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CORRELATION OF INTERNET GAMING DISORDER AND IMPULSIVITY ACROSS GENDER DIFFERENCES AMONG MALAYSIAN YOUTHS

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ABSTRACT

A significant portion of prior research has indicated that internet gamers' impulsivity is a risk factor and effect of Internet Gaming Disorder (IGD) in which IGD cases are gradually increasing globally. Besides, a male is more prone to develop IGD and being impulsive compared with a female historically referring from the evolutional perspectives. Yet, the empirical studies are still insufficient and inconsistent to ensure the correlation between both variables across gender. This study is aligned with the fifth Sustainable Development Goal: gender equality. This was descriptive correlational research utilised non-probability purposive sampling method. The present study expanded the existing research by indicating a positive correlation between IGD and impulsivity, where there are no gender differences among the sample of 130 Malaysian youths (70 males and 60 females) with a mean age of 20.72 years old on average (S.D. = 2.30) in relation with both variables. Findings from this study recommend future research to concentrate on features related to impulsivity as an imperative contributor to IGD.

Keywords: Internet gaming disorder; impulsivity; gender equality

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1. INTRODUCTION

In this era of the Fourth Industrial Revolution (IR 4.0), the gaming industry shifted from traditional gaming machines towards digital gadgets in our daily life, enhancing gaming visibility and accessibility to the public. The global game industry market has drastically increased since the outbreak of COVID-19 due to the mobility of citizens being restricted to control the virus transmission (Blake & Sauermilch, 2021; Shahid et al, 2021).

Nonetheless, the probability of gamers being exposed to harmful complications while engaging in Internet Gaming is equivalent to the positive experiences offered such as cyberbullying or expressing violent verbal gaming cues that fall under the signs of impulsivity (Gámez-Guadix & Gini, 2016; Ildırım et al., 2017; Pascual-Sanchez et al., 2021).

According to a survey from Statista, 73% of the Malaysian age group between 16-24 play online games daily (Statista, 2021). In Malaysia, youth is categorised as 15 to 30 years old, this age group is more likely to maximise addictive behaviour usage and overdependence on the internet, and potentially become problematic gamers that exhibit high impulsivity (Ismail et al., 2022; Nik Jaafar et al., 2021).

The main issues related to Internet Gaming Disorder (IGD) are physical and mental deterioration and even developing comorbidities like anxiety and depression of disordered youth gamers currently (Kaess et al., 2017; Yen et al., 2019). Insufficient studies of IGD in the Malaysian context, inconsistency of data presented among previous studies related to impulsivity, and vague conceptualization of both variables should be researched thoroughly for further clarification (D-Griffiths & Pontes, 2014; Dullur & Starcevic, 2017). Furthermore, there was an inadequate number of female participants to represent female populations in previous studies of IGD, this might be due to the gender stereotypical perspectives of females in this society that gaming is only for males as that contains aggressive content (Hartmann & Klimmt, 2006; Lopez-Fernandez et al., 2019).

This study addresses several gaps and limitations in the existing literature on IGD and impulsivity among Malaysian youths. Firstly, it aims to contribute to the understanding of IGD within the Malaysian context, where there is a notable lack of research in this area. Additionally, the study seeks to address inconsistencies in previous studies related to impulsivity and IGD to provide a clearer conceptualization of these variables (Chen et al., 2018; King et al., 2017). Furthermore, by examining the correlation between IGD and impulsivity among both male and female Malaysian youths, this study aims to provide insights into gender differences in gaming behaviors and their associated psychological factors. Overall, by addressing these gaps and providing new insights, this study aims to advance understanding of the complex relationship between internet gaming, impulsivity, and mental health outcomes among Malaysian youths.

Furthermore, the framing of impulsivity in relation to IGD presents profound theoretical and interpretive challenges (Ji et al., 2022; Şalvarlı & Griffiths, 2019). The prevailing misconception of IGD and impulsivity with vague definitions may lead to overgeneralizations that obscure the intricate gender-specific dynamics at this issue (Marraudino et al., 2022; Zhu et al., 2023).

Crucially, such an approach might misrepresent the actual behavioral and psychological profiles of Malaysian youths, neglecting culturally specific manifestations of impulsivity and gaming behavior. These conceptual deficiencies highlight the necessity for a more nuanced approach in examining the relationship between psychological traits and digital behavior disorders, particularly with respect to gender influences in the current study. As such, more meticulous and culturally sensitive investigation is essential to genuinely comprehend and address the subtleties of IGD among diverse populations.

Prior research has predominantly used a one-size-fits-all approach in the study of impulsivity and IGD, failing to consider how gender might influence these phenomena (King & Delfabbro, 2018; Shin et al., 2019). Studies examining impulsivity and IGD often overlook potential gender differences in gaming behaviors and impulsivity traits (Cerniglia et al., 2019; Desai et al., 2010; Wichstrøm et al., 2018). This oversight may result in a limited understanding of how impulsivity contributes to IGD differently among males and females.

In addition, the ambiguity in defining and operationalizing concepts like impulsivity introduces a substantial risk of distorting research outcomes (King et al., 2019; Ko et al., 2017). This issue is especially critical in studies on Internet Gaming Disorder (IGD) among Malaysian youths, where ignoring cultural and gender nuances can lead to significant misinterpretations. When impulsivity is poorly defined, it becomes challenging to discern its true impact on IGD, and as a result, research may fail to capture the complex ways in which this trait interacts differently across genders. This oversight can lead to generalized interventions that do not address the specific needs of distinct groups, potentially exacerbating the disorder rather than mitigating it. It is imperative for researchers to adopt rigorous and culturally sensitive methodologies to uncover the nuanced dynamics of impulsivity and IGD, thus paving the way for more effective and targeted interventions.

Therefore, the current study examined the correlation between IGD and impulsivity among male and female Malaysian youths.

2. LITERATURE REVIEW

2.1. *Internet Gaming Disorder (IGD)*

Those factors that connected with IGD based on the past studies were parental and peer attachments, initiation gaming age, gamer's context, and impulsivity trait.

Despite the duration of playing social online gaming could not significantly predict the degree of IGD, frequencies and play time spent per day still positively influence the mental well-being of Muslim gamers (Sabri & Yunus, 2021). Gamers that often engage with large social game groups prioritise online social obligations which emphasise more on rankings and achievement, ignoring the actual life relationships inducing the risk of IGD (King & Delfabbro, 2018). Parental attachment was demonstrated as a protective attribute towards IGD, whereas peer relationships signify a greater chance of getting IGD (Teng et al., 2020). This scenario might be the reason for family cohesion as the affection bonding established by the acceptance expressed in a family

decreases the at-risk individual to develop addictive or anxiety-related behaviours (Adams et al., 2018). On the contrary, parental rejection especially fathers' uninvolved parenting style, escalates the occurrence of IGD symptoms (Throuvala et al., 2019).

Following the initiation age of gamers is one of the causes of IGD as there is a positive association was established especially at lower age of first play (Beard et al., 2017; Paulus et al., 2018; Singh et al., 2021). Early age of gaming initiation was linked with the severity of IGD symptoms, yet gamers had high self-esteem as the protective factor towards the development of IGD (Beard et al., 2017).

Besides, gamers' context is an imperative predictor to distinguish excessive gaming and gaming addiction. The gamers' preferences, perceptions and shared beliefs provide an indisputable value or meaning towards the game they are participating in (Kuss, 2013). Thus, this study recruited participants from an Asian context, specifically from Malaysia.

Conversely, impulsivity emerged as a result of IGD (Mestre-Bach et al., 2022). Kräplin et al (2021) highlighted one of the IGD criteria, being preoccupied with gaming or playing internet games vigorously strengthened the altered state of reward learning neurocognitive processes predicting high disinhibition control as the impulsiveness appeared and triggering the extension of gaming duration. There was another study that found full mediation of interpersonal relationships and depression between impulsivity and IGD in Korean youths (Ryu et al., 2018).

2.2. ***Impulsivity***

Impulsivity upholds multidimensional facets such as experiential avoidance as withdrawing adverse personal events and inability to regulate own behaviour which is interlinked with other personality traits like extroversion, neuroticism, and low conscientiousness as it involves high risk-taking as looking for reward promptly and less fear of punishment (Farmer & Golden, 2009). Measure impulsivity as a trait not a state in young adulthood is required to fill in the current discrepancies of studies related to it (King et al., 2014; Rømer-Thomsen et al., 2018).

A large scale of studies had claimed this trait is linked with IGD (Bakhshani, 2014; Bargeron & Hormes, 2017; Deleuze et al., 2017; Sharma & Palanichamy, 2018; Yücens & Üzer, 2018). One of the subscales of impulsivity introduced by Barrett, attentional impulsivity was found to have a positive association with IGD as increasing the score in this subscale will elevate the risk of IGD (Bargeron & Hormes, 2017). Otherwise, sensation-seeking as an essential component of impulsivity was interrelated as the individual manifests this trait using the internet as a sensation-seeking tool which may lead to addictive complications (Sharma & Palanichamy, 2018). Yet, researchers should note that sensation seeking is not impulsivity which is misleading when it was used interchangeably, the negative sub-trait of impulsivity is known as risky impulsivity instead of sensation-seeking personality (Cross et al., 2011).

In contrast, there were a few researchers that found IGD and impulsivity were not presenting any significant relationship (Deleuze et al., 2017; Rømer-Thomsen et al., 2018; Yücens & Üzer, 2018). This situation might be due to other mediating variables or suggesting other factors such as self-control influencing the strength of the relationship within both variables. Limitations from these

studies include gender distribution unequal, ungeneralisable representative as targeting a specific community, and the sample size was not adequate to claim the weak correlation presented.

2.3. *Gender*

Gender is being distributed to males and females according to biological characteristics of humans in this study, and males are being emphasised to be more vulnerable compared to females regarding the advantage of females in evolution for having better social inhibition towards inappropriate responses related to impulsive behaviours (Dittrich & Leipold, 2014; MacDonald, 2008). Moreover, the majority of IGD studies were targeting male gamers as they had a significant prevalence of IGD and substance or non-substance-related addictions (Buono et al., 2020; Evren et al., 2021; Mihara & Higuchi, 2017; Singh et al., 2021).

Recent studies have shown males are more vulnerable to getting addicted while being displayed with gaming-related cues in a short-term period, raising the probability of developing a severe condition in IGD (Buono et al., 2020; Evren et al., 2021; Zhang et al., 2020). According to Zhang and his colleagues (2020), a male is less sensitive to loss but more sensitive to reward in a game which causes them to be more likely to develop IGD compared to a female that has opposite processing patterns of losses in a game.

Meanwhile, there were not many studies that recruited female participants to detect any potential risk factor in comparison with males, which consist of hostility and social phobia with body image, embodied experience, and social motives (Lopez-Fernandez et al., 2019). Primarily in a Korean study, females with IGD were more prevalent than the males with IGD to smartphone addiction use, and males had low self-esteem in contrast with females (Kim et al., 2020). Sex differences in shaping attitudes towards internet games, development of IGD and age of gaming-related data were currently available as the existing study in humans (Marraudino et al., 2022).

2.4. *Theoretical Framework*

Brands and his colleagues (2016) proposed the Interaction of Person-Affect-Cognition-Executive (I-PACE) Model as shown in Figure 2.1, understanding problematic Internet usage including IGD through the lens of bio-psycho-social factors. This model highlights four key components: (1) individual characteristics influenced by genetics, early experiences, and specific traits, like impulsivity; (2) cognitive and affective reactions to stimuli; (3) decision-making processes, encompassing executive and inhibitory control; and (4) the emergence of the internet use disorder criterion when individuals experience satisfaction and compensation. The current study particularly examines impulsivity as a trait that predisposes individuals to seek pleasure from gaming activities, leading to immediate emotional responses and subsequent undesirable consequences such as persistent urges or cravings, perpetuating a cycle of problematic behaviour (Brand et al., 2019; Şalvarlı & Griffiths, 2019; Young & Brand, 2017; Zhu et al., 2023). Figure 2.2 shows the conceptual framework of this study.

Figure 2.1: The modified part of I-PACE Model

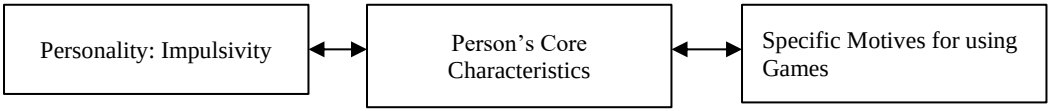
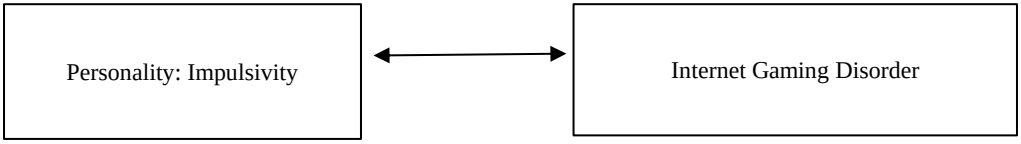


Figure 2.2: Impulsivity correlates with IGD



The current study analysed the connections of IGD with impulsivity among Malaysian youths which not only seeks to identify the underlying mechanisms but also examines the gender differences of both variables mentioned mainly.

3. METHODOLOGY

3.1. *Research design*

This study was descriptive correlational research utilised a non-probability purposive sampling method. This study was approved by the Faculty Ethical Board with reference number: DEC/PSY/2022/09/RP2/003.

3.2. *Sample size and participants*

A prior power analysis was done to estimate the sample size for the study via G* Power version 3.1.9.4. With a significant criterion of $\alpha = .05$ and 80% of power to detect the minimum number of participants' requirement is 120 for a small effect size of study based on the past research conducted by Ryu et al. (2018).

3.3. *Measurements*

Two main instruments had been applied by the current research to assess the level of IGD and degree of impulsivity among Malaysian youths. A demographics section to obtain gamer's background information that was relevant to both variables such as gender and family structure. A pilot study was conducted among 20 Malaysian respondents to check the instruments' reliability and sample recruitment.

3.3.1 Internet Gaming Disorder Scale-Short Form (IGDS9-SF)

The scale was proposed by Pontes and Griffiths (2015) to measure the manifestation of IGD symptoms via engaging in any form of internet gaming activities over 12 months. The scores obtained were used to estimate the level of IGD instead of being a diagnostic tool, which comprised of 9 items being rated on a 5-point Likert scale ranging from 1 *(never)* to 5 *(very often)*. Scoring high on this scale indicated a high level of IGD by calculating the total score from summing up all responses given based on the respondent's ratings. It possessed an acceptable internal consistency among 21 studies that translated to 15 languages, even though some of the items didn't achieve a satisfactory level, but this scale had scored an outstanding criterion validity by having a strong correlation between 27 items in the full version of Internet Gaming Disorder Scale (Poon et al., 2021).

3.3.2 Barrett Impulsivity Scale (BIS-11)

Two main instruments applied by the current research to assess the level of the Barrett Impulsivity Scale (BIS-11) were used to measure impulsiveness on a 4-point scale of 1 *(rarely)* to 4 *(always)* of a 30-items (Patton et al., 1995). The items were categorised under six first-order factors, attention (5, 9*, 11, 20*, 28), motor (2, 3, 4, 17, 19, 22, 25), self-control (1*, 7*, 8*, 12*, 13*, 14), cognitive complexity (10*, 15*, 18, 27, 29*), perseverance (16, 21, 23, 30*), and cognitive instability (6, 24, 26). Items with an asterisk (*) are needed to reverse code when performing data analysis. The three second-order factors within these six items are attentional (Attention and Cognitive Instability items), motor (Motor and Perseverance items) and non-planning (Self-control and Cognitive Complexity items).

Both instruments in the pilot study and actual study had good reliability by obtaining Cronbach values that were greater than 0.8 presented in Table 1. The internal consistency and stability over time for IGDS9-SF and BIS-11 were supported by other studies. Several studies reported that Cronbach's alpha values for IGDS9-SF were 0.81 to 0.87 among Malaysian young adults (Nik Jaafar et al., 2021; F'ng & Pau, 2020). For BIS-11, a neuroimaging study found an acceptable Cronbach's alpha value of 0.83 with a cut-off score ≥ 72 among Malaysian samples (Abdul-Rashid et al., 2021).

Table 1: Reliability of measurements

Measurement	Number of Items	Pilot Study (n=20)	Actual Study (n=130)
Internet Gaming Disorder Scale-Short Form (IGDS9-SF)	9	0.84	0.88
Barrett Impulsivity Scale (BIS-11)	30	0.79	0.83

Notes: This table showed the Cronbach alpha values for the pilot study and actual study with the total items of each measurement utilised.

3.4. *Data collection*

The data collection period was from September to November 2022 by posting a quick response code of the questionnaire via social media platforms and walk-in to any potential area in Klang

Valley, Malaysia. Permission had been acquired in the first section of the Google Form to obtain consent and voluntary participation or withdrawal from each 130 respondents recruited. Table 2 shows three sections that were assigned for each respondent in the Google Form accordingly.

Table 2: Sections distributed in the Google Form

Section	Description	No. of Item	Source
A	Demographic	4	-
B	Internet Gaming Disorder Scale-Short Form (IGDS9-SF)	9	Pontes & Griffiths (2015)
C	Barrett Impulsivity Scale (BIS-11)	30	Patton, Stanford & Barrett (1995)

Notes: This table presents the sequences and sections in the Google Form to collect data from respondents respectively.

3.5. *Data analysis*

Exploratory Factor Analysis (EDA) was used to verify the normal distribution of data, in which the skewness and kurtosis of both variables were lower than ±2.58 and ±1.96, respectively. The normal Q-Q plots for both variables were displayed as the plots tied closely with the trendline. Besides that, the three-sigma rule was applied to classify a mild, moderate, and severe level of IGD and impulsivity among the recruited sample.

Pearson correlation was used to determine the correlation between IGD and impulsivity. Independent *t*-tests were employed to identify the gender differences among male and female Malaysian young gamers.

4. RESULTS

More than half quarter of the participants live in Selangor (33.85%), close to half quarter of the participants live in Kuala Lumpur (30.00%), 12.30% (almost one-eighth) of the participants live in Johor, and others were located in Penang, Perak, Pahang, Negeri Sembilan, Sabah, and Sarawak. The majority of participants were aged between 18 to 22 years old (86.92%). The initiation gaming age of 11 to 15 years old among participants was the highest percentage (35.38%). Most of the participants were raised by their biological father and mother (75.38%). Results were reported elsewhere.

More than three-quarters of participants possessed a moderate level of IGD (70.00%). 15.38% of participants experienced a high level of IGD, with the difference of only 1 participant compared to the low level of the IGD group of participants (14.62%). Gaming is not only an entertainment, but also an alternative to cope with stress based on the past review (Pallavicini et al., 2021). Most of the respondents answered ‘often’ for question 8 “Do you play in order to temporarily escape or relieve a negative mood?” indicated youngsters play internet games as a type of avoidant coping mechanism to tackle daily stressors (Shi et al., 2019). The results are shown in Table 3.

Table 3: Level of IGD among Malaysian youths

Internet Gaming Disorder (level)	Number of Participant (N = 130)	Percentage (%)
Low (<6)	19	14.62
Moderate (6-22)	91	70.00
High (>22)	20	15.38

More than half of the respondents manifested a moderate degree of impulsivity (73.08%). Again, 13.85% of respondents had a high degree of impulsivity while 13.07% respondents had a low degree of impulsivity, with the difference of only one respondent (0.78%). Most participants answered 'often' in question 14 "I say things without thinking", and 'often' in question 19 "I act on the spur of the moment" of the BIS scale. Table 4 shows the degree of impulsivity among the Malaysian youths.

Table 4: Degree of impulsivity among Malaysian youths

Impulsivity (degree)	Number of Participant (N = 130)	Percentage (%)
Low (<28)	18	13.85
Moderate (28-50)	95	73.08
High (>50)	17	13.07

Table 5 shows a significant positive relationship between the level of IGD and impulsivity ($r = 0.56$, $p < 0.01$) among Malaysian young gamers. This was based on the Pearson correlation.

Table 5: Pearson Correlation for level of IGD and degree of impulsivity among Malaysian youths

Variable	Level of Impulsive Gaming Disorder
Degree of Impulsivity	0.56**
Significant 2-tailed	<0.001

Notes: ** $p < 0.01$.

Table 6 displays the data extracted from an independent sample t-test indicating that total scores of IGD were insignificant as $p > .05$, anticipated no significant differences across genders with respondents' IGDS9-SF scale.

Table 6: Differences of IGD scores among male and female of Malaysian youths

Gender	t	df	Significance (2-tailed)
Male	0.80	128	0.42
Female	0.79	118.37	0.43

Notes: $p > 0.01$.

As the data shows in Table 7 from an independent sample *t*-test revealed that summed-up scores of impulsivities were insignificant as $p > .05$ predicted no significant differences across genders in respondents for BIS-11 scale.

Table 7: Differences of impulsivity scores among male and female of Malaysian youths

Gender	t	df	Significance (2-tailed)
Male	-.59	128	.55
Female	-.58	112.19	.56

Notes: $p > 0.01$.

5. DISCUSSION & CONCLUSION

A moderate level of IGD was revealed among targeted gamers which were in line with the past study in the Malaysian context (Abdull-Nasser et al., 2020; Sabri & Yunus, 2021). A few prior studies disclosed about young gamers nowadays were having an average level of predisposition to developing IGD while they were being exposed towards highly immersive gaming experiences with advanced technology gadgets to connect virtually (Anthony et al., 2020; Gorowska et al., 2022; Sachdeva & Verma, 2015). This leads to the increase of dependency towards the internet resulting in not only preoccupation with gaming in daily functioning but also a high chance of engaging more in risky behaviours such as cyberbullying and victimisation (Taechoyotin et al., 2020; Teng et al., 2021). Another perspective from the European country, over half of the German gamers received an IGD diagnosis has a 2.5% prevalence as the negative consequence of losing interest in past-developed hobbies when shifting hobby to gaming, (Wichstrøm et al., 2018), this indicates an occurrence of IGD while losing interest in a particular previous hobby and transitioning gaming as the current hobby. Nevertheless, some studies have emphasised the culture and context of gaming as a prevalence of developing IGD, typically European gamers have a slightly higher risk of having IGD compared with Asian gamers because of various psychosocial problems across different countries (Cheng et al., 2018; Mihara & Higuchi, 2017; Stavropoulos et al., 2020). Since one of the mediums for internet gaming is the internet, past research has proven the significant relevance for Internet Addiction (IA) and IGD by presenting the moderate scorings of Internet Addiction Test (IAT) with IGD claiming the direct or indirect relationship between both variables among Muslim gamers (Abdull-Nasser et al., 2020).

Consequently, a moderate degree of impulsivity also emerged from the targeted respondents which is similar to the results of prior research done in Malaysia (Halim, et.al, 2020; Othman, 2017). There was existing research established a slope analysis displayed about all degrees of impulsivity were significantly related to depression and suicide ideation, although another study by Wang et al. (2015) argued that only an average to high level of impulsivity elevates the risk of suicide ideation (Halim, et.al, 2020). Researchers often find that the underlying cause of impulsivity is related to the individual's early life experiences. The emergence of impulsivity as early as age 3 has been linked to various forms of childhood stress, and this feature will continue throughout the puberty period (Romer, 2010). Adolescents with impulsive traits are likely to engage in risky behaviours that reinforce the impairment of impulse control, causing a higher chance of making poor decisions due to a lack of fully evaluating the outcomes of acting impulsively (Icenogle & Cauffman, 2021; Kray et al., 2021; Lutz et al., 2021). As a preventive tool against developing impulsivity, emotional regulation therapies such as emotion-focused coping have demonstrated the potential to lower the severity of impulsivity, as emotional dysregulation might predict maladaptive impulsive behaviours (Fowler et al., 2020; Miller & Racine, 2020). In addition, an impulsive sensation-seeking personality was interconnected with Internet Addiction based on a Malaysia medical study (Othman, 2017). Hence, contemporary studies have stated that not only the group

with the severe level of impulsivity required to pay more attention, but experts should also take care of the lowest and moderate levels of impulsivity groups.

The main objective of this study was achieved by indicating a significant positive correlation between IGD and impulsivity from the targeted sample. A correlation study surveyed most of the regular video game respondents had an increased level of attentional and motor impulsivity that met several criteria of IGD, which they were reported feeling more depressed, stressed, anxious and unsatisfied with their own life compared with the healthy control groups (Bargeron & Hormes, 2017). One of the studies targeting university students indicated an elevated level of Fear of Missing Out (FOMO) which caused their impulsivity leading to a negative outcome as the occurrence of IGD symptoms (Li et al., 2021). To explain this condition by applying the I-PACE theory, FOMO acts as one's specific trait or state that might allocate impaired executive functions and impulsivity of the person, resulting in the evolution of IGD towards a small group of people. Interestingly, one of the experimental types of research assessed 141 subjects that were categorised into 3 groups, IGD patients (PIGD), heavy internet gamers and non-disordered gamers (NIGP) with healthy controls. As the justification of this study, researchers examined their functional magnetic resonance imaging (fMRI) data and impulse-control behavioural evidence, they found that PIGD was able to be recognised based on the neuroactivational of altered impulsiveness appeared as 'unsuccessful control', which differentiated them from NIGP and healthy controls (Zha et al., 2022). This clarifies why IGD patients are prone to conduct impulsive behaviours because they are unable to control the urge, which is associated with their disordered gaming habits. As one of the reasons for this, a prior study suggested dysfunctional impulsivity predicts Internet Gaming Addiction which is relatively significant with other substance addictions, even though without a variable to explain the relationship itself (Blinka et al., 2016). Another study also claimed dysfunctional impulsivity related to greater hours of and intensity of playing video games by Massive Multiplayer Online Role Play Game (MMORPG) target participants (Puerta-Cortés et al., 2017). Summarising all the studies mentioned above, problematic gamers are those who presented as being more addicted towards internet games with a high degree of impulsivity and were more at risk of relapse compared with non-impulsive addicted gamers. Hence, these research results have proven a significant bidirectional relationship between IGD and impulsivity, highlighting the interaction elements of both variables that can be explored further in this multi-ethnic country, Malaysia. Future research is suggested to examine whether both variables will have a causal relationship in the Malaysian context.

On the other hand, there were no gender differences between IGD among respondents collected, which contrasts with the previous studies (Bonnaire & Baptista, 2019; Wartberg et al., 2017). Even though the sample of respondents in this study was proportionately categorised into male and female groups, previous studies suspected sampling distribution interfered with the relationship between gender and IGD (Carlisle et al., 2019; Dong et al., 2019; Salvarlı & Griffiths, 2019). The reason might be other factors linked with IGD such as gaming genre preferences being different among males and females (Rehbein et al., 2021; Wichstrøm et al., 2018). Males prefer strategy planning and shooting games which highly involve violent content as their main hobby, while females prefer entertainment and simulation games which involve both violent and non-violent content as their following hobby compared to watching TV shows (López-Fernández et al., 2020). From a biological perspective, one of the significant sexual dimorphisms that differentiate males and females is that males are more sensitive to rewards-related cues and less sensitive to losses compared with females who experience more emotional dysregulations and affective disorders

(Marraudino et al., 2022; Zhang et al., 2020). Meanwhile, females are more likely to engage with social media or online shopping games and show more addiction signs towards social network-related applications, having a greater risk of developing social media addiction (SMA) (Kuss & Griffiths, 2011; Su et al., 2020; Tang et al., 2017; Wei et al., 2023; Xia et al., 2021). However, studies have proven a significant number of female gamers growing from non-players to moderately strong players (Marraudino et al., 2022; Royse et al., 2007). Interestingly, some research found males were shown higher scores in SMA compared to females (Alnjadat et al., 2019; Azizi et al., 2019; Çam & İşbulan, 2012). Males are more obsessed with competitive games to pursue a masculine attitude, whereas females tend to play games to maintain social or intimate relationships, despite that European females also play games for achievement and power (López-Fernández, Williams, & Kuss, 2019; López-Fernándezet al., 2019a). All this evidence from past studies provides an in-depth background of IGD related studies between biological and psychological differences in males and females regarding gaming preferences, experiences and behaviours. Moreover, IGD at-risk male gamers are prone to addictive cravings and physical health related issues whereas IGD at-risk female gamers might suffer from negative body image and low self-esteem due to female gamer characters often being hypersexualised and exaggerated (Li et al., 2023; Liu et al., 2022; López-Fernández et al., 2019b; Mari et al., 2023). Additionally, a meta-analysis was unable to prove that gender is a significant moderator of the occurrence of IGD (Chia et al., 2020).

Similarly, there were no gender differences in impulsivity among the participants which contradicted the previous research (Campbell & Muncer, 2009; Cross, 2010; Navas et al., 2019). Despite patterns of impulsivity emerging in males compared to females according to deviant theoretical perspectives, there were a few studies that claimed the degree of impulsivity among males and females remains the same in adulthood (Cross et al., 2011; Cyders, 2013; Weafer et al., 2015). The male was only found to exhibit greater scores on motor impulsivity, as both male and female scores on attentional and non-planning impulsivity were no different in a non-clinical sample of undergraduate students (Lage et al., 2013). The female had the advantage of scoring better in cognitive tasks as a delayed response towards gratification in childhood compared with male, nonetheless, the female was only less impulsive when they underwent the fertility stage of the menstrual cycle as the hormonal effects interrupt the neurobiological mechanisms of reward in adulthood (Weinstein & Dannon, 2015). Aside from that, although males score high in sensation-seeking and lack of perseverance, there are no changes in impulsivity related traits with risky outcomes across genders (Cyders, 2013). To obtain a clearer understanding of sex differences in impulsivity, the distinctions of its multidimensional aspects should be recognised, especially differentiating sensation-seeking, executive, and effortful control with impulsivity as a deficit or a trait when there is no statistical difference found (Cross et al., 2011). In addition, emotional regulation between genders varies from internalising or externalising patterns and coping strategies. Females tend to internalise the emotions associated with impulsivity such as depression and anxiety by ruminations, while males express their anger and frustrations, exhibiting aggression or substance use related to impulsivity (Chapple & Johnson, 2007; DeVito et al., 2020; Su et al., 2019). Subsequently, even non-problematic gamers showed higher risk-taking tendencies under consideration of both genders were associated with impulsivity, even though deficiencies in decision-making among male participants related to problematic internet usage (Sariyska et al., 2017). Provocatively, impulsive male and female drinkers who learn from reinforced behaviours as a positive outcome tendency were directly linked with problematic alcohol use, however, a mediation relationship was found in female drinkers that positive outcome tendency mediated

impulsivity and alcohol-related problems (Fu et al., 2007). In sum, being a male or a female had no differences concerning the development of IGD or impulsivity yet varied between emotion regulations and cognition factors.

This study offered a clearer and more thorough understanding of the association of both variables, in which a positive correlation was found between IGD and impulsivity as this result can be adapted for future references under the Malaysian context. This study connected both variables to reinforce the validity of previous theories such as the I-PACE model. Besides, this research could expand the knowledge of differences in gender characteristics among Malaysian gamers which reduces the risk of false illusion negatives that only male is more at risk to develop IGD or impulsivity. Professionals such as counsellors, clinical psychologists, of mental healthcare centres practitioners could consider implementing interventions or treatment plans designed for the IGD population towards those who are having comorbid psychological disorders that are having a high degree of impulsivity, likewise, Impulse Control Disorder (ICD) groups and vice versa. For example, Cognitive-Behavioural Therapies (CBT) are utilised to shift preoccupied gaming thoughts and manage risky impulsive behaviours by altering coping mechanisms or techniques to enhance the mental well-being of the client who suffers from IGD or ICD. Mental health practitioners should also plan inclusive interventions that apply to both genders as a necessity to establish a gender equality community in Malaysia. Being non-judgemental and fair in treating clients from various types of gender to cultivate a gender-diversified country creating a positive gaming environment. This effort is aligned with one of the Sustainable Development Goals, which is gender equality.

Limitations of the study that readers should be cautious and take note of include the social desirability of self-reported surveys, the small effect size of the sample, the unrandomised sampling method, and the disproportionate race among Malaysian youths. Nevertheless, all the participants of this research were qualified to represent Malaysia as they filled up their nationality as Malaysian in the demographic section of the survey.

Future studies are recommended to improvise and resolve the limitations of the current study. The Self-Deception Questionnaire (SDQ) could be added to reduce and detect social desirability bias. This scale measures one's attitudes and traits based on several true or false questions. A high score indicated a high social desirability and vice versa (Gur & Sackeim, 1979). The limitations in using non-probability purposive sampling and small sample size were due to the time constraint to collect the data within three months with limited resources. Thus, the interpretation of results should be cautious. More sample size with bigger effect size and random sampling methods shall be used in future studies. Besides that, different age groups of gamers that are also found to be at risk of IGD or impulsivity should be included in the future study. To avoid the escalation from moderate to the high level of IGD and impulsivity among Malaysian youths, the Ministry of Youth and Sports, NGO policymakers, and parents with family members who are related to this community should collaborate to not only realise how crucial this issue can be but also advocating free mental health screening programs to tackle with it.

To conclude, this empirical research had shown that Internet Gaming Disorder (IGD) and impulsivity were correlated. In terms of raising public awareness, it could contribute towards society especially by providing a better understanding of impulsivity and acknowledging the existence of IGD in Malaysia. This study also provided consistent evidence to support past relevant

studies from various countries and reapplied it to this multiracial country, Malaysia. As there are no gender differences among Malaysian youths between IGD and impulsivity, it is imperative to optimise the prevention of treatments appropriate for both male and female gamers. Furthermore, the current study offers some useful information and acts as a reference for future researchers to produce a healthier Malaysian youth gaming community.

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