The serial mediation effects of body image-coping strategies and avatar-identification in the relationship between self-concept clarity and gaming disorder: A pilot study

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ABSTRACT

Gaming disorder (GD) has been recognized as a mental health problem, resulting in adverse and psychosocial consequences. Although previous evidence suggests poorer self-concept clarity (SCC) and avatar identification are associated with GD, less is known about the mediating role of body-image coping strategies (appearance-fixing and avoidance, a form of escapism) in this relationship. A total of 214 Italian online gamers (64 % males) were anonymously recruited online by posting the survey link on social media gaming forums and other online sites. The participants' ages ranged from 18 to 59 years (M = 24.07 years, SD = 5.19). The results of the correlational analysis showed that SCC was negatively related to GD, whereas body coping strategies and avatar-identification were positively associated with GD. Avoidance fully mediated the association between SCC and GD. Moreover, appearance-fixing and avatar-identification were full serial mediators between SCC and GD. Overall, the results of the present study suggest potential pathways for understanding the underlying determinants of GD, which can help in the design of intervention programs to help reduce the risk of GD among players.

1. Introduction

Gaming disorder (GD) is often conceptualized as a behavioral addiction (i.e., addictions that do not involve psychoactive substance ingestion). The popularity of online gaming can be partially attributed to the rapid growth of technological development (Brand et al., 2020; Castro-Calvo et al., 2021; Griffiths, 2022; Higuchi, Nakayama, Matsuzaki, Mihara, & Kitayuguchi, 2021; Stavropoulos, Kuss, Griffiths, Wilson, & Motti-Stefanidi, 2017; Teng, Pontes, Nie, Griffiths, & Guo, 2021). A popular practice in online gaming is the creation of an avatar, a digital self-representation of the user on-screen, which enables players to interact and communicate in shared digital environments (Blasi et al., 2019; Green et al., 2021a; Liew et al., 2018). The extent to which players feel a physical and emotional connection with their avatar has been suggested as a risk factor for GD (Casale et al., 2022).

Avatars can be realistic or stylized and can come with advanced customization options that allow players to change their attributes, abilities, and appearance (Green et al., 2020; Lemenager et al., 2020; Leménager et al., 2016; Loewen et al., 2021; Mancini et al., 2019; Szolin et al., 2022, for a review).

While characters and viewers are separated in traditional media, in videogames the line between players and avatars is often indistinct. This is because by manipulating their avatars as they interact in a virtual world, players can form a close bond with them and experience victory and failure through them. You et al. (2017) defined the identification of an avatar as a process in which gamers psychologically attach themselves to their desired avatar (online game character) and develop a strong affection for it. As such, avatar identification is one of the main elements that greatly affect gamers' psychological experience (Klimmt et al., 2009). On the other hand, qualitative research suggests players

tend to express their disapproval when asked for their opinions concerning avatars since they consider avatars a way of achieving in-game goals (Green et al., 2021a). Moreover, recent systematic reviews have reported a moderate relationship between avatar-identification and GD (Green et al., 2021b; Lemenager et al., 2020; Szolin et al., 2022). These results indicate that further research is necessary to identify psychosocial mechanisms underlying GD pathways.

Previous studies have shown that individual differences could lead to body dissatisfaction (Carter & Vartanian, 2022; Green et al., 2021b). One individual difference that might be relevant due to exposure to online idealized images is self-concept clarity (SCC) – the degree to which a person's sense of self is well-defined, specific, temporally stable, and internally congruent (Campbell et al., 1996; Carter & Vartanian, 2022). When individuals lack a clear sense of their identity, they rely more on external influences to help define themselves (Campbell et al., 1996) and identify their social position compared to others. Šporčić and Glavak-Tkalić (2018) found that identification with avatars could help individuals with a compromised body image find alternative ways to satisfy their social-life relational needs and avoid stress experienced in social environments. Indeed, since addictive behaviors, such as GD, are often used in a dysfunctional way to cope with the experienced aversive affective response, those unsatisfied with their body image seem more likely to engage in excessive gaming because online interactions through idealized avatars may compensate for their body dissatisfaction (Sioni et al., 2017).

For example, it has been shown that compared to non-disordered gamers, disordered gamers design and use avatars that are more closely linked with their ideal self, and there is a significant gap between their ideal and actual self (Leménager et al., 2016). These findings suggest that disordered gamers may experience a substantial distance between their actual self and their ideal self and that this gap can be closed by creating and customizing an avatar that is in line with their ideal self. In light of this, creating and maintaining an ideal self may be possible with the help of the avatar, which would lessen the anguish that results from self-discrepancy theory (Higgins, 1987). Therefore, it might be expected that low SCC would predict body image coping strategies and avatar identification. Furthermore, just as avatar identification has been found to mediate the association between SCC and GD, it might also be expected that body image coping strategies and avatar identification would serially mediate the association between SCC and GD.

Therefore, the present study tested the relationship between SCC, body image-coping strategies, avatar-identification, and GD among online gamers. In particular, the present study explored how individuals who feel a lack of SCC are more inclined to develop GD through two body image-coping strategies: *appearance-fixing* (attempts by individuals to alter their image with efforts to disguise, hide, camouflage, or modify the body area that they deem undesirable) and *avoidance* (the extent to which individuals avoid psychological discomfort through self-imposed ignorance of one's unpleasant thoughts or feelings) (Cash et al., 2005). Therefore, a serial mediation model was tested hypothesizing that body image-coping strategies and avatar-identification could work as serial mediators in the relationship between SCC and GD. However, due to the study's cross-sectional nature, an alternative model was tested in which GD was the predictor, avatar identification and avoidance were the mediators, and SCC was the outcome since GD might increase both avatar identification and avoidance levels, and this might in turn cause lower SCC.

2. Method

2.1. Participants and procedure

A convenience sample of 214 Italian online gamers (64 % males) was anonymously recruited between November 2021 and February 2022 by posting a survey link on social media gaming and other online gaming-related sites. Gamers were invited to complete the survey, and by using a snowball approach, they could invite other friends to join the study. Participants' age ranged from 18 to 59 years ($M = 24.07$ years, $SD = 5.19$). The inclusion criteria were being aged over 18 years and playing online for at least one hour per day using an avatar. The first author's university ethics committee approved the study, and all participants provided informed consent.

2.2. Measures

Socio-demographics and gaming habits. Data concerning socio-demographics (e.g., gender, age, occupation) and gaming habits were collected (see Appendix 1a).

Self-Concept Clarity Scale (SCCS). The 12-item Italian SCCS (Scalas et al., 2013; original version: Campbell et al., 1996) was used to assess SCC. It comprises two non-reversed items (e.g., *"In general, I have a clear sense of who I am and what I am"*) and ten reversed items (e.g., *"On one day I might have one opinion of myself and on another day I might have a different opinion"*) rated on a five-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores indicate greater SCC. Cronbach's α in the present study was 0.88.

Body Image Coping Strategies Inventory (BICSI). The 24-item Italian BICSI (Rollero et al., 2017; original version: Cash et al., 2005) was used to assess how individuals manage body-image stressors. Items are rated on a four-point scale from (0 = *definitely not like me*; 3 = *definitely like me*). Higher scores indicate body-image threats. Two dimensions were used: appearance-fixing (nine items; e.g., *"I do something to try to look more attractive"*; α = 0.86) and avoidance (seven items; e.g., *"I withdraw and interact less with others"*; α = 0.78).

Player-Avatar Identification Scale (PAIS). An adapted version of the PAIS (Li et al., 2013) was used in assess avatar-identification, translated from English into Italian followed APA guidelines (Gudmundsson, 2009). The scale comprises four first-order constructs: feeling during play (four items; e.g., *"When my character achieves his/her goals, I feel happy"*; α = 0.79), absorption during play (three items; e.g., *"I forget myself during the game"*; α = 0.75), positive attitude toward the avatar (four items; e.g., *"I am proud to play the character I am playing now"*; α = 0.86), and importance to identity (four items; e.g., *"The character I play reflects who I am"*; α = 0.84). Items are rated on a five-point scale (1 = *strongly disagree*; 5 = *strongly agree*). The scores of each factor are averaged to create four single indicators. Higher scores indicate higher levels in the construct. The results of the confirmatory factor analysis showed adequate fit with the data: robust $\chi^2(71, N = 214) = 143.48$, $p < 0.001$, CFI = 0.93, TLI = 0.92, RMSEA = 0.07, 90 % CI [0.05, 0.08], SRMR = 0.07.

Internet Gaming Disorder Scale (IGDS9-SF). The nine-item Italian version of the IGDS9-SF (Monacis et al., 2016; original version: Pontes & Griffiths, 2015) was used to assess GD. Items (e.g., *"Do you feel more irritability, anxiety or even sadness when you try to either reduce or stop your gaming activity"*?) are rated on a five-point scale (1 = *never*; 5 = *very often*). Higher scores indicate a higher degree of GD. Cronbach's α in the present study was 0.90.

2.3. Statistical analyses

Descriptive statistics were computed using SPSS v.27. Preliminary exploratory statistics indicated no missing item-level data because the online survey could not be submitted if there was missing responses. Kurtosis and skewness values were examined to estimate the normal distribution of key variables in the proposed research model. Since structural equation modelling (SEM) was used, to obtain more stable parameter estimates and better model fit, solutions based on item-parceling are more appropriate (Sterba & Rights, 2016). Item-parceling was generated by applying a balanced procedure to combine high and low inter-correlations values (Little et al., 2002). Therefore, three indicators were generated for each construct: SCC, body coping image strategies, and GD. To test the hypotheses of the study, SEM

analysis was conducted using Mplus 7.01 (Muthén & Muthén, 2014).

An alternative model was estimated to test the mediating role of each variable in the relationship between GD and SCC since the dependent, and the independent variables were reversed (Thurm et al., 2022). All models were estimated with maximum-likelihood parameters with standard errors and a mean-adjusted chi-square test statistic robust to non-normality (MLMV). The fit of the tested models was assessed using multiple indexes (Kline, 2016). Comparison with the models was performed by computing robust χ^2 difference statistic ($\Delta\chi^2$) under the MLMV estimator using the "DIFFTEST" command in Mplus (Pavlov et al., 2020).

3. Results

Skewness and kurtosis values were examined to test the normal distribution of the main variables. As shown in Table 1, the skewness and kurtosis of the main variables were all less than 2 and within the acceptable range (i.e., skewness < 2 and kurtosis < 4; Kline, 2016). This value indicates that the present study's sample distribution did not deviate from normality. Statistically significant correlations were found in the expected directions between the predictor variable, body image coping, avatar-identification, and GD (see Table 1). SCC was significantly negatively associated with appearance-fixing ($r = -0.49$) and avoidance ($r = -0.51$) and GD ($r = -0.38$). On average, participants spent 2.68 h gaming daily (range: 1–10, $SD = 1.97$). Additional results concerning the participants' gaming-related habits are shown in Appendix 1b.

SEM analysis was run to examine direct and indirect relationships between the study's variables (see Fig. 1). The full mediated model fitted the data well: robust χ^2 (93, N = 214) = 135.53, $p = 0.003$, CFI = 0.96, TLI = 0.95, RMSEA = 0.05, 90 % CI [0.03, 0.06], SRMR = 0.06, which accounted for 36 % of the variance in participants' GD. In addition, all coefficients estimated for the measurement model and the estimates of error variances were also significant.

Negative associations were found between SCC and the two dimensions of the body coping strategies (appearance-fixing: $\beta = -0.579$, $SE = 0.048$, avoidance: $\beta = -0.573$, $SE = 0.056$), and avatar-identification: $\beta = -.241$, $SE = 0.111$). A significant positive association was found between avatar-identification and appearance-fixing: $\beta = 0.281$, $SE = 0.092$. Avatar-identification was positively associated with GD: $\beta = 0.367$, $SE = 0.084$. The results indicated the full mediating role of avoidance ($\beta = -0.186$, $SE = 0.052$) and the full serial mediating effect of appearance-fixing and avatar-identification ($\beta = -0.060$, $SE = 0.027$) in the association between SCC and GD, of the total effect ($\beta = -0.430$, $SE = 0.064$). Results of the alternative mediation model (χ^2 (95, N = 214) = 145.06, $p < 0.001$, CFI = 0.96, TLI = 0.95, RMSEA = 0.05, 90 % CI [0.03, 0.06], SRMR = 0.07) showed that GD increased the levels of avoidance, appearance fix, and avatar identification, and in turn only

avoidance and appearance fixing decreased the levels of SCC. Therefore, only avoidance and appearance fixing fully mediated the relationship between GD and SCC. Avatar identification was not a significant mediator of the proposed association. However, given the fit of the alternative model did not improve, this model was not accepted ($\Delta\chi^2$[2] = 11.23, $p = 0.004$). Therefore, the hypothesized model was the best-fitting model and the strongest basis for interpreting the results.

4. Discussion

In line with prior studies (e.g., Green et al., 2021b; Šporčić & Glavak-Tkalić, 2018), a negative correlation between SCC and GD was found. Lower levels of SCC predicted high GD, and provided evidence that players with a less clear self-concept play videogames to achieve a temporary sense of certainty, stability, identity, and control that is often lacking in other areas of their lives (Green et al., 2021a; Lemenager et al., 2020). This result could be interpreted in the framework of self-discrepancy theory (Higgins, 1987), suggesting that virtual identities are used by individuals who lack self-concept as a strategy to compensate for their body dissatisfaction, which could contribute to increasing their avatar-identification, and they could become at-risk of GD (Szolin et al., 2022; Teng, 2017).

The results indicated that avoidance, a form of escapism, fully mediated the relationship between SCC and GD. This finding aligns with previous research that individuals tend to avoid psychological discomfort through self-imposed ignorance of their unpleasant thoughts or feelings, increasing the risk of developing GD (Blasi et al., 2019; Castro-Calvo et al., 2021; Stavropoulos et al., 2017).

Furthermore, as hypothesized, the serial pathway fully mediated the relationship between SCC and GD via appearance-fixing and avatar-identification. In other words, SCC was indirectly related to GD through the suggested serial path. Indeed, appearance-fixing underlines the nature of the association between the player and avatar. Therefore, there is the possibility that some online games offer players the opportunity to create idealized avatars to alter their personal image with the opportunity to disguise or modify the body area that they deem undesirable. Moreover, it may be a chance to express some repressed aspects of self in secure environments (online videogames) by experiencing a new identity through the avatar (Cash et al., 2005; Loewen et al., 2021). These results, in line with other studies, suggest that the more customizable the avatar is, the more the players amplify their avatar identification. This vicarious experience is an attempt to satisfy the player's identity need since they are motivated to generate an avatar that is better than the actual self, and could increase the risk of GD (Green et al., 2021b; Lemenager et al., 2020; Mancini et al., 2019; Szolin et al., 2022). More specifically, low levels of SCC may be responsible for higher avatar-identification which, in turn, is predictive of GD (Green et al., 2021a; Sioni et al., 2017; Šporčić & Glavak-Tkalić, 2018).

Table 1
Descriptive statistics and correlation matrix for the study variables.

	M	SD	Skew	Kurtosis	1	2	3	4	5	6	7	8	9	10
1. SSC	3.34	0.77	−0.26	0.19	–									
2. Appearance-fixing	2.26	0.62	−0.00	−0.67	−0.49***	–								
3. Avoidance	1.94	0.59	0.56	−0.18	−0.51***	0.45***	–							
4. Feeling during play	3.00	0.88	−0.27	−0.36	−0.14*	0.25***	0.09	–						
5. Absorption during play	2.60	0.96	−0.08	−0.75	−0.32***	0.28***	0.23***	0.56***	–					
6. Positive attitude towards avatar	3.20	0.82	−0.79	0.69	−0.06	0.13*	0.02	0.61***	0.46***	–				
7. Importance to identity	2.13	0.87	0.37	−0.67	−0.33***	0.30***	0.22***	0.40***	0.45***	0.37***	–			
8. IGDS9-SF	1.78	0.74	0.16	0.85	−0.38***	0.25***	0.43***	0.23***	0.36***	0.22***	0.36***	–		
9. Age	24.10	5.19	2.27	10.5	0.18***	−0.21***	−0.12	−0.02	−0.02	−0.01	−0.13*	−0.04	–	
10. Gender	–	–	–	–	−0.19***	0.21***	0.06	−0.09	−0.10	−0.15*	−0.06	−0.15*	−0.08	–

Note. SCC = Self-Concept Clarity; IGDS9-SF = Internet Gaming Disorder Scale–Short Form. Gender (1 = male, 2 = female) is point-biserial serial correlation ($r$pb).
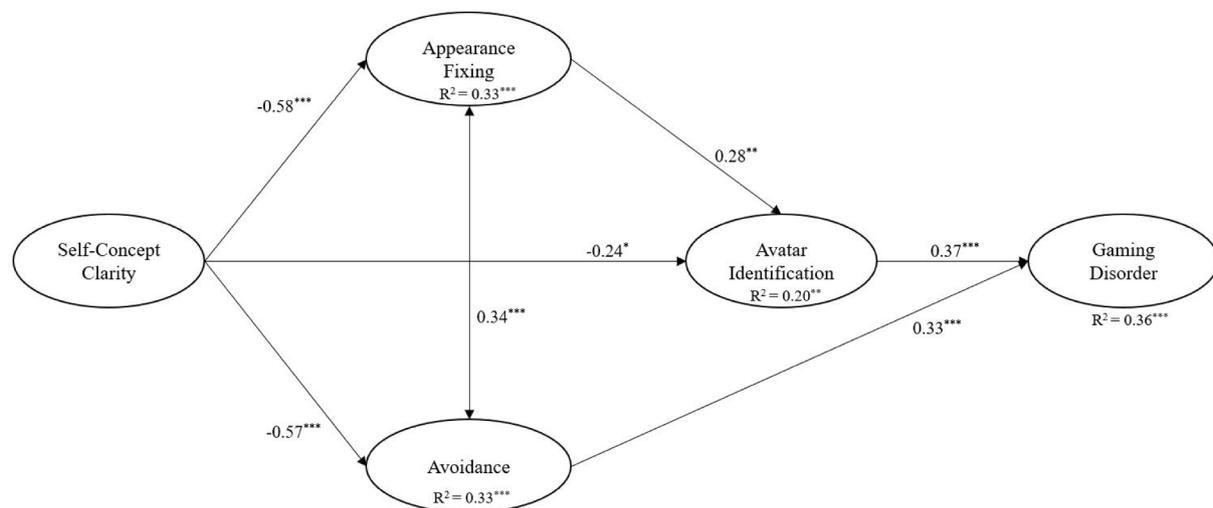* $p < 0.05$. *** $p < 0.001$.

Fig. 1. Results of the full mediated model. *Note.* All the values are standardized. Latent factors are presented in the circle. All factor loadings were significant ($p < 0.001$), ranging between 0.57 and 0.90. All coefficients estimated for the measurement model and the estimates of error variances were also significant. $^{*}p < 0.05$. $^{**}p < 0.01$. $^{***}p < 0.001$.

Although the participants of this study did not show high levels of GD, the current findings provide insight into the risk of GD (Liew et al., 2018; Teng, 2017). As previous evidence suggests, avatar-identification is not the main factor for GD, but in many cases often represents the exciting side of gaming (Casale et al., 2022; Green et al., 2021a, 2021b). Therefore, the player-avatar bond increases the risk of developing gaming addiction, and other variables should be considered in this relationship. Indeed, the results suggest that an antecedent of avatar-identification is the appearance-fixing coping strategy related to body dissatisfaction, which is involved in explaining GD.

The results should be considered in light of the sample's characteristics, which mainly included adults with low GD levels. It could be that gamers are more likely to report high GD levels when their body and personal concerns negatively impact social and personal well-being. The results highlighted the central role of body image-coping strategies and avatar-identification in the association between SCC and GD. Through avatar creation, gamers can design idealized characters that align with their ideal self to compensate for their perceived real-world deficiencies and/or escape from social situations that elicit negative emotions associated with self-discrepancy (Green et al., 2020; Leménager et al., 2016).

Further studies should investigate the role of body image-coping strategies in GD among players to explore which individuals are more influenced by gaming features, such as avatar customization, to compensate for their dissatisfaction. Furthermore, although the reliability analysis results suggested that the PAIS was satisfactory, future studies should consider the opportunity to validate the scale in the Italian context. Additionally, since the PAIS includes four dimensions, future studies should ascertain whether these dimensions have a different role in predicting GD (see, for example, the results concerning proto-self-presence as found by Liew et al., 2018). Finally, it would be interesting to investigate whether body dissociation (see Casale et al., 2022) affects the proposed relationships.

Considering the study's cross-sectional design, caution is required concerning the generalization of the results. Nevertheless, the comparison of the two tested models suggests more significant evidence for the role of SCC in predicting GD symptoms (via body coping strategies and avatar-identification) rather than the opposite. These results could inspire future investigations that experimentally explore the association between the study variables.

5. Author agreement**a

All authors have seen and approved the final version of the manuscript. The paper is original, and it is not under consideration for publication elsewhere.

CRediT authorship contribution statement

Rocco Servidio: Conceptualization, Project administration, Data curation, Formal analysis, Methodology, Writing – original draft. **Mark D. Griffiths:** Writing – review & editing, Supervision. **Stefano Boca:** Investigation, Methodology. **Zsolt Demetrovics:** Writing – review & editing, Supervision.

Declaration of Competing Interest

Data availability

Data will be made available on request from the corresponding author.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.abrep.2023.100482.

References

Blasi, M. D., Giardina, A., Giordano, C., Coco, G. L., Tosto, C., Billieux, J., & Schimmenti, A. (2019). Problematic video game use as an emotional coping strategy: Evidence from a sample of MMORPG gamers. *Journal of Behavioral Addictions, 8*(1), 25–34. https://doi.org/10.1556/2006.8.2019.02

Brand, M., Rumpf, H.-Jü., Demetrovics, Z., MÜller, A., Stark, R., King, D. L., … Potenza, M. N. (2020). *Which conditions should be considered as disorders in the International Classification of Diseases (ICD-11) designation of "other specified disorders due to addictive behaviors"? Journal of Behavioral Addictions.* https://doi.org/10.1556/2006.2020.00035

Campbell, J. D., Trapnell, P. D., Heine, S. J., Katz, I. M., Lavallee, L. F., & Lehman, D. R. (1996). Self-concept clarity: Measurement, personality correlates, and cultural boundaries. *Journal of Personality and Social Psychology, 70*(1), 141–156. https://doi.org/10.1037/0022-3514.70.1.141

Carter, J. J., & Vartanian, L. R. (2022). Self-concept clarity and appearance-based social comparison to idealized bodies. *Body Image, 40*, 124–130. https://doi.org/10.1016/j.bodyim.2021.12.001

Casale, S., Musicò, A., Gualtieri, N., & Fioravanti, G. (2022). Developing an intense player-avatar relationship and feeling disconnected by the physical body: A pathway towards internet gaming disorder for people reporting empty feelings? *Current Psychology.* https://doi.org/10.1007/s12144-022-03186-9

Cash, T. F., Santos, M. T., & Williams, E. F. (2005). Coping with body-image threats and challenges: Validation of the Body Image Coping Strategies Inventory. *Journal of Psychosomatic Research, 58*(2), 190–199. https://doi.org/10.1016/j.jpsychores.2004.07.008

Castro-Calvo, J., King, D. L., Stein, D. J., Brand, M., Carmi, L., Chamberlain, S. R., … Billieux, J. (2021). Expert appraisal of criteria for assessing gaming disorder: An international Delphi study. *Addiction, 116*(9), 2463–2475. https://doi.org/10.1111/add.15411

Green, R., Delfabbro, P. H., & King, D. L. (2020). Avatar- and self-related processes and problematic gaming: A systematic review. *Addictive Behaviors, 108*, Article 106461. https://doi.org/10.1016/j.addbeh.2020.106461

Green, R., Delfabbro, P. H., & King, D. L. (2021a). Player-avatar interactions in habitual and problematic gaming: A qualitative investigation. *Journal of Behavioral Addictions, 10*(2), 223–233. https://doi.org/10.1556/2006.2021.00038

Green, R., Delfabbro, P. H., & King, D. L. (2021b). Avatar identification and problematic gaming: The role of self-concept clarity. *Addictive Behaviors, 113*, Article 106694. https://doi.org/10.1016/j.addbeh.2020.106694

Griffiths, M. D. (2022). Disorders due to addictive behaviors: Further issues, debates, and controversies ●: Commentary to the debate: "Behavioral addictions in the ICD-11". *Journal of Behavioral Addictions, 11*(2), 180–185. https://doi.org/10.1556/2006.2022.00025

Gudmundsson, E. (2009). Guidelines for translating and adapting psychological instruments. *Nordic Psychology, 61*(2), 29–45. https://doi.org/10.1027/1901-2276.61.2.29

Higgins, E. T. (1987). Self-discrepancy: A theory relating self and affect. *Psychological Review, 94*(3), 319–340. https://doi.org/10.1037/0033-295X.94.3.319

Higuchi, S., Nakayama, H., Matsuzaki, T., Mihara, S., & Kitayuguchi, T. (2021). *Application of the eleventh revision of the International Classification of Diseases gaming disorder criteria to treatment-seeking patients: Comparison with the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders Internet gaming disorder criteria. Journal of Behavioral Addictions, 10*(1), 149–158. https://doi.org/10.1556/2006.2020.00099

Klimmt, C., Hefner, D., & Vorderer, P. (2009). The video game experience as "true" identification: A theory of enjoyable alterations of players' self-perception. *Communication Theory, 19*(4), 351–373. https://doi.org/10.1111/j.1468-2885.2009.01347.x

Kline, R. B. (2016). *Principles and practice of structural equation modeling (Fourth edition)*. The Guilford Press.

Leménager, T., Dieter, J., Hill, H., Hoffmann, S., Reinhard, I., Beutel, M., Vollstädt-Klein, S., Kiefer, F., & Mann, K. (2016). Exploring the neural basis of avatar identification in pathological internet gamers and of self-reflection in pathological social network users. *Journal of Behavioral Addictions, 5*(3), 485–499. https://doi.org/10.1556/2006.5.2016.048

Lemenager, T., Neissner, M., Sabo, T., Mann, K., & Kiefer, F. (2020). "Who am I" and "How should I be": A systematic review on self-concept and avatar identification in gaming disorder. *Current Addiction Reports, 7*(2), 166–193. https://doi.org/10.1007/s40429-020-00307-x

Li, D. D., Liau, A. K., & Khoo, A. (2013). Player–avatar identification in video gaming: Concept and measurement. *Computers in Human Behavior, 29*(1), 257–263. https://doi.org/10.1016/j.chb.2012.09.002

Liew, L. W. L., Stavropoulos, V., Adams, B. L. M., Burleigh, T. L., & Griffiths, M. D. (2018). Internet gaming disorder: The interplay between physical activity and user–avatar relationship. *Behaviour & Information Technology, 37*(6), 558–574. https://doi.org/10.1080/0144929X.2018.1464599

Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the question, weighing the merits. *Structural Equation Modeling, 9*(2), 151–173. https://doi.org/10.1207/S15328007SEM0902_1

Loewen, M. G. H., Burris, C. T., & Nacke, L. E. (2021). Me, myself, and not-I: Self-discrepancy type predicts avatar creation style. *Frontiers in Psychology, 11*, 1902. https://doi.org/10.3389/fpsyg.2020.01902

Mancini, T., Imperato, C., & Sibilla, F. (2019). Does avatar's character and emotional bond expose to gaming addiction? Two studies on virtual self-discrepancy, avatar identification and gaming addiction in massively multiplayer online role-playing game players. *Computers in Human Behavior, 92*, 297–305. https://doi.org/10.1016/j.chb.2018.11.007

Monacis, L., de Palo, V., Griffiths, M. D., & Sinatra, M. (2016). Validation of the Internet Gaming Disorder Scale – Short-Form (IGDS9-SF) in an Italian-speaking sample. *Journal of Behavioral Addictions, 5*(4), 683–690. https://doi.org/10.1556/2006.5.2016.083

Muthén, L. K., & Muthén, B. O. (2014). Mplus (Version 7.2) [computer software]. *Muthén & Muthén.*

Pavlov, G., Shi, D., & Maydeu-Olivares, A. (2020). Chi-square difference tests for comparing nested models: An evaluation with non-normal data. *Structural Equation Modeling, 27*(6), 908–917. https://doi.org/10.1080/10705511.2020.1717957

Pontes, H. M., & Griffiths, M. D. (2015). Measuring DSM-5 internet gaming disorder: Development and validation of a short psychometric scale. *Computers in Human Behavior, 45*, 137–143. https://doi.org/10.1016/j.chb.2014.12.006

Rollero, C., Tartaglia, S., & De Piccoli, N. (2017). *Psychometric properties of the Italian version of the Body Image Coping Strategies Inventory. Psicologia Sociale, 3*, 293–306. https://doi.org/10.1482/87886

Scalas, F. L., Fadda, D., & Meleddu, M. (2013). *Contributo alla validazione Italiana della Self-Concept Clarity Scale. Giornale Italiano di Psicologia, 3*, 615–646. https://doi.org/10.1421/76218

Sioni, S. R., Burleson, M. H., & Bekerian, D. A. (2017). Internet gaming disorder: Social phobia and identifying with your virtual self. *Computers in Human Behavior, 71*, 11–15. https://doi.org/10.1016/j.chb.2017.01.044

Šporčić, B., & Glavak-Tkalić, R. (2018). The relationship between online gaming motivation, self-concept clarity and tendency toward problematic gaming. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 12*(1), 4. https://doi.org/10.5817/CP2018-1-4

Stavropoulos, V., Kuss, D., Griffiths, M. D., Wilson, P., & Motti-Stefanidi, F. (2017). MMORPG gaming and hostility predict Internet Addiction symptoms in adolescents: An empirical multilevel longitudinal study. *Addictive Behaviors, 64*, 294–300. https://doi.org/10.1016/j.addbeh.2015.09.001

Sterba, S. K., & Rights, J. D. (2016). Accounting for parcel-allocation variability in practice: Combining sources of uncertainty and choosing the number of allocations. *Multivariate Behavioral Research, 51*(2–3), 296–313. https://doi.org/10.1080/00273171.2016.1144502

Szolin, K., Kuss, D., Nuyens, F., & Griffiths, M. (2022). Gaming disorder: A systematic review exploring the user-avatar relationship in videogames. *Computers in Human Behavior, 128*, Article 107124. https://doi.org/10.1016/j.chb.2021.107124

Teng, C.-I. (2017). Impact of avatar identification on online gamer loyalty: Perspectives of social identity and social capital theories. *International Journal of Information Management, 37*(6), 601–610. https://doi.org/10.1016/j.ijinfomgt.2017.06.006

Teng, Z., Pontes, H. M., Nie, Q., Griffiths, M. D., & Guo, C. (2021). Depression and anxiety symptoms associated with internet gaming disorder before and during the COVID-19 pandemic: A longitudinal study. *Journal of Behavioral Addictions, 10*(1), 169–180. https://doi.org/10.1556/2006.2021.00016

Thurm, A., Satel, J., Montag, C., Griffiths, M. D., & Pontes, H. M. (2022). The relationship between gambling disorder, stressful life events, gambling-related cognitive distortions, difficulty in emotion regulation, and self-control. *Journal of Gambling Studies.* https://doi.org/10.1007/s10899-022-10151-5

You, S., Kim, E., & Lee, D. (2017). Virtually real: Exploring avatar identification in game addiction among massively multiplayer online role-playing games (MMORPG) players. *Games and Culture, 12*(1), 56–71. https://doi.org/10.1177/1555412015581087