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Problematic Video Game Play and ADHD Traits in an Adult Population

Maria Panagiotidi^{a*}

^a School of Psychology, Sport and Exercise, Staffordshire University, Science Centre
Stoke-on-Trent, ST4 2DF

* maria.panagiotidi@staffs.ac.uk

ALL CAPS SHORT TITLE 50 CHARACTERS OR LESS

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Abstract

This study examined the relationship between problematic video game playing (PVGP), video game usage, and ADHD traits in an adult population. A sample of 205 healthy adult volunteers completed the Adult ADHD Self-Report Scale (ASRS), a video game usage questionnaire, and the Problematic Video Game Playing Test (PVGT). A significant positive correlation was found between the ASRS and the PVGT. More specifically, inattention symptoms and time spent playing video games were the best predictors of PVGP. No relationship was found between frequency and duration of play and ADHD traits. Hyperactivity symptoms were not associated with PVGP. Our results suggest that there is a positive relationship between ADHD traits and problematic video game play. In particular, adults with higher level of self-reported inattention symptoms could be at higher risk of PVGP.

Introduction

Attention deficit hyperactivity disorder (ADHD) is a behavioural disorder defined by either an attentional dysfunction, hyperactive/impulsive behaviour or both (DSM-V¹). ADHD is the most common neurodevelopmental disorder² and its worldwide prevalence in children and adolescence is between 0.85% and 10%^{3,4}. In roughly half of the children diagnosed with ADHD, symptoms persist into adulthood⁵. Therefore, ADHD has also been validated as an adulthood disorder, with remaining symptoms in adults including distractibility and difficulties with maintaining goal-directed behaviour rather than hyperactivity.

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2 Mainstream video games first appeared in the 1970s and their popularity has been
3 steadily increasing since. Video games can vary in theme and style, can be played online or
4 offline, can encourage cooperation or competition, and they are played on various devices
5 (e.g., consoles, computers, mobile phones). Recently, the idea of problematic video game play
6 (PVGP) has emerged. Such behaviour refers to persistent, recurrent, and excessive video
7 game play, which can disrupt an individual's functioning on various settings (e.g. social,
8 academic)⁶. The percentage of players affected by PVGP vary among different countries but
9 its prevalence is estimated to be around 7.5%^{7,8}.

10
11 The increasing number of individuals affected by PVGP resulted in its inclusion in the
12 latest version of the Diagnostic and Statistical Manual of Mental Disorders, DSM-V¹. PVGP
13 is included under the term, "Internet Gaming Disorder" (IGD)⁶. Previous research has shown
14 that massively multiplayer online role-playing game (MMORPG) are most often associated
15 with PVGP⁹. However, Internet use is not a required element for PVGP^{9,10}; offline role-
16 playing games have also been linked to problem use^{9,10}. As a result both online and offline
17 video games were considered in this study.

18
19 Behaviours associated with PVGP are similar to those exhibited in gambling and
20 internet 'addiction'¹¹. In addition to this, pathological gaming as characterised by DSM-V,
21 resembles substance use disorders. Individuals who exhibit PVGP usually play video games
22 longer than the average user (>50 hours per week¹²). This behaviour can lead to neglecting
23 other responsibilities and developing an increased level of emotional and social problems,
24 resulting in psychological dependence. However, it is worth noting that extensive play does
25 not necessarily predict PVGP. Many players spend a significant amount of time playing
26 videogames without reporting any behavioural or addiction problems¹³.

27
28 A number of factors have been associated with PVGP including poor time
29 management, underlying personal problems or mental health problems¹⁴. ADHD has been

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1 repeatedly associated with addiction. Certain traits found in those with ADHD (e.g.
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3 impulsivity, boredom, restlessness) play a key role in addiction¹⁵. More specifically, ADHD
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5 has been linked to illegal substances at a younger age, when not treated with medication and
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7 stimulant therapy² and demonstrate problem behaviour with forms of interactive media¹⁵.
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9 There is some emerging evidence suggesting that children and adolescents with ADHD
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11 exhibit more problematic video game behaviours^{13,17} compared to typically developing
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13 children.
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18 The majority of studies so far have focussed on children and adolescents^{13,17}.
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20 However, problematic video game use is also common among adults¹⁸. ADHD
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22 psychopathology can be viewed dimensionally, with inattentive and hyperactive-impulsive
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24 symptoms distributed continuously in the general population¹⁹. Higher level of ADHD
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26 symptoms could potentially predict PVGP. To our knowledge, only one study²⁰ has
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28 investigated the relationship between PVGP and ADHD traits in an adult population. Even
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30 though a positive relationship was found, the researchers did not examine potential
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32 differences in the contribution of Inattention and Hyperactivity ADHD symptoms. Evidence
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34 from substance use disorders research suggests that there are potential ADHD subtype
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36 differences in the prevalence of addiction²¹. The main aim of this study was to examine the
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38 contribution of inattention and hyperactivity, as well as overall ADHD traits, to PVGP.
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Method

Participants

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48 205 participants took part in the study (105 females). The mean age was 27.4 (SD =
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50 10, Range = 41). The majority (65.4%) had an undergraduate degree. Only individuals who
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52 played videogames for at least 1 hour per week were invited to take part in the study.
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55 Participants completed the study online after receiving a personal email.
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PROBLEMATIC VIDEO GAME PLAY AND ADHD TRAITS

Measures*Problem video game playing*

PVGP was assessed using the Problem Video Game Playing Test (PVGT)²¹. The PVGT is an adapted version of the Internet Addiction Test (IAT), a 20-item questionnaire designed by Young²³ to measure clinical features of Internet use. Each item is scored on a five-point Likert scale ranging from “1 = Never” to “5 = Always”. Thus, total scores range from 20 to 100. The PVGT measures aspects of problematic involvement in videogames and is based on the six core features of Brown’s addiction model; salience (‘ Do you feel preoccupied with video games when not playing’), mood modification (‘Do you play video games as a means of altering your mood’), tolerance (‘Do you often find yourself playing video games for longer than you intend’), withdrawal (‘Do you feel depressed, moody or nervous when not playing video games, that goes away when you are back playing video games’), relapse (‘Do you try and cut down on the amount of time spent playing video games and fail’), and conflict (‘ Do you spend more time playing video games than with others’).

The internal consistency of the scale in our study was good ($\alpha = .94$). This was consistent with previous research¹¹.

Video game usage

Participants were asked to disclose the number of hours per week they spend playing games and the duration spent playing before taking a break from play.

ADHD traits

ADHD traits were measured with the Adult ADHD Self-Report scale (ASRS)²⁴. The ASRS is an instrument consisting of the 18 DSM-IV-TR criteria and was developed in conjunction with the World Health Organization (WHO), and the Workgroup on Adult ADHD. The scores obtained through the ASRS have been found to be predictive of symptoms

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consistent with ADHD²⁵. The ASRS contains eighteen items from DSM-IV-TR (American Psychiatric Association, 2000) but measures the frequencies of the symptoms. The subjects are asked to report how often they experience each symptom in a period of six months on a five point Likert scale which ranges from 0 for never, 1 for rarely, 2 for sometimes, 3 for often, and 4 for very often^{25,26}. The ASRS has a two factor structure which includes an inattention scale and a hyperactivity/impulsivity scale. Each subscale contains nine items. The ASRS examines only current adult symptoms of ADHD. The reliabilities (Cronbach's alpha) for the two subscales of inattention (.75) and impulsivity (.77) as well as for the total ASRS (.82) are satisfactory²⁶. The original questionnaires are formatted with darkly shaded boxes in certain items which signify more severe symptoms, but these were removed from the questionnaire administered to our participants to avoid potential bias in the responses.

Results

Descriptive Analyses

Participants reported spending an average of 8.6 hours per week playing video games ($SD = 11.1$, Range = 80). Players took a break from playing every 1.8 hours ($SD = 1$, Range = 4). The mean score on the PVGT was 36.5 ($SD = 14$) and the distribution was slightly positively skewed (Skewness = .5, Standard Error of Skewness = .16). This distribution is consistent with the literature which states that only a minority of players experience significant disruption as a result of excessive video game playing.

PVGT scores were positively correlated with hours spent playing videogames ($r = .58$, $p < .001$) and frequency of breaks from playing ($r = .56$, $p < .001$). Age was negatively correlated with PVGT scores ($r = .23$, $p < .001$), with older participants reporting fewer problematic behaviours.

There was a significant difference between males and females in PVGT scores, $t = -6.1$, $p < .001$. Males reported higher levels of problematic behaviours ($M = 42.04$, $SD = 13.2$)

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2 compared to females ($M = 31.14$, $SD = 12.5$). Gender differences were also observed in the
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4 hours spent playing per week, $t = -5.9$, $p < .001$, and time before taking a break, $t = -4.9$,
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6 $p < .001$.
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9 The average score on the ASRS was 27.1 ($SD = 11$, range = 64). Participants reported
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11 more inattentive than hyperactive symptoms; the mean on the ASRS inattentive subscale was
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13 14.8 ($SD = 5.9$) compared to 12.3 ($SD = 5.6$) on the hyperactive subscale. No gender
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15 differences were found in the ASRS scores. Age did not correlated with the ASRS or any of
16
17 its subscales.
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Relationship between ADHD traits and PVGP

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23 The relationship between ASRS and the PVGT as well as the time spent playing video
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25 games and time between breaks was examined (Table 1). A weak correlation was found
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27 between overall ADHD traits ($r = .22$) and the Inattention subscale of the ASRS ($r = .3$). No
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29 association was found between ASRS and time spent video games per week or time between
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31 breaks.
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35 To determine the relative contribution of these variables to the PVGT score, a
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37 simultaneous linear regression was conducted with PVGT score as the dependent variable and
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39 the following independent variables; time spent playing video games per week, ASRS scores,
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41 ASRS Inattention subscale. The results indicated that time spent playing video games ($b = .57$,
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43 $t = 10.7$, $p < .001$) and ASRS Inattentive scores ($b = .3$, $t = 5.3$, $p < .001$) remained significant
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45 predictors of PVGT. Overall ASRS score was not significant predictor of PVGT ($p = .92$),
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47 when controlling for the above variables. The model could predict 41% of the variance in
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49 PVGT.
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Discussion

PROBLEMATIC VIDEO GAME PLAY AND ADHD TRAITS

1
2 In this study we examined the relationship between PVGP and ADHD traits in an
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4 adult sample. Our findings indicate that higher level of ADHD traits is associated with more
5
6 problematic behaviour in video game play. This is consistent with previous research on
7
8 children and adolescents with ADHD^{13,17,18,27,28}. Inattention symptoms and time spent playing
9
10 video games were the best predictors of PVGP. These findings suggest that subclinical
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12 ADHD symptoms, especially inattention symptoms, could contribute to PVGP in adults.
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16 Males reported a higher number of PVGP compared to females. This is consistent with
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18 results from previous studies that have shown that males score on average higher²⁷. No
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20 differences in ADHD traits, however, were found between males and females.
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24 A few possible explanations can be offered for the relationship between problematic
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26 video game behaviours and ADHD symptoms. Video games include potent attention grabbing
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28 cues (e.g., interactivity, sound effects, flickering light levels)²⁸. There is some evidence
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30 suggesting that video game play increases the release of dopamine within the nucleus
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32 accumbens²⁹. Abnormalities in local dopamine metabolism have been associated with
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34 ADHD^{30,31}. Furthermore, several studies have demonstrated that frequent video game play
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36 can improve various aspects of visual attention³², a function often impaired in ADHD³³.
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38 Playing video games may temporarily increase dopaminergic tone, which may temporarily
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40 enhance arousal and cognitive control functions. Thus, video game play might be used for
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42 self-medication by individuals with ADHD or high ADHD traits.
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46 It is worth noting that ADHD traits were not associated with extensive game play
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48 sessions or infrequent breaks between sessions. Studies in children and adolescents have
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50 found a positive relationship between ADHD symptoms and time spent playing video
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52 games^{14,20}. It is possible that adults with ADHD traits reduce the frequency of play. However,
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54 the relationship between ADHD and PGVP remains positive. This could potentially affect
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56 future interventions for video game addiction.
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2 We do not claim that problematic videogame use among individuals with ADHD traits
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4 always leads to detrimental effects. In this study we demonstrate that ADHD traits, especially
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6 inattention symptoms, are associated with problematic videogame use in an adult non-
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8 clinically diagnosed population. Future studies need to examine whether this finding
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10 generalises to adult clinical ADHD samples and what effect it has in their everyday lives. In
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12 addition to this, previous research using the PVGT to measure problematic videogame use
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14 only found weak associations with measures of psychological distress³⁴. Follow-up should
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16 focus on players with high PVGT scores and assess their risk of anxiety or depression.
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20 The current study examined the relationship between PVGP and ADHD traits without
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22 considering differences in video game genre preferences. Previous studies in children with
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24 developmental disorders have shown that there is an interaction between video game genre
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26 preferences and PVGP²⁴. In particular, specific game genres, such as role-playing games may
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28 provide its own unique contribution in the prediction of problematic game use^{13,24}. Future
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30 studies should attempt to investigate the relationship between genre preferences, ADHD traits,
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32 and PVGP.
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36 Finally, our findings are similar to those obtained in studies with clinical
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38 populations^{14, 15, 16}. This further supports the dimensional theory of ADHD and shows that
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40 using subclinical populations could provide us with information of clinical relevance.
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Table 1

Correlations Among ADHD traits and PVGP variables

Variables	1	2	3	4	5	6
1. ASRS total	-					
2. ASRS Inattention	.92**	-				
3. ASRS Hyperactivity	.91**	.68**	-			
4. PVGT	.22**	.3**	.12	-		
5. Time Spent Playing Video Games	-.08	-.00	-.1	.58**	-	
6. Time between breaks	-.03	.06	-.11	.55**	.54**	-