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Articles

The associations between loneliness, anxiety, and problematic gaming behavior during the COVID-19 pandemic: The mediating role of mentalization

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Abstract

Background: The COVID-19 pandemic has negatively impacted mental health, contributing to increase the feeling of loneliness, the psychological distress, and the gaming involvement. Despite accumulating data in the field of gaming, the research examining the psychological determinants of gaming severity, especially in the unique circumstances of COVID-19 pandemic, is still in its infancy. The aim of the present study was to examine, for the first time, the role of mentalization in gaming and to clarify the pattern of associations between loneliness, psychological distress, and problematic gaming behavior, as well as the mediating role of mentalizing in this relationship during COVID-19 pandemic in Italy.

Methods: A total of 466 adults aged 18-29 years completed an online survey including the Internet Gaming Disorder Scale-Short Form, the Reflective Functioning Questionnaire, the UCLA Loneliness Scale, and the Depression Anxiety Stress Scales.

Results: Regression analysis showed that male gender, anxiety, hypermentalizing, and loneliness were good predictors of problematic gaming behavior. The path analysis indicated that gender predicted gaming directly, whereas anxiety and loneliness contributed to gaming both directly and indirectly via hypermentalizing.

Conclusions: The present study is the first to examine the role of mentalizing in gaming during COVID-19 pandemic and provide insight into the interrelationships between mentalization, psychological distress, perceived loneliness, and problematic gaming behavior, demonstrating that an inaccurate mentalization has a key role in contributing to problematic gaming. The study provides a useful contribution for prevention of gaming severity and indicates that specific intervention on mentalizing could be effective in reducing problematic gaming by reducing levels of both anxiety and perceived loneliness.

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1. Introduction

After the declaration of the novel coronavirus disease 2019 (COVID-19) as a global pandemic by the World Health Organization (WHO, 2020) in March 2020, several restrictions by various governments were adopted in order to inhibit and contain the rapid spread of the disease (Adhikari et al., 2020). These restrictions, such as the physical distancing, quarantining, the use of face masks, and lockdowns have profoundly changed human life, negatively impacting both economic and social life activities (Amin et al., 2020; Chen et al., 2020; Gössling et al., 2020; Lin, 2020).

The social isolation due to restrictions, along with the fear of contagion and potentially worrying information disseminated by the mass media, have resulted in adverse mental health consequences, among which has been an increased use of digital entertainment, in particular gaming and related activities (Javed, 2020; King et al., 2020; Perez, 2020; Teng et al., 2021). Although gaming can have a therapeutic value in raising self-esteem, overcoming depressive symptoms and managing pain (Griffiths et al., 2017), these benefits arise from the use of gaming in moderation. When the frequency and duration of games is excessive, it could become problematic and, in extreme cases, disordered among a minority of individuals (i.e., Internet Gaming Disorder [IGD]; Alimoradi et al., 2019; Männikkö et al., 2020).

Following its formal recognition as a behavioral addiction by the World Health Organization (WHO), as well as its inclusion in the Appendix of the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association, 2013) as a condition that needs further research, IGD has received increased attention. IGD consists in a loss of control over gaming behavior and loss of interest for other activities, with a significant negative impact and clinical impairment in important areas of life (WHO, 2019). Its prevalence rate was estimated to vary between 1.7% to over 10% of the population (Griffiths et al., 2012; Kuss et al., 2013), with a recent meta-analysis by Stevens, Dorstyn, Delfabbro and King (2020) estimating the worldwide prevalence rate of problematic gaming behavior to be between 1.96% and 3.05%.

Among the psychological correlates of problematic gaming, feelings of loneliness and psychological distress are the most significant. Loneliness is a psychological state experienced when individuals perceive a discrepancy between their desired and actual levels of interpersonal relationships (Perlman & Peplau, 1981). Significant associations have been found between adolescents' loneliness and problematic gaming (King et al., 2010). More specifically, in a two-wave panel study among adolescent gamers, loneliness was found to predict an increase in

pathological gaming six months later, indicating that gaming could be a symptom of pre-existing vulnerabilities (e.g., Lemmens et al., 2011; for similar results, see Traş, 2019).

Similarly, several studies have demonstrated a robust association between psychological distress, conceived as heightened levels of depression, anxiety, and stress (e.g., Ahorsu et al., 2020; Ko & Yen, 2020; Pfefferbaum & North, 2020), and gaming severity (Park et al., 2016; Rho et al., 2018). Among these, a recent study found that being male, being alexithymic, and reporting high depression and anxiety scores were risk factors for problematic gaming (Bonnaire & Baptista, 2019).

Studies examining the role that loneliness and psychological distress singularly play in gaming involvement during the COVID-19 pandemic have generally confirmed that the association of each of these two factors with gaming has been even stronger. This is likely due to the restriction of outdoor activities, frustration, boredom, and the prohibition of in-person socializing, with the consequent impoverishment of social relationships, all contributing to enhance both feelings of loneliness (Killgore et al., 2020; Li & Wang, 2020; Padmanabhanunni & Pretorius, 2021) and psychological distress (Qiu et al., 2020; Shah et al., 2021), and facilitating an increased involvement in gaming activities (e.g., Paschke et al., 2021).

However, despite accumulating data in the field of gaming (Pontes et al., 2020), the research on the etiology of IGD is still in its infancy, especially among non-student adult samples (Hu et al., 2017). Furthermore, research examining the psychological determinants of gaming severity in the unique circumstances of COVID-19 pandemic is even more scarce. For example, no study has to date investigated the interplay between loneliness, psychological distress, and gaming, neither in general nor during the pandemic, as well as no study has never examined the role of mentalizing in gaming severity in emerging adult samples.

While in the field of addictions the role of mentalization has been identified in alcohol abuse (e.g., Imperatori et al., 2020), problem gambling (e.g., Ciccarelli et al., 2021; Cosenza et al., 2019), and drug addiction (e.g., Savov & Atanassov, 2013), no previous study has ever examined the relationship between problematic gaming behavior and mentalization in emerging adult samples. Mentalizing, or reflective functioning, is the ability to understand oneself and others in terms of intentional mental states, such as thoughts, beliefs, goals, and feelings (Luyten et al., 2020). It is a dynamic ability, affected by factors such as stress and arousal that can determine a return to pre-mentalizing modalities, with consequent increase in emotional intensity and failure in the ability to be reflective (Bateman & Fonagy, 2015). A study discussing the clinical implications of COVID-19 pandemic has documented a difficulty to regain mentalizing among

individuals with previous stable mentalizing, hypothesizing that this difficulty is due to the restrictions in the activities that individuals generally use to regulate their emotions (e.g., socializing, shopping, travelling, etc.) (Lassri & Desatnik, 2020).

1.1 The present study

Based on these premises, the present study performed a mediation analysis to explore the relationships between loneliness, psychological distress, and gaming severity among emerging adults during COVID-19 pandemic, hypothesizing a mediation role played by mentalization. This analysis could help to advance the knowledge of the mechanisms underlying problematic gaming, explaining the rise in gaming involvement observed during COVID-19 outbreak, and clarifying the pattern of association between loneliness, psychological distress, and gaming. It was hypothesized that there would be: (i) increased gaming involvement during COVID-19 pandemic; (ii) an association of gaming behavior with loneliness, psychological distress, and mentalizing; and (iii) a mediation role for mentalizing in the association between loneliness, psychological distress, and gaming severity.

2. Methods

2.1 Participants and procedure

The sample comprised 466 Italian young adults (54.5% males) aged from 18 to 29 years (M_{age} = 22.24; SD_{age} = 2.68) recruited utilizing an online survey during the COVID-19 pandemic. The link of the survey was shared on different online platforms and social media. Individuals who agreed to participate in the study signed an electronic informed consent form. The online survey started with several items concerning socio-demographic variables (i.e., gender, age, education, professional status and marital status). Participants then completed a number of psychometric instruments in the same order. To successfully submit the survey, all questions needed to be completed, therefore no missing data were recorded. Participation in the study was voluntary, confidential, and anonymous. The survey took approximately 20 minutes to complete. The procedure was approved by the research team's university Psychology Department ethics committee.

2.2 Measures

The nine-item Internet Gaming Disorder Scale - Short-Form (IGDS9-SF; Pontes & Griffiths, 2015; Italian version: Monacis et al., 2016) is a self-report assessment tool and the items are rated on a five-point Likert scale from 1 (*never*) to 5 (*very often*). The scale assesses the severity of both online and offline gaming over the past 12 months with items that reflect the nine

diagnostic criteria for IGD according to the DSM-5 (APA, 2013), such as gaming to escape from a negative mood, the loss of interest in other entertainment activities, and the perceived inability to stop gaming. Items include "Do you feel the need to spend increasing amount of time engaged gaming in order to achieve satisfaction or pleasure?" and "Have you continued your gaming activity despite knowing it was causing problems between you and other people?". The scores range from 9 to 45, with high scores reflecting problematic gaming. In the present study, the IGDS9-SF had very good internal consistency ($\alpha = 0.80$).

The eight-item Reflective Functioning Questionnaire (RFQ-8; Fonagy et al., 2016; Italian version: Morandotti et al., 2018) is a self-report assessment tool and the items are rated on a seven-point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). The scale assesses two different processes of reflective functioning: *Certainty about mental states* (e.g., "I always know what I feel") and *Uncertainty about mental states* (e.g., "I don't always know why I do what I do"). A low agreement with the Certainty scale indicates hypermentalizing (i.e., an excessive but inaccurate mentalizing), while high agreement indicates genuine mentalizing (i.e., the acknowledgment of the opaqueness of their own and others' mental states). A high agreement with the Uncertainty scale reflects hypomentalizing (i.e., a lack of knowledge about mental states), while low agreement reflects genuine mentalizing. In the present study, the two subscales had good internal consistency: Certainty ($\alpha = 0.77$) and Uncertainty ($\alpha = 0.73$).

The 20-item University of California, Los Angeles, Loneliness Scale-Version 3 (UCLA LS3; Russell, 1996; Italian version: Boffo et al., 2012) is a self-report assessment tool and the items are rated on a four-point Likert scale ranging from 1 (*never*) to 4 (*always*). The scale assesses perceived loneliness, and the frequency and quality of social relationships. Nine items are positively formulated and reverse-scored ("How often do you feel close to people?") and eleven items are negatively formulated ("How often do you feel alone?"). Higher scores reflect greater degrees of perceived loneliness. In the present study, the UCLA had excellent internal consistency ($\alpha = 0.91$).

The 21-item Depression Anxiety Stress Scales (DASS-21; Henry & Crawford, 2005; Italian version: Bottesi et al., 2015) is a self-report assessment tool and the items are rated on a four-point Likert scale ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*). The scale assesses emotions and mood states in the past two weeks, with seven items for each of the three dimensions: Depression (e.g., "I could see nothing to be hopeful about"), Anxiety (e.g., "I felt scared without any good reason") and Stress (e.g., "I tended to over-react to situations"). Higher scores reflect severe psychological distress. In the present study, the full

DASS-21 had excellent internal consistency ($\alpha = 0.94$) and the subscales had very good internal consistency: depression ($\alpha = 0.88$), anxiety ($\alpha = 0.84$), and stress ($\alpha = 0.88$).

2.3 Statistical analysis

Statistical analysis was performed using SPSS 20.0 Statistical Package for the Social Sciences (Armonk, NY, USA), with a significance level of $p < .05$. All variables were initially screened for distribution abnormalities and outliers (Tabachnick & Fidell, 2019). Given that the distribution of the IGDS9-SF was positively skewed, square-root transformation was performed on this variable so that assumptions of normality, linearity, and homoscedasticity had been adequately met.

First, Pearson correlation coefficients among the examined variables were computed. Linear regression analysis was used to examine the independent contributions of RFQ-8, UCLA, and DASS-21 in predicting gaming severity (IGDS9-SF score). To control for the presence of multicollinearity, the variance inflation factors (VIF) was calculated before interpreting the regression coefficients, which were below the recommended cut-off of 10 (max. VIF = 1.198; Ryan, 1997).

Finally, a path analysis, using EQS. 6.2 software program (Encino, CA, USA) for structural equation modelling (Bentler, 2008), was conducted to examine a mediation model where the direct and indirect hypothesized relationships among variables contributing to gaming severity were tested. More specifically, mentalizing deficit (in the direction of both hypomentalizing and hypermentalizing) was hypothesized to act as a mediator in the relationship between loneliness, negative emotions, and gaming. The adequacy of the estimated model was assessed with a range of fit indices: the likelihood ratio chi-square test statistic corrected for data non-normality with Satorra and Bentler's (1994) method (S-B χ^2), the standardized root-mean square residual (SRMR), the root-mean-square error of approximation (RMSEA) with 90% confidence interval (90% CI), the goodness of fit index (GFI), and the comparative fit index (CFI). A non-significant S-B χ^2, GFI and CFI estimates greater than 0.95, and a RMSEA value between 0.05 and 0.08 are indicative of good fits between model and data (Kline, 2011).

3. Results

The socio-demographic variables are reported in Table 1. Regarding frequency of engagement in gaming in the past year, 51.7% participants reported having played more than once a week, 14.4% once a week, 9% once a month, and 13.9% less than once a month. Over half of the participants (57.1%) reported gaming more than before the COVID-19 pandemic, whereas the

12% reported gaming less than before the pandemic. Within a typical week, 21.2% participants reported gaming every day. The number of gaming days for the rest of the sample was six days (4.9%), five days (8.4%), four days (7.9%), three days (10.5%), two days (10.9%), and one day (23.8%). Among participants who reported gaming every day, 86.7% played up to three hours.

The majority of the sample participated in both online and offline games (58.2%), whereas the 22.5% preferred offline gaming and the 14.4% preferred online gaming. The most popular were games involving other players (59.4%) compared to those not (33.5%). The most reported motivations for gaming (where participants could report more than one motivation) were entertainment (59.6%), boredom (44.8%), distraction (25.8%), excitement (12.2%), loneliness (11.8%), and curiosity (6.8%).

The relationships between all variables were assessed using Pearson correlations. As Table 2 shows, all variables were strongly associated each other. More specifically, problematic gaming behavior was (i) negatively correlated with Certainty, and (ii) positively correlated with Uncertainty, Loneliness, Depression, Anxiety, and Stress. Table 2 also reports the descriptive statistics of the sample. For ease of interpretation, descriptive statistics are reported for the untransformed variables.

To identify the predictors of problematic gaming behavior, a hierarchical regression analysis on IGDS9-SF score was run, entering gender, age, RFQ-8 and DASS-21 subscales, and UCLA score as predictors.

Table 1. Socio-demographic variables of the overall sample

		Total sample (*N* = 466)	
	Range	**M (*SD*)**	
Age	18-29	22.24 (2.68)	
Education	8-18	13.88 (2.64)	
		N	**%**
Professional status	Unemployed	37	7.9
	Workman	17	3.6
	Student	347	74.4
	Servant	39	8.3
	Trader	4	0.9

	Freelancer	22	4.7
Education	Middle School diploma (8 years)	31	6.7
	High School diploma (13 years)	322	69.1
	Master's degree (18 years)	113	24.2
Marital status	Single	442	94.8
	Married	22	4.7
	Separated	2	0.4

Table 2. Means, standard deviations and Pearson correlation coefficients of measures of interest among gamers (N = 466)

	1	2	3	4	5	6	7
1. IGDS9-SF	-						
2. RFQ-8-CERTAINTY	-.274**	-					
3. RFQ-8-UNCERTAINTY	.250**	-.631**	-				
4. UCLA	.267**	-.263**	.309**	-			
5. DASS-21 DEPRESSION	.318**	-.302**	.384**	.526**	-		
6. DASS-21 ANXIETY	.321**	-.263**	.373**	.317**	.667**	-	
7. DASS-21 STRESS	.319**	-.368**	.501**	.393**	.714**	.724**	-
M (SD)	13.51 (4.43)	0.95 (0.78)	0.77 (0.62)	45.00 (10.25)	7.22 (5.30)	4.67 (4.32)	8.16 (5.01)

Note. IGDS9-SF = Internet Gaming Disorder Scale – Short Form; RFQ-8 = Reflective Functioning Questionnaire; UCLA = University of California Los Angeles Loneliness Scale; DASS-21 = Depression Anxiety Stress Scales. Descriptive statistics are reported for the untransformed variables.

* $p < 0.05$; ** $p < 0.01$

Results showed that, along with male gender, low scores on RFQ-8 Certainty, high scores on DASS-21 anxiety scale and UCLA total score significantly predicted gaming severity, with the overall model explaining just over one-fifth of the total variance of the IGDS9-SF ($R^2_{adj} = 0.22$; $F_{4, 461} = 33.91$; $p < .001$) (see Table 3).

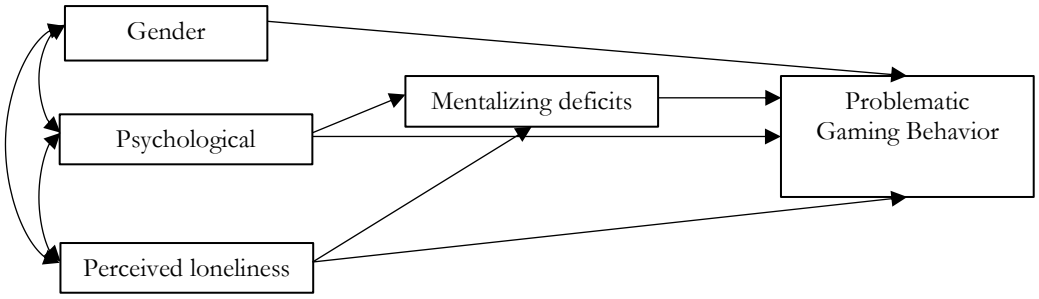

Figure 1. Proposed theoretical model

Finally, to analyze the causal relationships among the variables that contribute to problematic gaming behavior, the theoretical model was tested utilizing path analysis, using the variables that emerged as predictors from the regression analysis.

Table 3. Results of hierarchical linear regression analysis on adolescent problem gaming (IGDS9-SF)

Predictors	B	R^2	ΔR^2	β	*t*	*p*	VIF
Model 1 (R^2adj = 0.030; $p < 0.001$)							
Gender	-1.595	.032	.032	-.179	-3.929	<.001	1.000
Model 2 (R^2adj = 0.168; $p < 0.001$)							
Gender	-2.274	.171	.139	-.256	-5.924	<.001	1.042
DASS-21 Anxiety	.390			.381	8.813	<.001	1.042
Model 3 (R^2adj = 0.202; $p < 0.001$)							
Gender	-2.234	.208	.036	-.251	-5.945	<.001	1.043
DASS-21 Anxiety	.336			.328	7.483	<.001	1.119
RFQ-8 Certainty	-1.119			-.198	-4.608	<.001	1.075
Model 4 (R^2adj = 0.221; $p < 0.001$)							
Gender	-2.270	.227	.020	-.255	-6.107	<.001	1.043
DASS-21 Anxiety	.296			.288	6.435	<.001	1.198
RFQ-8 Certainty	-.954			-.169	-3.895	<.001	1.118
UCLA	.065			.151	3.431	<.001	1.157

Note. B: unstandardized coefficient; β: standardized regression coefficient. ΔR^2: *R* square change; VIF: Variance Inflation Factor.

IGDS9-SF = Internet Gaming Disorder Scale – Short Form; RFQ-8 = Reflective Functioning Questionnaire; UCLA = University of California Los Angeles Loneliness Scale; DASS-21 = Depression Anxiety Stress Scales.

More specifically, it was assumed that anxiety and loneliness would predict gaming both directly and indirectly via hypermentalizing. Model fit statistics for the tested model are displayed in the Figure 2. As Figure 2 shows, the hypothesized model, with hypermentalizing as mediator of the impact of anxiety and loneliness on problematic gaming behavior, showed a good fit to the observed data, indicating that gender predicted gaming directly, whereas anxiety and loneliness contributed to gaming both directly and indirectly via hypermentalizing. Figure 2 also shows the mediation model with the standardized parameter estimates. All paths were significant at $p < .05$.

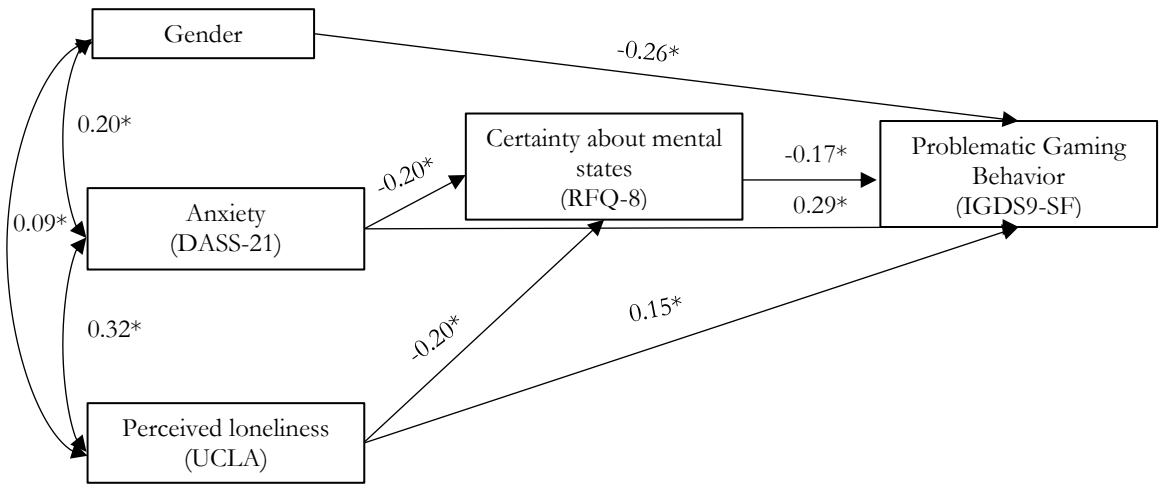

Figure 2. Results of the path diagram model. Model fit statistics for the model: S-B $\chi 2$ (1) = 0.365; p = .55; GFI = 1.00; CFI = 1.00; RMSEA [90% CI] = .000 [.000, .103]; SRMR = .007
Note. * Standardized solution.

4. Discussion

The present study examined, for the first time, the interplay between gaming severity, loneliness, and psychological distress (i.e., depression, anxiety, and stress), as well as the mediating effect of mentalizing among emerging adults during the COVID-19 pandemic. The findings demonstrated that gaming was associated with both anxiety and loneliness and that, when included in the analysis, hypermentalizing played a mediating role in this association. Results showed that male gender predicted more severe gaming involvement. This is consistent with previous studies (e.g., Ciccarelli et al., 2021; Sicari et al., 2021) in which males were found to spend more time in gaming, probably due to their interest in competitive activities and confidence in electronic devices use (Klimmt et al., 2009; Lemmens et al., 2015; Terlecki et al., 2011).

The first hypothesis was that there would be an increase in gaming involvement during COVID-19 pandemic. This was supported, with many participants reporting having played during the lockdown more than in the period prior to the pandemic. The same observation emerged in a previous study where an increase in gaming behavior was found among college students, associated with the belief that gaming would help manage stress (Balhara et al., 2020). Similarly, a recent study into how gaming has changed during lockdown (i.e., Barr & Copeland-Stewart, 2022) reported an increase in playing multiplayer games and a shift towards playing online. The same study found a preference for relaxing or passive games and the main motivations identified for playing were to help cope with the pandemic and socialization. In the present study, the majority of participants played mainly for entertainment and boredom, and preferred games

involving other players. This could be associated with the crisis of the entertainment sector during the lockdown period (Nhamo et al., 2020), whereby gaming was a recreational activity that replaced those that could not be practiced. This suggests that in a period where basic needs of social affiliation and autonomy were frustrated and normal daily activities suspended, gaming was a new way of maintaining social bonds (Griffiths, 2020), minimizing the isolation, and escaping from reality (Allen & Anderson, 2018; Snodgrass et al., 2018). This speculation seems to be further confirmed by the fact that loneliness was among the factors contributing to gaming severity, as regression analyses showed. This concurs with the findings of several cross-sectional studies that have observed higher loneliness levels among pathological gamers, as compared to non-pathological gamers (e.g., Parsons, 2005; Qin et al., 2007; Tras, 2019), as well as a reciprocal relationship between loneliness and online gaming, with loneliness encouraging gaming and gaming that, in turn, increases the feeling of loneliness (e.g., Kim et al., 2009). More specifically, a longitudinal study by Seay and Kraut (2007) provided insight on the directionality of the relationship between these two factors and found that loneliness was a predictor of problematic gaming one year later, with no significant effect of gaming on loneliness. This finding is also in line with results of previous research showing a relationship between low emotional distress during the lockdown and the involvement in social gaming as a way to prevent feelings of loneliness (Giardina et al., 2021).

Among the factors contributing to gaming involvement during COVID-19 pandemic, anxiety has emerged as a potential predictor. Corroborating this, in the present study, participants reported having played mostly for distraction, which suggests the existence of something unpleasant that individuals want to escape through leisure activity. The association between gaming and anxiety is not unanticipated, as a wealth of research also evidenced high anxiety levels among participants with problematic gaming (e.g., Andreassen et al., 2016; Ho et al., 2014; Mehroof & Griffiths, 2010; Wong et al., 2020), as well as more time spent in gaming among adolescents with elevated psychological distress (Ho et al., 2014; Yen et al., 2019). Moreover, these results seem to suggest the use of gaming as a self-medication strategy for dealing with negative emotion during the COVID pandemic, and supports recent findings (e.g., Elhai et al., 2021; Taylor et al., 2020).

In line with the second hypothesis, this study found significant and positive associations among gaming behavior, loneliness, psychological distress, and mentalizing. Although previous studies have documented exacerbated levels of loneliness, anxiety, and gaming severity (Li & Wang, 2020; Padmanabhanunni & Pretorius, 2021; Teng et al., 2021), as well as fluctuations in the

ability to mentalize (Lassri & Desatnik, 2020) during the pandemic, the interplay among these factors was observed in this study for the first time.

Although the nature of the present study prevents the establishment of cause-and-effect links, based on previous longitudinal studies (e.g., Rapinda, 2011; Seay & Kraut, 2007), it can be speculated that the deterioration of real contacts during COVID-19 pandemic increased loneliness. Moreover, the lack of knowledge concerning COVID-19 and the uncertainty about when the pandemic will end are likely to have contributed to increased anxiety symptoms, strengthening the dysfunctional recourse to gaming in order to maintain relationships and find relief from anxiety (Chappell et al., 2006; Fazeli et al., 2020). Supporting this hypothesis, a recent longitudinal study evaluating gaming behavior before (T1) and during COVID-19 pandemic (T2) among children and adolescents found that a significant rise in gaming involvement from T1 to T2 was predicted by depressive and anxiety symptoms (Teng et al., 2021), concluding that problematic gaming behavior is a consequence of psychological distress. Similarly, another longitudinal study investigating gaming behavior among adults at the beginning of lockdown (T1) and three days before the end of the lockdown (T2) found that feelings of loneliness longitudinally predicted both gaming and social media addiction, even after controlling for gaming use at T1 (Rogier et al., 2021).

The present study also provided empirical evidence to support the notion that the ability to mentalize is associated with gaming behavior (for similar results, see Ciccarelli, Cosenza, et al., 2021). More specifically, it was found that the dimension of mentalizing that predicts gaming severity was hypermentalizing (i.e., an over-attribution of inaccurate mental states not supported by objective data but that goes beyond what can actually be inferred from the situation) (Sharp et al., 2011; Sharp et al., 2013). This finding dovetails with a recent study demonstrating that problem gaming shares with problem gambling a common risk factor – hypermentalizing (Ciccarelli, Cosenza, et al., 2021). Elaborating a model of the mentalizing dysfunctions observed in patients suffering from borderline personality disorder, one study proposed that, in conditions of high emotional arousal, individuals can hypermentalize and, as a result, behave in a dysregulated way (Bo et al., 2017). Therefore, it is reasonable to assume that during the COVID-19 pandemic, negative emotions resulting from the stress of contagion, job disruption, social isolation, and the loss of loved ones, could have impacted mentalization, which is known to be a dynamic ability, potentially conditioned by external factors (Lassri & Desatnik, 2020). Hypermentalizing, as a response to overwhelming feelings of loneliness and anxiety, could have induced individuals to take refuge in other worlds, such as those offered by gaming.

The present results also provided, for the first time, empirical evidence that loneliness and anxiety exert their influence on gaming through the mediating role of hypermentalizing. This suggests that the impact of both loneliness and anxiety on gaming is partly mediated by hypermentalizing, and that people who hypermentalize are more likely to increase their gaming involvement when feel anxious and alone.

5. Limitations and strengths

The present study has several limitations. First, the community nature of the sample prevents clinical conclusions. Second, data were exclusively based on self-report measures that limit the generalizability of the results due to recall bias and social desirability. Finally, the cross-sectional design used in the present study requires caution when interpreting the mediation results. Future studies involving clinical populations and using longitudinal data are needed to further examine the hypothesized mediating relationships.

6. Conclusions

Despite the aforementioned limitations, the present findings that loneliness and anxiety could represent a vulnerability condition to gaming severity through mentalizing represent a step forward in the knowledge of the mechanisms underlying problematic gaming behavior, demonstrating that hypermentalizing has a role in mediating the relationship between loneliness, anxiety, and gaming severity. These findings also have clinical implications suggesting that interventions on mentalizing may be useful in reducing and preventing the severity of gaming involvement.

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Conflict of interest: Maria Ciccarelli, Giovanna Nigro, Francesca D'Olimpio, Mariagiulia Sacco, Barbara Pizzini, and Marina Cosenza declare that they have no conflict of interest. Mark Griffiths' University currently receives funding from Norsk Tipping (the gambling operator owned by the Norwegian Government) for gambling-related research. He has also received funding for a number of research projects in the area of gambling education for young people, social responsibility in gambling and gambling treatment from Gamble Aware (formerly the Responsibility in Gambling Trust), a charitable body, which funds its research program based on donations from the gambling industry. He also undertakes consultancy for various gaming companies in the area of social responsibility in gambling.

Ethics approval: The study procedures were carried out in accordance with the Declaration of Helsinki. The Ethics Committee of the Department of Psychology of the first author's university approved the study.

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

Authors' contribution: Maria Ciccarelli: Summary of previous research studies, statistical analyses and original draft. Maria Ciccarelli and Giovanna Nigro: Conceptualization. Mariagiulia Sacco and Barbara Pizzini: Data collection. Francesca D'Olimpio: Methodology and Software. Marina Cosenza: Literature searches, Investigation. Mark D. Griffiths: Review & Editing. Marina Cosenza: Supervision.

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