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# Negative Emotional States, Satisfaction with Life, and Romantic Relationships in Young Adult Gamers and non-Gamers: An Exploratory Study

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**Abstract.** *Objectives:* A body of research is clarifying the complexity of the effects of online gaming on the lives of gamers. We explored self-reported negative emotional states, satisfaction with life, and relationship satisfaction in a sample of young adults. *Methods:* We recruited 165 student participants (70.9% female;  $M_{age} = 24.24$ ,  $SD = 6.15$ ) who completed an online survey. Two-way ANCOVAs were used to assess the relationships between online gaming, gender and the measures of negative emotional states, satisfaction with life, and relationship satisfaction. *Results:* No effects of gaming on relationship satisfaction were evident. However, gaming was positively related to satisfaction with life. In contrast, when negative emotional states were examined, female gamers had higher levels of depression, anxiety, and stress than both non-gamers and male gamers. *Conclusion and Implications:* This highlights the complexities of the effects of gaming and that gaming itself should not be pathologized. The interactions evident in female gamers require further investigation, with the results supporting the notion that in some cohorts pre-existing characteristics of gamers might be a factor, as could how female gamers engage with online gaming environments. Further, the distinction between cognitive judgmental measures of satisfaction with life and negative emotional states was reiterated.

**Keywords:** Gaming, Satisfaction with Life, Negative Emotional States, Romantic Relationships, Young Adults

## Background

The array of gaming products and platforms available globally means that gaming opportunities are available to, and used by, substantial proportions of the population (Entertainment Software Association, 2019). In New Zealand, Brand et al., (2017) found that 67% of New Zealander's play video games, their average age is 34, and 47% of gamers are female – these data are consistent with international data (e.g., Entertainment Software Association, 2019). Given the high levels of engagement globally and the ongoing growth of the industry, researchers have become increasingly interested in the effects of gaming on people, *both* positive and negative (e.g., Anderson et al., 2010; Granic et al., 2014; Halbrook et al., 2019; Jones et al., 2014; Prescott et al., 2018).

Researchers have for the most part been focused on understanding the negative impacts of gaming, in particular two key aspects: First, relationships between depictions of violence in games and aggression (e.g., Anderson et al., 2010; Ferguson, 2015; Ferguson & Wang, 2019; Prescott et al., 2018); and second, the existence and measurement of 'gaming addiction' (e.g., Aarseth et al., 2017; Dullar & Starvevic, 2018; Griffiths et al., 2017; King et al., 2018; 2019; Markey & Ferguson, 2017; Saunders et al., 2017; van Rooij et al., 2018). These issues remain complex and developing areas of understanding, but irrespective it is apparent that excessive gaming is associated with a range of negative effects. Studies have shown relationships between problematic gaming and issues such as low self-efficacy (Jeong & Kim, 2011) and clinical symptoms of depression and anxiety (Richard et al., 2020; Wang et al., 2018). Other consequences such as stress (Milani et al., 2018) and reduced well-being (Lemmens et al., 2011) have also been documented.

However, many gamers engage with the products non-problematically, and many further believe gaming has a positive impact on their well-being (Brand et al., 2017; Entertainment Software Association, 2019). These notions are supported by a growing body of research (e.g., Halbrook et al., 2019; Herodotou et al., 2014; Jin & Li, 2017; Jones et al., 2014; von der Heiden et al., 2019). In a review, Halbrook et al. synthesised a range of research and highlighted positive social and well-being effects of gaming engagement, particularly when they are played in specific ways. They discussed gaming as generally beneficial unless overshadowed by a competitive approach or played excessively. They concluded that games are not explicitly good nor bad, rather their "effect on well-being depends on the aspects present, motivation behind the play, and gaming in moderation" (p. 1100). Given the widespread engagement with gaming it is important to also explore the relationships between gaming and a range of social and behavioural outcomes. As Halbrook et al. noted, a focus on gaming more broadly than excessive or problematic gaming is important to understanding the effects of gaming on multiple domains of life.

Research has suggested gaming can have negative impacts on relationship quality (Kowert et al., 2014; Northup & Shumway, 2014; Padilla-Walker et al., 2010). These studies noted negative effects of gaming on real-world social relationships and highlighted potential concerns around both relationship development and maintenance. At the extremes of excessive gaming, negative impacts on relationships at all levels are unsurprising. But when social gaming is considered, the situation is more nuanced. For example, in a comparison of adult and adolescent gamers, Griffiths et al. (2004) found that 20.8% of adult and 12.5% of adolescent gamers reported sacrificing socialising with friends, family and/or partners for gaming. However, it is pertinent to not that that 21% of each group reported *no sacrifices* for their gaming.

Research exploring the impacts of gaming on romantic relationships is in its relative infancy, however similarly mixed findings are evident (see Hertlein & Hawkins, 2012 for a review). Some research has suggested that gaming can be associated with increased aggression, notably amongst males, which can negatively impact relationships (Ahlstrom et al., 2012; Coyne et al., 2012). Ahlstrom et al. found that marital satisfaction is more affected by conflict arising from differences in couples' gaming patterns and attitudes toward gaming, rather than the amount of time spent on gaming per se (see also Dew & Tulane, 2015). They also noted that when both partners participated, online gaming may be linked to increased relationship satisfaction in contrast to when only one partner is a gamer. McDaniel and Coyne (2016) used the term 'technoference' to describe a specific detrimental pattern of impact where technology is permitted to interfere with conversations, activities, and time with romantic partners. More technoference was associated with more conflict over technology use, lower relationship and life satisfaction, and more depressive symptoms. Like Ahlstrom et al., McDaniel and Coyne described a misalignment in which unintentionally, or even briefly, gamers might convey implicit messages that they value gaming more than their romantic relationships which could lead to conflict and negative outcomes.

These mixed results highlight that measures of engagement with online gaming are not always sufficient, and that how people engage with games (Halbrook et al., 2019; Herodotou et al., 2014) and a broader range of contextual factors warrant further consideration (Norton et al., 2020; Quandt & Kowert, 2015). Norton et al. found that higher rates of partner game use and higher rates of partner acceptance were linked to higher rates of dyadic acceptance. They stressed the importance of exploring contextual factors and seeking to understand how gaming use is linked to a range of constructs.

There is growing interest in the relationship between gaming and various aspects of psychological and social functioning. Research has often focused on links between excessive gaming and scores on scales measuring stress, self-esteem or symptoms of depression and anxiety. Excessive online behaviour necessarily reduces the time available other activities,

sometimes including developing and maintaining offline social skills (Kowert & Oldmeadow, 2013; Kowert et al., 2014; Liu & Peng, 2009), so links to negative emotional states would be expected. For example, Kowert et al., showed that increased time gaming online was related to smaller and lower quality offline social networks. Furthermore, several studies have shown links between excessive online gaming and anxiety (e.g., Achab et al., 2011; Cole & Hooley, 2013; Mehroof & Griffiths, 2010). Other studies have shown relationships between problematic gaming and a broad range of psychological symptoms including increased stress, anxiety, and depression (e.g., Barger & Hormes, 2017; von der Heiden et al., 2019).

An alternative approach is to consider satisfaction with life (SWL, Diener et al., 1985). Subjective well-being has been conceptualised as consisting of three components: positive affect, negative affect, and life satisfaction (Andrews & Withey, 1976; Diener, 1984). Across many areas of research, the focus has often been on the former two more proximal symptom-oriented components, most commonly measures of negative affect, leaving the third, SWL comparatively overlooked. The SWL scale which measures life satisfaction as a cognitive judgmental process (Diener et al., 1985) is at the very least a useful adjunct to symptom-based measures and can allow respondents to reflect on aspects of their lives in the context of their own standards and values (Pavot & Diener, 1993).

Research has shown that problematic gaming is related to lower SWL (e.g., Barger & Hormes, 2017; Mentzoni et al., 2011). However, reviews have shown that gaming *can be* associated with greater life satisfaction along with reduced symptomology (e.g., Granic et al., 2014; Halbrook et al., 2019; Jones et al., 2014). Jones et al. noted that by nature games are aligned with various aspects of well-being, and they are no longer primarily a solitary or male-dominant activity (Brand, 2012). They concluded that moderate levels of gaming can have a positive effect on well-being, is associated a range of benefits (e.g., Przybylski et al., 2011; Snodgrass et al., 2011), and with better outcomes than both excessive and no gaming (e.g., Durkin & Barber, 2002; Turel & Bechara, 2019).

Taken together, the evidence is mixed, developing, and nuanced. The effects of gaming on various domains of life seem context specific. It is clear, as would be expected, that problematic gaming measured in various ways is associated with a broad range of deleterious outcomes. Where relationships are concerned, much of the existing research has focused on the impacts of gaming on established long-term cohabiting relationships. Social or leisure-oriented gaming, which is how most consumers interact with gaming products, has mixed effects that are likely dependent on how gamers engage with products (Halbrook et al., 2019), and as Quandt and Kowert (2015) noted these effects are likely to be very contextualised and influenced by a range of factors. Given the emerging nature of understanding in this area and the lack of research in New Zealand, an exploratory study without any formal hypotheses was appropriate. Our research question was: Are there differences between gamers and non-

gamers on measures of relationship satisfaction, negative emotional states, and SWL in a sample of university students?

## Methods

### Participants

Participants ( $n = 165$ ) were volunteers undertaking an undergraduate degree in the Health Sciences. The sample was made up of 46 males and 117 females, with two participants choosing not to disclose their gender. Ages ranged from 18 to 33 years old, with a mean age of 24.24 years old ( $SD = 6.148$ ). Half of the participants disclosed that there were currently in a romantic relationship ( $n = 83, 50.3\%$ ).

### Measures

Online-gaming behaviour was documented by asking participants to consider the last month and how much time they thought they would spend gaming per day. The response categories were: None, or up to 1, 2, 3, 4, 5, and 6-or-more hours per day.

**Rosenberg Self-Esteem Scale.** Self-esteem was assessed using Rosenberg's self-esteem scale (RSES), a commonly used instrument for measuring global self-esteem (Sinclair et al., 2010). The RSES consists of five positively worded items (e.g., 'I feel that I have a number of good qualities') and five negatively worded items (e.g., 'At times I think I am not good at all') that sum to a ten-item scale. Responding was by a seven-point Likert scale with responses ranging from 1 ('Strongly disagree') to 7 ('Strongly agree'). Total scores are calculated by summing scores across the ten items following the reverse-coding of negatively worded items, with higher scores indicative of higher self-esteem.

**Satisfaction with Life Scale.** Satisfaction with life was measured using Diener et al.'s (1985) five-item Satisfaction with life Scale (SWLS). The scale uses a five-point Likert scale with response options ranging from 1 ('Strongly disagree') to 5 ('Strongly agree'). Responses to the five items are summed to derive a total score, with higher scores indicating higher levels of life satisfaction.

**Depression, Anxiety, and Stress Scale.** Psychological well-being was determined using the 42-item Depression, Anxiety, and Stress Scale (DASS-42: Lovibond & Lovibond, 1995). The DASS has a trivariate structure comprising 14 items each. Participants indicate levels of depression, anxiety, and stress by considering the extent to which statements applied to them over the past week. A four-point scale is used with response options ranging from 1 ('Not at all') to 4 ('Very much'). Three total scores are derived by the summation of the appropriate 14 items, with higher scores indicating higher levels of self-reported depression, anxiety, or stress.

**Relationship Assessment Scale.** Relationship satisfaction was measured by the Relationship Assessment Scale (RAS) developed by Hendrick (1988) to gauge the level of satisfaction between romantic partners. The RAS is a seven-item scale assessing respondents' feelings toward their partner and their relationship. Responding is via a five-point Likert scale, with responses ranging from 1 ('Hardly at all') to 5 ('Completely'). After the reverse-coding of two items, total scores are obtained by summing the rating for all seven items, with higher scores indicating higher relationship satisfaction.

### **Procedure**

Data were collected from 165 undergraduate health science students. Participants responded to an email invitation and/or advertisements placed on online curriculum delivery platforms. The advertisements contained a link to an online survey available on Qualtrics. The first part of the survey consisted of a participant information sheet describing the purpose of the research, inclusion criteria, instructions of the survey, risks and benefits of participating, and any other necessary information. The research was approved by the authors' institutional ethics committee (Approval #19/171)

### **Data Analysis**

Data were prepared and analysed using the Statistical Package for the Social Sciences (SPSS v. 26), including the recoding of items and the computation of total scores and checking of assumptions for all analyses. Prior to analysis, participants were grouped according to whether they participated in online gaming or not by asking them to indicate how much time they spent on gaming. Those who answered "none" were classed as a "non-gamer", whereas participants who answered from "up to an hour per day" to "five or more hours per day" were classified as "gamers". To determine the relationships between online gaming, gender, and the outcome variables (i.e., RSES, SWLS, DASS-42, and the RAS), two-way ANCOVAs were used which statistically controlled for participant age. In these models the main effects of gaming and gender were assessed, as well as the combined (i.e., interaction) effects of the two grouping variables on the dependent variables (see Table 1 for summary data). Effect size was also reported using partial eta squared ( $\eta^2$ ) statistics interpreted with reference to Cohen's (1969) benchmarks:  $< .0099$  is considered a small effect,  $> .1379$  a large effect, and values in between medium effects.

**Table 1**

Overall means and standard deviations stratified according to gaming status for the three DASS subscales, self-esteem, satisfaction with life (SWL) and relationship satisfaction.

Measure	Gamers	Non-Gamers
Depression	24.61 (12.53)	20.33 (9.10)
Males	20.59 (10.16)	19.29 (8.68)
Females	28.03 (13.51)	20.57 (9.25)
Anxiety	22.47 (8.54)	19.49 (7.39)
Males	19.41 (6.23)	19.76 (7.05)
Females	24.86 (9.12)	19.49 (7.52)
Stress	25.53 (10.97)	23.58 (9.19)
Males	20.79 (8.58)	21.29 (9.35)
Females	29.79 (11.28)	24.14 (9.12)
Self-esteem	33.75 (10.44)	33.33 (8.65)
Males	33.45 (8.77)	31.59 (10.12)
Females	34.79 (10.86)	32.82 (7.54)
SWL	17.88 (7.17)	15.75 (6.97)
Males	17.62 (7.34)	16.10 (7.59)
Females	19.90 (7.78)	16.35 (6.46)
Relationship	28.81 (6.29)	29.67 (6.07)
Males	28.33 (6.89)	26.00 (7.26)
Females	29.10 (6.07)	30.81 (4.40)

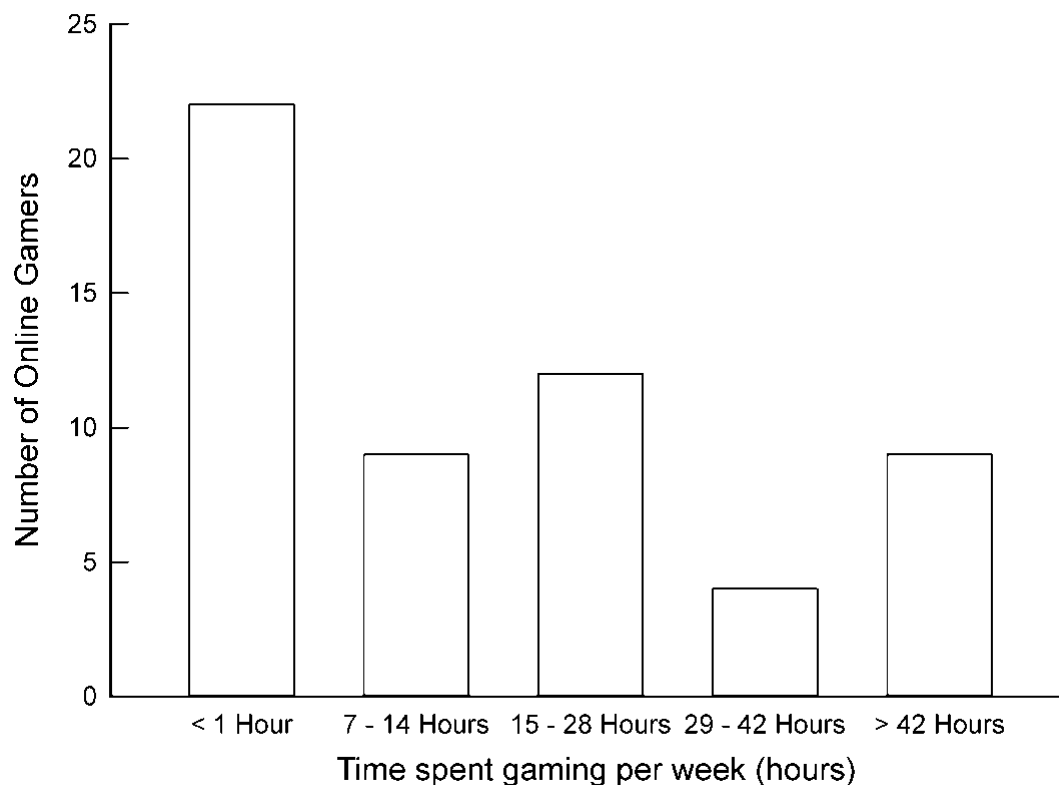
Parentheses contain standard deviations.

## Results

A total of 59 participants (30 males, 29 females) reported that they played online games for an hour-or-more on a typical day (*re*: Figure 1). The remaining 106 participants (17 males, 88 females) reported that they did not engage in online gaming. Online-gaming was statistically linked to gender ( $\chi^2(1) = 21.083, p < .001$ ), with 69% of males reporting gaming online compared to only 24.8% of females. In contrast, online gaming was not linked to whether the participant was in a relationship or not ( $\chi^2(1) = 0.561, p = .451$ ). Significant differences in age ( $t(162) = 3.860, p = .002$ ) were noted across those who reported online gaming ( $M_{\text{age}} = 21.9$  years,  $SD = 2.79$ ) and those who did not ( $M_{\text{age}} = 25.33$  years,  $SD = 7.18$ ).

**Figure 1**

Bar graph showing time spent online gaming per week.



A series of ANCOVAs was conducted to examine the main effect of online gaming on psychological well-being and romantic relationships satisfaction, while controlling for participant age. In addition, interaction effects between online gaming and gender were also assessed.

Considering first the Depression subscale of the DASS-42, significant effects of gender ( $F(1,158) = 5.112, p = .013, \eta_p^2 = .031$ ) and

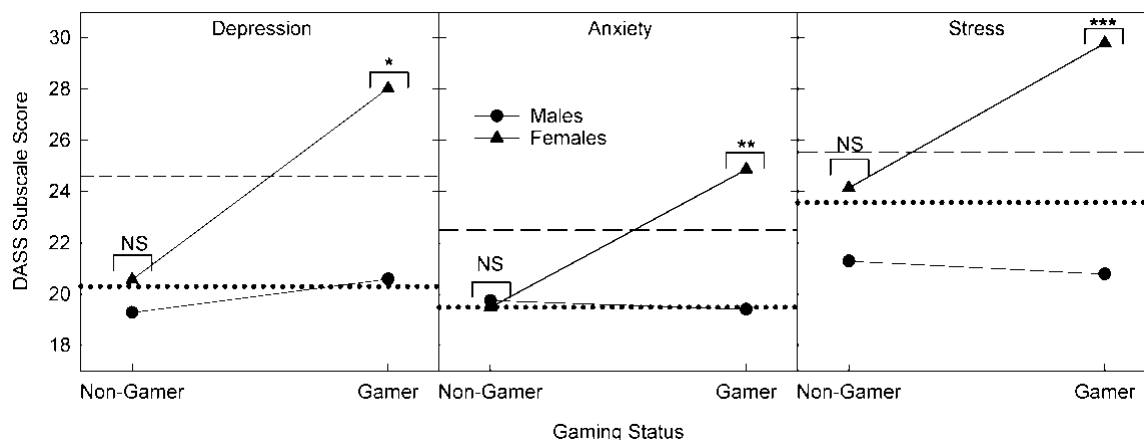


gaming ( $F(1,158) = 4.866, p = .015, \eta_p^2 = .030$ ) were noted, but no significant effect of participant age ( $F(1,158) = 0.003, p = .428, \eta_p^2 = .001$ ) was evident. Additionally, the interaction effect between gender and gaming was not statistically significant ( $F(1,158) = 3.601, p = .054, \eta_p^2 = .016$ ). Turning now to the Anxiety subscale, there were again significant main effects of gender ( $F(1,158) = 3.253, p = .036, \eta_p^2 = .020$ ) and gaming ( $F(1,158) = 4.081, p = .046, \eta_p^2 = .018$ ), but not age ( $F(1,158) = 0.014, p = .457, \eta_p^2 = .001$ ). However, there was a significant interaction ( $F(1,158) = 4.081, p = .023, \eta_p^2 = .025$ ) between gender and gaming on anxiety, with the difference between males and females exaggerated for gamers relative to non-gamers (*re*: Figure 2). For the DASS stress scale, only gender returned a main effect ( $F(1,158) = 10.569, p < .001, \eta_p^2 = .063$ ), while gaming ( $F(1,158) = 1.477, p = .113, \eta_p^2 = .009$ ) and age ( $F(1,158) = 0.684, p = .204, \eta_p^2 = .004$ ) did not reach significance. However, the model showed a gaming-by-gender interaction ( $F(1,158) = 3.066, p = .041, \eta_p^2 = .019$ ).

Figure 2 shows further that while the differences in each of the Depression, Anxiety and Stress subscales are negligible for both males and females in the non-gaming group, they are substantially different in the gaming group with female gamers having significantly higher scores than male gamers (and all non-gamers).

**Figure 2**

Interaction plots for the three DASS subscales.



The outcome of independent samples t-tests performed between gender at each level of gaming are included (NS = non-significant, \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ ). For each subscale the dashed horizontal lines represent the overall means for gamers, while the dotted lines are the overall means for non-gamers.

When self-esteem was examined, there were no significant main or interaction effects (all  $p > .10$ ). With respect to the SWL scale there was a significant main effect of gaming ( $F(1,158) = 3.437, p = .033, \eta_p^2 = .021$ ) but not of gender ( $F(1,158) = 0.924, p = .169, \eta_p^2 = .006$ ) or age ( $F(1,158)$

= 0.030,  $p = .431$ ,  $\eta_p^2 = .001$ ). Neither was there a interaction effect between gaming and gender ( $F(1,158) = 0.578$ ,  $p = .224$ ,  $\eta_p^2 = .004$ ).

Finally, for the relationship satisfaction measure, and noting the change in sample size, there was a main effect of both gender ( $F(1,77) = 4.250$ ,  $p = .022$ ,  $\eta_p^2 = .052$ ) and age ( $F(1,77) = 3.149$ ,  $p = .040$ ,  $\eta_p^2 = .039$ ). However, neither gaming ( $F(1,77) = 0.037$ ,  $p = .423$ ,  $\eta_p^2 = .001$ ) nor the gaming-by-gender interaction ( $F(1,77) = 2.584$ ,  $p = .051$ ,  $\eta_p^2 = .032$ ) were significant.

## Discussion and Implications

The present study explored measures of relationship satisfaction, negative emotional states, and satisfaction with life in a student sample of gamers and non-gamers. Overall, the results were consistent with literature that suggests moderate levels of gaming are not harmful, and in some respects, they can be beneficial as evidenced by increased SWL in gamers. With respect to relationship satisfaction, no effect of gaming was evident. When negative emotional states were examined via subscales of the DASS-42, interesting gaming-by-gender interactions were identified. These provided an interesting contrast to the SWL results.

When SWL was considered, the notion that gaming can be associated with increased SWL was supported (Granic et al., 2014; Halbrook et al., 2019; Jones et al., 2014). Here, gamers had significantly higher SWL scores than non-gamers. As we noted, the SWL scale allows respondents to subjectively consider their life satisfaction in the context of their own standards and values. Thus, provided discriminable harm is not being experienced, it is unsurprising that people engaging with a behaviour that they enjoy and value do not report diminished SWL scores. What is perhaps less obvious is why gamers would have higher SWL scores than non-gamers. In this sample of undergraduate students, non-gamers would be expected to similarly engage with activities that they enjoy and value. Given the cohort, we could speculate on activities such as social media use conferring fewer benefits, however research suggests that the effects of social media are similarly contextual and nuanced (Orben et al., 2019). We did not assess for harmful gaming, but as Figure 1 shows there were participants who reported large amounts of time devoted to gaming. Thus, at this point, the more parsimonious explanation based on these data is simply that positive engagement with online gaming confers tangible benefits to SWL. Halbrook et al. (2019) argued that this could be the case given appropriate motivations for gaming and that many games encourage cooperation and social components. Given findings of this nature, care is required to not pathologize gaming per se (Dullar & Starcevic, 2018; Griffiths, 2018) whilst ensuring that problematic gaming is recognised and supported appropriately (King et al., 2018; 2019).

Perhaps the most interesting findings here are the gender by gaming interactions evident when well-being was assessed using symptomatic

measures from the DASS-42 which contrasted with the SWL effects discussed above. Female gamers scored significantly higher on the depression, anxiety, and stress subscales than their male counterparts, and indeed both female and male non-gamers in the present cohort. Recent results from a large nationally representative sample of 13-15 adolescents in the UK examined problematic mental health by levels of screen media use and show both gender, and media type, differences (Twenge & Farley, 2020). Specifically, in females, high levels of social media and internet use were most strongly associated with problematic mental health, following by gaming. When genders were compared, clinically relevant depressive symptoms were evident in females after just 1-2 hours gaming per day, but not evident in males until they were gaming five or more hours per day. Similar results were evident across social media and internet use (Twenge & Farley, 2020; Table 1).

Twenge and Farley (2020) argued that parents, policy makers and health professionals be aware that there is variation in issues across activities and individuals, and in particular the online activities of adolescent females can present high levels of concern. In an older cohort, we have found related results with moderate-level adult female gamers reporting higher levels of depression, anxiety and stress than non-gamers, and male gamers. While Twenge and Farley stressed concerns around social media and internet use, they noted issues around females gaming that we extend here. In the context of internet addiction, other researchers have focused on internet use as compensatory (e.g., Kardefelt-Winther, 2014) or the notion that in psychologically healthy individuals' online activity is beneficial, whereas in psychologically unhealthy individuals it worsens issues (e.g., Snodgrass et al., 2014). Our results align with the notion that much depends on context, and how individuals engage with online activities (e.g., Halbrot et al., 2019; Snodgrass et al., 2018; Twenge & Fairly, 2020)

Previous research (e.g., Fox & Tang, 2014; 2017; McLean & Griffiths, 2019) has documented issues specific to female gamers that might be relevant in interpreting the present results. These issues centre on sexism in games, and experiences of both general and sexual harassment while gaming. Female online gamers can experience harassment leading to ruminations and a perception of unresponsiveness to issues when raised (Fox & Tang, 2017). In a qualitative study, McLean and Griffiths noted these experiences were related to feelings of anxiety and loneliness. Further, the negative experiences were mirrored in real-life situations. These experiences were attributed in the main to male gamers' behaviours, but for some the perception was they were due to internal characteristics.

In the present context it was interesting that no effects of gaming were evident on self-esteem, and further that gaming was related to enhanced SWL and had no effect on relationship satisfaction. If harassment, which was not assessed here, was the key factor underlying these results then it would be surprising if the effects did not extend beyond

depression, anxiety, and stress. Clearly, this does not eliminate harassment as a factor and further research is required to understand the experiences of female gamers, and the interactions between the various factors involved. The patterns evident in the present results do lend some support to the notion that in this cohort some pre-existing characteristics specific to female gamers (higher depression, anxiety, and stress) might be a factor as suggested by McLean and Griffiths (2019). Conceptually, the present results also further support the notion that SWL is distinct from negative emotional states. When considering their SWL in the context of their own standards and values, gamers SWL was rated more highly than non-gaming peers despite higher levels of symptomology on DASS subscales. Again, the importance of not pathologizing gaming in and of itself is reiterated here (Dullar & Starcevic, 2018; Griffiths, 2018).

Finally, there was no evidence in these data of any effect of gaming on relationship satisfaction. As outlined earlier, existing research in this space has tended to focus on more established marital or cohabiting relationships (e.g., Ahlstrom et al., 2012; Dew & Tulane, 2015; McDaniel & Coyne, 2016) with these studies supporting the notion that negative impacts arise when there is a misalignment in gaming behaviours between partners. The present results do not speak to that aspect but raise the possibility that in younger individuals where gaming is more normalised and perhaps intrinsic to relationship development fewer problems might be evident, as least in the earlier stages of relationship development. Naturally, that would be dependent on the gaming behaviour remaining controlled and positive (Granic et al., 2014; Halbrook et al., 2019; Jones et al., 2014) and a range of factors influencing both relationship and personal development. Across time, the nature of gaming behaviour and relationships would be subject to change and given the increasing popularity of online gaming research focused in this area is required.

Interpretation and any generalisation of the present results must be undertaken with caution. First, no causal relationships can be inferred from this study, carefully designed longitudinal studies would be required to clarify the nature of such relationships. The sample is smallish from an undergraduate student cohort that is predominantly female and issues such as desirability bias could have impacted responses. While similar numbers of gamers were obtained, that is in the context of a much overall number of male participants. More broadly, there are always constraints when interpreting student samples (e.g., Henrich et al., 2010; Simons et al., 2017). Nonetheless, given their age, students are a key group of interest in terms of the impacts of gaming on a range of psychological domains. The present results add to a growing body of research in that area and suggest further studies of the shared and specific experiences of and effects on both genders are required.

In conclusion, the present results add to a growing body of research that suggests engaging with online gaming can confer positive effects on life satisfaction. Further, no negative effects were evident on relationship

satisfaction. The interactions evident between gender and gaming (see Figure 2) are of particular interest and require further consideration. Female gamers had significantly higher scores on the DASS subscales of depression, anxiety, and stress. However, they simultaneously had higher SWL scores than female non-gamers. This seems consistent with the notion that there might be pre-existing characteristics underpinning these results (McLean & Griffiths, 2019) or that there are key differences in females' experiences of online gaming and reinforces the importance of using multiple measures to assess aspects of well-being. Documenting the pre-existing characteristics, experiences, and motivations of female gamers along with the games they play is an important focus for future research. Carefully designed longitudinal studies could clarify some of these complex relationships.

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None

### **Availability of data and material**

Data will be made available upon request.

### **Author's contributions**

All authors significantly contributed to the research and preparation of the manuscript

### **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 (5). Informed consent was obtained from all patients for being included in the study.

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