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**Objective:** Problematic gaming has emerged as a contemporary concern, leading to the introduction of the diagnostic term 'Internet Gaming Disorder' (IGD; American Psychiatric Association). The present study aims to empirically assess the association between inattention and IGD, in the light of variable levels of vertical-individualism that reflects cultural inclinations towards independence, competitiveness, and hierarchy. **Method:** The participants (N=1032) comprised a normative cohort of Massively Multiplayer Online (MMO) gamers (M<sub>age</sub>=24 years; 48.7% male). IGD was measured with the nine-item short-form IGD Scale (IGD9-SF), inattention with the Attention Deficit Hyperactivity Disorder (ADHD) Self-Report Scale, and vertical individualism with the Individualism-Collectivism Questionnaire. Complex hierarchical and moderated regressions were employed. **Results:** Findings demonstrated an association between IGD and inattention, and additionally showed that this association was exacerbated by a more vertically-individualistic cultural orientation without significant gender differences. **Conclusion:** The need of differentially addressing IGD risk among inattentive gamers of diverse cultural orientation is highlighted.

**Keywords:** Internet Gaming Disorder; Inattention; Vertical Individualism; Adults; Gender.

## **Introduction**

Since their commercial introduction in the 1970s, videogames have become an integral part of modern leisure entertainment and recreation. In particular, internet-based videogames, especially Massively Multiplayer Online (MMO) games, which constitute the focus of the present paper, have garnered increasing research attention based on their absorbing combination of achievement, socialization, and game-character-development features (Stavropoulos et al., 2019a, b). Research has suggested that gaming has many positive benefits and can improve persistence (Imbellone et al., 2015), spatial visualisation (Subrahmanyam & Greenfield, 1994), problem solving (Griffiths, 2002), and communication skills (Wood et al., 2004) as well as having educational and therapeutic benefits (De Freitas & Griffiths, 2007; Griffiths et al., 2017a). However, detrimental effects of excessive gaming among a small minority of individuals have also been empirically demonstrated. These could include heightened aggressive behaviour and preoccupation (Carnagey & Anderson, 2005), increased impulsivity (Gentile et al., 2010), and addictive gaming tendencies (Kuss & Griffiths, 2012). It is this research investigating the negative effects of gaming that has led to the development and introduction of diagnostic terminologies such as Internet Gaming Disorder (IGD; American Psychiatric Association [APA], 2013) and Gaming Disorder (GD; World Health Association, 2019).

### **Disordered gaming**

IGD is described as a persistent, and uncontrollable use of online videogames. It was added to the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; APA, 2013) as a tentative disorder needing additional research and clinical elaboration. More recently, Gaming Disorder (GD), with or without the use of the internet, was also

officially included in the International Classification of Diseases (ICD-11; World Health Organization, [WHO], 2019). Nevertheless, criticisms have been highlighted considering the formalization of disordered gaming in its various forms. These stem mainly from the uncertainty around the nature of the behaviour as a genuine addiction, although it is treated as such (Blaszczynski, 2006; Wood, 2008; Király et al., 2015). Further concerns have been posed in relation to pathologizing normal everyday behaviours, such as recreational gaming, as well as clarifying the conceptual difference between IGD, Internet Use Disorder, and Internet Addiction (IA; terms that tend to occasionally be used interchangeably; Kardefelt-Winther et al., 2017; Király et al., 2015; Pontes & Griffiths, 2015) including the text in the DSM-5 (APA, 2013; Kuss et al., 2017b). Acknowledging these reservations in the literature, the term 'IGD' is used in the present paper, due to the focus being on internet gaming, alongside the existence of standardised and validated IGD assessment instruments, as well as the need for comparability/consistency with past empirical findings internationally (Griffiths & Pontes, 2014; Stavropoulos et al., 2018a).

According to the DSM-5, to be diagnosed as having IGD, individuals must experience five or more of nine symptoms: (1) preoccupation with online gaming (salience); (2) withdrawal symptoms when online games are unable to be played (withdrawal); (3) a need to spend increasing amounts of time online gaming (tolerance); (4) failed attempts to control online gaming (relapse); (5) online gaming becoming the predominant interest while other interests being lost and/or neglected (conflict); (6) excessive online gaming persisting despite the acknowledgement of its detrimental impact (conflict); (7) use of online gaming to escape or relieve a negative mood state (mood modification); (8) deception of others associated with online gaming engagement (conflict); (9) impairment or loss of relationships, education, and jobs due to excessive internet gaming (conflict) (APA; 2013).

### **Age of interest**

According to the DSM-5, the age range of risk for the onset of IGD is adolescence, broadly from the age of 12-20 years (APA, 2013). However, subsequent research has found that gamers also present with persistent videogame use during emergent adulthood (18 to 29 years; Griffiths & Pontes, 2014). Furthermore, several recent studies have claimed that IGD risk in young adulthood needs to be more carefully addressed (Adams et al., 2018; Burleigh et al., 2019; Liew et al., 2018). This was based on a sequence of arguments suggesting that: (i) addictive risk in young adulthood is increased due to higher independence and impulse (Adams et al., 2018); (ii) internet use is highly prevalent during this time (Ohannessian et al., 2017); and (iii) this developmental period has been significantly under-researched in relation to IGD (compared to adolescence; Stavropoulos et al., 2018b). Based upon these arguments, the present study emphasizes adult (rather than younger adult) online gamers. In this context, and given: (i) the recommendation of APA (2013) for further research into the understanding of risk and protective factors associated with IGD and; (ii) the need to better comprehend cultural orientation differences in already empirically established associations, the present study prioritizes the examination of cultural differences and variations in the association between inattention and IGD for reasons that will be explained below (Stavropoulos et al., 2019a).

### **Inattentive Attention Deficit Hyperactivity Disorder (ADHD) and IGD**

ADHD consists of two subtypes; inattentive and hyperactive-impulsive. Both of these require endorsement of at least six (out of nine) type-specific symptoms to be present for over six months, and in more than one setting, for an ADHD subtype diagnosis to be given (APA; 2013). Hyperactivity refers to excessive movement such as fidgeting, while impulsivity refers to actions and reactions carried out without prior thought about the risks or consequences

(APA, 2013). Inattention refers to a lack and/or trouble maintaining focus when carrying out tasks (APA, 2013). However, it is worth noting that although ADHD has been found to be almost twice as prevalent in males (than females), more diagnosed females present with the inattention subtype (APA, 2013). Additionally, ADHD (overall) and IGD have been found to be frequently comorbid (e.g., APA, 2013; Haghbin et al., 2013; Han et al., 2015; Paulus et al., 2017; Yen et al., 2017). Consequently, the present study particularly emphasizes the association between inattention (as an ADHD component) and IGD on the basis of the following observations: (i) recent literature has suggested that the effects of hyperactive-impulsive and inattentive ADHD-symptoms on IGD should be investigated separately (Stavropoulos et al., 2019); (ii) although a greater proportion of research, that has independently studied the effects of hyperactive-impulsive and inattentive symptoms on IGD, has focused on the hyperactive-impulsive IGD effects (Yen et al., 2017), findings have indicated that inattention might be more related to IGD (Yen et al., 2009); (iii) the association between inattention and IGD has been described as more complex and controversial because excessive levels of inattention could hinder game performance, decreasing gaming engagement and subsequently IGD risk (Stavropoulos et al., 2019); and (iv) inattention tends to be more prevalent among ADHD diagnosed females, while IGD is more prevalent among diagnosed males (APA, 2013), potentially inviting significant gender effects in the association between inattention and IGD.

Although the psychological literature has assumed that inattention increases IGD vulnerability (Lemmens et al., 2011; Bioulac et al., 2008), their association acts bidirectionally (Stavropoulos et al. 2019a). Videogame playing has been known to be exacerbated by inattention symptoms because it satisfies reward-seeking behaviours among those individuals with inattention, while in a later stage may increase real-life inattention due to gaming preoccupation (Antrop et al., 2000; Park et al., 2017; Percy et al., 2017). Despite

this being acknowledged here, being restricted by the cross-sectional nature of the data, only the risk association of inattention with IGD will be assessed in the present study.

### **Culture and IGD**

In the present study, the association between inattention and IGD in the light of cultural differences is examined to address literature recommendations and expand the knowledge base (Stavropoulos et al., 2019a, b; Pontes et al., 2017). First, risk of addiction (and behavioural addictions including IGD) is higher among individuals with more individualistic cultural orientation (i.e., driven more by individual needs than group needs) (Rolando & Katainen, 2014; McKinnon et al., 2017). This has been attributed to inclinations of independence, competitiveness, and hierarchy that may compromise social connectedness and increase isolation, thus enhancing the employment of pathological behaviours to moderate the way an individual feels (i.e., dependencies/addictions, instead of relationships and communication; Rolando & Katainen, 2014; McKinnon et al., 2017). Second, gaming motivations appear to differ according to cultural orientation, with individualistic cultural tendencies being directed by more gaming-status predicted goals (Lee & Wohn, 2012). Third, recent studies have identified differences in IGD risk effects and measurement patterns across countries, theoretically implicating individualistic cultural tendencies without empirically assessing them (Stavropoulos et al., 2019a, b; Stavropoulos et al., 2018a). More specifically, one study found living with parents to exacerbate the social withdrawal IGD risk differently between Australian and United States of America (USA) gamers (Stavropoulos et al., 2019b), while a second study supported that inattentive American gamers were at higher risk than Australian gamers with similar levels of inattention (Stavropoulos et al., 2019a). In both studies, competitive, independent, and hierarchy driven cultural inclinations of (presumably more individualistic) American gamers were implied to perpetuate IGD risk due to achievement and ranking game-related features (Stavropoulos et al., 2019a, b). Although both

these findings confirmed IGD differences in relation to countries and implied the significance of individualistic tendencies, they did not empirically examine cultural orientation differences, especially within the same countries' populations, which is particularly important in multicultural societies such as Australia and the USA (Stavropoulos et al, 2019b). The present study aims to empirically expand on these findings using a culturally diverse sample of online gamers, aligning with research recommendations that have been made repeatedly (e.g., APA, 2013; Király et al., 2015).

In that context, the multi-dimensional cultural orientation conceptualization of Singelis et al. (1995) will be utilized. This involves four sub-dimensions which are defined as Horizontal and Vertical Individualism, and Horizontal and Vertical Collectivism (Singelis et al., 1995). Horizontal-Individualism (HI) refers to cultures that emphasise equality, while maintaining social autonomy and independence among individuals (e.g., Australia; Singelis et al., 1995). Vertical-Individualism (VI) refers to cultures that include elements of hierarchy while maintaining social autonomy and independence (e.g., USA; Singelis et al., 1995). Horizontal-Collectivism (HC) refers to cultures emphasising equality while also being socially interdependent (e.g., Israeli kibbutz; Singelis et al., 1995). Finally, Vertical-Collectivism (VC) refers to a culture emphasising hierarchy while individuals are simultaneously socially interdependent (e.g., Japan; Singelis et al., 1995). Of these four dimensions, variations of VI cultural orientation will be focused upon here. Independent and competitive aspects associated to VI have been proposed to nurture excessive gaming motivations related to in-game accomplishment and ranking, that could be accommodating of inattention behaviours in real life (Stavropoulos et al., 2019a, b). These associations will be examined whilst concurrently taking into consideration gender differences.

## **Gender and IGD**

Gender, referring to biological sex has been proposed to play a key role in IGD behaviours (Weiser, 2000), with males (especially adolescents) being at greater IGD risk (APA, 2013). More technology-, achievement-, and hierarchy-orientated males (than females) appear to be more absorbed by the related game-structure aspects (Anderson, Steen & Stavropoulos, 2017). Nevertheless, given that achievement and ranking tendencies are less gender defined when a more VI-orientation is adopted (i.e., gender roles with females being more relationship- and less achievement-orientated tend to be more distinct in more collectivistic cultures; Singelis et al., 1995), associations between IGD and gender could neutralize. Accordingly, it could be assumed that the intensity of these associations might be even more blurred when it comes to the association between inattention and IGD, where although males tend to present higher IGD risk, inattentive-ADHD diagnosed females tend to outnumber their male counterparts (APA, 2013). To address these complexities, the present study explores gender differences in the association between inattention and IGD in a multi-cultural normative sample, focusing simultaneously on variations of VI (see Figure 1).

*-Figure 1-*

## **The present study**

Studies have consistently supported that it is the complex interaction between effects associated with gamers, the real context around them, and the game context itself that explains the development of IGD (Griffiths & Nuyens, 2017; Yee, 2006). Considering gamers in particular, it is the integration of psychological and neurobiological processes in the context of the “Person-Affect-Cognition-Execution” sequence that has been suggested to determine the presence of an excessive use behaviour (Brand, Young, Laier, Wölfling &

Potenza, 2016). While such factors related to gamers, and specifically the IGD inducing effect of psychopathological manifestations that they may present with have been established (Han, Kim, Bae, Renshaw, & Anderson, 2015), there is a dearth of findings in relation to how such associations could vary in the context of diverse cultural orientations and/or across genders (Stavropoulos et al., 2019). This is particularly important for multicultural societies such as Australia and the USA, where the mental health services provided are recommended to be culturally sensitive and responsive (Sue, Sue, Neville & Smith, 2019). To contribute to this area, the present study uses a normative online cohort of MMO gamers to examine the IGD risk effect of inattention in the light of variable levels of VI (implicated with higher ranking and achievement motivations that could accommodate inattention tendencies in real life) across genders (Burleigh et al., 2018; Liew et al., 2018; Stavropoulos et al., 2019a, b). The following hypotheses will be addressed:

*H<sub>1</sub>*: Higher inattention will be associated with increased IGD risk.

*H<sub>2</sub>*: The association between inattention and IGD will vary according to the levels of VI of the gamer.

*H<sub>3</sub>*: The interplay between inattention, VI, and IGD risk, will differ between genders.

## **Method**

### **Participants**

A normative sample of 1032 adult MMO gamers (48.7% male) primarily from Australia and the USA were recruited online (Mean<sub>age</sub>=24 years, SD<sub>age</sub>=7). Online collection was preferred for a four reasons: (i) online surveys have been recommended for accessing Internet gamers (Griffiths 2010); (ii) measurement-invariance analyses have indicated no differences between data collection modes for the vast majority of scales examined (Zhang, Kuchinke, Woud, Velten, & Margraf, 2017); (iii) online and face to face collected data have

been specifically suggested not to significantly differ (Pettit 2002) and; (iv) online data collection has been associated with lower risk for social desirability effects and biases (Zhang et al., 2017). The maximum estimated sampling error for a number of 1032 at the 95% confidence interval, is estimated at  $\pm 3.11\%$ , which is less than the recommended accepted level of  $\pm 4$  (Hill, 1998). Specific information considering socio-demographics and internet use characteristics of the sample is provided in Table. 1.

-Table 1-

### **Measures**

***Sociodemographic data:*** Information was collected concerning socio-demographic variables (gender, employment status, country of residence, who they were living with) and internet engagement prior to the data collected from the scales listed below.

***Individualism and Collectivism Scale (ICS) (Triandis & Gelfland, 1998):*** The ICS was used to assess cultural orientation differences (i.e., “*I’d rather depend on myself than others*”, “*I feel good when I cooperate with others*”). The 16-item instrument employs a nine-point Likert Scale ranging from 1 (“*never or definitely not*”) to 9 (“*always or definitely*”). The scale items are divided into four equally numbered groups of four items each, which inform four cultural sub-dimensions/ indices (VI, VC, HI and HC). The total scores for the four sub-dimensions are calculated by adding the points in the included items, resulting to a range of 4 to 36, where higher scores indicate higher levels of the cultural behaviours reflected. Their internal reliabilities were calculated to be sufficient here (Cronbach<sub>VI</sub>  $\alpha = .67$ , Cronbach<sub>VC</sub>  $\alpha = .68$ , Cronbach<sub>HI</sub>  $\alpha = .57$ , Cronbach<sub>HC</sub>  $\alpha = .86$ ).

***Internet Gaming Disorder Scale-Short Form (IGD9-SF) (Pontes & Griffiths, 2015):*** The IGDS9-SF was used to assess IGD risk. Participants respond to questions such as “*Do you feel more irritability, anxiety or even sadness when you try to either reduce or stop*

*your gaming activity?*” on a five-point Likert scale ranging from 1 (“*never*”) to 5 (“*very often*”). Total score was derived by the addition of all items’ scores ranging from 9 to 45 with higher scores indicating higher risk of IGD. The internal reliability was very good (Cronbach  $\alpha = .87$ ).

***ADHD Self-Report Scale (ASRS) (Kessler et al., 2004):*** The 18-item ASRS was used to assess hyperactive-impulsive and inattentive behaviours/symptoms. Participants respond to questions such as “*How often do you feel overly active and compelled to do things, like you were driven by a motor?*” on a five-point Likert scale ranging from 0 (“*Never*”) to 4 (“*very Often*”). Each sub-dimension comprises nine items and their scores are added together to inform the total sub-dimension score between a minimum of 0 and a maximum of 36. The higher the scores, the higher the relevant sub-dimension symptoms. The internal reliabilities for the ASRS sub-dimensions were good to very good (Inattention Cronbach  $\alpha = .85$ , Hyperactivity-Impulsivity Cronbach  $\alpha = .77$ ).

### **Procedure**

The study was approved by the research team’s institutional Human Research Ethics Committee. Participants, Massively Multiplayer Online (MMO) games players, were recruited online via advertisements on various platforms including social media (e.g., *Facebook*), game forums (e. g. *PC Gamer*) and internet chatrooms (e.g., *Discord*). Individuals who clicked the survey link were debriefed on the first page with a description of the study and its aims via the Plain Language Information Statement (PLIS). Verification that participants’ data would be recorded anonymously was provided, and a statement ensuring that they had the choice to stop participating in the survey at any point in time was also included. Participants digitally provided their informed consent by clicking to proceed to take part in the survey.

### Data analyses

To determine if inattentive symptoms increased risk of IGD ( $H_1$ ), a two-step linear regression analysis was conducted, while controlling for the possible confounding effects of gender and age. Age (in years) and gender (dummy coded 0 = females, 1 = males) were inserted as independent variables at step one, and inattention scores as the independent variable in the second step. To assess the VI effect on the association between inattention and IGD ( $H_2$ ), a moderation analyses based on Model 1 (Process Macro; Hayes, 2013) was used. The potential confounding effects of age and gender were also considered. For  $H_3$ , the  $H_2$  calculation was expanded with the addition of gender using Model 3 (Process Macro; Hayes, 2013), controlling simultaneously for the confounding effects of age. For this, the independent effect was inattention, the outcome was IGD, VI was the moderator, and gender was the moderator of the moderating effect of VI on the interaction inattention and IGD. Age was also used as the covariate. Bootstrapping was implemented at the optimum level of 5000 resamples for all the analyses implemented (Fisher & Hall, 1990).

### Results

Descriptive and inter-correlation information of the data is available in Table 2. For the analysis of  $H_1$ , the slope of the two-step (step<sub>1</sub> gender and age, step<sub>2</sub> Inattention) linear hierarchical regression calculation was significant ( $F_{(3, 1028)} = 117.50, p < .001$ ) and accounted for 25.5% of the variance in IGD ( $R^2 = .255$ ). Inattention effect exclusively accounted for 23.8% of the variance in IGD ( $R^2_{\text{change}} = .238$ ). Additionally, the inspection of the unstandardized coefficient indicated that for each point of Inattention increase, IGD behaviours increased by .57 ( $b = .57, p = 0.001$ ).

-Table 2-

H<sub>2</sub> was assessed using a moderation analysis (Hayes, 2013). Inattention was the predictor (X), IGD the outcome (Y), and VI (M) was the moderator. To control the effects of gender and age, both were included as covariates (see equation below).

$$IGD = a + b1(Inattention) + b2(VI) + b3(Inattention \times VI) + b6(Age) + b7(Gender)$$

The full model accounted for 30.1% of IGD variance with a significant slope ( $F_{(5,1026)} = 89.23, p < 0.001$ ). An examination of the moderation coefficient indicated a mild VI exacerbating effect in predicting IGD ( $b_3 = .02, t_{(1026)} = 8.73, p = .032, LLCI = .001, ULCI = .017$ ). These results show that IGD scores increase by .02 when gamers' scores are concurrently one point higher on Inattention and VI. The Johnson-Neyman (J-N) technique was additionally applied and showed no-significant differences in this exacerbating effect across the range of VI values (see *Figure 2*).

-Figure 2-

To analyse H<sub>3</sub>, a moderated moderation analysis was conducted (Hayes, 2013), where the H<sub>2</sub> model was expanded with the addition of gender as the moderator of the VI moderating effect. The estimated equation was as follows:

$$IGD = a + b1(inattention) + b2(VI) + b3(inattention \times VI) + b4(VI \times Gender) + b5(inattention \times VI \times Gender) + b6(Age) + b7(Gender)$$

Although the full model accounted for 31.2% of IGD variance and had a significant slope ( $F_{(8,1023)} = 57.51, p < .001$ ), the three-way interaction coefficient between inattention, VI, and gender was non-significant ( $b = -0.02, t = -1.51, p = .13$ ). In brief, findings indicated that inattention predicted higher IGD risk and this was mildly exacerbated by a more VI cultural orientation without significant gender differences.

## **Discussion**

Literature in the gaming studies field has suggested country variations in the association between inattention and IGD s on the basis of cultural orientation differences (Stavropoulos et al., 2019a). The present study added to the knowledge base in the area by empirically examining the association between inattention and IGD in the context of variable levels of VI (reflecting cultural orientation towards autonomy, independence, and hierarchy) in a normative online sample of MMO gamers from multicultural societies. Furthermore, the study also examined potential gender variations in the interplay between experienced inattention, IGD, and levels of VI. Complex regression, moderation, and moderated moderation analyses confirmed previous findings suggesting that inattention predicts IGD and additionally highlighted an exacerbating effect of higher VI-orientation levels on this association. The latter was not significantly different across genders. Results indicated that although inattentive MMO gamers were at higher risk of disordered gaming, those individuals that tend to be more VI culturally-orientated need to be prioritized in relative prevention and intervention programs independent of their gender.

### **Inattention and IGD**

Findings from the present study confirmed that inattentive adult MMO gamers were more likely to report increased levels of IGD (H<sub>1</sub>). Similarly, previous studies have shown that IGD is associated with ADHD symptoms among young adults (Yen et al., 2016; Mazurek & Engelhardt, 2013), college students, and especially female students (Yen et al., 2009). A study by Evren et al. (2018) concluded that the likelihood of being diagnosed with IGD was approximately three times higher among gamers presenting with ADHD (Evren, Evren, Dalbudak, Topcu, & Kutlu, 2018). Additionally, Evren et al. (2018) suggested there was a positive relationship between ADHD and IGD severity (Evren et al., 2018), while

Stavropoulos et al. (2019a) differentially assessed the associations between inattention-IGD and hyperactive/impulsive IGD across confirming higher intensity of these particular IGD risk effects among American compared to Australian gamers. These findings have predominantly been explained in the light of the increased risk of addictive behaviours due to symptoms of ADHD in general, and especially behaviours such as lower impulse control and inhibited attention being accommodated by IGD (Stockdale & Coyne, 2018).

Additionally, inattentive individuals with IA have been specifically assumed to present with excessive gaming behaviours due to their difficulty to redirect attention to real-life goals that in turn compromises their overall performance, therefore allowing gaming to be their main source of achievement and satisfaction (Peeters, Koning, & Eijnden, 2018). These factors, alongside poor impulse control (that is often co-present with inattention) may impede disengagement from the continuously rewarding stimuli embedded in videogames (Stockdale & Coyne, 2018; Anderson et al., 2017; Yen et al., 2009). In this context, inattention to non-game stimuli could become strengthened due to the ‘flow’ of online games (i.e., the ‘absorption’ of gamers in a game tasks where they feels challenged, due to their skills being matched with the demands of the game-action involved) (Csikszentmihalyi, 1990; Hu et al., 2019). Similarly, it could be assumed that gaming-induced flow could gravitate the attention of gamers to the extent that they become inattentive offline. This could be higher especially in cases where gaming functions as a compensatory outlet for the lack of real-life achievements and status (Anderson et al., 2017; Evren et al., 2018; Yen et al., 2016).

### **The role of VI in the association between inattention and IGD**

Expanding on previous findings, the present study proposed that more VI culturally-orientated inattentive MMO gamers have a mildly higher risk of IGD (than less VI culturally-orientated MMO gamers; H<sub>2</sub>). This finding aligns with: (i) literature suggesting that

inattentive individuals from the USA (a country with high levels of VI; Triandis, 1996) have higher levels of disordered gaming (Stavropoulos et al., 2019a); and (ii) studies suggesting that specific culturally-related aspects, related to achievement, hierarchy, and ranking (inherent within the MMO gaming structure) increase IGD susceptibility and score-measurement equivalence (Clemens et al., 2014; Stavropoulos et al., 2018a). Nevertheless, previous literature has failed in providing empirical evidence considering the size and the significance of the hypothesized VI effect, especially across multicultural populations from the same country of origin, which was sufficiently addressed by the present findings. The VI exacerbating effect demonstrated may be explained by VI embracing the key characteristics of personal achievements and ranking as culture-related drives for individuals (Stavropoulos et al., 2018a; Singelis et al., 1995). Such drives for achievements and ranking are facilitated and fed in gaming contexts, structure, and progress, and therefore, might further increase gaming engagement and in turn increase IGD risk. This might be of higher importance among more VI-orientated inattentive gamers, who may be less able to achieve and compete in their real lives due to their inattention (Arpaci, Kesici, & Baloglu, 2017; Lee & Wohn, 2012; Stetina et al., 2011). Furthermore, individual autonomy and independence, related to higher VI tendencies, have been proposed as increasing the risk of developing IGD (Lee & Kim, 2015; Triandis, 1996). Such cultural traits could occasionally be coupled with low extraversion, which is a known mediator of inattentive and hyperactive/impulsive behaviours and IGD (Evren et al., 2018). This finding specifically suggests that prevention and treatment planning priority should be given to more inattentive gamers with a more VI-cultural orientation.

### **The role of gender**

In contrast to H<sub>3</sub>, the present study found that the complex association between ADHD Inattention, IGD risk, and VI did not significantly differ across genders. This finding

was contrary to expectations. Previous literature has consistently shown that males are more likely to experience IGD (Müller et al., 2015; Yen et al., 2007). This could be due to gender differences in gaming motivations, with males being driven by competition (Veltri, Krasnova, Baumann, & Kalayamthanam, 2014), or the fact that (despite the recent increase in videogames targeting female gamers; McLean & Griffiths, 2019) most videogames continue to be primarily designed by males for other males (Stavropoulos et al., 2019; Griffiths, 1993), and gaming is stereotypically viewed as a male activity in which females are not socially rewarded for engaging in (McLean & Griffiths, 2013). Meanwhile, inattentive ADHD has shown the opposite gender effect, with females being more likely to present with inattentive symptoms than males (APA, 2013). Nevertheless, in the light of effects of a more vertically individualistic cultural-orientation, such opposing gender effects, explained on the basis of culturally (vertically-individualistic) appealing game motivations of achievement and ranking could have been neutralised (Triandis et al., 1995). This is because the effects of Vertical Individualism could have overridden the gender effects concerning culturally-defined IGD motivations of achievement and ranking, because when gamers adopt a more vertically individualistic and egalitarian cultural-orientation, these stop being exclusively male-related drives.

### **Conclusion and implications** **Conclusions always come after the limitations**

The conclusive implications of the present study's findings are significant. Firstly, due to the confirmation of previous research advocating the association between inattention and IGD, the treatment of individuals with inattention-IGD comorbidity could be optimized by simultaneously targeting both clinical presentations and/or through the use of trans-diagnostic protocols (Stavropoulos et al., 2019a; Gomez et al., 2019). Secondly, in the context of the global-multicultural nature of IGD, the high gaming expansion among countries with populations of diverse cultural orientation (i.e., USA; Pontes et al., 2017) and

the higher multi-cultural tendencies across societies worldwide in the context of globalization, the IGD risk-protective effect of varying cultural orientations should be more carefully considered in both research and clinical planning (Pieterse, 2019). Furthermore, the present findings suggest that among inattentive gamers, those who are more VI culturally-orientated may need to be more carefully addressed. This could be done by culturally responsive assessment and treatment in order to moderate/ buffer the effect of vertically individualistic dictated drives for achievement and ranking that may exacerbate gaming involvement. This could be particularly important for multicultural societies, such as the USA and Australia where gamer cultural drives could significantly differ. Consequently, for those with IGD presenting with such features, prevention and treatment utilizing cognitive-behavioural therapy should focus on drives and values related to independence, competitiveness, and hierarchy (inherent with VI) through the use of cognitive restructuring, cognitive processing, and reframing strategies. Finally, the findings of the present study suggest that comorbid inattention-IGD treatment plans should not be different for male and female MMO gamers.

### **Limitations and directions for future research**

Despite the value of the present findings, the study has some significant limitations. Firstly, the measures, including the scale to assess disordered gaming, used in the present study were exclusively self-report scales. Therefore, the data are subject to well-known biases that should be taken into account when interpreting the findings (e.g., memory recall, social desirability). Secondly, participants were exclusively MMO players, primarily from Australia and the USA. This is not representative of the range of other game genres. It may also not be representative of the range of VI, as well as how a higher VI-orientation could manifest in relation to IGD within different macro-systems and across different game genres. Finally, the direction of causality for associations established is restricted due to the cross-sectional

nature of the present study. Future research should therefore explore these associations in more culturally diverse populations other than the USA and Australia. In particular in Asian populations with supported high prevalence rates of IGD (APA, 2013) or in different multicultural populations from the same country of origin in Europe. Furthermore, other research methods such as longitudinal and qualitative research are recommended as a way to strengthen the empirical database. This would also strengthen the reliability of the associations examined in the present study and help to better identify more robust causal directions.

### **Compliance with ethical standards**

*Funding:* There was no funding

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

*Ethical standards:* All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

*Informed consent:* Informed consent was obtained from all individual participants included in the study.

*Confirmation statement:* Authors confirm that this paper has not been either previously published or submitted simultaneously for publication elsewhere.

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Table 1. *Sociodemographic and internet gaming use information for present study participants (N=1032)*

| Socio-demographic variables                  |   | Total<br>(n = 1032)                     |                 |
|--|---|---|-----------------|
| Gender                                       | Male  | 503 (48.7%)                             |                 |
|  | Female  | 529 (51.3%)                             |                 |
| Country                                      | Australia   | 738 (71.5%)                             |                 |
|  | United States   | 222 (21.5%)                             |                 |
|  | United Kingdom  | 7 (.7%)                                 |                 |
|  | Other   | 65 (6.3%)                               |                 |
| Employment status                            | Other   | 128 (12.4%)                             |                 |
|  | Trainee   | 3 (.3%)                                 |                 |
|  | Student   | 345 (33.4%)                             |                 |
|  | Part-time employment                                    | 193 (18.7%)                             |                 |
|  | Full-time employment                                    | 363 (35.2%)                             |                 |
| Living with                                  | Family of origin (two parents and siblings if any)      | 312 (30.2%)                             |                 |
|  | Mother and siblings if any (parents divorced/separated) | 110 (10.7%)                             |                 |
|  | Mother and siblings if any (father passed away)         | 20 (1.9%)                               |                 |
|  | Father and siblings if any (parents divorced/separated) | 33 (3.2%)                               |                 |
|  | Father and siblings – if any (mother passed away)       | 49 (4.7%)                               |                 |
|  | With partner  | 259 (25.1%)                             |                 |
|  | With partner and siblings                               | 28 (2.7%)                               |                 |
|  | Alone   | 97 (9.4%)                               |                 |
|  | With friends  | 97 (9.4%)                               |                 |
|  | Transient accommodation                                 | 18 (1.7%)                               |                 |
|  | Years using the internet (M)                            | 14.53 (SD= 5.15)                        |                 |
|  | Internet use  | Hours spent online on a weekday (M)     | 3.66 (SD= 2.55) |
|  |   | Hours spent online on a weekend day (M) | 7.92 (SD= 4.76) |
| Years of playing preferred internet game (M) |   | 5.12 (SD=4.36)                          |                 |
| Gaming Use                                   | Average gaming time on a weekday (M)                    | 3.66 (SD=3.35)                          |                 |

Table 2. Means, standard deviations, and inter-correlations of IGD, inattention, and vertical individualism

| Variables              | Descriptive Statistics |     | Inter-correlations |             |                        |
|------------------------|------------------------|-----|--------------------|-------------|------------------------|
|                        | Mean                   | SD  | IGD                | Inattention | Vertical Individualism |
| IGD                    | 21.1                   | 7.1 | -                  | .482**      | .305**                 |
| Inattention            | 14.5                   | 6.2 | .482**             | -           | .184**                 |
| Vertical Individualism | 18.2                   | 6.1 | .305**             | .184**      | -                      |

Note. \*\* $p < 0.01$ .