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Interdependent Effect of Impulsivity, Sensation Seeking and Addictive Behaviour Including Excess Gaming, Facebooking and Internet Abusing

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SUMMARY

Impulsivity has been shown to be related to both substance- and non-substance addictions. In the case of internet gaming addiction, on one hand, higher impulsivity and sensation seeking have been reported in problematic online gamers. On the other hand, problematic online gamers were also identified as introverted, socially anxious, and generally inhibited in social behaviour. This review study tried to investigate and correlate the role of dysfunctional impulsivity and sensation seeking in gaming addiction. Online gamers completed a questionnaire that was advertised online and targeted the core of the gaming community. Internet gaming addiction was measured using the Addiction-Engagement Questionnaire. Dysfunctional impulsivity was measured using the 11 items of Dickman's (1990) sub-scale of the Impulsivity Inventory. Pearson's correlation coefficients were calculated for variables and a regression model was constructed using hierarchical linear regression to determine the association between online gaming addiction and dysfunctional impulsivity, while controlling for age, gender, and the frequency of online gaming. A set of chi-square tests were employed to compare the patterns of addiction criteria among highly impulsive addicted gamers and non-impulsive addicted gamers. Dysfunctional impulsivity was a good predictor of gaming addiction (β = .252) which actually explained only about 7% of the addiction variance. Problematic gamers high on impulsivity had similar patterns of addiction criteria as non-impulsive gamers, with only one exception – they had a significantly higher tendency to relapse. There was no role of impulsivity in gaming engagement. The results suggested that dysfunctional impulsivity is a risk factor for online gaming addiction (similar to other addictions), but it does not have prominent explanatory value in itself. Also the results show that problematic gamers high on impulsivity are more prone to relapse and reinstatement.

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Introduction

In western countries the rate of internet addiction is on average 8.2 percent. The rate is increasing day by day not only in western countries but also in our south Asian countries. Few studies has shown much higher rate of internet addiction that are alarming like 38% [1]. The American Psychiatric Association created a category called "Substance Related and Addictive Disorders" in its fifth revision of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013). This category now includes gambling, which was previously understood as an impulse control disorder. The revision also suggested Internet Gaming Disorder as a related condition for further study. Impulsivity and addictions share some of the core features and understanding the role of impulsivity in internet gaming may produce important information for the understanding and conceptualization of excessive online play as a behavioural addiction [2]. A number of neuroimaging studies found support for shared neurocircuitries between behavioural and substance addictions, with neurotransmitter systems contributing to shared involvement in addiction- and impulse-control disorders [3]. A core set of frontostriatal circuits was found in various types of impulsivity, substance addiction , and pathological gambling have shown a strong relationship between impulsivity and addiction-

related behaviours, and also the potential susceptibility of those with poor impulse control for substance or behavioural addiction [4,5]. Indeed, impulsivity was associated with both substance- and non-substance addictions in some studies [6]. However, this may not be fully true in the case of internet gaming disorder as the evidence to date provides limited outcomes. According to the American Psychiatric Association, internet addiction needs more research. Understanding the role of impulsivity in online gaming addiction may be an important contribution in the conceptualization of excessive gaming as a behavioural addiction.

Higher impulsivity was found to be a risk factor for becoming a pathological gamer in a longitudinal study by Gentile et al. (2011). Liau et al. (2015) showed the association of impulsivity and low self-regulation with gaming addiction. In another comparative study by Walther, Morgenstern, and Hanewinkel (2012), higher levels of impulsivity was the only predictor of problematic gaming shared with other addictions, such as gambling, and with the use of tobacco, alcohol, and cannabis. Problematic internet gamers had distinct personality types compared to those with other addictions, e.g. they were younger, less extroverted, and showed higher levels of social anxiety. In a small clinical sample, Choi et al. (2014) found that overall impulsivity was higher in addicted gamers than in both gamblers and a healthy control group. A number of studies also pointed out that online gaming addiction may be influenced by higher levels of sensation seeking which is highly correlated and shares some similarities, such as disinhibition, with impulsivity [7,8].

Research on impulsivity and online gaming has to reflect upon the inverse proportionality between impulsivity and age: impulsivity decreases towards adulthood (Steinberg et al., 2008) and it changes its structural features with age. Gaming addiction seems to be more prevalent among younger people and many studies have been conducted with adolescent samples [9]. Thus, it is not certain to what extent higher impulsivity in gamers is specifically explained by their young age and whether impulsivity is still a predictor of addiction in older age. For instance, in a study by Choi et al. (2014) that claimed that higher impulsivity is attributed to gaming addiction, internet gamers in treatment were significantly younger (in their late teens and early 20s) compared to gamblers and the healthy control group (who were about seven years older on average) [10].

Objective

The objective of this review was to evaluate the interdependent effect of dysfunctional impulsivity and sensation seeking in excessive online gaming, face booking and other forms of abusing both in a pathological and non-pathological way.. On one hand, impulsivity was significant and a rather strong predictor of online gaming addiction. The strength of the association was similar to the association between the frequency of gaming and addiction. However, adding dysfunctional impulsivity to the model increased the variance of addiction by only 7%. This likely means that higher levels of dysfunctional impulsivity elevate the risk of developing the symptoms of addiction, but impulsivity itself is not the most important factor behind gaming addiction.

Discussion

Impulsivity is a multifaceted trait that is known as a characteristic construct of many mental disorders including addictive behaviours, although its underlying neurobiological bases (e.g., impulsive disinhibition/ decreased inhibitory control, impulsive inattention, impulsive decision-making, delay discounting) are highly heterogeneous. According to Müller et al. (2016) sensation seeking and impulsivity to some extent is lower in addicted gamers, while Billieux et al. (2015) showed that for certain groups of pathological gamers some impulsive traits are typical, e.g. the lack of premeditation and the lack of perseverance. Findings seem be in line with the views that impulsivity is probably involved with gaming addiction, but its contribution is rather small; gaming addiction has to be accompanied by other individual traits or risk factors; and/or gaming addiction is typical only for specific groups of gamers. Other factors may be more important, such as introversion, low conscientiousness, low social competence, and low self-esteem [11-13]. Müller et al. (2014) found that addicted gamers differed from gamblers and other addicts in their low extraversion. But it is extraversion that is related to higher impulsiveness and, thus, high impulsivity is not likely to be significant in gaming addiction. Our study is in line with this assumption on-impulsive gamers (e.g. it may be possible that they spend more money on extra in-game content) [14].

Interestingly, age, although a significant predictor of addiction in the first model, lost its effect after the frequency of gaming and impulsivity entered the analysis. This confirms our assumption that age and impulsivity interact. Many studies focused on adolescents or did not control for age when analysing impulsivity and gaming addiction; indeed, the results that younger gamers are more likely to be addicted could be expected. Moreover, some studies compared the levels of impulsivity in various addictions, but the group of online gamers was younger than the other addicts and the control group (e.g. Choi et al., 2014), which might bias the results. The structure of our sample helped to overcome this problem because it includes a large number of both adolescents and adults. Based on our results, it seems that younger gamers are more likely to also fulfil the addiction criteria because they are in a developmental stage that is characterised by higher levels of impulsivity — impulsivity and sensation seeking peak during adolescence and steadily decrease afterward [15].

As a putative behavioral addiction similar with gambling disorder, PIU shares many clinical manifestations with substance use disorders (SUD), including excessive use of the Internet (e.g., excessive gaming and sexual preoccupations) with a loss of time sense, withdrawal symptoms (e.g., feelings of anger, tension, and depression), tolerance, and negative repercussions (Block, 2008). However, it is highly controversial whether PIU should be formally considered a new clinical disorder (Petry and O'brien, 2013), and more empirical studies are required to detect the shared and distinct aspects and mechanisms between PIU and SUD for a better comprehending of the nature of PIU [16].

Measurement of impulsivity includes self-report personality questionnaires and laboratory-based cognitive tasks [17]. For the former, the Barratt Impulsiveness Scale (BIS-11; Patton et al., 1995) measures the three-dimension model of impulsiveness (i.e., non-planning impulsiveness, attentional impulsiveness, and motor impulsiveness), and the UPPSP Impulsive Behaviors Scale (UPPSP; Whiteside and Lynam, 2001; Smith et al., 2007) figures five distinct pathways to impulsive behavior (i.e., negative urgency, positive urgency, lack of premeditation, lack of perseverance, and sensation seeking). For the latter, the Stop-Signal Test (Logan et al., 1997), Stroop Task (MacLeod, 1991), and analogous Go/No-Go Task mainly tax inhibitory control and response inhibition. Besides, the Delay-discounting Test (DDT; Kirby et al., 1999) assesses the discounting degree of delayed values when individuals make a choice between immediate and delayed rewards. The close connections of impulsivity with addictive behaviors have been well recognized in plentiful previous studies. Higher impulsivity

traits measured by self-report questionnaires (e.g., the BIS-11) and impaired inhibitory control measured by cognitive tasks (e.g., the Stop-Signal Test) have been found in different forms of substance use disorders as well as in gambling disorder (Dick et al., 2010; Albein-Urios et al., 2012; Leeman and Potenza, 2012). Consistently, many studies have also revealed dysfunctional impulsivity properties in PIU on the BIS-11 (Cao et al., 2007; Lin et al., 2011; Dalbudak et al., 2013; Ryu et al., 2018), and on the Stop-Signal Test and Go/No-Go Task (Dong et al., 2010; Choi et al., 2014; Ding et al., 2014). Particularly, PIU subjects showed increased impulsivity traits comparable to patients with gambling disorder on the BIS-11 (Lee et al., 2012). These findings signified the candidacy of impulsivity as a vulnerability marker for different addictive disorders, and impulsivity might also serve as an aspect in identifying the nature of PIU as a potential addiction (Lee et al., 2012; Grant and Chamberlain, 2014). However, little research has directly compared PIU with substance use disorders (SUD) on impulsivity, and the shared and distinct mechanisms underlying them remain unclear. The present study thus aimed to investigate the associations of impulsivity traits with PIU and one usual type of SUD, cigarette smoking, among Chinese college students.

The participants included two independent sample cohorts (i.e., Sample 1 and Sample 2) of young adult students from a local university located in Guiyang City, the capital of Guizhou Province, China. The Sample 1 consisted of 1,318 students, who were recruited from 12 randomly selected freshman classes at the university in November 2014. Similarly, the Sample 2 consisted of 1,060 students recruited from 10 randomly selected freshman classes at the same university in November 2017. As mentioned before, the purpose of recruiting these two separate samples was to investigate the possible over-time effects on PIU, smoking, and impulsivity. All of these students were kindly invited to complete a series of questionnaires and provide demographic information by self-report in a psychology class lasting 45 min. The inclusion criteria included: (1) ≥18 years of age, and (2) willingness to participate in our study. The exclusion criteria included: (1) current or past major psychiatric disorders (e.g., schizophrenia, major depressive disorder, bipolar disorder), (2) a history of brain injury or trauma, neurological diseases, or mental disorders, and (3) ever or current use of psychoactive substance (e.g., opioids, cocaine, marijuana, and amphetamine), which were evaluated by self-report. There were 37 students in the Sample 1 and 26 students in the Sample 2 excluded from this study because of meeting one or more of these exclusion criteria.

Thus finally, 1,281 participants in the Sample 1 (aged 18–23 years, mean age = 19.1 ± 1.1 years; 434 males, 33.9%) and 1,034 participants in the Sample 2 (aged 18–23 years, mean age = 19.2 ± 1.1 years; 405 males, 39.2%) were included in this study. All subjects supplied written informed consent, and they were compensated with a gift equivalent to RMB ¥ 50 for their time. The Human Research Ethics Committee at the Guizhou Medical University thoroughly reviewed and approved this study. Our proposed study design, subject recruitment process, and our plans to compensate the participants were in accordance with the Declaration of Helsinki. They were classified into groups. The Internet use status was classified by employing the Chinese version of the Internet Addiction Test (IAT; Young, 1998), which has been carefully validated and widely used among Chinese students (e.g., Cao et al., 2011; Wang et al., 2011; Dong et al., 2012; Tang et al., 2014). The IAT is a self-report questionnaire with 20 items. Each item is rated on a 5-point Likert scale from 1 (not at all) to 5 (always). The IAT total score ranges from 20 to 100. Higher scores indicate a greater tendency of excessive Internet use symptoms. Scores ≥ 50 indicate potential problematic Internet use (PIU), while scores 20–49 indicate normal Internet use (NIU) (Khazaal et al., 2008). The Cronbach's α was 0.92 (Sample 1) and 0.90 (Sample 2) in this study.

We used the Barratt Impulsiveness Scale-11 (BIS-11; Patton et al., 1995) to measure three dimensions of impulsivity, including non-planning impulsiveness (a tendency to plan and think carelessly), attentional impulsiveness (refers to difficulties in focusing on a task and cognitive instability such as racing thoughts and thought insertion), and motor impulsiveness (a tendency to act on the spur of the moment). Each of the three dimensions consists of 10 items, with each item rated on a 4-point Likert scale. Sum scores of the three dimensions were obtained for further analyses, respectively, with higher scores indicating higher levels of impulsivity. In our study, the Chinese version of BIS-11 (Li et al., 2011) was adopted. The Cronbach's α was 0.77–0.89 for the three subscales.

The UPPSP Impulsive Behaviors Scale (UPPSP; Whiteside and Lynam, 2001; Smith et al., 2007) was also used to evaluate five distinct personality traits of impulsive behavior (i.e., negative urgency, lack of premeditation, lack of perseverance, sensation seeking, and positive urgency.

Data were administered and analyzed with the Statistical Package for the Social Sciences for Windows, Version 16.0 (SPSS Inc., Chicago, IL, United States). Differences on the categorical data (i.e., home locality, ethnicity, and gender) between groups were analyzed with chi-square tests. Scores on impulsivity measurements were compared between PIU and NIU groups with t-tests. Multiple linear regressions were employed to analyze the effects of impulsivity traits on IAT and FTND scores. Furthermore, logistic regression analyses were used to test the effects of different traits of impulsivity on PIU and smoking behaviors, controlling for gender.

Results

This study depicted the profiles of impulsivity in problematic Internet use (PIU) and cigarette smoking across two independent samples of Chinese college students. Our data showed that pure problematic Internet users (PIUs) had elevated scores than non-smoking normal Internet users (NIUs) on the BIS-11 (Motor Impulsiveness, Attentional Impulsiveness, and Non-planning Impulsiveness) and on the UPPSP (Lack of Perseverance, Lack of Premeditation, Negative Urgency, and Positive Urgency). Pure cigarette smokers also scored higher than non-smoking NIUs on the BIS-11 (Motor Impulsiveness, Attentional Impulsiveness, and Non-planning Impulsiveness) and on the UPPSP (Lack of Perseverance, Negative Urgency, Positive Urgency, and Sensation Seeking). Significant positive correlations were found between IAT and FTND scores and most impulsivity traits on the BIS-11 and UPPSP. More interesting findings in this study were from the logistic regression models, revealing that BIS Attentional Impulsiveness was the common trait positively predicting both PIU and cigarette smoking. Additionally, although BIS Motor Impulsiveness and UPPSP Lack of Perseverance, Lack of Premeditation, and Negative Urgency characteristically predicted PIU, UPPSP Sensation Seeking predicted cigarette smoking uniquely. In particular, all of these findings were coherently detected across the two separate data collections (i.e., Sample 1 and Sample 2), which occurred 3 years apart from each other. As a whole, these results support our hypotheses that PIU as a candidate of addiction shares some basic mechanisms on impulsivity (Attentional Impulsiveness) with cigarette smoking, although each of these two problem behaviors could be characterized by

linking to specific impulsive traits (i.e., Motor Impulsiveness, Lack of Perseverance, Lack of Premeditation, and Negative Urgency vs. Sensation Seeking), representing a commonality-specificity profile of impulsivity implicated in addiction.

More importantly in this study, we found that BIS Attentional Impulsiveness positively predicted both problematic Internet use (PIU) and cigarette smoking in the logistic regression models, after excluding the confounding effects of comorbidity between PIU and smoking behaviors as well as demographic variables (i.e., gender). To our best knowledge, this finding presented the first direct evidence that specific trait of impulsivity (i.e., Attentional Impulsiveness) is overtly increased as a predictive indicator in both PIU and one typical form of substance use disorders (i.e., cigarette smoking) among young adult populations. This data, together with previous preliminary evidence revealing parallel increased impulsivity characteristics on the BIS model between PIU and gambling disorder (Lee et al., 2012), suggest that specific traits of impulsivity might serve as important vulnerability candidates for PIU (Grant and Chamberlain, 2014). These results support our hypothesis that certain impulsivity trait (i.e., Attentional Impulsiveness) is shared by both PIU and cigarette smoking behaviors, putatively representing the basic mechanism and marker for PIU and other addictive disorders. Furthermore, the logistic regression models showed that BIS Motor Impulsiveness and UPPSP Lack of Perseverance, Lack of Premeditation, and Negative Urgency predicted PIU, while UPPSP Sensation Seeking predicted cigarette smoking distinguishingly. This finding demonstrated a domain-specific tendency of impulsivity traits linked to PIU and cigarette smoking behaviors. Sensation Seeking refers to the liability to enjoy and pursue exciting activities that may be dangerous (Smith et al., 2007). It has been clearly showed that both male and female smokers were higher in Sensation Seeking than their non-smoking counterparts among adolescents and young adults (Carton et al., 1994; Martin et al., 2002), and Sensation Seeking had strong predictive value for cigarette use as well as marijuana and alcohol use in high school students (Crawford et al., 2003). Therefore, our data further support the notion that Sensation Seeking is an important factor in identifying youths at increased risk for smoking behaviors (Case et al., 2017). By contrast, Motor Impulsiveness (a tendency to act on the spur of the moment), Lack of Perseverance (refers to an ability to remain focused on a task), Lack of Premeditation (a tendency to think and reflect on the consequences of an act), and Negative Urgency (a tendency to experience strong impulses under the condition of negative affect) were indicated as the positive predictors for PIU separately. These results might potentially reflect the heightened risk of involving in PIU activities (e.g., gaming and shopping) for young adult students, who are dysfunctional in behavioral inhibition, myopic for the future, or having maladaptive emotion-focused coping styles (Hetzel-Riggin and Pritchard, 2011; Li et al., 2016; Nikolaidou et al., 2016).

Our results indicated that problematic Internet use (PIU) as a potential addictive behavior shared the basic and common mechanism with smoking behavior on certain impulsivity trait (i.e., Attentional Impulsiveness), which is essentially relevant to maladaptive cognitive inhibition, including attention deficit (refers to difficulties in focusing on a task at hand) and cognitive instability (refers to thought insertion and racing thoughts) (Patton et al., 1995; Nigg, 2000). This finding provided the direct converged evidence in PIU and cigarette smoking, supporting the notion that impulsivity is a vulnerability marker for addictive disorders (Verdejo-García et al., 2008; De Wit, 2009; Ersche et al., 2010; Robbins et al., 2012; Pattij and De Vries, 2013). In addition, specific aspects of impulsivity were distinctively linked to PIU (i.e., Motor Impulsiveness, Lack of Perseverance, Lack of Premeditation, and Negative Urgency) and smoking (i.e., Sensation Seeking), representing a domain specificity of impulsive traits implicated in substance and non-substance addictions.

Last but not the least, different measures and models of impulsivity were utilized in our study, including a three-dimension model (i.e., the BIS-11) that mainly highlights cognitive-behavioral disinhibition facets (i.e., Attentional, Non-Planning, and Motor Impulsiveness) (Patton et al., 1995; Meda et al., 2009) and a five-pathway model (i.e., the UPPSP) that contains more diverse and complex traits (i.e., Negative Urgency, Positive Urgency, Lack of Perseverance, Lack of Premeditation, Sensation Seeking), as well as a delay discounting task (i.e., the DDT). However, because of the multi-dimensions and heterogeneity of these impulsivity traits, we failed to detect universal relationships between them with PIU and smoking, even though some traits seem to be similar in concept (e.g., Non-Planning Impulsiveness vs. Lack of Premeditation). Thus, our findings prompt that more integrated and refined models of impulsivity are quite necessary for future similar studies. As an example, a superior model that encompasses the all-round facets of impulsivity, including inhibitory control (e.g., cognitive inhibition related to Attentional Impulsiveness and Perseverance, behavioral inhibition related to Motor Impulsiveness), forward-looking planning (e.g., Delay Discounting, Premeditation, and Non-planning Impulsiveness), novelty/reward sensitivity (e.g., Sensation Seeking), and emotional urgency (e.g., Negative/Positive urgency), should be extremely beneficial to sniff out core marker traits of impulsivity implicated in addictive disorders, paving the way for better treating addiction in future (Ersche et al., 2010).

Conclusion

Internet addiction or dependency has now become a social problem. It has made the future of next generation children at eminent risk regardless of sex and habitat. Along with thousands of advantage of progressive digitalization in human civilization, science & intelligence, internet addiction is a mere disadvantage of its excessive use. However parents of those users are becoming more scared and anxious about their future [1,17]. Learning the skilled technique to control impulse and proper parenting including child rearing, early upbringing, and grooming in a disciplined way are pivotal to safe guard their children from addiction. We also need to carry large scale study to find out the prevalence and correlates of internet addiction in our country having a large pool of 95.07 million internet subscribers.

References

1. Islam MA (2019) Shisu Kishor Monobikash o autism. 1st edition, internet addiction 79.
2. American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. Arlington, VA, American Psychiatric Association, 2013.
3. Jentsch JD, James R. Ashenhurst, M. Catalina Cervantes, Alexander S. James, Stephanie M. Groman, et al., (2014) Dissecting Impulsivity and its Relationships to Drug Addictions. Ann N Y Acad Sci 1327: 1-26.
4. Guebaly EL, Mudry, Zohar, Tavares, Potenza et al. (2014) Dysfunctional impulsivity in online gaming addiction and engagement.
5. Chu, Stephanie BA, Luke Clark (2015) Cognitive and Neurobiological Aspects of Problem Gambling: Relevance to Treatment. The Canadian Journal of Addiction 6: 62-71.
6. King Daniel L, Delfabbro Paul H, Griffiths Mark D (2010)

Mehroof & Griffiths, Recent innovations in video game addiction research and theory. Global Media Journal: Australian Edition 4: 1-13.

7. Steinberg L (2008) A social neuroscience perspective on adolescent risk-taking. Dev Rev 28: 78-106.
8. Leshem R, Glicksohn J (2007) The construct of impulsivity revisited. Personality and Individual Differences 43: 681-691.
9. Kuss DJ, Griffiths MD (2012) Internet gaming addiction: A systematic review of empirical research. International Journal of Mental Health and Addiction 10: 278-296.
10. James M Cantor (2015) Purported changes in pedophilia as statistical artefacts: Comment on Müller et al., (2014). Arch Sex Behav 44: 253-254.
11. Blinka L, Mikuska J (2014) The role of social motivation and sociability of gamers in online game addiction. Cyberpsychology: Journal of Psychosocial Research on Cyberspace 8.
12. Ko CH, Yen JY, Chen CC, Chen SH, Yen CF, et al., (2005) Screening for Internet addiction: an empirical study on cut-off points for the Chen Internet Addiction Scale. The Kaohsiung Journal of Medical Sciences 21: 545-551.
13. Brunas W, AngelaBergquist, PatriciaRichardson, AngelaConnor (1995) The relationships between functional and dysfunctional impulsivity and the Eysenck personality questionnaire. Personality and Individual Differences 18: 681-683.
14. Leshem R & Glicksohn J (2007) Cited by 816 Related articles All 10 versions.
15. Rotem Leshem, Joseph Glicksohn (2012) A critical look at the relationship between impulsivity and decision-making in adolescents: are they related or separate factors? Dev Neuropsychol 37:712-731.
16. De Wit (2009) Impulsivity as a determinant and consequence of drug use: a review of underlying processes. Addict Biol 14: 22-31.
17. Winstanley CA, Reynolds, Kristen R Hamilton, Marci R Mitchell, Victoria C Wing, et al., (2015) Choice impulsivity: Definitions, measurement issues, and clinical implications. Personal Disord 6: 182-198.