Internet gaming disorder: Feeling the flow of social games

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ABSTRACT

Introduction: Gaming Disorder (GD) was added to the recent publication of the International Classification of Diseases (ICD-11) by the World Health Organization. This aligns with recommendations of the fifth edition of the Diagnostic Statistical Manual for Mental Disorders (DSM-5), issued by the American Psychiatric Association. Accordingly, further relevant research has been invited. The interplay between preference for online social game genres, the degree of online Flow (or *immersive pleasure*) experienced, and the gamer's biological gender were examined here as contributing factors of IGD.

Method: A normative sample of adult internet gamers was collected online (*N* = 237, Age = 18–59, Males = 157; 66%; Females = 80; 34%). Participants completed the nine-item Internet Gaming Disorder Scale-Short Form (IGDS-SF9), the Online Flow Questionnaire (OFQ), and also self-reported demographics and internet/gaming behaviours.

Results: Mediation and moderated mediation analyses indicated that the level of online Flow experienced considerably mediated the association between the preference for social games genres and the intensity of IGD behaviours across both biological genders.

Conclusions: Results suggest that the level of online Flow experienced constitutes a risk factor in relation to the development of IGD. Furthermore, games which mandate social interaction with others present to be conducive to online Flow, and thus enhancing IGD risk irrespective of the biological gender of the gamer. Implications and limitations of the study are discussed.

1. Introduction

Play is an innate part of the human experience. In fact, play has been argued as an integral element in child development (Vygotsky, 1967). In the digital era, the opportunity to engage in play has been widened by the proliferation of video games (hereafter, games). With an estimated global market value exceeding 135 billion dollars (Wijman, 2018), games are pervasive and more in demand than they have ever been (Entertainment Software Association [ESA], 2013, 2014, 2015, 2016). As the industry continues to expand, there is a growing number of people engaged in this entertainment medium (Anderson, Steen, & Stavropoulos, 2016). For many game consumers (or *gamers*), playing games is a habitual leisure-time activity. In a survey of 2001 adults living in the United States of America, the Pew Research Center reported that nearly half (49%) of the participants played games (Duggan, 2015).

Furthermore, the 2015 report by the ESA revealed that almost 70% of parents believed that games were a positive influence on the life of their children. For the vast majority of gamers, games are not considered to be problematic. Rather, games can promote development in several areas, including cognition (Colzato, Van Leeuwen, Van Den Wildenberg, & Hommel, 2010), positive mood (Russoniello, O'Brien, & Parks, 2009), physical well-being (Agmon, Perry, Phelan, Demiris, & Nguyen, 2011), and prosocial behaviours (Gentile et al., 2009).

Further support for this notion was found in a systematic review of 38 articles by Primack and colleagues (2012). They reported that there is evidence for the use of games to improve health outcomes particularly in psychological and physical therapy. However, despite these findings, there is a known subset of gamers who, as a consequence of their excessive gaming involvement, present with clinically significant problems (Kuss & Griffiths, 2012; Stavropoulos, Burleigh, Beard, Gomez, & Griffiths, 2018). Such manifestations are considered to be symptoms indicative of the candidate diagnosis of *Internet Gaming Disorder* (IGD) introduced by the American Psychiatric Association (APA) in the latest *Diagnostic Statistical Manual of Mental Disorders* (DSM-5; APA, 2013). Interestingly, the clinical nature of disordered gaming has been further supported by the by the World Health Organization (WHO) with the inclusion of *Gaming Disorder* (GD), irrespective of the use of the

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Internet, in the recent publication of the *International Classification of Diseases* (ICD-11; WHO, 2018). It is, therefore, a condition worthy of further enquiry, especially in relation to the interplay of the risk and protective factors associated with it (APA, 2013; Burleigh, Stavropoulos, Liew, Adams, & Griffiths, 2018). Given the focus of the present work in Internet gaming, the IGD definition is employed.

The DSM-5 proposes nine criteria that constitute IGD (APA, 2013). Six of the suggested criteria embody Griffiths' (2005) core components of addiction, which were derived from a biopsychosocial framework and have also been used to conceptualise non- chemical addictions. These criteria are (1) salience, (2) mood modification, (3) tolerance, (4) withdrawal, (5) conflict, and (6) relapse. The remaining three criteria in the DSM-5 include: (1) loss of interest in previous hobbies, (2) jeopardised or lost a job, education or career opportunity, or a significant relationship, and (3) lying to others about the amount of time spent gaming. Although, there is conjecture about nomenclatures and these criteria, the present study avails of the APA description to afford consistency and comparability with other international studies (Gomez, Stavropoulos, Beard, & Pontes, 2018; Kuss, Griffiths, & Pontes, 2017a; Kuss, Griffiths, & Pontes, 2017b; Pontes, Stavropoulos, & Griffiths, 2017; Van Rooij & Kardefelt-Winther, 2017).

Despite the theoretical disagreements evident in the field (Griffiths et al., 2016), there is international agreement that IGD related behaviours are prevalent across many cultures including Australia (Thomas & Martin, 2010), Norway (Wittek et al., 2016), Germany (Rehbein, Kliem, Baier, Mößle, & Petry, 2015), Greece (Stavropoulos, Alexandraki, & Motti-Stefanidi, 2013b), Pakistan (Khan & Muqtadir, 2016), Iran (Ahmadi & Saghafi, 2013), Turkey (Canan, Ataoglu, Ozcetin, & Icmeli, 2012), China (Wang et al., 2011), and Taiwan (Lin et al., 2014). Moreover, there is a consensus that IGD related behaviours are associated with numerous clinically significant consequences (Beard, Haas, Wickham, & Stavropoulos, 2017). Some of these include: increased depression (Schou Andreassen et al., 2016; Wei, Chen, Huang, & Bai, 2012), loneliness (Lemmens, Valkenburg, & Peter, 2011), conduct problems (Brunborg, Mentzoni, & Frøyland, 2014), lower academic achievement (Chiu, Lee, & Huang, 2004; Stavropoulos, Alexandraki, & Motti-Stefanidi, 2013b), maladaptive coping (Schimmenti, Guglielmucci, Barbasio, & Granieri, 2012; Weidman et al., 2012), substance use (Van Rooij et al., 2014), suicidal ideation and attempt (Lin et al., 2014), and loss of relationship with partner and family (Yee, 2006a; Young, 2004).

The potentially detrimental consequences and ambiguities about IGD demonstrate the need for further elucidation and understanding of the phenomenon (Stavropoulos, Griffiths, et al., 2018). In this context, clinicians have been invited repeatedly to become more familiar with the antecedents and impacts of IGD in order to provide more effective therapy/treatment, as well as to contribute to the repository of knowledge and the literature on relevant excessive gaming behaviours (Adams et al., 2018; Liew, Stavropoulos, Adams, Burleigh, & Griffiths, 2018). To address these needs, an integrative conceptualisation has been suggested that portrays the level of IGD behaviours as a continuum/dimension (Adams et al., 2018; Burleigh et al., 2018). The level of IGD behaviours exhibited has been suggested to depend on the interplay between individual, game related, and contextual factors (Liew et al., 2018). In line with recent studies, the current work will follow this conceptualisation to investigate the interplay between the experience of online Flow (i.e. immersive pleasure due to online gaming participation), the preferred type of game genre (i.e., social or not; as a game related factor), as well as the gamer's actual, as opposed to virtual, gender in relation to the level of IGD behaviours reported (Liew et al., 2018; Burleigh et al., 2018; Stavropoulos, Beard, et al., 2018; Stavropoulos, Griffiths, et al., 2018).

1.1. Online flow

Similar to the metaphor of "*being in the zone*", Flow, as adopted from a Positive Psychology conceptualization, is viewed in the present study as a psychological state (of immersive pleasure) that gives rise to a form of mental energy, empowering motivation and enabling optimal experience (Csikszentmihalyi, 1990; Nakamura & Csikszentmihalyi, 2014). Essentially, Flow refers to the feeling of enjoyment and pleasure arising from deep immersion in an activity. In that line, Flow is viewed as the ideal middle ground between anxiety (i.e., when a task is beyond the capability of an individual) and boredom (i.e., when an individual's level of skill exceeds the demands of a task; Stavropoulos, Alexandraki, & Motti-Stefanidi, 2013a; Stavropoulos, Alexandraki, & Motti-Stefanidi, 2013b; Stavropoulos, Beard, et al., 2018; Stavropoulos, Griffiths, et al., 2018). The state of Flow can occur in numerous settings, including work (Csikszentmihalyi & Lefevre, 1989; Salanova, Bakker, & Llorens, 2006), play (Csikszentmihalyi & Bennett, 1971) and interestingly, as an outcome of social interactions (Chang, 2013).

As the internet gained popularity, researchers attempted to improve the use and experience of the World Wide Web by endeavouring to induce psychological states of immersive pleasure, by accommodating online Flow (Chen, Wigand, & Nilan, 1999). There has been an ongoing interest to better identify, understand and even optimize the role of online Flow in various internet activities ranging from e-health and e-commerce to internet related entertainment (Novak & Hoffman, 1997; Stavropoulos, Alexandraki, & Motti-Stefanidi, 2013a; Rettie, 2001; Pañella, 2011). More recently, researchers acknowledged the role of Flow experiences (immersive pleasure) in internet gaming and IGD. For example, Abuhamdeh and Csikszentmihalyi (2012) found a significant positive relationship between perceived challenge and enjoyment in a sample of 87 male internet chess players.

Stavropoulos, Alexandraki, and Motti-Stefanidi (2013a) reported findings wherein online Flow and (tele)-presence were found to significantly interact in regard to internet abuse (independent of the preferred internet application), with online Flow (immersive pleasure) being experienced more by males than females. However, potential variations in the susceptibility to the immersive pleasure experience/online Flow based on one's biological gender have been identified as requiring further investigation (especially in the context of internet games; Stavropoulos, Beard, et al., 2018; Stavropoulos, Griffiths, et al., 2018). Such recommendations align with findings which have shown that the increased use of internet games was positively associated with online Flow experiences (Lee, Aiken, & Hung, 2012). The present study aspires to shed more light on the potential association between the preferred game genre and the Flow (immersive pleasure) experienced online in relation to IGD behaviours. To the best of the authors' knowledge there is a dearth of findings pertaining to the relationship between game genre, online Flow, and IGD. Knowledge about this relationship is envisaged to better inform and improve the effectiveness of more targeted IGD prevention and intervention protocols (Liew et al., 2018).

1.2. Game genre

A common theme in the international literature is that the addictive risk associated with different game genres depends significantly on the structural characteristics that these may embody (King, Delfabbro, & Griffiths, 2011; Männikkö, Billieux, Nordström, Koivisto, & Kääriäinen, 2017). Accordingly, a synthesis of the literature revealed a general consensus that *Massively Multiplayer Online Role Playing Games* (MMORPGs) constitute a problematic game genre that are significantly associated (if not the most) with IGD (Kuss, Louws, & Wiers, 2012; Stavropoulos, Kuss, Griffiths, & Motti-Stefanidi, 2016; Yee, 2006a). Among others, MMORPGs (such as *World of Warcraft*; WoW) are renowned for the emphasis that is placed on playing collectively, which has been assumed to be highly associated with their popularity (Nardi & Harris, 2006; Stavropoulos et al., 2016). In this regard, Cole and Griffiths (2007) provided evidence of the highly socially interactive environment within MMORPGs, as indicated by roughly 75% of male

and female participants reporting making good in-game friendships. Furthermore, Chen, Duh, Phuah, and Lam (2006) found that positive social interactions experienced when gaming influenced game enjoyment and the level of engagement. In contrast, gamers who were not engaged (i.e., spent fewer hours per week playing MMORPGs) considered social interactions as a hindrance and a wasted effort.

Given the popularity of MMORPGs and the social mechanics involved in such games (aside from the gradually increasing challenges and rewards and character customisation/development), it is understood why the research literature has focused on this genre (Anderson et al., 2016). However, there are other genres, which in recent times have gained a sizeable growth and impact, by adopting and, equally (as MMORPGs) emphasising the importance of socialising in the online context. For instance, *Multiplayer Online Battle Arena* (MOBA) games such as *Defence of the Ancients 2* or *League of Legends* host hundreds of thousands of players daily. These types of games can only be played with other gamers, and therefore, could be viewed in the context of cyber-relationship game applications, to embody a social component that enhances their attractiveness and absorbance (Lemmens & Hendriks, 2016; Young, Pistner, O'Mara, & Buchanan, 1999). However, although this broader category of social games increased in popularity, their effects, specifically related to their social nature, have not been studied in comparison to other (non-social) games while taking into consideration the level of online Flow (immersive pleasure) experienced (Stavropoulos, Beard, et al., 2018; Stavropoulos, Griffiths, et al., 2018). This is particularly important given the established association between online Flow and IGD behaviours (Kaye, 2016). Consequently, there is a need for a better understanding of the implications of social games in relation to online Flow (immersive related pleasure) and IGD behaviours.

1.3. The present study

The present study aims to address the gaps in the IGD literature as described above.

Specifically, it aspires to increase the level of understanding in regard to the association between the preference for social games, the level of Flow (immersive pleasure) experienced online, as well as their interplay in relation to IGD behaviours. Given that MMORPGs and MOBA games are played exclusively in a multiplayer setting, these genres are classified as social games in the present study. This conservative approach is utilised to control for effects which can occur when playing games that can be played either in single-player or multiplayer mode (Kuss & Griffiths, 2012). Given that previous research has indicated that social games are implicated in online Flow (immersive pleasure due to online action; Wan & Chiou, 2006), and online Flow is shown to contribute to an overuse of internet applications (Stavropoulos, Alexandraki, & Motti-Stefanidi, 2013a), the present study hypothesises that:

H1. The preference for social games will be positively associated with the level of online Flow (immersive pleasure) experienced.

H2. Online Flow (immersive pleasure) mediates the relationship, if any, between the preference for social games and IGD behaviours (see Fig. 1).

H3. Biological gender will moderate the mediation effect, if any, of online Flow (immersive pleasure) in relation to IGD behaviours (see Fig. 1).

2. Method

2.1. Participants

In sample used in the current study ($N = 237$), the majority of participants were Australian and New Zealand gamers ($N = 177$;

66.1% males), 40.9% were between the age of 18–23, followed by 39.2% between 24 and 29. The remainder were international participants ($N = 60$). With a total sample size of 237, the estimated maximum sampling error is ± 6.37% at the 95% confidence interval ($Z = 1.96$). Detailed participant demographics are depicted in Table 1. It is noted that participants were recruited online by way of convenience and snowball sampling (e.g. through using social media platforms; *Facebook* and *Reddit*). Participant recruitment was completed through recurrent updates on the relevant web platforms for approximately one month. Participants were directed to the questionnaire using a link to SurveyMonkey. They were informed about the nature of the study, their rights, and what they would be required to do by way of the Plain Language Information Statement.

Consent was deemed to be given if potential participants answered in the affirmative the question "Do you consent to participate in this study?". Online data collection was chosen as this method has been shown to be cost-effective and permits relatively easy access to relevant populations (i.e., gamers), who were the relevant population in the present study (Griffiths, 2010). It has been shown that data quality is not affected by the mode in which the data is collected, whether that be face to face or online (Pettit, 2002).

2.2. Measures

The full questionnaire was comprised of 32 items including the Online Flow Questionnaire (OFQ; Chen et al., 1999), the Internet Gaming Disorder Short Form – 9 (IGDS- SF9; Pontes & Griffiths, 2015), game-context items (e.g., *"From this list, what genre of game best describes the primary game you play";* recoded into a dummy coded variable with 0 indicating "Non Social Game Genres" and 1 indicating "Social Game Genres"; Kuss & Griffiths, 2012), and sociodemographic items (e.g., age, biological gender). It is noted that given the highlighted limitations of Cronbach's α (α requires the assumption of tau- equivalence/equal factor loadings for all items, which is not realistic; Revelle & Zinbarg, 2009) in estimating reliability (despite its continual use in psychology; Gomez & Stavropoulos, 2018), the present study assessed the reliability of the relevant scales based on McDonald's (1999) Ω coefficient (Revelle & Zinbarg, 2009; Trizano-Hermosilla & Alvarado, 2016).

2.2.1. IGDS-SF9

The severity of IGD was measured with the Internet Gaming Disorder Scale Short-Form 9 (IGDS-SF9; Pontes & Griffiths, 2015), a nine-item scale based on the nine IGD criteria in the DSM-5 (APA, 2013). Participant's responses were recorded on a 5- point Likert scale ranging from 1 (*Never*) to 5 (V*ery Often*). A sample item is *"Have you lost interests in previous hobbies and other entertainment activities as a result of your engagement with the game?"*. The final score was computed by summing all item responses. IGD scores ranged from 9 to 45, with 9 indicating minimal IGD behaviours and 45 indicating extreme IGD behaviours. The suggested clinical cutoff is 36 out of 45 (Pontes & Griffiths, 2015) The internal reliability of the IGDS-SF9 was satisfactory ($\Omega = 0.83$).

2.2.2. OFQ

To assess internet Flow, the Online Flow Questionnaire (OFQ; Chen et al., 1999) was used. The scale comprises of five items. For each item of the scale, participants were asked to report whether they had ever experienced Flow in the internet environment (0 = No, 1 = Yes). A sample item from the scale is "Have you ever experienced the feeling of 'positive challenge' during your Web navigation?". The final score was computed by summing all item responses. Ultimately, online Flow scores ranged from 0 to 5, with 0 indicating a minimal experience of online Flow, and 5 indicating a maximum experience. The internal reliability of the OFQ was satisfactory ($\Omega = 0.71$).
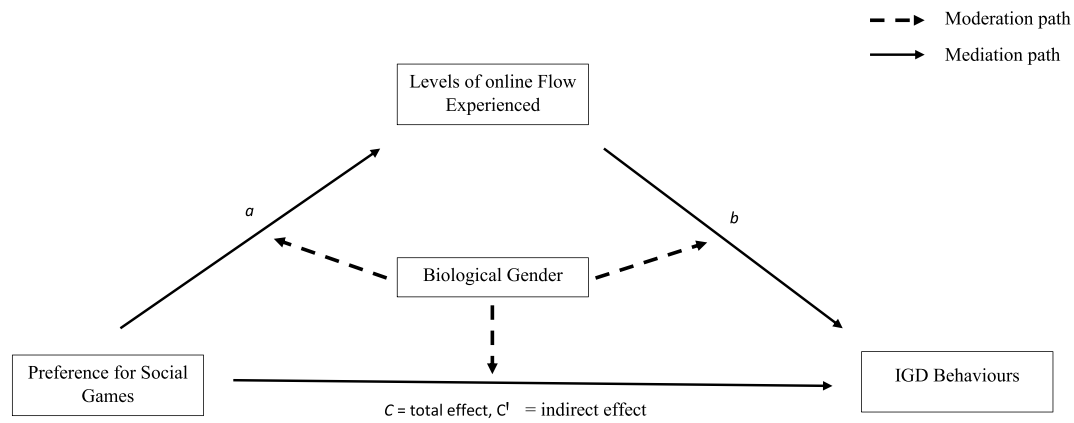
Fig. 1. The mediating interplay between social games preference, online Flow experience and IGD behaviours.

Table 1
Participant demographics.

Country	N	Age spread						Biological gender	
		18–23	24–49	30–35	36–41	42–49	50–59	Females	Males
Australia and New Zealand	177	73 (41.2%)	69 (39%)	26 (14.7%)	6 (3.4%)	2 (1.1%)	1 (0.6%)	60 (33.9%)	117 (66.1%)
United States of America	30	12 (40%)	14 (46.7%)	2 (6.7%)	1 (3.3%)	1 (3.3%)	–	10 (33.3%)	20 (66.7%)
United Kingdom	9	4 (44.4%)	4 (44.4%)	1 (11.1%)	–	–	–	5 (55.6%)	4 (44.4%)
Singapore	4	2 (50%)	1 (25%)	1 (25%)	–	–	–	2 (50%)	2 (50%)
China	3	1 (33.3%)	1 (33.3%)	–	–	–	1 (33.3%)	1 (33.3%)	2 (66.7%)
Germany	3	2 (66.7%)	1 (33.3%)	–	–	–	–	–	3 (100%)
Canada	2	1 (50%)	1 (50%)	–	–	–	–	1 (50%)	1 (50%)
Norway	2	1 (50%)	1 (50%)	–	–	–	–	–	2 (100%)
Portugal	1	–	1 (100%)	–	–	–	–	–	1 (100%)
Spain	1	–	1 (100%)	–	–	–	–	–	1 (100%)
Poland	1	1 (100%)	–	–	–	–	–	–	1 (100%)
Malaysia	1	1 (100%)	–	–	–	–	–	1 (100%)	–
Israel	1	1 (100%)	–	–	–	–	–	–	1 (100%)
Costa Rica	1	1 (100%)	–	–	–	–	–	–	1 (100%)
Not Specified	1	–	1 (100%)	–	–	–	–	–	1 (100%)
Total	237	100 (42.2%)	95 (40.1%)	30 (12.7%)	7 (3%)	3 (1.3%)	2 (0.8%)	80 (33.8%)	157 (66.2%)

2.3. Procedure

The initial number of participants who responded to the survey was 305. The data was inspected for cases where a significant number of items were missing. These were removed and as reported above the number of cases used for analysis was 237. For all variables (i.e., Flow, IGD, and Genre) the Shapiro-Wilk's test was significant, indicating that the variables were not univariate normal. However, this test is known to be sensitive to sample size. In the present study, given that none of the skewness and kurtosis coefficients exceeded the benchmarks of absolute three and eight, respectively (Field, 2013), no transformations of the variables were performed. A test for multivariate normality using the Mahalanobis Distance statistic measure was also performed. Eight cases showed Mahalanobis Distances values which were greater than the critical value of 7.815, the largest value being 17.12. Since the number of cases was small, they were retained. In addition, in the present study, significance tests for the regression equations estimated used bootstrapped standard errors to compensate for the known bias in standard errors which occurs as a consequence of multivariate skewness (bootstrap standard errors have been suggested to efficiently address deviations from normality; Preacher, Rucker, & Hayes, 2007).

2.4. Statistical analysis

All analyses were on conducted using SPSS (version 22). Hayes' PROCESS Macro (v. 2.16.3) was employed to test whether the level of online Flow experienced mediates the relationship between the preference for social games and IGD behaviours exhibited. The Hayes PROCESS Macro is, in essence, a test of mediation which follows the prescription of Baron and Kenny (1986), enhanced by bootstrapping procedures.

3. Results

To assess whether a preference for social games was associated with Flow (H1), and whether the level of online Flow experienced mediates this relationship (H2), Model 4 of Haye's PROCESS procedure was estimated. H1 was supported. A preference for social games was significantly associated with the level of online Flow experienced, B = 0.325, p = .018, 95% CI [0.057, 0.593]. H2 was also supported. The total unstandardised effect (path c) of a preference for social games on IGD behaviours was significant, B = 2.16, p = .026, 95% CI [0.258, 4.06]. The unstandardized indirect effect was 0.617, and the bootstrapped 95% CI ranged from 0.178 to 1.26, indicating that the indirect or the mediating path (path a*b) through the level of online Flow (immersive pleasure) experienced was significant. In the presence of high levels of online Flow experience, the effect of a preference for social games was no longer significant (path c') B = 1.54, p = .103, 95% CI [−0.316, 3.40]. Therefore, in this model, there was full mediation (see Fig. 2). However, the proportion of the total effect represented by the indirect effect was modest at 0.29. Thus, although Flow fully mediated the effect of a preference for social games on IGD behaviours, it is but one factor which may be responsible for this effect. A test of this significance of this proportion using a bootstrapped
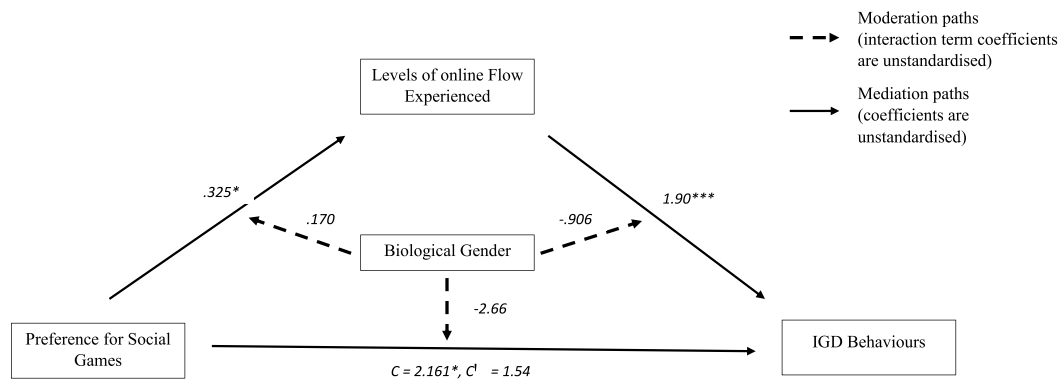
Fig. 2. The mediating interplay between social games preference, online Flow experience and IGD behaviours.

standard error produced a 95% CI of 0.062 to 2.34. Since this interval does not pass through 0, the proportion of the total effect represented by the indirect effect is statistically significant. The Sobel test returned a *p*-value of 0.0415 also indicating that the indirect effect was statistically significant. However, as reported by Zhao, Lynch Jr, and Chen (2010), the Sobel test must be interpreted with caution since it is based on the assumption that the product of the coefficients on an indirect path is normally distributed which they are not.

To control for potential gender differences (i.e., gender could be a confounding factor in relation to online Flow effects based on relevant literature; Stavropoulos, Alexandraki, & Motti-Stefanidi, 2013a; Stavropoulos, Alexandraki, & Motti-Stefanidi, 2013b; Stavropoulos, Beard, et al., 2018; Stavropoulos, Griffiths, et al., 2018) a moderated mediation analysis (i.e., PROCESS Model 59) was conducted to test whether biological gender moderated the mediating influence of the level of online Flow (immersive pleasure) experienced on IGD behaviours (H3). An indication of gender differences was observed. The mediation model was not significant for females as indicated by the bootstrapped 95% CI whose values were in the range −0.962 to 1.984.

However, the mediation model was significant for males as indicated by the bootstrapped 95% CI whose values were in the range 0.093 to 1.267. Nevertheless, as indicated by the Index of Moderated Mediation, the overall difference between the genders was not significant. The Index value was 0.102, the bootstrapped standard error was 0.785 and the bootstrapped 95% CI ranged from −1.542 to 1.618. Since this interval passed through 0, the moderation of the mediation was not statistically significant. The index of moderated mediation is, apparently, an application of simple slopes logic to indirect effects. In this example, the difference in the slopes of the indirect effects is found by subtracting the coefficient of the indirect effect for females (0.445) from the coefficient of the indirect effect for males (0.546), which equals 0.101 (the index of moderated mediation). This difference in the coefficient divided, by the bootstrapped standard error produced a non-significant result as shown above by the 95% CI estimate for the index of moderated mediation. As correctly reported by Hayes (2015) the sampling distribution of the product regression coefficients is not normal. This means that it is not proper to reference the normal distribution when making an inference about the significance of moderated mediation. As noted above, in the PROCESS Macro, Model 59, the significance of the Index of Moderated Mediation is determined by dividing the coefficient of the index by the bootstrapped standard error. This removes the complication which arises when using test statistics founded on the normal distribution. Therefore, the index of moderated mediation can be relied on in relation to inferences made about the significance, or otherwise, of moderated mediation.

4. Discussion

The aim of the present study was to contribute to the extant

knowledge considering risk factors and processes associated with IGD behaviours. In the present study, online Flow (or an immersive pleasurable experience) and a preference for social games, as well as their interplay, were concurrently assessed to determine the nature of their associative contribution, if any, to IGD behaviours. Tests were also conducted to determine whether biological gender was implicated in the relationship between a preference for social games, online Flow, and IGD behaviours.

4.1. Feeling the flow of social games

Hypothesis 1 was supported. A preference for social games was shown to be positively associated with self-reports of online Flow (immersive pleasure experience) while gaming.

In relation to the structural characteristics of games, the social component is well documented in the literature to be a pivotal element in many facets of gaming. In Yee's (2006b) study of MMORPG gamers, female participants were motivated to play because (as reported) WoW provided them with the opportunity to make deep social connections. On the other hand, although males also valued socialization and friendship, in most cases, social interaction was perceived as a means to achieve game-related objectives. Thus, the need for affiliation may be more pronounced in females whereas the need for achievement appears more pronounced for males. Irrespective of these differences, when playing social games (such as MMORPGs and MOBA games; conceptualized here as social games), males and females must navigate the intricacies embedded within the games to build and nurture social networks. Extending previous studies (e.g., Chang, 2013; Stavropoulos et al., 2017), the challenge of developing social relationships in games provides conditions, where optimal interaction experiences may result in online Flow (immersive pleasure experience). A study by Cole and Griffiths (2007) highlighted the rich social environment available to gamers who play MMORPGs. In their sample of 912 participants, approximately 75% reported making friendship bonds with other players, while there were no significant gender differences in this regard. Interestingly, they also found that there was a positive association between the number of friends a player had in a game and the hours per week that was spent gaming. Again, there were no gender differences in relation to this. This finding, and in line with the results of the present study, exemplifies the capacity for social aspects within a game to create and facilitate higher levels of immersive pleasurable experiences. This would, in turn, explain why gamers who socialize more, spend more time online and report greater enjoyment when playing with others online (Chang, 2013; Choi & Kim, 2004; Lee et al., 2012). Moreover, the study by Choi and Kim (2004) supported the idea that social interactions in games can elicit a state of Flow. Specifically, their study reported that positive social interactions can foster optimal experience, which offers an explanation as to why gamers may choose to continue to play online games. It seems that online Flow (immersive

pleasure) can potentially be further elevated by the achievement of in game objectives by a social group within a game (Stavropoulos et al., 2017; Stavropoulos, Beard, et al., 2018; Stavropoulos, Griffiths, et al., 2018).

In a study pertaining to the experience of Flow (immersive pleasure) and the excessive use of smartphones, Zhao, Chen, Zhao, and Lee (2004) found that reinforcement motives, namely, instant gratification and mood regulation were positively associated with Flow (immersive pleasure), which in turn, is positively associated with excessive use of smartphones. In the present study, although a preference for social games was positively associated with online Flow, the effect size was small ($r2 = 0.024$). It may be that the preference for social games merely reflects a means to an end, whereby the instant gratification which also occurs when playing online games and the opportunity to regulate mood by playing online games are the motivational factors which explain the experience of online Flow (immersive pleasure). This line of enquiry is worthy of future research.

4.2. Social games and IGD: Flow as a mediator

Hypothesis 2 was supported. Flow fully mediated the relationship between the preference for social games and IGD behaviours.

The results of the present study are consistent with the findings of past studies which investigated the relationship between online Flow and IGD. In two studies, gamers who reported experiencing higher Flow (immersive pleasure) were also found to spend more time playing games (Seger & Potts, 2012; Lee et al., 2012). Clearly, the experience of online Flow is attractive to gamers. Thus, a desire to attain the feeling of Flow (immersive pleasure), might affect the frequency and duration of gaming, and therefore be implicated in the development and persistence of IGD behaviours (Kuss & Griffiths, 2012; Stavropoulos, Beard, et al., 2018; Stavropoulos, Griffiths, et al., 2018). Similarly, Sherry (2004) proposed that the opportunity to experience immersion and pleasure (i.e., Flow) may be a powerful motivator for gaming. In line with this view, the present study contends that for some gamers, it may be possible that their IGD behaviours derive from a perpetual need to experience Flow, exacerbated by the game structure, especially when this might involve social elements (Anderson et al., 2016). After all, Flow is synonymous with enjoyment (Csikszentmihalyi, 1990; Stavropoulos, Beard, et al., 2018; Stavropoulos, Griffiths, et al., 2018). The desire to achieve online Flow (immersive pleasure) through gaming, may have parallels with similar behaviours found in other behavioural addictions (Trivedi & Teichert, 2017). Therefore, gaming induced immersive pleasure experiences (i.e., Flow) may have a dosage effect, such that gamers develop a tolerance and as a result, participate in gaming more frequently and for longer periods of time in an attempt to satisfy their need for Flow (Stavropoulos, Beard, et al., 2018; Stavropoulos, Griffiths, et al., 2018). As a result, gamers may become absorbed, not primarily by the game, but by the online Flow (immersive pleasure) experience which social gaming delivers. This may explain why those who have a preference for social games might be more susceptible to develop IGD behaviours as indicated by the present findings.

At this point it should be noted that in the present study, for the model as a whole, the effect size overall was modest ($r2 = 0.091$). A mediation model which incorporates variables to measure the reinforcement motives discussed in Section 4.1 as potential predictors of the preference for game genre, online Flow, and IGD behaviours might enhance results in future studies.

4.3. Moderated mediation: gender

Hypothesis 3 was not supported. Although the indirect effect of the preference for game genre on IGD behaviours by way of online Flow was different for males and females, this difference did not reach statistical significance.

These results are not in keeping with the findings of Stavropoulos, Alexandraki, and Motti-Stefanidi (2013a); Stavropoulos, Alexandraki, and Motti-Stefanidi (2013b) who reported that males were more susceptible to the experience of immersion and pleasure (i.e., Flow) which in turn was found to be predictive of internet abuse. However, their study investigated internet use in general, which includes other internet applications such as social network sites, and therefore the nature of gender effects on the experience of immersive pleasure may have been confounded. In a more specific context, Seger and Potts (2012) found that for males, online Flow was more predictive of the amount of time spent playing games than for females. In keeping with Sherry (2004), he argued that games are designed for males, and as a result, females find gaming less attractive than males. If this is true, then the finding by Seger and Potts (2012), that females experience lesser Flow (immersive pleasure) than males in playing games is not surprising. Greenberg, Sherry, Lachlan, Lucas, and Homstrom (2010) showed that males preferred physical-oriented games (e.g. action and sports) while females preferred traditional-orientated games (e.g., puzzles and board games). Similarly, in a study of fifth-grade school students, Hamlen (2011) also found gender differences in game preference. The results of that study showed that males preferred action games, followed by simulation games. Conversely, females preferred simulation games, followed by actions games. In response to this, internet games predominantly targeting females have gradually been introduced (Schultheiss, 2017). Not only is there a growing population of female gamers (ESA, 2010; ESA, 2018), but game features that appeal to females are increasingly in development and introduced to existing platforms such as mobile games which are typically puzzle games (e.g., *"Candy Crush Saga"* or *"Angry Birds 2"*), (Cole & Griffiths, 2007). Thus, although male and female gamers appear to be motivated by different elements in games (Anderson et al., 2016), the response of the gaming industry (as a whole and due to gender tailoring the production of new games) to these differences may mean that the experience of online Flow (as reported overall) is not different according to the biological gender of the gamer.

Notwithstanding this, and as recommended above, future research which embodies variables which measure reinforcement motives for the play of games may reveal differences between males and females in respect to these motivations. It could be, for example, that the instant gratification that online gaming provides is more attractive for males, while the mood regulation afforded by gaming is more attractive for females.

4.4. Limitations and future directions

The present study has added to the understanding of the experience of online Flow (immersive pleasure) while playing social game genres which may be fundamental to the development of IGD. However, the present study is not without limitations. Firstly, the study was retrospective. Consequently, the recollections people make may not be accurate. Secondly, social desirability bias may have affected the results. Thirdly, in relation to gender, there were large differences in the number of males and females who responded to the survey. It is known that unequal sample sizes can affect the power of statistical tests.

However, in the present study, this limitation was mitigated by using the statistical tests which compensate for the effects of unequal sample sizes. For example, in testing the path model standard errors were estimated which accounted for heterogeneity in the variances of the samples. Finally, the present study employed an online sample that may potentially affect the generalizability of the results.

Based on the present study's findings, there are several significant implications for researchers and clinicians. Firstly, although there was a minor but non-significant difference in Flow between males and females, this result warrants further investigation. It would also be beneficial to test the moderating role of gender on Flow in clinical and non-clinical samples while controlling for genres. Perhaps Flow (immersive pleasure) is experienced unequally between the genders in clinical

samples and in specific genres. Controlled experimental testing would be beneficial. Moreover, the present study discussed the possibility that a gamer's pursuit for Flow is behaviorally similar to substance abusers. Although testing of this proposition was beyond the scope of this paper, it may explain why people develop IGD behaviours. Additional research is needed. Secondly, while moderated mediation was not established in the present study, there is scope to investigate this further. There was an observed difference between males and females in the relationship between social games and Flow (immersive pleasure). This was not statistically significant. However, this too warrants further research. By doing so, this may assist researchers and clinicians to better understand the fundamental mechanism that propels players towards IGD behaviours. As noted above, reinforcement motives may be implicated in the relationship between the preference for social games, online Flow (immersive experience), and IGD behaviours. It may be that these motives are what drive the preference for social games and they may also directly affect online Flow and the manifestation of IGD behaviours. Moreover, these reinforcement motives may affect males and females differently. Further research is also warranted.

The findings of the present study support the notion that social games and the experience of an immersive pleasurable feeling (i.e., online Flow) are implicated in IGD, and that gender may play some role in this relationship. The limitations of this study have been acknowledged. Clearly, the growing concern about the impact of technology on everyday life, as evidenced in the popular media and in the academic literature, creates a need for further research in this area of interest. The implications of the use of technology for the well-being of individuals are not to be underestimated and should not be ignored.

Conflict of interest

The authors of the present study do not report any conflict of interest.

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