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Mediators and moderators of self-esteem's risk to gaming disorder

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Abstract

Aim: This study aimed to understand the mediating and moderating effects of self-esteem's relationship with gaming disorder (GD).

Methods: Participants (N = 1,712) were recruited from online gaming forums. A battery of measures including GD, self-esteem, depression, anxiety, escapism, and playing time were completed.

Results: Escapism, depression, and playing time have a significant mediating effect on self-esteem's relationship with GD. Escapism and depression explained most of the mediated effect, with playing time showing a much smaller effect. Anxiety was not a significant mediator. Unexpectedly, high self-esteem does not appear to buffer against the effects escapism and playing time have on GD. This contradicts clinical literature that promotes high self-esteem as a resilience factor.

Conclusions: Mediating effects of self-esteem's relationship with GD were identified in this study. Moderators other than self-esteem might be more prudent to investigate in GD research.

Keywords

Gaming disorder, self-esteem, mediation, moderation

Introduction

Gaming disorder (GD) has been recognized as a diagnosis in the eleventh edition of the International Classification of Diseases-11 (ICD-11) [1]. The ICD-11 describes the disorder as: persistent gaming behavior and impaired control over gaming which effects social and personal functioning for a period of at least 12 months. To elucidate with an example; this can mean a person struggles to control the frequency, intensity, and duration of gaming and the priority of important activities of daily living over gaming. This can then lead to negative consequences (e.g., occupationally, socially, or health).

According to Stevens et al.'s [2] systematic review, the prevalence rate of GD is estimated to be 1.96%, meaning, that for most people, gaming provides positive recreational or social experiences [3]. However, for a subgroup of the population, gaming becomes a problematic addiction that adversely affects their social, relational, and professional lives [4].

Current treatments for GD are mostly adaptations of treatments used in other addictions [5]. Therefore, researching the risk factors for GD could assist in the development of more targeted and specialized treatments.

This study investigates GD within the context of massively multiplayer online role-playing games (MMORPGs) as players of MMORPGs are more vulnerable to GD [6]. In an MMORPG, thousands of gamers interact with one another. Each gamer develops their own unique avatar over time and can form in-group 'guilds', which are a hierarchical organization of players with common goals [7].

Research indicates that self-esteem is a risk factor for GD [8]. However, the mediating and moderating effects of this relationship are understudied. Better understanding the effects of mediation and moderation on self-esteem's relationship with GD, could allow clinicians to more efficiently target treatments for GD. For example, resilience research has indicated that high self-esteem can buffer/moderate against the effects of stressful situations [9]. Therefore, it might also moderate against risk factors for GD. If high self-esteem moderates stress, conversely low self-esteem might predict psychological suffering which might then increase risk of GD. Evidence for the vulnerability hypothesis seems to confirm this where low self-esteem contributes to anxiety and depression [10].

Overall, previous research provides stronger support that low self-esteem contributes to depression and weaker support that depression erodes self-esteem [10]. In a review, Ostinelli et al. [11] identified strong correlations between depression and GD. Regarding mediation, Scerri et al. [12] found that the relationship between need-fulfilment deficiencies and GD could be explained through a serial mediation of need-fulfilment deficiencies to self-esteem to depression to GD. It is unclear what type of gamers Scerri et al. [12] recruited in their study: "gamers were recruited via Facebook networking". Therefore, this study builds on Scerri et al.'s [12] findings by investigating if depression mediates self-esteem with a specific focus on MMORPG players.

Like depression, there is stronger support that low self-esteem contributes to anxiety and weaker support that anxiety erodes self-esteem [13]. In their review, González-Bueso et al. [14] identified strong correlations between anxiety and GD. Research from problematic internet addiction studies has found inconclusive evidence as to whether anxiety mediates self-esteem. Kim and Davis [15] found anxiety to mediate self-esteem's relationship to internet addiction but Koronczai et al. [16] did not. Gao et al. [17] found that anxiety mediated self-esteem's relationship to addictive smart phone use. Considering the results of problematic internet use studies more generally, the relationship between self-esteem and GD may be mediated by anxiety, however, to the best of our knowledge, this remains unexplored.

Some research has indicated that longer playing time is associated with higher scores of GD [18] with other research finding no relationship [19]. Inconsistent findings have initiated a debate as to whether playing time can be considered a GD diagnostic criterion [20, 21]. It is unclear why increased playing time might lead to GD for some people but not others. Potentially playing time combined with a type of stressor in life leads to problematic gaming. Considering high self-esteem can mitigate against stressful experiences [9], it might be that high self-esteem has a moderating relationship between playing time and GD. A conference abstract from a study by Koncz et al. [22] suggests that self-esteem moderates the relationship between gaming time and GD for people who identify as female. However, outside of this abstract, to the best of our knowledge, this moderating effect has not been explored previously in the GD literature.

In addition to self-esteem potentially being a moderator of playing time; playing time as a mediator of self-esteem will also be investigated. Cudo et al. [23] previously found a large effect size for playing time as a mediator of self-esteem's relationship to GD. However, Cudo et al. [23] study was of undergraduates from one university and did not investigate a specific game type. Cudo et al. [23] also potentially missed other important mediators in their mediation model like depression and anxiety which as noted above have shown strong correlations with both GD and self-esteem. Therefore, it is important to build on Cudo et al. [23] results by including other important mediators in a mediation model, with a wider sample and a specific game type.

Escapist players are defined as individuals who use gaming to escape from real life problems [24]. Whilst Stetina et al. [25] identified motivations to game to 'escape' real life problems can be a valuable coping strategy, it is also associated with GD [26, 27]. Therefore, identifying why escapist gaming is a functional strategy for some but predicts GD for others is important. Again, considering high self-esteem can mitigate against the negative effects of stress/real life problems [9], it may be that gamers with high self-esteem use escapism in a functional and less disordered way. Therefore, assessing if self-esteem moderates the relationship between escapism and GD is important. Previously, Goh et al. [28] found that self-esteem moderated escapism's relationship to psychological wellbeing, through a complex model of playing time mediated by escapism and escapism's effect on psychological wellbeing moderated by self-esteem. However, the researchers did not measure GD in their model. Kardefelt-Winther [29] found that self-esteem moderated escapism's relationship to a measure of problem World of Warcraft (a type of MMORPG) gaming. However, the measure they used to assess problem gaming was unvalidated and adapted from measures assessing problematic internet use. Also, the author only used 6-items from the Rosenberg Self-Esteem Scale (RSES) [30], but it is unclear why they picked those 6-items. Therefore, assessing if self-esteem still moderates escapism using a validated GD measure is important. In addition to potentially being a moderator of escapism, escapism may also be a mediator of self-esteem, where gamers play to escape real world threats to their self-esteem [31]. To the best of our knowledge, this mediation effect remains unexplored in the GD literature.

Current theories pertaining to relationship between self-esteem and GD suggest that gamers can compensate for low self-esteem in the 'real world' by achieving within their 'gaming world' [23, 31, 32]. With lower self-esteem in the 'real world', and higher self-esteem in the 'gaming world', it makes sense as to why a gamer would rather stay in the 'gaming world' compensating for low self-esteem in the 'real world'. Therefore, it might be that total time spent gaming mediates the relationship between self-esteem and GD. In their quasi-experimental study, Kavanagh et al. [31] found that after self-esteem is experimentally lowered based on an outcome, people scoring above average on a GD measure are not motivated to engage in gaming. Despite this, Kavanagh et al. [31] also found that gamers report higher self-esteem when they immerse themselves in the 'gaming world' compared to their self-esteem in the 'real world'. An explanation for the two conflicting results in the study is that there might be a potential delay from when a person's self-esteem is lowered based on an outcome to when they are then motivated to try and find a method to cope with their lowered self-esteem as per Williams's [33] temporal need-threat model of ostracism. It has been argued that people escape into the gaming world to avoid negative affective states [34], and therefore it might be that post-lowered self-esteem negative effect states of anxiety and depression are activated which predict a person to game problematically [32].

Considering these compensatory mediation theories of self-esteem's relationship with GD; variables such as escapism, depression, anxiety, and playing time appear to be more appropriate explanatory mediators of self-esteem's relationship with gaming GD. For this reason, other variables that have associations with GD such as trauma [35], personality traits [36], and perceived social support [37] are not included as potential mediators in this study, as they are less likely to explain a self-esteem compensatory mediated relationship with GD. For example, regards personality, it is true that neuroticism is associated with GD [36]; however, this study's mediation model would argue that neurotic individuals are prone to anxiety and depression, and therefore may use gaming to escape because they perceive the gaming world as a more controllable method of lifting self-esteem than their life outside of the 'gaming world' [38]. It is the activation of depression and anxiety that would explain the relationship between low self-esteem and GD, rather than trait neuroticism. Therefore, personality traits appear less relevant for this model. Trauma is also less relevant as it is more likely that self-esteem would mediate the relationship between trauma and GD rather than vice-versa [39]. Regards trauma and self-esteem it is worth noting that in Kircaburun et al.'s [40] multiple mediation model, self-esteem was not a significant mediator of childhood emotional trauma relationship with GD.

Study aims

Much of the current clinical literature's understanding of the mediators and moderators of self-esteem's risk to GD is based on studies that used poorly validated measures, limited samples, or poorly defined ones. Additionally, as noted above, important variables have not been investigated yet. Therefore, to add value to the current GD literature, this study aims to understand the mediating and moderating effects of self-esteem's relationship with GD for MMORPG players, the game type players at greatest risk of GD [6]. We hope this understanding helps clinicians develop more efficiently targeted GD psychological treatments.

Considering previous research and the theories outlined above, it is hypothesized that self-esteem's relationship with GD will be mediated by depression, anxiety, playing time, and escapism. It is also hypothesized that high self-esteem will moderate the relationship between playing time and GD as well as escapism and GD.

Materials and methods

Measures

Participants provided data on age, gender, employment, level of education, nationality, and most played game genre. Additionally, participants completed the measures below.

GD

The Internet GD Scale-Short Form (IGDS9-SF) [41] is a nine item self-report instrument based on the diagnostic criteria for IGD. In their systemic review of assessment tools for GD, King et al. [42] noted that the IGDS9-SF was one of five scales that had greater evidential support for its psychometric properties. The IGDS9-SF provides total coverage of both DSM-5 and ICD-11 GD criteria [42]. The scoring ranges from 9 to 45 with higher scores reflecting greater severity of GD symptoms [Cronbach's alpha (α) = 0.83].

Self-esteem

The RSES [30] is a widely used 10-item self-report instrument for evaluating self-esteem. It also appears to be the most widely used measure of self-esteem in the GD literature [43]. The scoring ranges from 10 to 50 with higher scores reflecting greater self-esteem (α = 0.93).

Anxiety and depression

The Hospital Anxiety and Depression Scale (HADS) [44] assesses anxiety and depression symptoms within one scale which can help decrease participant burden. It has 7-items in either subscale. The HADS is well validated across different populations and has good psychometric properties [45]. Scores for both anxiety and depression subscales range from 7–28 and higher scores indicate more severe scores of anxiety or depression (α = 0.86 for anxiety and α = 0.79 for depression).

Escapism

The Motives for Online Gaming Questionnaire (MOGQ) [24] is a 27-item self-report measure used to assess the full range of motives for online gaming. The seven motivational dimensions assessed by MOGQ are: social, escape, competition, coping, skill development, fantasy, and recreation. The scale has been validated in different languages [46]. Only the escapism subscale will be used in this study (α = 0.91).

Average length of time played

Participants will be asked, over the last year, how many hours on average per week they play online games.

Attention check question

Evidence suggests that > 5% of respondents answer scale items carelessly increasing to as high as 60% when respondents receive no incentive to complete a survey [47] challenging a study's validity [48]. To mitigate against this, an instructional manipulation check item was included in the IGDS9-SF measure based on Oppenheimer et al. [49].

As part of a separate study, participants also completed measures assessing self-concept clarity and self-compassion [31].

Participants

Participants were recruited through online gaming forums. To be included, participants had to be over 18 years old, primarily play MMORPGs over other game types, spend at least one hour per week playing MMORPGs, and have fluent English proficiency.

A total of N = 2,574 individuals accessed the study through the advertised link. Responses were excluded if they only supplied demographic details (n = 619). Further exclusions were made for failing the attention check question (n = 165), having a primary gaming genre other than MMORPGs (n = 54), spending less than one hour per week gaming (n = 8), or being classified as spam (n = 16). This left a final sample of N = 1,712 participants. The average age was 30.31 years (SD = 8.77), with 65% identifying as male, 29% as female, 5% as non-binary, and 1% preferring not to disclose their gender. Participants represented 74 nationalities, with the highest percentages from the USA (47.9%), Britain (8.9%), Canada (7.1%), and Germany (4.6%). By continent, representation included North America (55.8%), Europe (29.6%), Asia (6.7%), Australia (4.1%), South America (3.3%), and Africa (0.5%). In terms of education, 96.3% had completed high school, and 51.5% held a university degree. Employment status was reported as 48.5% full-time employed, 17% students, 14.8% unemployed, 9.1% part-time employed, 6.5% self-employed, 3.7% homemakers, and 0.4% retired.

Procedure

The study received ethical approval from the University of Southampton (ethics code: 64224). Participants were recruited through an advertisement posted on a webpage. By clicking the link provided, they were directed to the Qualtrics platform, where they were presented with an information page about the study and a consent form. As an incentive, participants were offered entry into a raffle for a chance to win one of 10 £20 Amazon vouchers upon completing the study. After providing informed consent, participants proceeded to complete the measures outlined above.

Results

Whilst the clinical cut-off point for the IGDS9-SF is not definitive, recent research proposes a cut-off score of 32 [50, 51]. This would indicate that 6.5% of our sample met the cut-off score for GD. This is higher than the global prevalence rate of 1.96% reported by Stevens et al. [2], which is unsurprising given that participants were recruited from gaming forums.

A multiplication factor of three times the interquartile range was used to identify potential outliers. This resulted in n = 9 outliers being removed for the playing time measure. Altogether N = 1,528 completed all measures. Then, N = 1,549 completed measures sufficient to investigate self-esteem's moderating effect on escapism's relationship to GD. Then, N = 1,681 completed measures sufficient to investigate self-esteem's moderating effect on playing time's relationship to GD.

Histograms and scatterplots indicated the data was normally distributed. There was no indication of multicollinearity or homoscedasticity. The means, SD, and correlations among each variable are presented in Table 1.

Mediation analysis

PROCESS macro version 4.0, Model 4 [52] was used to test if the effect of self-esteem on GD was mediated by depression, anxiety, escapism, and time. Bootstrapping with 5,000 resamples to compute 95% confidence intervals (CIs) was applied. An effect was considered significant if the CI did not include zero. As expected, the total effect of self-esteem on GD was significant, b = –0.31, SE = 0.016, 95% CI [–0.34, –0.28]; the lower the self-esteem, the higher the GD score. There remained a significant relationship between self-esteem and GD even when accounting for the combined mediators; b = –0.05, SE = 0.022, 95% CI [–0.09, –0.01].

Table 1. Means, *SD*, and correlations for each variable (*N* = 1,528)

Scale	Mean	*SD*	Correlation						Reference
			1	2	3	4	5	6	
1. IGDS9-SF	20.79	6.41	-	–0.44	0.49	0.38	0.53	0.24	[41]
2. RSES	32.43	9	-	-	–0.66	–0.63	–0.49	–0.18	[30]
3. HADS-depression	12.77	3.93	-	-	-	0.57	0.5	0.19	[44]
4. HADS-anxiety	15.43	4.68	-	-	-	-	0.47	0.1	[44]
5. MOGQ escapism	11.34	4.95	-	-	-	-	-	0.19	[24]
6. Playing time	23.05	14.63	-	-	-	-	-	-	-

All variables correlated at $p < 0.001$. IGDS9-SF: Internet Gaming Disorder Scale-Short Form; RSES: Rosenberg Self-Esteem Scale; HADS: Hospital Anxiety and Depression Scale; MOGQ: Motives for Online Gaming Questionnaire. -: no data

There was a significant relationship between self-esteem and escapism, $b = -0.27$, $SE = 0.01$, 95% CI [–0.3, –0.25]; suggesting that those with lower self-esteem are more likely to game to escape difficulties. There was also a significant relationship between escapism and GD, with escapism associated with higher GD scores; $b = 0.44$, $SE = 0.03$, 95% CI [0.38, 0.51].

There was a significant relationship between self-esteem and depression, $b = -0.29$, $SE = 0.01$, 95% CI [–0.31, –0.27]; suggesting those with lower self-esteem feel more depressed. There was also a significant positive relationship between depression and GD, with those perceived as feeling more depressed scoring higher in GD; $b = 0.37$, $SE = 0.04$, 95% CI [0.28, 0.47].

There was a significant relationship between self-esteem and playing time, $b = -0.29$, $SE = 0.04$, 95% CI [–0.37, –0.21]; suggesting that those with lower self-esteem are likely to play games for more time. There was also a significant relationship between playing time and GD, where longer playing time was associated with higher GD scores; $b = 0.05$, $SE = 0.01$, 95% CI [0.03, 0.07].

There was a significant relationship between self-esteem and anxiety, $b = -0.326$, $SE = 0.01$, 95% CI [–0.35, –0.3]; suggesting that those with lower self-esteem are likely to experience more anxiety. However, unexpectedly, there was no significant relationship between anxiety and GD in the model; $b = 0.05$, $SE = 0.038$, 95% CI [–0.02, 0.12] (Figure 1).

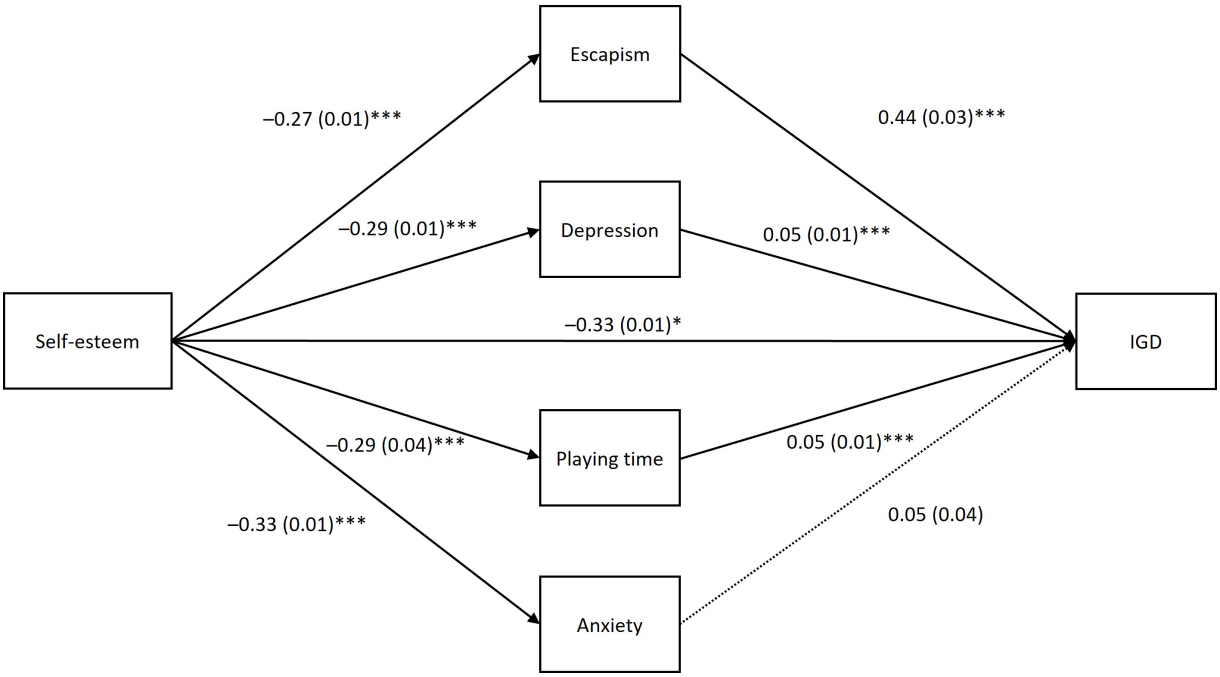

Figure 1. Multiple mediation model illustrating the direct and indirect effects of self-esteem on gaming disorder through escapism, depression, playing time, and anxiety. Solid lines indicate significant pathways, while dashed lines represent non-significant paths. Path values show path coefficients (standard errors). *** $p < 0.001$; * $p < 0.05$. IGD: Internet Gaming Disorder

The total indirect effect of the mediation model was significant, suggesting that self-esteem effects GD via the mediation model, b = –0.26, β = 0.36, bootstrapped SE = 0.02, bootstrapped 95% CI [–0.3, –0.22]. When accounting for the indirect effect of other mediators: the indirect effect of escapism was significant, suggesting that self-esteem can effect GD via escapism, b = –0.12, β = –0.17, bootstrapped SE = 0.01, bootstrapped 95% CI [–0.14, –0.1]; the indirect effect of depression was significant, suggesting that self-esteem can effect GD via depression, b = –0.11, β = –0.15, bootstrapped SE = 0.02, bootstrapped 95% CI [–0.14, –0.08]; the indirect effect of playing time was significant, suggesting that self-esteem can effect GD via time, b = –0.01, β = –0.02, bootstrapped SE = 0.01, bootstrapped 95% CI [–0.02, –0.01]; the indirect effect of anxiety was not significant, suggesting that self-esteem does not effect GD via anxiety independent of the effect of other mediators, b = –0.02, β = –0.02, bootstrapped SE = 0.01, bootstrapped 95% CI [–0.04, 0.01]. Overall, self-esteem, escapism, playing time, depression, and anxiety explained 37% of variance in GD. Taking Cohen's [53] effect sizes of a mediation model (small = 2%, medium = 13%, and 26% = large), the total indirect effect of the mediation model was large. The effect sizes also suggest that the main mediators of self-esteem's relationship to GD are escapism (largest effect) and depression (second largest effect). The results support the hypothesis that "self-esteem's relationship with GD will be mediated by depression, playing time, and escapism". However, unexpectedly it does not support the hypothesis of anxiety as a mediator.

Due to the unsupported anxiety mediation hypothesis, a non a priori mediation analysis was conducted to examine if by excluding the other mediation variables (escapism, playing time, and depression), anxiety mediates the relationship between self-esteem and GD. The mediation model was tested using 5,000 bootstrap samples. Results indicated a significant indirect effect of self-esteem on GD through anxiety b = –0.08, SE = 0.01, 95% CI [–0.11, –0.06], p < 0.001. This indicates that anxiety significantly mediated the relationship between self-esteem and GD. Furthermore, the direct effect of self-esteem on GD was significant b = –0.22, SE = 0.02, 95% CI [–0.27, –0.18], p < 0.001. This suggests that even after accounting for anxiety as a mediator, there was still a significant direct relationship between self-esteem and GD. The total effect of self-esteem on GD was also significant b = –0.31, SE = 0.02, 95% CI [–0.34, –0.28], p < 0.001. The proportion of the total effect mediated by anxiety was 26.75% (prop. mediated = 0.27, 95% CI [0.18, 0.37], p < 0.001). Indicating that 26.75% of the total effect of self-esteem on GD is explained by anxiety.

Moderation analysis

Moderation analysis was carried out using PROCESS macro version 4.0, Model 1 [52], bootstrapping for 5,000 resamples to compute 95% CIs. Table 2 details the moderation analysis and interaction effect.

Table 2. Self-esteem's moderating effect on escapism's relationship to gaming disorder *N* = 1,549

	b	*SE*	*t*	*p*	95% CI
Escapism	0.541	0.031	17.28	≤ 0.001	0.480, 0.603
Self-esteem	–0.165	0.017	–9.59	≤ 0.001	–0.2, –0.131
Escapism X self-esteem interaction	0.007	0.003	2.28	0.023	0.001, 0.013

The simple slopes analysis showed that at low (b = 0.479, SE = 0.04, 95% CI [0.4, 0.558], t = 11.86, $p \leq$ 0.001), average (b = 0.541, SE = 0.031, 95% CI [0.48, 0.603], t = 17.23, $p \leq$ 0.001) and high (b = 0.603, SE = 0.043, 95% CI [0.52, 0.687], t = 14.11, $p \leq$ 0.001) levels of self-esteem, escapism predicted GD. The PROCESS output signified that there were no statistically significant transition points within the observed range of the moderator found using the Johnson-Neyman method.

Figure 2 displays the interaction effect. It suggests that for both low and high self-esteem groups, as escapism scores rise, so do GD scores. However unexpectedly, this rise in scores is larger for the high self-esteem group, indicating that gamers with higher escapism scores experience more GD symptoms if they have higher self-esteem. This does not support the hypothesis that high self-esteem moderates the relationship between escapism and GD. It is worth stressing that the effect size for the interaction was small according to Cohen [53] and Kenny's [54] recommendations for effect size.

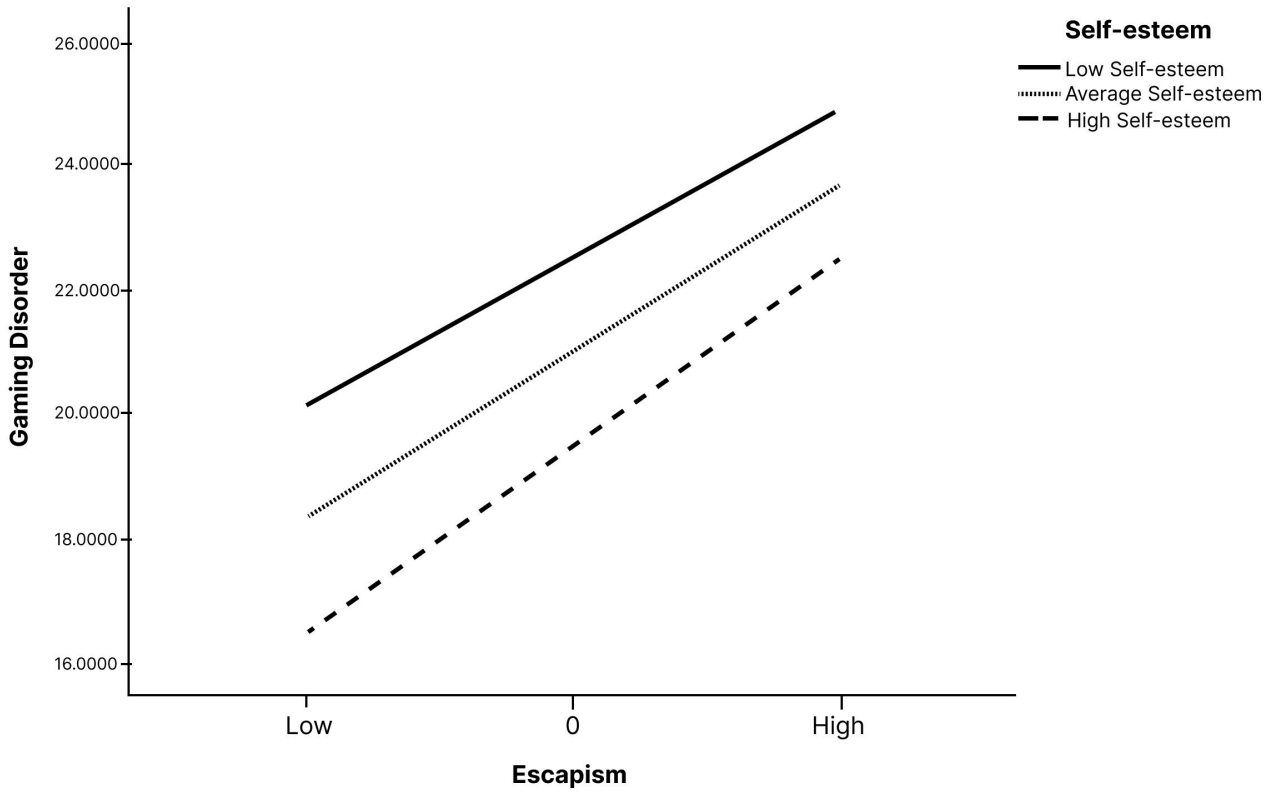

Figure 2. Interaction between escapism and self-esteem for gaming disorder

Table 3 details the moderation analysis for time spent gaming. Unexpectedly, the relationship between playing time and GD was not significantly moderated by self-esteem. This does not support the study's hypothesis that "self-esteem will moderate the relationship between playing time and GD".

Table 3. Self-esteem's moderating effect on playing time's relationship to gaming disorder *N* = 1,681

	b	*SE*	*t*	*p*	95% CI
Playing time	0.069	0.01	6.93	< 0.001	0.049, 0.088
Self-esteem	–0.294	0.015	–18.67	< 0.001	–0.325, –0.263
Playing time X self-esteem	< 0.001	0.001	–0.219	0.827	–0.002, 0.017

Discussion

The finding that depression mediates self-esteem provides further support for the vulnerability model [10]. The result suggests that gamers with low self-esteem are more likely to become depressed which consequently leads them to engage in problematic gaming. The results are in line with Scerri et al.'s [12] study. However, rather than a serial mediation, this study more clearly demonstrates that self-esteem's relationship with GD is mediated by depression. This study also builds on Scerri et al. [12] findings by investigating the mediation with a larger sample size and a specific focus on MMORPG players. As far as we are aware, this is the first study to establish depression as a mediator of self-esteem's relationship to GD in an MMORPG sample.

To our knowledge, this is also the first study to establish escapism as a mediator of self-esteem's relationship to GD. This is important considering it was the largest mediator in the model. Unexpectedly in the escapism moderator model, although a small effect size, the results indicate that gamers motivated to play for escapism experience more problematic gaming if they have higher self-esteem. This conflicts with Kardefelt-Winther [29] study which suggests high self-esteem has a moderating/buffering effect. The differences in results may be explained by Kardefelt-Winther [29] using an unvalidated GD measure and half of the RSES. Therefore, Kardefelt-Winther [29] highly cited study does not appear to replicate with a validated GD measure and needs to be interpreted with caution. Previously, Goh et al. [28] found that self-

esteem moderated escapism's relationship to psychological wellbeing. Therefore, it may be that higher self-esteem moderates the effects of escapism's relationship to psychological wellbeing but not GD. To the best of our knowledge, this is the first study to assess self-esteem's moderating effect on escapism's relationship to GD using a validated GD measure. Overall, it seems that escapism is better described as a mediator of self-esteem's relationship to GD.

Unexpectedly anxiety was not a significant mediator in the multiple mediation model. This finding is in line with Koronczai et al.'s [16] study of general internet addiction. However, it conflicts with Kim and Davis [15] and Gao et al.'s [17] studies which did find a significant anxiety mediation in internet addiction and smart phone use studies respectively. The differences in results may be due to the different measures used between the studies. Kim and Davis [15] measured generalized anxiety, Koronczai et al. [16] measured state and trait anxiety, Gao et al. [17] measured anxiety related to quality of life, and this study measured symptoms of generalized anxiety. However, considering Kim and Davis [15] and this study both measured generalized anxiety and found conflicting results, the differences may be explained by another factor. Potentially differences in results are due to Gao et al. [17] and Kim and Davis [15] not including depression in their mediation model, whereas Koronczai et al. [16] and this study did. Therefore, it seems for GD (according to the results of the non a priori simple anxiety mediation model in this study) and potentially internet addiction more generally, in a simpler model, anxiety does mediate self-esteem's relationship to GD. However, with additional more powerful mediators such as depression and escapism, anxiety becomes a non-significant mediator. Consequently, the results suggest it is unlikely that low self-esteem increases anxiety which leads the person to cope through problematic gaming. Escapism is defined as the avoidance of real life problems and anxiety often includes problem avoidance [55]. Potentially for low self-esteem's relationship to GD, avoidance of low self-esteem is better explained through escapism. As far as we are aware, this is the first study to investigate if anxiety mediates the relationship between self-esteem and GD.

Whilst playing time was also a significant mediator, the effect size was smaller compared to the mediating effects of escapism and depression. This indicates that a small part of self-esteem's relationship to GD might be explained through increased playing time. The result contrasts with Cudo et al.'s [23] study which found a larger effect size for time as a mediator of self-esteem's relationship to GD. Again, the differences in effect sizes may be due to the weight of other mediators in this study's model. Considering Cudo et al. [23] did not include escapism and depression in their mediation model, it may be that this study found a smaller effect size for playing time because self-esteem's relationship with GD is better explained through depression and escapism. However, differences may also be explained by the study's samples. Cudo et al. [23] sample consisted of a more limited sample, "university students from Lublin" and did not break their sample down by game type. As far as we are aware, this is the first study to establish playing time as a mediator between self-esteem and GD in an MMORPG population.

The multiple mediation analysis might help explain the results of Kavanagh et al.'s [31] study. Potentially the reason why Kavanagh et al. [31] did not find that their participants were motivated to game post-lowered self-esteem (despite reporting higher self-esteem when immersed in the 'gaming world' vs the 'real world') is because after self-esteem is lowered a negative affect state (depression) needs time to activate before a person is motivated to escape into the gaming world to cope as per Williams's [33] temporal need-threat model of ostracism.

Unexpectedly, self-esteem was not found to be a significant moderator of playing time. This suggests that high self-esteem does not mitigate against increased playing time's effect on GD. A conference abstract by Koncz et al. [22] suggests that self-esteem has a small moderating effect on the relationship between gaming time and GD for people who identify as female. However, outside of this abstract, to the best of our knowledge, this moderating effect has not been explored previously in the GD literature. Due to only having access to the conference abstract of Koncz et al.'s [22] study, it is difficult to make interpretations of the reason for conflicting results between this study and theirs. However, it may be that Koncz et al.'s [22] study had a limited sample (5th grade students from Budapest public schools with a mean age of 10.7). Therefore, differences in results could be explained by age, geography, gender, or another methodological factor.

It is worth pointing out that of all the variables assessed in this study, Table 1 indicates that playing time had the smallest relationship with GD. This raises further questions around the debate as to whether playing time can be considered a diagnostic criterion for GD [21].

The result that high self-esteem does not buffer against the negative effects of escapism or playing time was unexpected. It suggests the literature that promotes high self-esteem as a resilience factor [9] does not extrapolate to the GD literature. The clinical implications are that treatment interventions that attempt to increase self-esteem when escapism or playing time is an important contributary factor to the person's problematic gaming; are likely to be ineffective. Other buffers/moderators are potentially more clinically relevant and prudent to investigate in future research. Considering its conceptual overlap with self-esteem, one optional avenue for future GD escapism moderation research is self-compassion [56]. Self-compassion has been shown to provide greater emotional resilience than self-esteem in response to negative outcomes [56]. Considering that escapist gamers are motivated to game to avoid negative outcomes, self-compassion may mitigate/moderate the need to escape into MMORPGs to game problematically.

Considering escapism was dominant in the mediation model and that it also showed the largest relationship with GD (Table 1), it could be an important focus for clinical practice and research. Regards clinical practice, consider a person with GD who reports wanting to escape as a motivation to engage in gaming. Helping that person to identify and formulate their urge/motivation to escape into the gaming world to cope and then replace that urge with more functional coping strategies could be an effective component of a GD intervention [57, 58]. Future research could assess the effectiveness of including routine questions around escapism in the assessment/formulation phase of treatment for GD as well as specifically targeting the urges/motivations to escape when using intervention techniques. It is important to caveat that these clinical implications and research suggestions are limited in that other relevant psychological variables not included in this study may have more explanatory power than escapism.

Limitations

The study focused exclusively on MMORPG gamers, which limits the ability to generalize findings to players of other game types. While the majority of participants were male, this aligns with GD prevalence rates, which, according to Stevens et al. [2], show a 2.5:1 male-to-female ratio. The HADS is primarily designed to assess symptoms of generalized anxiety disorder [59]. Therefore, the non-significant findings related to anxiety mediation should be interpreted with caution, as they may be specific to generalized anxiety and may not extend to other types of anxiety disorders. The study used self-report measures which are subject to various forms of bias [60]. It is important to note that other variables not included in this study's multiple mediation analysis may have a stronger explanatory effect on the relationship between self-esteem and GD and therefore the investigation of other potential mediators in future research is warranted. The study used a diverse geographical sample, and some research has indicated that self-esteem is perceived differently across cultures, which could affect the validity of the self-esteem measure in this study [61].

Conclusion

Escapism, depression, and playing time have a significant mediating effect on self-esteem's relationship with GD. Escapism and depression explained most of the mediated effect, with playing time showing a smaller effect. Anxiety is a significant mediator of self-esteem's relationship with GD outside of the multiple mediation model. However, it becomes non-significant when mediators of depression, escapism, and playing time are included in a multiple mediation model. High self-esteem does not appear to buffer against the effects escapism and playing time have on GD.

The study helps to fill a number of gaps in the GD literature. It is the first to: establish escapism as a mediator of self-esteem's relationship to GD; the first to assess self-esteem's moderating effect on escapism's relationship to GD using a validated GD measure; the first to establish depression as a mediator of self-esteem's relationship to GD in a MMORPG sample; the first to investigate if anxiety mediates the relationship between self-esteem and GD; and finally, the first to establish playing time as a mediator between self-esteem and GD in a MMORPG population.

Abbreviations

CIs: confidence intervals

GD: gaming disorder

HADS: Hospital Anxiety and Depression Scale

ICD-11: International Classification of Diseases-11

IGDS9-SF: Internet Gaming Disorder Scale-Short Form

MMORPGs: massively multiplayer online role-playing games

MOGQ: Motives for Online Gaming Questionnaire

RSES: Rosenberg Self-Esteem Scale

Declarations

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Author contributions

MK: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing—original draft, Writing—review & editing.

Conflicts of interest

The author declares that there are no conflicts of interest.

Ethical approval

The study received ethical approval from the University of Southampton (ethics code: 64224). 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 (5).

Consent to participate

Informed consent to participate in the study was obtained from all participants.

Consent to publication

Not applicable.

Availability of data and materials

The raw data supporting the conclusions of this manuscript will be made available by the authors, without undue reservation, to any qualified researcher.

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Publisher's note

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