correctly.

2.3. Data analyses

The MCT offers an overall discounting rate (*k* overall). The distribution of *k* values in the MCT were log-transformed - log(*k*) -, which normalized the distributions so as to avoid skewness and kurtosis. Higher log(*k*) values are indicative of greater DD (i.e., greater impulsivity).

Preliminary descriptive statistics (chi-squared and independent-samples *t* tests after Levene's test for equality of variances) were used to assess sex differences in sociodemographic and gaming-related variables, as well as in log(*k*) and DERS-28 global scale and subscales.

Bivariate correlational analyses were conducted to estimate the association between sex (coded as 0 = female; 1 = male), DERS-28 global scale and subscales, log(*k*) and gaming severity assessed by the IGDS-9. The strength of the relationships was determined as per Cohen's guidelines (1988), where small effects are in the range between 0-0.49, medium between 0.50-0.80, and large ≥0.80.

In order to examine the unique contribution of ED, sex, and log(*k*) on gaming severity (IGDS-9), a set of six three-step hierarchical linear regressions were conducted (considering log(*k*) and sex as independent variables in all models as well as DERS-28 [total score] -Model 1- and each of its five subscales [Models 2-6]). Each of the independent variables were entered separately in the regression model, in order to control for the influence of the remaining ones (i.e., one independent variable per regression step). Given that log(*k*)

functions as the independent variable in the mediation analyses, it was included in the last (third) step of the regression models, so as to previously control for the influence of DERS-28 [total score] (or each of its five subscale) and sex in the first and second steps of the regression models, respectively.

Following previous studies testing the mediating effect of ED on the association between addictive behaviors and psychological variables (Marchica et al., 2019), a total of 12 simple mediation models were performed through the macro-PROCESS v. 4.2. for SPSS (Hayes, 2022). Figure 1 depicts the mediation pathway model, which was independently tested by sex. The mediation analyses were conducted using model 4 in PROCESS and tested the indirect effect of log(*k*) rates (independent variable [X]) on internet gaming severity as measured by IGDS-9 (dependent variable [Y]) through ED global score (models 1a and 1b for females and males, respectively) or subscales (one model per each DERS-28 subscale [Models 2a–6a and 2b-6b for females and males, respectively]; mediator [M]). A bootstrapping procedure was performed with 10,000 resamples (Hayes, 2022) and the confidence level set for all the analyses was 95%. The statistical packages employed were SPSS (V25; SPSS, Inc., Chicago, IL) and JASP (V 0.18.1; University of Amsterdam).

Please insert Figure 1 here

2.4. Transparency and Openness

Materials and analysis code for this study are available by emailing the corresponding author. This study was not preregistered.

3. Results

3.1. Relationship between sex, emotion dysregulation (ED), impulsivity and gaming severity

Bivariate correlations between the study variables for the global sample, females and males are shown in Figures 2, 3 and 4, respectively. Without considering the associations between DERS-28 (total scale and subscales), Figure 2 shows that the strongest significant correlations were between gaming severity assessed by the IGDS-9 and DERS-28 global score (r = .305), followed by sex and gaming severity (r = .283) and lack of emotional control and gaming severity (r = .257). DD related only to the lack of emotional awareness dimensions of the DERS-28 (r = .082). Among females, Figure 3 depicts the strongest significant correlations between gaming severity and DERS-28 global score (r = .320), gaming severity and non-acceptance of emotional responses (r = .282) and gaming severity and lack of emotional control (r = .280). In females, DD was unrelated to DERS-28 global (total scale and subscales) and negatively associated with gaming severity (r = -.092). When considering men, Figure 4 shows that the strongest significant correlations were between gaming severity and DERS-28 global score (r = .462), gaming severity and lack of emotional control (r = .404) and gaming severity and non-acceptance of emotional responses (r = .351). Among males, DD was associated with DERS-28 total scale and 3 out of its 5 subscales (r values between .088 and .118) as well as with gaming severity (r = .127).

Please insert Figures 2, 3 and 4 here

3.2. Predictive role of emotion dysregulation (ED), sex, and impulsivity on gaming severity

Table 2 displays the results from the three-step hierarchical linear regressions with gaming severity being considered as the dependent variable. Steps 1 and 2 that included both DERS-28 total score (Model 1) or subscales (Models 2-6) and sex were significant for all models, with the largest increase in the variance accounted for Model 1-Step 2 that considers DERS-28 total score and sex [ΔR^2 =.129; F (2, 1,178) = 167.709; p < .001], followed by

Model 3-Step 2 which consists of lack of emotional control DERS-28 dimension and sex [ΔR^2 =.121; F (2, 1,178) = 135.084; p < .001] and Model 2-Step 2 that comprises non-acceptance of emotional responses DERS-28 subscale and sex [ΔR^2 =.118; F (2, 1,178) = 121.485; p < .001]. Log (k) did not yield significance in any of the models.

Please insert Table 2 here

3.3. The mediating role of emotion dysregulation (ED) in the relationship between impulsivity and gaming severity by sex

Table 3 summarizes the mediational models carried out. There was a statistically significant direct effect of log(k) on gaming severity (c' path) in all models. The indirect effect of log(k) on gaming severity through DERS-28 total score or subscores was significant for males (see models 1b-4b and 6b), but such indirect effect was not evidenced in females (see models 1a-6a). Lack of emotional clarity was the only DERS-28 subscale that did not significantly mediate the association between higher DD rates and gaming severity in either sex (see models 5a and 5b for women and men, respectively).

Please insert Table 3 here

4. Discussion

The present study examined the interrelationship between ED, sex, DD, and IGD severity in a sample of young adults. It also assessed the mediating effect of ED in the association between DD and IGD severity, independently by sex. The major findings are: (1) ED (considering both DERS-28 total score and subscales) and sex were both independently associated with IGD severity, while DD rates were not; and 2) ED mediated the relationship between DD rates and IGD severity in males but not in females.

This study showed that ED is positively associated with gaming severity, which further supports previous findings obtained with analogous samples (Estévez et al., 2014, 2017; Müller & Bonnaire, 2021). ED is characterized by experiencing challenges in controlling impulses toward negative feelings, engaging in goal-directed behavior, and retrieving efficient emotion–regulation strategies (Estévez et al., 2017; Gratz & Roemer, 2004). Gaming may have a compensatory function so as to escape from real-life difficulties or regulate negative feelings and emotions (Aldao et al., 2010; Király et al., 2015). On the other hand, gaming may also serve as a dysfunctional behavior performed to enhance positive emotions among those with ED (Estévez et al., 2017). The I-PACE model developed by Brand et al. (2016) provides further neurobiological support for such compensatory purpose of gaming by highlighting that ED in individuals with IGD is associated with an imbalance between neurological ED circuits and cognitive flexibility (Schettler et al., 2023).

Even though females showed higher ED scores and subscores than males, we found that DD was indirectly associated with gaming severity via ED among males but not among females. This finding suggests that young males with high DD rates may be more vulnerable to IGD triggered by ED. This is consistent with the fact that, in the majority of the mediational models, the pathway linking DD and ED (i.e., the *a* path) was statistically significant for males, but not for females. This sex-biased association may be taken as evidence that ED does play much of a fundamental role in externalizing disorders that are more common in males than in women (see Nolen-Hoeksema (2012) for a review). Several studies have shown that male gamers with high impulsivity are at a higher risk of developing IGD (Rikkers et al., 2016; Yen et al., 2017) and that, when compared to non-problematic gamers, those with IGD show higher ED, such as more difficulty in describing feelings and higher scores on alexithymia, which expresses an emotional unawareness (Bonnaire & Baptista, 2019). For males with IGD, gaming itself may become a dysfunctional strategy to

alleviate the emotional regulation deficit associated with alexithymia, without being able to find an alternative way to express their emotions (Marraudino et al., 2022). In this regard, the association between alexithymia and IGD has proven to differ by sex, with male (but not female) gamers more than doubling the risk of presenting IGD if they also evidence alexithymia (Bonnaire & Baptista, 2019).

The present results should be considered in light of several limitations. First and more importantly, this study involved cross-sectional survey data which does not permit the identification of cause-and-effect associations. Second, despite a large sample size, this study analyzed gaming severity in a non-clinical population of past-year gamers, so there is limited generalizability of these findings to other populations, including clinical samples of individuals diagnosed with IGD. Third, this study only considers DD as a measure of impulsive choice, so if the current results can be generalized when considering measures of impulsive action or impulsive personality traits (see MacKillop et al., 2016) remains to be determined. Additionally, the relatively low base rate of IGD (10.8 %) in the sample may limit the ability to generalize the study's findings to individuals with IGD. Nevertheless, it is important to consider the dimensionality of the IGDS, as this variable was treated continuously in all the statistical analyses, which is relevant for informing prevention efforts. Lastly, we only considered biological sex as an independent variable; however, sexual orientation or gender identity affect the gaming experience (Gillin & Signorella, 2024). Nevertheless, and as regards to gender identity, prevalence rates of transsexualism in the Spanish population over 15 years old are estimated in .022% (Becerra-Fernández et al., 2017), so the generalizability of the current findings to cisgender young adults is guaranteed.

In conclusion, despite the above-mentioned shortcomings, this study outlines that the screening of ED and DD is highly encouraged when assessing gaming severity in young adults, as these variables increase the risk for IGD, both directly and indirectly. The present

study also highlights the importance of considering sex when designing interventions to address IGD. For male gamers, especially among those with high DD rates, clinical efforts that target ED are highly encouraged. In this regard, serious games (i.e., videogames that are designed for other purposes beyond entertainment, such as health care or educational ones; Kato, 2010) have emerged as a promising intervention modality so as to train ED and impulsivity control in clinical samples of individuals with a gambling disorder (mainly or completely composed of men), either alone (Mena-Moreno et al., 2021) or combined with cognitive behavioral treatment (Tárrega et al., 2015). In serious games, individuals' physiological activity and emotional state are continuously being monitored through biofeedback sensors. The biofeedback connects the emotional reaction to the media display, training gamblers on how to regulate their emotions and visually reinforcing them when doing so (Jerčić & Sundstedt, 2019). As a future prospect, it remains to be determined whether this technology-based strategy to alleviate ED is also effective among individuals with IGD, especially among male gamers. Lastly, and from a preventive standpoint, these results emphasize the significance of parents and educational institutions prioritizing the promotion of children's and adolescents' emotional regulation skills, thereby enabling them to develop flexible and appropriate strategies for regulating their emotions (Lin et al., 2023). In this regard, universal, school-based prevention programs such as the recently tested Boost Camp program (Volkaert et al., 2022) have shown promising results in improving emotion regulation skills up to 6 months post-intervention. Other universal parent-based interventions, such as the Game Over Intervention (Li et al., 2019), have shown effectiveness at three-month follow-up for mitigating gaming-related problems among upper primary school children by empowering their parents with knowledge, attitudes, and emotion regulation skills to cultivate positive parenting and family environments. By learning how to regulate and cope with their emotions in a healthy way, young gamers, specially men, may no longer

feel the urge to engage in video games excessively or unhealthily, but rather may be able to enjoy video gaming recreationally (Kim et al., 2023).

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Table 1

Participants' descriptive characteristics

	Total (N = 1,181)	Men (n = 659)	Women (n = 522)	Statistic	p
Age (years)[a]	19.38 ± 1.63	19.42 ± 1.72	19.34 ± 1.51	-0.793[1]	.428
Course year (n/%)				15.760[2]	<.01
1st year	509 (43.1)	309 (46.9)	(200) 38.3		
2nd year	479 (40.6)	235 (35.7)	(244) 46.7		
3rd year	46 (3.9)	29 (4.4)	(17) 3.3		
4th year	34 (2.9)	18 (2.7)	(16) 3.1		
Vocational training	113 (9.6)	68 (10.3)	(45) 8.6		
Weekly allowance (€)[a]	64.38 ± 170.22	69.63 ± 189.30	57.74 ± 142.45	-1.192[1]	.233
Employment status (n/%)				0.324[2]	.850
Unemployed	1000 (84.7)	561 (85.1)	439 (84.1)		
Part time	160 (13.5)	86 (13.1)	74 (14.2)		
Full time	21 (1.8)	12 (1.8)	9 (1.7)		
IGDS-9 score[a]	22.59 ± 5.25	23.90 ± 5.43	20.93 ± 4.44	-10.386[1]	<.001
IGD classification (n/%)				13.200[2]	.001
Non-disordered gamers	1,054 (89.2)	569 (86.3)	485 (92.9)		
At-risk disordered gamers	35 (3)	34 (3.6)	11 (2.1)		
Disordered gamers	92 (7.8)	66 (10)	26 (5)		
Types of videogames played within the last year (n/%)					
Action-adventure	180 (15.2)	87 (13.2)	93 (17.8)	14.951[2]	<.001
Shooting-fighting	201 (17)	137 (20.8)	64 (12.3)		
Sports-simulation	209 (17.7)	140 (21.2)	69 (13.2)		
Platformer	103 (8.7)	14 (2.1)	89 (17)		
Races	110 (9.3)	33 (5)	77 (14.8)		
Other	378 (32)	248 (37.6)	130 (24.9)		
log(k)[a]	-1.9677 ± 0.6815	-1.9338 ± 0.6720	-2.0106 ± 0.6915	-1.926[1]	.054
DERS-28 total score[a]	63.98 ± 20.71	59.32 ± 18.48	68.51 ± 22.20	7.604[1]	<.001

Non-acceptance of emotional responses DERS-28 subscore[a]	15.25 ± 7.63	13.74 ± 6.72	17.15 ± 8.28	7.629[1]	<.001
Lack of emotional control DERS-28 subscore[a]	17.44 ± 7.60	15.97 ± 6.60	19.29 ± 8.34	7.426[1]	<.001
Difficulties in engaging in goal-directed behavior DERS-28 subscore[a]	11.26 ± 4.32	10.72 ± 4.18	11.95 ± 4.41	4.882[1]	<.001
Lack of emotional clarity DERS-28 subscore[a]	9.20 ± 3.50	8.80 ± 3.40	9.70 ± 3.56	4.447[1]	<.001
Lack of emotional awareness DERS-28 subscore[a]	10.24 ± 3.87	10.09 ± 3.76	10.42 ± 4.01	1.458[1]	.145

Note. IGDS-9 = Internet Gaming Disorder Scale; IGD = Internet Gaming Disorder; DERS-28 = Difficulties in Emotion Regulation Scale.

[a] Mean ± Standard Deviation; [1]Student's *t*; [2]Chi-squared.

Table 2

Hierarchical linear regressions with gaming severity as the dependent variable

	B	*SE B*	β	*t*	*p*	ΔR^2	Δ*p* value
Model 1.							
Step 1. DERS-28 total score	0.077	0.007	0.305	10.978	**<.001**	.093	**<.001**
Step 2. DERS-28 total score/sex						.129	**<.001**
DERS-28 total score	0.097	0.007	0.386	14.633	**<.001**		
Sex	3.872	0.277	0.368	13.966	**<.001**		
Step 3. DERS-28 total score/sex/log (*k*)						.000	.689
DERS-28 total score	0.097	0.007	0.385	14.566	**<.001**		
Sex	3.864	0.278	0.367	13.898	**<.001**		
Log (*k*)	0.079	0.198	0.010	0.401	.637		
Model 2.							
Step 1. Non-acceptance of emotional responses DERS-28 subscore	0.158	0.019	0.231	8.140	**<.001**	.053	**<.001**
Step 2. Non-acceptance of emotional responses DERS-28 subscore/sex						.118	**<.001**
Non-acceptance of emotional responses DERS-28 subscore	0.211	0.019	0.309	11.349	**<.001**		
Sex	3.702	0.286	0.352	12.937	**<.001**		
Step 3. Non-acceptance of emotional responses DERS-28 subscore/sex/log (*k*)						.001	.276
Non-acceptance of emotional responses DERS-28 subscore	0.211	0.019	0.308	11.315	**<.001**		
Sex	3.683	0.287	0.350	12.848	**<.001**		
Log (*k*)	0.222	0.204	0.029	1.089	.276		
Model 3.							

Step 1. Lack of emotional control DERS-28 subscore	0.177	0.019	0.257	9.119	**<.001**	.066	**<.001**
Step 2. Lack of emotional control DERS-28 subscore/sex						.121	**<.001**
Lack of emotional control DERS-28 subscore	0.230	0.019	0.334	12.402	**<.001**		
Sex	3.743	0.283	0.356	13.220	**<.001**		
Step 3. Lack of emotional control DERS-28 subscore/sex/log (*k*)						.000	.470
Lack of emotional control DERS-28 subscore	0.229	0.019	0.333	12.339	**<.001**		
Sex	3.729	0.284	0.355	13.139	**<.001**		
Log (*k*)	0.146	0.202	0.019	0.723	.470		
Model 4.							
Step 1. Difficulties in engaging in goal-directed behavior DERS-28 subscore	0.304	0.034	0.251	8.916	**<.001**	.063	**<.001**
Step 2. Difficulties in engaging in goal-directed behavior DERS-28 subscore/sex						.104	**<.001**
Difficulties in engaging in goal-directed behavior DERS-28 subscore	0.360	0.032	0.297	11.073	**<.001**		
Sex	3.425	0.283	0.326	12.120	**<.001**		
Step 3. Difficulties in engaging in goal-directed behavior DERS-28 subscore/sex/log (*k*)						.001	.347
Difficulties in engaging in goal-directed behavior DERS-28 subscore	0.358	0.033	0.296	11.023	**<.001**		
Sex	3.408	0.283	0.324	12.039	**<.001**		
Log (*k*)	0.192	0.204	0.025	0.941	.347		
Model 5.							
Step 1. Lack of emotional clarity DERS-28 subscore	0.350	0.042	0.235	8.283	**<.001**	.055	**<.001**
Step 2. Lack of emotional clarity DERS-28 subscore/sex						.100	**<.001**
Lack of emotional clarity DERS-28 subscore	0.411	0.040	0.275	10.199	**<.001**		
Sex	3.354	0.284	0.319	11.806	**<.001**		
Step 3. Lack of emotional clarity DERS-28 subscore/sex/log (*k*)						.000	.450

	Lack of emotional clarity DERS-28 subscore	0.409	0.040	0.274	10.130	**<.001**		
	Sex	3.340	0.285	0.318	11.731	**<.001**		
	Log (*k*)	0.156	0.206	0.020	0.755	.450		
Model 6.								
Step 1.	Lack of emotional awareness DERS-28 subscore	0.244	0.039	0.181	6.319	**<.001**	.033	**<.001**
Step 2.	Lack of emotional awareness DERS-28 subscore/ sex						.085	**<.001**
	Lack of emotional awareness DERS-28 subscore	0.261	0.037	0.193	7.063	**<.001**		
	Sex	3.068	0.288	0.292	10.650	**<.001**		
Step 3.	Lack of emotional awareness DERS-28 subscore/ sex/log (*k*)						.000	.441
	Lack of emotional awareness DERS-28 subscore	0.259	0.037	0.192	6.971	**<.001**		
	Sex	3.055	0.289	0.290	10.583	**<.001**		
	Log (*k*)	0.163	0.211	0.021	0.771	.441		

Note. DERS-28 = Difficulties in Emotion Regulation Scale.
The ΔR^2 and the Δp value represent the increase in variance accounted (ΔR^2) and statistical significance (Δp value) for beyond the previous step in the regression model.

Table 3

Mediational models with gaming severity as the dependent variable

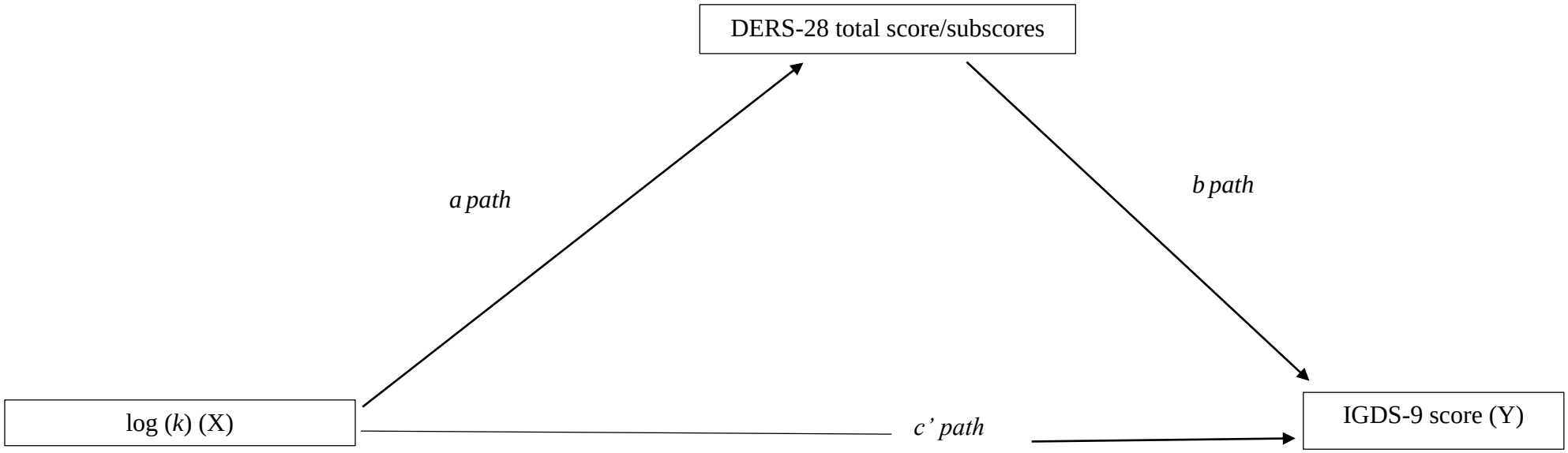
Model path	Women (*n* = 522)						Men (*n* = 659)					
	b[a]	*SE*[b]	*t*	*p*	95 % CI Lower[c]	95% CI Upper[c]	*b*[a]	*SE*[b]	*t*	*p*	95 % CI Lower[c]	95% CI Upper[c]
	Model 1a. DERS-28 total score (M)						Model 1b. DERS-28 total score (M)					
a path: log(*k*) (X)→ DERS-28 total score (M)	0.480	1.408	0.341	.733	-2.286	3.246	3.255	1.066	3.055	**.002**	1.163	5.348
b path: DERS-28 total score (M)→ IGDS-9 score (Y)	0.064	0.008	7.777	**<.001**	0.048	0.081	0.133	0.102	13.058	**<.001**	0.113	0.153
c' path: log(*k*) (X) → IGDS-9 score (Y)	-0.624	0.265	-2.351	**.019**	-1.145	-0.103	0.591	0.281	2.107	**.036**	0.040	1.142
Indirect effect of log(*k*) (X) on IGDS-9 score (Y)	0.031	0.089	-	-	-0.145	0.209	0.434	0.150	-	-	**0.144**	**0.733**
	Model 2a. Non-acceptance of emotional responses DERS-28 subscore (M)						Model 2b. Non-acceptance of emotional responses DERS-28 subscore (M)					
a path: log(*k*) (X)→ Non-acceptance of emotional responses DERS-28 subscore (M)	-0.231	0.525	-0.440	.660	-1.262	0.800	0.761	0.389	1.958	.051	-0.002	1.525
b path: Non-acceptance of emotional responses DERS-28 subscore (M)→ IGDS-9 score (Y)	0.150	0.023	6.685	**<.001**	0.106	0.195	0.278	0.030	9.422	**<.001**	0.220	0.335
c' path: log(*k*) (X) → IGDS-9 score (Y)	-0.558	0.269	-2.075	**.039**	-1.087	-0.030	0.814	0.294	2.764	**.006**	0.236	1.392
Indirect effect of log(*k*) (X) on IGDS-9 score (Y)	-0.035	0.081	-	-	-0.200	0.120	0.211	0.111	-	-	**0.002**	**0.438**
	Model 3a. Lack of emotional control DERS-28 subscore (M)						Model 3b. Lack of emotional control DERS-28 subscore (M)					
a path: log(*k*) (X)→ Lack of emotional control DERS-28 subscore (M)	0.048	0.529	0.090	.928	-0.992	1.087	1.091	0.381	2.866	**.004**	0.344	1.839
b path: Lack of emotional control DERS-28 subscore (M)→ IGDS-9 score (Y)	0.149	0.022	6.683	**<.001**	0.105	0.193	0.324	0.029	11.014	**<.001**	0.267	0.382
c' path: log(*k*) (X) → IGDS-9 score (Y)	-0.600	0.269	-2.230	**.026**	-1.129	-0.072	0.671	0.289	2.321	**.021**	0.103	1.239
Indirect effect of log(*k*) (X) on IGDS-9 score (Y)	0.007	0.077	-	-	-0.142	0.161	0.354	0.132	-	-	**0.108**	**0.625**
	Model 4a. Difficulties in engaging in goal-directed behavior DERS-28 subscore (M)						Model 4b. Difficulties in engaging in goal-directed behavior DERS-28 subscore (M)					

a path: log(*k*) (X)→ Difficulties in engaging in goal-directed behavior DERS-28 subscore (M)	-0.076	0.280	-0.272	.786	-0.625	0.473	0.549	0.242	2.273	**.023**	0.075	1.023
b path: Difficulties in engaging in goal-directed behavior DERS-28 subscore (M)→ IGDS-9 score (Y)	0.254	0.043	5.965	**<.001**	0.170	0.338	0.441	0.048	9.281	**<.001**	0.348	0.534
c' path: log (*k*) (X) → IGDS-9 score (Y)	-0.574	0.271	-2.115	**.035**	-1.107	-0.041	0.783	0.295	2.652	**.008**	0.203	1.363
Indirect effect of log(*k*) (X) on IGDS-9 score (Y)	-0.019	0.072	-	-	-0.159	0.129	0.242	0.111	-	-	**0.032**	**0.466**
	Model 5a. Lack of emotional clarity DERS-28 subscore (M)						Model 5b. Lack of emotional clarity DERS-28 subscore (M)					
a path: log(*k*) (X)→ Lack of emotional clarity DERS-28 subscore (M)	0.334	0.225	1.482	.139	-0.109	0.776	0.310	0.197	1.573	0.116	-0.077	0.698
b path: Lack of emotional clarity DERS-28 subscore (M)→ IGDS-9 score (Y)	0.272	0.053	5.106	**<.001**	0.168	0.377	0.528	0.058	9.064	**<.001**	0.414	0.643
c' path: log(*k*) (X) → IGDS-9 score (Y)	-.0684	0.274	-2.494	**.013**	-1.223	-0.145	0.861	0.295	2.914	**.004**	0.281	1.441
Indirect effect of log(*k*) (X) on IGDS-9 score (Y)	0.091	0.063	-	-	-0.023	0.222	0.164	0.112	-	-	-0.050	0.400
	Model 6a. Lack of emotional awareness DERS-28 subscore (M)						Model 6b. Lack of emotional awareness DERS-28 subscore (M)					
a path: log(*k*) (X)→ Lack of emotional awareness DERS-28 subscore (M)	0.406	0.234	1.599	.110	-0.093	0.904	0.544	0.217	2.504	**.013**	0.117	0.970
b path: Lack of emotional awareness DERS-28 subscore (M)→ IGDS-9 score (Y)	0.166	0.048	3.460	**.006**	0.072	0.260	0.339	0.055	6.217	**<.001**	0.232	0.447
c' path: log(*k*) (X) → IGDS-9 score (Y)	-0.660	0.278	-2.376	**.018**	-1.206	-0.114	0.840	0.305	2.752	**.006**	0.241	1.440
Indirect effect of log(*k*) (X) on IGDS-9 score (Y)	0.067	0.051	-	-	-0.015	0.183	0.185	0.081	-	-	**0.038**	**0.356**

Note. Statistically significant *p* values are shown in bold. DERS-28 = Difficulties in Emotion Regulation Scale; IGDS-9 = Internet Gaming Disorder Scale
[a] = Unstandardized coefficients; [b] = Standard Error; [c] = Confidence Interval.

Figure 1

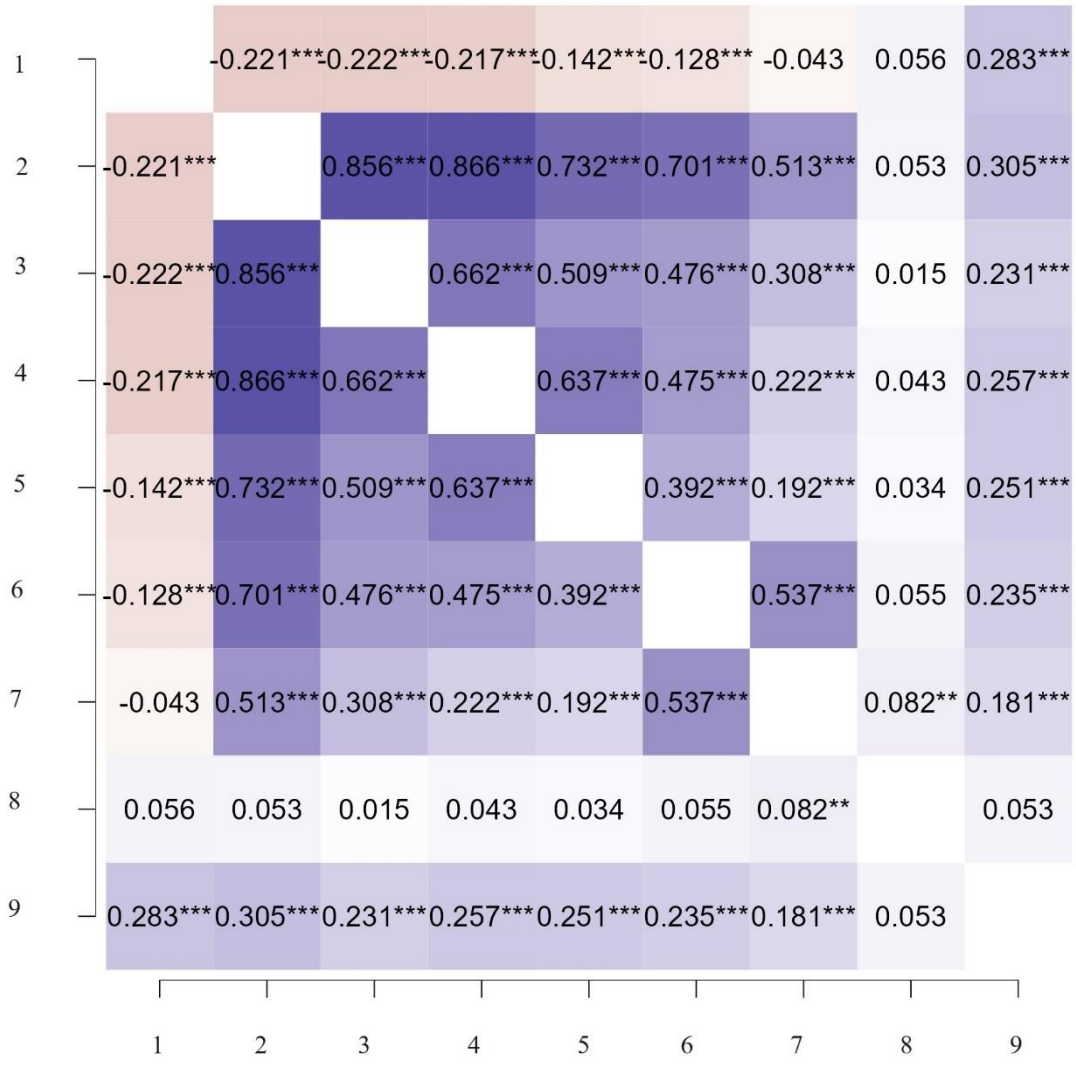
Mediational model for log (k) (X), DERS-28 total score/subscores (M), and IGDS-9 score (Y). c' represents the direct effect, a and b the indirect effects. This model was independently tested for men and women



Note. DERS-28 = Difficulties in Emotion Regulation Scale; IGDS-9 = Internet Gaming Disorder Scale; log (*k*) = delay discounting.

Figure 2

Bivariate correlations between sex, Difficulties in Emotion Regulation Scale (DERS-28) and subscales, log(k) and Internet Gaming Disorder Scale (IGDS-9)

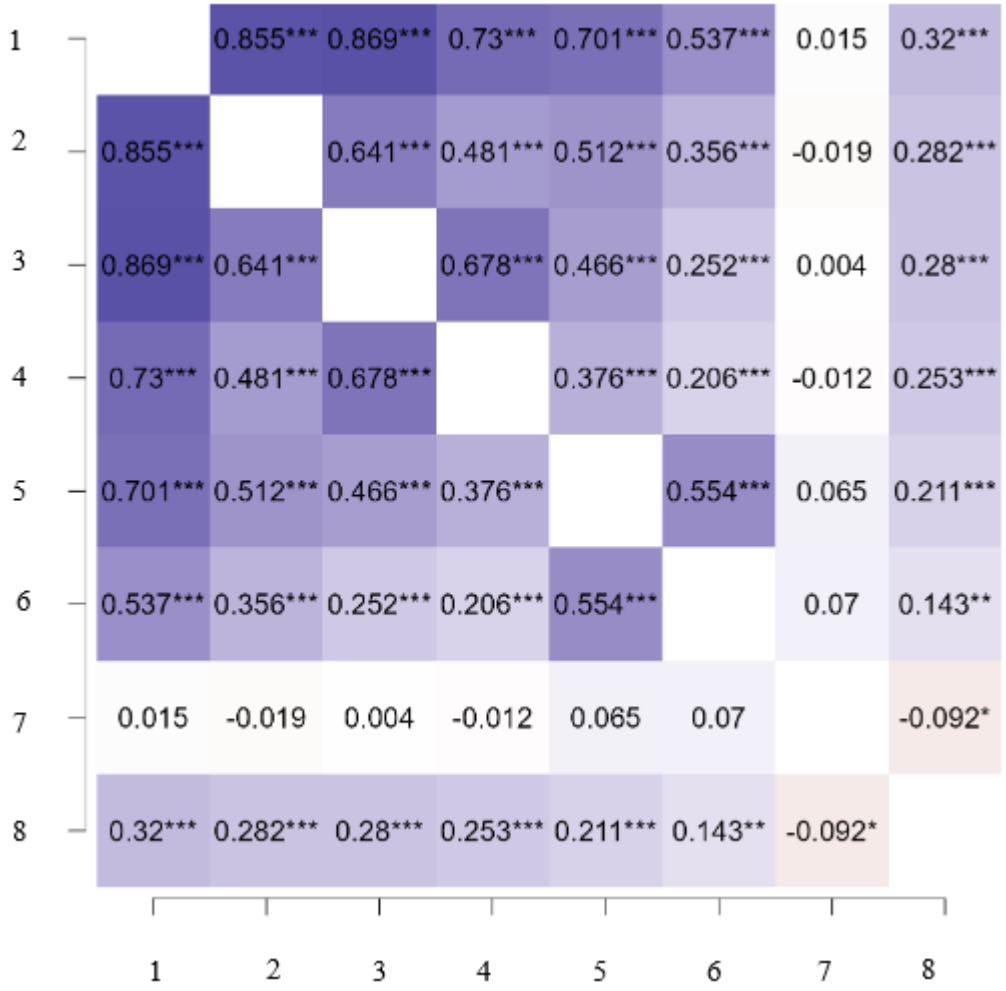


Note. 1 = Sex; 2 = DERS-28 total score = Difficulties in Emotion Regulation Scale; 3 = Non-acceptance of emotional responses DERS-28 subscore; 4 = Lack of emotional control DERS-28 subscore; 5 = Difficulties in engaging in goal-directed behavior DERS-28 subscore; 6 = Lack of emotional clarity DERS-28 subscore; 7 = Lack of emotional awareness DERS-28 subscore; 8 = delay discounting - log(*k*); 9 = IGDS-9 = Internet Gaming Disorder Scale-9 (IGDS).

*$p < .05$; **$p < .01$; ***$p < .001$.

Figure 3

Bivariate correlations between Difficulties in Emotion Regulation Scale (DERS-28) and subscales, log(k) and Internet Gaming Disorder Scale (IGDS-9) among females

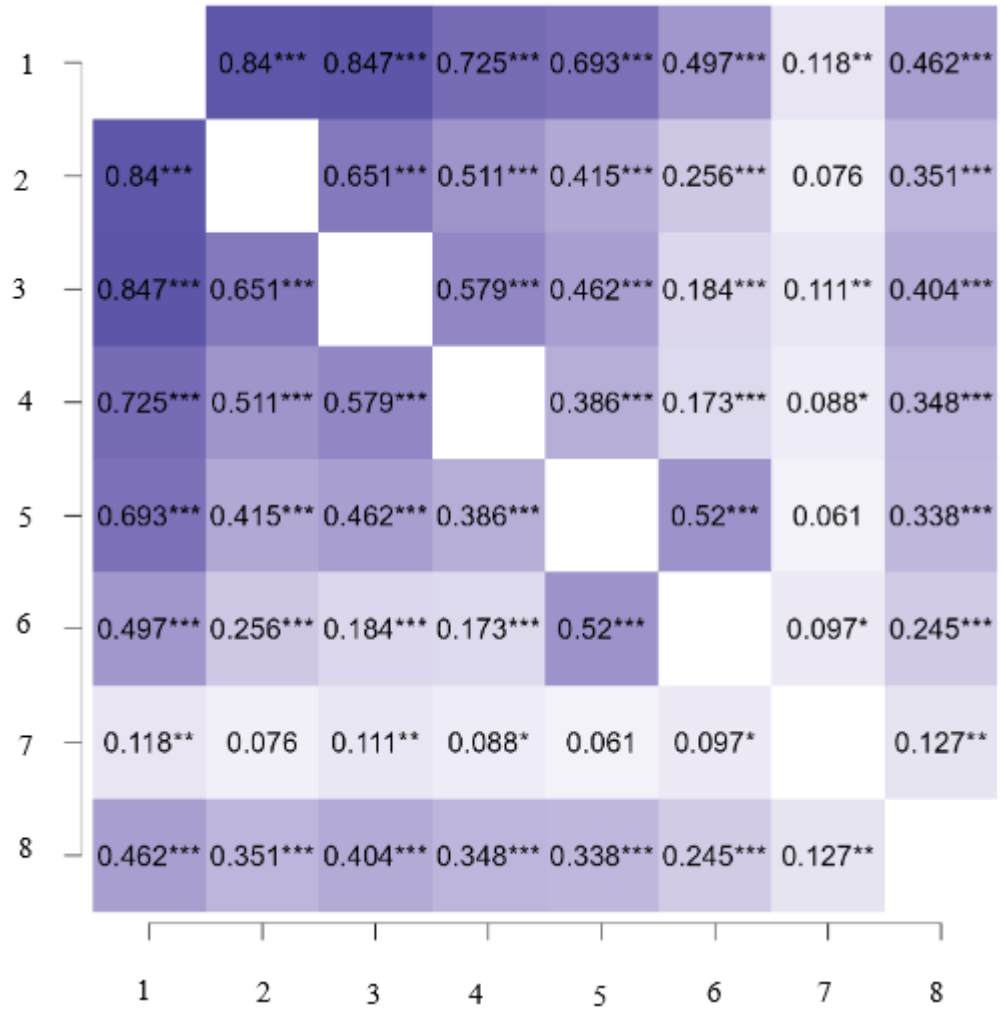


Note. 1 = DERS-28 total score = Difficulties in Emotion Regulation Scale; 2 = Non-acceptance of emotional responses DERS-28 subscore; 3 = Lack of emotional control DERS-28 subscore; 4 = Difficulties in engaging in goal-directed behavior DERS-28 subscore; 5 = Lack of emotional clarity DERS-28 subscore; 6 = Lack of emotional awareness DERS-28 subscore; 7 = delay discounting - log(*k*); 8 = IGDS-9 = Internet Gaming Disorder Scale-9 (IGDS).

*$p < .05$; **$p < .01$; ***$p < .001$.

Figure 3

Bivariate correlations between Difficulties in Emotion Regulation Scale (DERS-28) and subscales, log(k) and Internet Gaming Disorder Scale (IGDS-9) among males



Note. 1 = DERS-28 total score = Difficulties in Emotion Regulation Scale; 2 = Non-acceptance of emotional responses DERS-28 subscore; 3 = Lack of emotional control DERS-28 subscore; 4 = Difficulties in engaging in goal-directed behavior DERS-28 subscore; 5 = Lack of emotional clarity DERS-28 subscore; 6 = Lack of emotional awareness DERS-28 subscore; 7 = delay discounting - log(*k*); 8 = IGDS-9 = Internet Gaming Disorder Scale-9 (IGDS).

*$p < .05$; **$p < .01$; ***$p < .001$.