



The University of  
**Nottingham**

UNITED KINGDOM • CHINA • MALAYSIA

Arcelus, Jon and Bouman, Walter Pierre and Richards, Christina and Jimenez-Murcia, Susana and Griffiths, Mark (2017) Video gaming and gaming addiction in transgender people: an exploratory study. *Journal of Behavioral Addictions* . ISSN 2063-5303

**Access from the University of Nottingham repository:**

<http://eprints.nottingham.ac.uk/41072/2/2006%252E6%252E2017%252E002.pdf>

**Copyright and reuse:**

The Nottingham ePrints service makes this work by researchers of the University of Nottingham available open access under the following conditions.

This article is made available under the Creative Commons Attribution licence and may be reused according to the conditions of the licence. For more details see:  
<http://creativecommons.org/licenses/by/2.5/>

**A note on versions:**

The version presented here may differ from the published version or from the version of record. If you wish to cite this item you are advised to consult the publisher's version. Please see the repository url above for details on accessing the published version and note that access may require a subscription.

For more information, please contact [eprints@nottingham.ac.uk](mailto:eprints@nottingham.ac.uk)

## Video gaming and gaming addiction in transgender people: An exploratory study

JON ARCELUS<sup>1,2\*</sup>, WALTER PIERRE BOUMAN<sup>1</sup>, BETHANY ALICE JONES<sup>1,3</sup>, CHRISTINA RICHARDS<sup>1</sup>,  
SUSANA JIMENEZ-MURCIA<sup>4</sup> and MARK D. GRIFFITHS<sup>5</sup>

<sup>1</sup>Nottingham Centre for Transgender Health, Nottingham, UK

<sup>2</sup>Institute of Mental Health, Faculty of Medicine & Health Sciences, University of Nottingham, Nottingham, UK

<sup>3</sup>School of Sport, Exercise, and Health Sciences, Loughborough University, Loughborough, UK

<sup>4</sup>Department of Psychiatry, University Hospital of Bellvitge-IDIBELL, Barcelona, Spain

<sup>5</sup>International Gaming Research Unit, Psychology Division, Nottingham Trent University, Nottingham, UK

(Received: August 17, 2016; revised manuscript received: January 10, 2017; accepted: January 15, 2017)

---

*Background:* There is anecdotal clinical evidence that transgender people use the online world – such as forums and online video gaming – for the purpose of experiencing their gender identity in a safe, non-threatening, non-alienating, non-stigmatizing, and non-critical environment. *Aims:* To describe gaming behavior, degree of problematic gaming behavior and associated factors with problematic gaming in a comparatively large group of transgender people accessing transgender health services. *Methods:* Every individual referred to a national transgender health service in the United Kingdom during a 12-month period was invited to complete a series of questionnaires to measure gaming behavior, interpersonal functioning, severity of autistic features, and anxiety and depressive symptoms. *Results:* A total of 245 people agreed to participate in the study with 154 (62.9%) describing themselves as current gamers. Gaming behavior in the transgender population attending transgender health services was prevalent, but less than 1% of them presented with clinical scores for Internet Gaming Disorder, with no differences according to gender. Problematic gaming behavior was associated with general interpersonal problems, depression, and young age. *Discussion and conclusions:* Transgender people who engage in problematic gaming behavior are younger, and present with high interpersonal problems, and depression, which can affect a successful transition. In view of the high levels of gaming activity in this population games that are designed to address these psychological problems may be well received by transgender people.

**Keywords:** transgender, gaming, addiction, interpersonal, anxiety, depression

---

### INTRODUCTION

Transgender people are individuals whose gender identity does not match the gender assigned at birth based on their sexual characteristics. Transgender women are those assigned male at birth but whose gender identity is female; and transgender men are those assigned female at birth with a male gender identity (Ahmad et al., 2013). Some transgender people may decide not to transition to their experienced gender, and others choose to transition socially without the need of gender confirming medical interventions (GCMI) [cross-sex hormones (CSH) and/or genital surgeries] (Beek, Kreukels, Cohen-Kettenis, & Steensma, 2015). However, many access transgender health services in order to access GCMI (Bockting, Coleman, & De Cuypere, 2011). Although previous epidemiological studies examining the numbers of transgender people accessing transgender health services suggest low prevalence rates (Arcelus et al., 2015), reality is rather different. Transgender health services around the world (in places where they are available) have shown an increase rate of demand (De Vries, Kreukels, T'Sjoen, Ålgars, & Mattila, 2015), which may be a reflection of the high number of people with a self-identified transgender identity (Van Caenegem et al., 2015).

When people do wish GCMI, many (but not all) transgender health services require their patients to socially transition before such potentially irreversible interventions are considered. For many transgender people, living as their experienced gender without the aid of GCMI, can be a challenge. However, it is the view of many clinicians working in the field – including some of whom are transgender themselves – that living as their experienced gender allows individuals to test their gender identity in the real world before the initiation of potentially irreversible treatments (Wylie et al., 2014). Real life experience of gender identity might include considerable social and interpersonal challenges (e.g., Budge, 2013), such as disclosing one's gender identity to others (Gagne, Tewksbury, & McGaughey, 1997; Wylie et al., 2014); facing rejection (Koken, Bimbi, & Parsons, 2009); managing social gender role transition (Budge, 2013; Rowniak & Chesla, 2013)

---

\* Corresponding author: Jon Arcelus; Institute of Mental Health, Faculty of Medicine & Health Sciences, Nottingham National Centre for Transgender Health, University of Nottingham, Oxford Street 3, NG1 5BH Nottingham, UK; Phone: +44 115 8760160; Fax: +44 115 947 5609; E-mail: [jon.arcelus@nottingham.ac.uk](mailto:jon.arcelus@nottingham.ac.uk)

---

This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium for non-commercial purposes, provided the original author and source are credited.

---

including the occupational and personal arenas; and coping with discrimination and stigma (Adams, Nagoshi, Filip-Crawford, Terrell, & Nagoshi, 2016; Clements-Nolle, Marx, & Katz, 2006). As a consequence, transgender people who have poor social and interpersonal skills may be more likely to encounter difficulties when socially transitioning.

Cross-sectional studies investigating mental health problems of people attending transgender health services have found high rates of depression and anxiety in this population (Bouman, Claes, Marshall, et al., 2016; Dhejne, Van Vlerken, Heylens, & Arcelus, 2016; Millet, Longworth, & Arcelus, 2016). Research has provided evidence that psychopathology in transgender people is predicted by interpersonal skills (Arcelus, Claes, Witcomb, Marshall, & Bouman, 2016). High levels of anxiety, low mood and poor interpersonal skills may hinder social gender role transition, and as a consequence some individuals may hide themselves from the real world (Jones, Arcelus, Bouman, & Haycraft, 2017), and only explore their gender identity in online environments.

There is anecdotal clinical evidence that transgender people use the online world – such as forums and online video gaming – for the purpose of experiencing their gender identity in a safe, non-threatening, non-alienating, non-stigmatizing, and non-critical environment (Griffiths, Bouman, & Arcelus, 2016). The online world (including online gaming) may be used by transgender individuals as a preliminary, complementary, and/or alternative medium for helping them to negotiate their gendered status. Such online games and forums may typically involve creating an avatar that aligns with the gender they are experiencing. This could be so for transgender men and women in the same way as both may benefit from experiencing their gender in a safe environment. Although video gaming activities may be useful for transgender people to express their gender, it may also encourage isolation and a minimum contact with the outside world. Particularly, people with social difficulties or those with some level of depression may be presenting with high levels of gaming behavior.

Case studies exploring gaming activity in the transgender population have found that the use of video gaming among this population is not unusual (Griffiths et al., 2016). However, to date no empirical study has explored the degree of gaming behavior in the transgender population or the social and interpersonal factors associated with gaming behavior. If the psychosocial characteristics of transgender people who engage in gaming can be established, perhaps gaming can be used therapeutically to address psychosocial vulnerabilities (i.e., social and interpersonal difficulties) and facilitate the person through their social transition if the person is having difficult negotiating this in the real world.

In cisgender populations, online gaming has been found to be an alternative way of coping with distress, as it provides psychological benefits such as measured goal attainment, community connection, and a sense of escapism (Granic, Lobel, & Engels, 2014). Gaming also has the potential to increase physical and psychological wellbeing (Griffiths, Kuss, & Ortiz de Gortari, 2013). Gaming has already been successfully used to tackle anxiety and improve socialization (Rothbaum, Hodges, Smith, Lee, & Price, 2000; Wilkinson, Ang, & Goh, 2008), including in people on the autistic spectrum (Charlop-Christy, Le, &

Freeman, 2000). In light of these benefits, gaming could also be particularly beneficial in the transgender population.

In summary, there is good clinical evidence of high levels of gaming behavior in transgender people attending gender services, which has not been reported in the literature, apart from a case series study. As gaming can help people deal with psychopathology, in view of the high levels of psychopathology among this population, gaming can also be used for transgender people. However, the levels of gaming activity need to be explored first in order to evaluate whether this method is feasible to be used among this population. In view of this, the aims of the present study were exploratory. The first aim is to describe gaming behavior and levels of problematic gaming behavior in a comparatively large group of transgender people accessing transgender health services. Among this self-selected group of transgender people, the second aim was to examine the characteristics that are associated with problematic gaming behavior. In view of the high levels of anxiety and depression levels reported in this particular population (Dhejne et al., 2016), the high numbers of people on the autistic spectrum who also have transgender identities (Glidden, Bouman, Jones, & Arcelus, 2016), and the high levels of interpersonal problems already found in these populations (Davey, Bouman, Meyer, & Arcelus, 2015), the present study explored whether these four factors were associated with the degree of gaming activity found among transgender gamers.

## METHODS

### *Participants and procedure*

Every individual referred to a national transgender health service in the United Kingdom and accepted for assessment during a 12-month period (from June 2015 to June 2016), was invited to participate in the study. Individuals referred to the service are offered assessment, and possibly GCMI (e.g., CSH, and a referral for chest reconstructive surgery, and gender confirming genital surgery) if required. In order for an individual to be accepted for treatment, they need to socially transition first, which includes not only living as their experienced gender but also changing their name and most legal documents. Prior to the clinical assessment at the service, patients were invited to participate in the study. If they agreed, they completed a series of self-report psychometric measurements (detailed below) and signed a consent form.

### *Materials*

*Sociodemographics characteristics.* Questions were asked relating to age, birth assigned gender, gender description (male; female; non-male or female; male and female; other; and not sure), and information about social transitional status (socially transitioned – yes or no). All sociodemographic information, including social gender role transition status, was self-reported. No evidence (e.g., legal documents) of social transition was collected at this stage.

*Information about gaming behavior.* Participants were asked to self-report information about whether or not they

engage in gaming behaviors (yes or no) and whether they have engaged in gaming behavior in the past (yes or no). This information was used to categorize the participants as “current gamers” or as “non-gamers.” For the purpose of this study, people who indicated they had previously engaged in gaming behavior were categorized as non-gamers.

*Internet Gaming Disorder Scale – Short-Form (IGDS9-SF)* (Pontes & Griffiths, 2015). The IGDS9-SF is a short psychometric tool adapted from the DSM-5 criteria for Internet Gaming Disorder (American Psychiatric Association, 2013). The aim of the instrument is to assess the degree of problematic gaming behavior. It has nine questions that are answered using a 5-point Likert scale: 1 (“Never”), 2 (“Rarely”), 3 (“Sometimes”), 4 (“Often”), and 5 (“Very Often”). The scores are obtained by summing the gamer’s answers and total scores can range from 9 to 45, with higher scores being indicative of higher degrees of gaming disorder. Although it is not diagnostic for the purposes of this research, it may be possible to classify disordered gamers as those gamers that obtain a minimum of 36 out of 45 points (Pontes & Griffiths, 2015). The measure has excellent validity and reliability (Pontes & Griffiths, 2015) and has previously been used (e.g., Kim et al., 2016). The Cronbach’s  $\alpha$  for the IGDS9-SF in the present study was 0.92.

*Inventory of Interpersonal Problems (IIP-32)* (Barkham, Hardy, & Startup, 1996). The IIP-32 assesses common interpersonal problems, across eight subscales: hard to be assertive; hard to be sociable; hard to be supportive; hard to be involved; too dependent; too caring; too aggressive; and too open. The subscales are grouped into four: problems with competition; problems with socializing; problems with nurturance; and problems with independence. A global score provides an indication of overall interpersonal problems and higher scores indicate greater interpersonal problems. The IIP-32 is a shortened version of the original IIP, yet the psychometric properties are retained. A confirmatory factor analysis demonstrated high reliability with  $\alpha$  coefficients of 0.70–0.88 (Barkham et al., 1996). The IIP-32 has been used successfully in both non-clinical (e.g., Berry, Wearden, Barrowclough, & Liversidge, 2006) and clinical samples (e.g., Arcelus et al., 2009; Paley et al., 2008), including a transgender population (Davey et al., 2015). For the present study, the problem with socializing scale (which can provide negative values) and the global IIP-32 were used. In the present study, the Cronbach’s  $\alpha$  for the global IIP-32 was 0.90, and for the scales measuring problems socializing it was 0.82.

*Hospital Anxiety and Depression Scale (HADS)* (Zigmond & Snaith, 1983). The HADS is a commonly used instrument to assess levels of anxiety and depression. It has 14 items and generates an overall score for depression and for anxiety separately. Seven of the items relate to anxiety and seven relate to depression. The HADS has been used in clinical studies, including several with transgender people (e.g., Bouman, Claes, Brewin, et al., 2016; Dhejne et al., 2016). It has shown to have good test–retest and inter-rater reliability (Zigmond & Snaith, 1983). For the present study, both the anxiety and depression subscales were used. The Cronbach’s  $\alpha$  for the HADS-anxiety in the present study was 0.85 and 0.76 for HADS-depression.

*Autistic Spectrum Quotient 28 (AQ-28)* (Hoekstra, Bartels, Cath, & Boosman, 2008). The AQ-28 is a 28-item

instrument that was developed from the AQ-50 (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001). The AQ is a valuable instrument for rapidly quantifying where any given individual is situated on the continuum from autism to normality. The higher the score the more autistic characteristics the individual presents with. Both the AQ-50 and AQ-28 have shown good test–retest and inter-rater reliability (Baron-Cohen et al., 2001; Hoekstra et al., 2008). For the present study, the total scores of the AQ-28 were used. The Cronbach’s  $\alpha$  for the AQ-28 in the present study was 0.87.

### Analyses

All gaming questionnaire data were positively skewed in both groups and non-normally distributed, as demonstrated by significant ( $p < .002$ ) Kolmogorov–Smirnov tests and Shapiro–Wilk tests. Similarly, the rest of the data were mostly non-normally distributed but negatively skewed in both groups (gamers and non-gamers). Therefore, non-parametric tests were selected where possible and regression analyses were interpreted with caution, as there are no non-parametric equivalents available. For the first aim of the study, descriptive data are presented as well as mean scores of the individual psychometric instruments. For comparison between groups, Mann–Whitney  $U$  tests and Chi-square tests were conducted. For the second aim of the study, a series of one-tailed Spearman’s rho correlations were performed. The function of this preliminary analysis was to identify which predictor variables significantly correlated with problematic gaming behavior and to subsequently only include these variables in a multiple linear regression model to increase its robustness. The enter method was used. According to Cohen (1992) between 91 and 126 participants are required to meet a power of 0.80 (for a medium effect size, with an  $\alpha$  of 0.05 or 0.01) for a five-factor regression model. Statistical significance ( $\alpha$ ) was set at  $p < .05$ . All data analyses were performed using SPSS 22 (IBM Corporation, 2013).

### Ethics

The study received ethical approval from the NHS Ethics committee and from the Research and Development Department of the Nottinghamshire Healthcare NHS Foundation Trust in line with Health Research Authority guidance (HRA, 2013).

## RESULTS

### Descriptive data

During the period of the study, 257 people were accepted for the assessment at the center. Of these, 245 (95.3%) people agreed to participate in the study. One hundred and forty-five individuals self-identified as assigned male gender at birth (59.2%) and 99 as assigned female gender at birth (40.4%). One person did not identify their birth assigned gender. Regarding gender identity, the majority of participants self-identified as being in the binary of male and female. People, who identified as “non-male or female” and

Table 1. Sociodemographic characteristics, psychopathology related to social problems, gaming activity, and information regarding transition for the whole sample, current gamers, and non-current gamers (N= 245)

	Total	Current players (n = 154)		Non-current players (n = 91)		Mann-Whitney U			Chi-square		
			z	r	p	$\chi^2$	df	Phi	p		
Birth assigned gender: N (%)	Female: 99 (40.4) Male: 145 (59.2)	Female: 69 (44.8) Male: 85 (55.2)		Female: 30 (33.1) Male: 60 (65.9)		3.10	1	-0.11	.08		
Mean age (SD)	27.41 (12.4)	24.21 (9.9)		32.63 (14.4)							
Civil status: N (%)	Single: 150 (61.2) Married: 56 (22.9) Divorced: 12 (4.9) Other: 14 (5.7)	Single: 107 (69.5) Married: 33 (21.4) Divorced: 2 (1.3) Other: 8 (5.2)		Single: 43 (47.3) Married: 23 (25.3) Divorced: 10 (11.0) Other: 6 (6.6)		16.17	3	0.26	.01**		
Self-description: N (%)	Man: 86 (35.1) Woman: 122 (44.8) Non-binary: 18 (7.3) Not sure: 9 (3.7)	Man: 55 (35.1) Woman: 72 (46.8) Non-binary: 12 (7.8) Not sure: 6 (3.9)		Man: 31 (34.9) Woman: 50 (54.9) Non-binary: 6 (6.6) Not sure: 3 (3.3)		0.84	3	0.06	.84		
Socially transitioned: N (%)	Yes: 115 (46.9) No: 130 (53.1)	Yes: 63 (40.99) No: 91 (59.1)		Yes: 52 (57.1) No: 39 (42.9)		6.05	1	-0.16	.01**		
Occasions playing each day		1.77 (0.99)									
Occasions playing each week		9.42 (7.39)									
Amount of time that each session last (hr)		2.80 (1.48)									
Preferred way to play		Computers: 77 (50%) Game console: 66 (42.9%) Smart phone or tablets: 4 (2.6%) Other: 7 (4.5%)									
Mean score of IGDS9-SF		17 (5.64)									
Mean problems socializing (IIP-32) (%)	-0.8 (1.1)	-0.67 (1.0)		-1.12 (1.08)							
Global IIP-32, mean (%)	1.37 (0.66)	1.40 (0.64)		1.32 (0.69)							
Mean AQ-28 (%)	56.01 (12.93)	57.55 (11.89)		53.39 (14.22)							
Mean HADS-anxiety (%)	10.34 (3.41)	10.62 (3.27)		9.86 (3.60)							
Mean HADS-depression (%)	7.33 (2.9)	7.35 (2.9)		7.3 (3.0)							

Note. IGDS9-SF: Internet Gaming Disorder Scale – Short-Form; IIP-32: Inventory of Interpersonal Problems; HADS: Hospital Anxiety and Depression Scale; AQ-28: Autistic Spectrum Quotient 28. \*\*Statistically significant at  $p < .05$ .

Table 2. Spearman’s rho correlations between gaming behavior and all other variables

	Problematic gaming behavior
Age	-0.13
Problems socializing	0.18*
Global IIP-32	0.44**
AQ-28	0.38**
HADS-anxiety	0.35**
HADS-depression	0.32**

Note. IIP-32: Inventory of Interpersonal Problems; HADS: Hospital Anxiety and Depression Scale; AQ-28: Autistic Spectrum Quotient 28. \* $p < .05$ . \*\* $p < .001$ .

those identified as “male and female” were grouped into one category (non-binary) in Table 1. The mean age of the total group was 27.34 years ( $SD = 12.48$ ). Out of the 245 participants, 154 (62.9%) described themselves as currently using video games (categorized as gamers), and 40 (37.1%) as using video games in the past, but not any longer (categorized as non-gamers for the purposes of the present study). The remaining participants did not, and had never played video games at all (categorized as non-gamers). In the group categorized as gamers, on average participants would play 9.42 times a week, 1.77 times a day and spent an average of 2.80 hr playing on each occasion.

When comparing gamers and non-gamers, no statistical difference was found regarding assigned gender. Gamers were younger, single, had not socially transitioned, had more problems socializing, higher anxiety levels, and higher scores in the AQ-28. All the effect sizes of the between group comparisons were considered small, apart from the age difference between gamers and non-gamers which was considered moderate. Only two people (0.7%) presented with scores above 36 in the IGDS-9-SF. See Table 1 for sociodemographics and clinical variables between gamers and non-gamers.

Predictor data

In order to investigate predictors of problematic gaming behavior based on the scores of the (IGDS9-SF), only the gamers group was selected ( $n = 154$ ). Spearman’s correlation analysis showed a positive correlation, which was statistically significant, between problematic gaming and age ( $r = -.27, p < .001$ ), global IIP-32 scores (interpersonal

problems) ( $r = .45, p < .001$ ), problems socializing ( $r = .19, p < .001$ ), total AQ-28 ( $r = .37, p < .007$ ), anxiety scale ( $r = .34, p < .001$ ), and depression ( $r = .31, p < .001$ ) (see Table 2 for all correlations).

A multiple linear regression model was calculated to predict problematic gaming behavior based upon the variables found to be significant (age, general interpersonal problems, problems socializing, AQ-28 total, anxiety, and depression). Preliminary analyses were performed to ensure there was no violation of the assumption of linearity and multicollinearity. The regression model for problematic gaming behavior was found to be statistically significant [ $R^2 = .29, F(6) = 13.30, p < .001$ ]. The model explained 56% of the variance in problematic gaming behavior. Age, global IIP-32, and depression all significantly predicted problematic gaming behavior. The main predictor of gaming behavior was interpersonal problems. Out of the three variables that significantly predicted problematic gaming behavior, global IIP-32 made the largest contribution (see Table 3).

DISCUSSION

This study aimed to examine whether transgender people attending transgender health services engage in gaming activities, the degree of problematic behavior, and factors associated with problematic gaming behavior. The present study found that contrary to previous studies, video gaming behavior was not related to assigned gender. The prevalence of IGD (0.7%) was much lower than in previous studies that have examined the prevalence of online gaming problems in nationally representative populations such as adolescents (1.2%–8.5%) and adults (1.4%–5.4%) (Pontes, Macur, & Griffiths, 2016). This may be because transgender gamers use online gaming in a more functional and non-problematic way to explore their gender identity in a safe and non-stigmatizing environment (Griffiths et al., 2016). Additionally, the population selected were those attending transgender health services and therefore able to prioritize their needs above their gaming activity to ask for help. It may be the case that there is still a population of transgender people who suffer from IGD, but who are not in contact with clinical services. The results of this study, therefore, are only generalizable to the population of transgender people attending clinical services and wishing to transition.

Table 3. Regression models and significant individual predictors of problematic gaming among transgendered gamers

	Unstandardized B (95% CI)	SEB	Standardized B	p
(Constant)	-3.37	0.487	2.248	.177
IIP-32 problems socializing	-0.730	0.435	-0.125	.95
Global IIP-32 score	3.178	0.902	0.349	.001*
HADS-anxiety total	0.014	0.119	0.010	.909
HASD-depression total	0.327	0.144	0.200	.024*
Total AQ-28	0.040	0.040	0.081	.329
Age	-0.100	0.38	-0.176	.01*

Note. IIP-32: Inventory of Interpersonal Problems; HADS: Hospital Anxiety and Depression Scale; AQ-28: Autistic Spectrum Quotient 28. Adj  $R^2 = .27$ .

\* $p < .05$ .

Furthermore, differences between assigned males and females in relation to their gaming behavior were not found. This is contrary to previous studies among the cisgender population which have found that being male-assigned (vs. female) is significantly associated with both frequent and problematic/addictive use of video games (Andreassen et al., 2016). There are two hypotheses that present themselves relating to transgender individuals as a result of this study: (a) the sex assigned at birth (and some degree of childhood socialization) is important, and therefore birth-assigned males would play games more frequently and have higher levels of gaming problems than birth-assigned females; or (b) the gender of identity is important due to later socialization and possibly neuronal features in line with the gender of identity and not of birth gender (e.g., Chung et al., 2002; Zhou, Hofman, Gooren, & Swaab, 1995). Therefore birth-assigned females would play more games and have higher levels of gaming problems than birth-assigned males. Further research using larger samples is needed to further explore these hypotheses, as in the present study only two individuals in the whole sample were operationally defined as having a gaming addiction.

As expected, the present study also found that gaming was more prevalent in younger groups. Although gaming behavior in the transgender population attending transgender health services appeared to be prevalent, the degree was not high and less than 1% of them presented with clinical scores for Internet Gaming Disorder as assessed with the IGDS9-SF.

Problematic gaming behavior was associated with high levels of depression, and interpersonal problems. These psychological characteristics may explain why less than 50% of the gamers had socially transitioned by the time they were assessed at the clinic (i.e., people with interpersonal problems are less likely to be able to negotiate their social transition successfully in the real world). The high levels of interpersonal problems found, and the association and predictive capacity of problematic gaming may indicate that tackling interpersonal problems through gaming could be considered beneficial for transgender individuals who have interpersonal difficulties. Although gaming appears (at least initially) to be a positive and beneficial activity for many transgender people, coping strategies developed in the safe virtual reality world may serve as inadequate in “real life” settings due to the diversity in virtual and “real life” social constructs.

The association between problematic gaming behavior and depression is not unique to the transgender population. A large study with more than 8,000 young people found problematic gaming behavior to be associated with an increased risk for emotionally related symptoms, conduct disorder, hyperactivity/inattention, self-injurious behaviors, and problems with peers (Strittmatter et al., 2015). For transgender people, the use of gaming as a coping mechanism and as a way to avoid interpersonal interaction may create a vicious circle where the transgender person does not wish to move out of the secure online world, and back into the real world, thereby making transitioning impossible for those who wish to do so.

Some studies have also identified relationship difficulties among the general population to be associated with high

levels of gaming behavior (Suissa, 2015). Furthermore, spending an increasing amount of time in online gaming carries the risk of developing a gaming dependence or addiction (Hellman, Schoenmakers, Nordstrom, & van Holst, 2013). This may affect one’s personal relationships, work and/or study, and reduce the social support that can be vital for a successful transition (Davey, Bouman, Arcelus, & Meyer, 2014; Richards & Barker, 2013).

Transgender people have been found to present with high levels of social anxiety (Millet et al., 2016) and anxiety disorders (Bouman, Claes, Brewin, et al., 2016). New technologies, such as VR, which have been found to be useful for social anxiety disorders (Kampmann, Emmelkamp, & Morina, 2016), could be well received by this population; these could also improve interpersonal skills and reduce anxiety. Video games have proved to be realistic enough to generate successful graded exposure trials against phobias of spiders (Bouchard, Côté, St-Jacques, Robillard, & Renaud, 2006) and heights or enclosed spaces (Robillard, Bouchard, Fournier, & Renaud, 2003) and social anxiety (Kampmann et al., 2016). Older studies (e.g., Dewis et al., 2001) demonstrate that while computer-aided vicarious exposure is superior to the control, live-graded exposure remains superior to both. However, in the last few years VR has improved considerably.

The study also found that autistic traits were not associated to gaming behavior, which is surprising, as video games have been found to be of special interest to people with autistic features (Mazurek, Shattuck, Wagner, & Cooper, 2012; Parsons, Leonard, & Mitchell, 2006).

The nature of the population selected (transgender people accessing transgender health services) and the tools used may limit the results of the present study. The findings could not be generalized to all transgender people. Additionally, due to the cross-sectional nature of the study, causality cannot be determined conclusively. The strength of the study is that it consists of a large number of transgender people, which is unusual in most studies in the field of transgender health. The study cannot conclude that spending too much time gaming in accordance with experienced gender will prevent people testing their experienced gender in the real world, as the number of transgender participants who initiated social gender role transition was higher among participants currently engaged in gaming compared to participants not currently engaged in gaming. However, the study provides an indication that problematic gaming behavior is associated with several psychological symptoms, some of which (depression and interpersonal problems) may affect a successful transition. The findings from this study suggest that games that are designed to help transgender people manage these psychological symptoms may be well received by the transgender population accessing clinical services.

---

*Funding sources:* Nothing declared.

*Authors’ contribution:* JA: study concept and design, analysis and interpretation of data, responsibility of data, ethics application, statistical analysis, and drafting of manuscript.

WPB: study concept and design, responsibility of data, ethics application, and drafting of manuscript. BAJ: drafting of manuscript. CR and SJ-M: study design and drafting of manuscript. MDG: study concept and design, interpretation of data, supervision, and drafting of manuscript.

*Conflict of interest:* None.

## REFERENCES

- Adams, K. A., Nagoshi, C. T., Filip-Crawford, G., Terrell, H. K., & Nagoshi, J. L. (2016). Components of gender-nonconformity prejudice. *International Journal of Transgenderism, 17*(3–4), 185–198. doi:10.1080/15532739.2016.1200509
- Ahmad, S., Barrett, J., Beaini, A. Y., Bouman, W. P., Davies, A., Greener, H. M., Lenihan, P., Lorimer, S., Murjan, S., Richards, C., Seal, L. J., & Stradins, L. (2013). Gender dysphoria services: A guide for general practitioners and other healthcare staff. *Sexual and Relationship Therapy, 28*(3), 172–185. doi:10.1080/14681994.2013.808884
- American Psychiatric Association. (2013). *Multiple regression: A primer*. Washington, DC: American Psychiatric Press.
- Andreassen, C. S., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E., & Pallesen, S. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. *Psychology of Addictive Behaviors, 30*(2), 252–262. doi:10.1037/adb0000160
- Arcelus, J., Bouman, W. P., Van den Noortgate, W., Claes, L., Witcomb, G. L., & Fernandez-Aranda, F. (2015). Systematic review and meta-analysis of prevalence studies in transsexualism. *European Psychiatry, 30*(6), 807–815. doi:10.1016/j.eurpsy.2015.04.005
- Arcelus, J., Claes, L., Witcomb, G. L., Marshall, E., & Bouman, W. P. (2016). Risk factors for non-suicidal self-injury among trans youth. *The Journal of Sexual Medicine, 13*(3), 402–412. doi:10.1016/j.jsxm.2016.01.003
- Arcelus, J., Whight, D., Langham, C., Baggott, J., McGrain, L., Meadows, L., & Meyer, C. (2009). A case series evaluation of a modified version of interpersonal psychotherapy (IPT) for the treatment of bulimic eating disorders: A pilot study. *European Eating Disorders Review, 17*(4), 260–268. doi:10.1002/erv.932
- Barkham, M., Hardy, G. E., & Startup, M. (1996). The IIP-32: A short version of the Inventory of Interpersonal Problems. *British Journal of Clinical Psychology, 35*(1), 21–35. doi:10.1111/j.2044-8260.1996.tb01159.x
- Baron-Cohen, S., Wheelwright, S., Skinner, R., Martin, J., & Clubley, E. (2001). The autism-spectrum quotient (AQ): Evidence from Asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. *Journal of Autism and Developmental Disorders, 31*(1), 5–17. doi:10.1023/A:1005653411471
- Beek, T. F., Kreukels, B. P., Cohen-Kettenis, P. T., & Steensma, T. D. (2015). Partial treatment requests and underlying motives of applicants for gender affirming interventions. *The Journal of Sexual Medicine, 12*(11), 2201–2205. doi:10.1111/jsm.13033
- Berry, K., Wearden, A., Barrowclough, C., & Liversidge, T. (2006). Attachment styles, interpersonal relationships and psychotic phenomena in a non-clinical student sample. *Personality and Individual Differences, 41*(4), 707–718. doi:10.1016/j.paid.2006.03.009
- Bockting, W., Coleman, E., & De Cuypere, G. (2011). Care of transsexual persons. *The New England Journal of Medicine, 364*(26), 2559–2560. doi:10.1056/NEJMc1104884
- Bouchard, S., Côté, S., St-Jacques, J., Robillard, G., & Renaud, P. (2006). Effectiveness of virtual reality exposure in the treatment of arachnophobia using 3D games. *Technology and Health Care, 14*(1), 19–27.
- Bouman, W. P., Claes, L., Brewin, N., Crawford, J. R., Millet, N., Fernandez-Aranda, F., & Arcelus, J. (2016). Transgender and anxiety: A comparative study between transgender people and the general population. *International Journal of Transgenderism*, Epub ahead of print. doi:10.1080/15532739.2016.1258352
- Bouman, W. P., Claes, L., Marshall, E., Pinner, G. T., Longworth, J., Maddox, V., Witcomb, G., Jimenez-Murcia, S., Fernandez-Aranda, F., & Arcelus, J. (2016). Socio-demographic variables, clinical features and the role of pre-assessment cross-sex Hormones in older trans people. *The Journal of Sexual Medicine, 13*(4), 711–719. doi:10.1016/j.jsxm.2016.01.009
- Budge, S. L. (2013). Interpersonal psychotherapy with transgender clients. *Psychotherapy, 50*(3), 356–359. doi:10.1037/a0032194
- Charlop-Christy, M. H., Le, L., & Freeman, K. A. (2000). A comparison of video modeling with in vivo modeling for teaching children with autism. *Journal of Autism and Developmental Disorders, 30*(6), 537–552. doi:10.1023/A:1005635326276
- Chung, C. J., De Vries, G. J., & Swaab, D. F. (2002). Sexual differentiation of the bed nucleus of the stria terminalis in humans may extend into adulthood. *Journal of Neuroscience, 22*(3), 1027–1033.
- Clements-Nolle, K., Marx, R., & Katz, M. (2006). Attempted suicide among transgender persons. *Journal of Homosexuality, 51*(3), 53–69. doi:10.1300/J082v51n03\_04
- Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155–159. doi:10.1037/0033-2909.112.1.155
- Davey, A., Bouman, W. P., Arcelus, J., & Meyer, C. (2014). Social support and psychological well-being in gender dysphoria: A comparison of patients with matched controls. *The Journal of Sexual Medicine, 11*(12), 2976–2985. doi:10.1111/jsm.12681
- Davey, A., Bouman, W. P., Meyer, C., & Arcelus, J. (2015). Interpersonal functioning among treatment-seeking trans individuals. *Journal of Clinical Psychology, 71*(12), 1173–1185. doi:10.1002/jclp.22209
- Dewis, L. M., Kirkby, K. C., Martin, F., Daniels, B. A., Gilroy, L. J., & Menzies, R. G. (2001). Computer-aided vicarious exposure versus live graded exposure for spider phobia in children. *Journal of Behavior Therapy and Experimental Psychiatry, 32*(1), 17–27. doi:10.1016/S0005-7916(01)00019-2
- De Vries, A. L. C., Kreukels, B. P. C., T'sjoen, G., Ålgars, M., & Mattila, A. (2015). Increase of referrals to gender identity clinics: A European trend? In *Transgender healthcare in Europe. Book of abstracts* (p. 10). Ghent, Belgium: European Professional Association of Transgender Health.
- Dhejne, C., Van Vlerken, R., Heylens, G., & Arcelus, J. (2016). Mental health and gender dysphoria: A review of the literature. *International Review of Psychiatry, 28*(1), 44–57. doi:10.3109/09540261.2015.1115753



- Gagne, P., Tewksbury, R., & McGaughey, D. (1997). Coming out and crossing over: Identity formation and proclamation in a transgender community. *Gender & Society, 11*(4), 478–508. doi:10.1177/089124397011004006
- Glidden, D., Bouman, W. P., Jones, B. A., & Arcelus, J. (2016). Gender dysphoria and autism spectrum disorder: A systematic review of the literature. *Sexual Medicine Reviews, 4*(1), 3–14. doi:10.1016/j.sxmr.2015.10.003
- Granic, I., Lobel, A., & Engels, R. C. (2014). The benefits of playing video games. *American Psychologist, 69*(1), 66–78. doi:10.1037/a0034857
- Griffiths, M. D., Bouman, W. P., & Arcelus, J. (2016). Video gaming and gender dysphoria: Some case study evidence. *Aloma: Revista de Psicologia, Ciències de l'Educació i de l'Esport, 34*(2), 59–66.
- Griffiths, M. D., Kuss, D. J., & Ortiz de Gortari, A. (2013). Videogames as therapy: A review of the medical and psychological literature. In I. M. Miranda & M. M. Cruz-Cunha (Eds.), *Handbook of research on ICTs for healthcare and social services: Developments and applications* (pp. 43–68). Pennsylvania, USA: IGI Global.
- Health Research Authority (HRA). (2013). *Guidance for NHS research studies*. London, UK: Health Research Authority.
- Hellman, M., Schoenmakers, T. M., Nordstrom, B. R., & van Holst, R. J. (2013). Is there such a thing as online video game addiction? A cross-disciplinary review. *Addiction Research & Theory, 21*(2), 102–112. doi:10.3109/16066359.2012.693222
- Hoekstra, R. A., Bartels, M., Cath, D. C., & Boomsma, D. I. (2008). Factor structure, reliability and criterion validity of the autism-spectrum quotient (AQ): A study in Dutch population and patient groups. *Journal of Autism and Developmental Disorders, 38*(8), 1555–1566. doi:10.1007/s10803-008-0538-x
- IBM Corporation. (2013). *IBM SPSS statistics for windows, version 22.0*. Armonk, NY, USA: IBM Corporation.
- Jones, B. A., Arcelus, J., Bouman, W. P., & Haycraft, E. (2017). A systematic review of the literature relating to sport participation and competitive sport policies. *Sports Medicine*. doi:10.1007/s40279-016-0621-y
- Kampmann, I. L., Emmelkamp, P. M., & Morina, N. (2016). Meta-analysis of technology-assisted interventions for social anxiety disorder. *Journal of Anxiety Disorders, 42*, 71–84. doi:10.1016/j.janxdis.2016.06.007
- Kim, N. R., Hwang, S. S., Choi, J. S., Kim, D. J., Demetrovics, Z., Király, O., Nagygyörgy, K., Griffiths, M. D., Hyun, S. Y., Youn, H. C., & Choi, S. W. (2016). Characteristics and psychiatric symptoms of Internet gaming disorder among adults using self-reported DSM-5 criteria. *Psychiatry Investigation, 13*(1), 58–66. doi:10.4306/pi.2016.13.1.58
- Koken, J. A., Bimbi, D. S., & Parsons, J. T. (2009). Experiences of familial acceptance-rejection among transwomen of color. *Journal of Family Psychology, 23*(6), 853–860. doi:10.1037/a0017198
- Mazurek, M. O., Shattuck, P. T., Wagner, M., & Cooper, B. P. (2012). Prevalence and correlates of screen-based media use among youths with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 42*(8), 1757–1767. doi:10.1007/s10803-011-1413-8
- Millet, N., Longworth, J., & Arcelus, J. (2016). Prevalence of anxiety symptoms and disorders in the transgender population: A systematic review of the literature. *International Journal of Transgenderism*, Epub ahead of print. doi:10.1080/15532739.2016.1258353
- Paley, G., Cahill, J., Barkham, M., Shapiro, D., Jones, J., Patrick, S., & Reid, E. (2008). The effectiveness of psychodynamic-interpersonal therapy (PIT) in routine clinical practice: A benchmarking comparison. *Psychology and Psychotherapy: Theory, Research and Practice, 81*(2), 157–175. doi:10.1348/147608307X270889
- Parsons, S., Leonard, A., & Mitchell, P. (2006). Virtual environments for social skills training: Comments from two adolescents with autistic spectrum disorder. *Computers & Education, 47*(2), 186–206. doi:10.1016/j.compedu.2004.10.003
- Pontes, H. M., & Griffiths, M. D. (2015). Measuring DSM-5 Internet gaming disorder: Development and validation of a short psychometric scale. *Computers in Human Behavior, 45*, 137–143. doi:10.1016/j.chb.2014.12.006
- Pontes, H. M., Macur, M., & Griffiths, M. D. (2016). Internet gaming disorder among Slovenian primary schoolchildren: Findings from a nationally representative sample of adolescents. *Journal of Behavioral Addictions, 5*(2), 304–310. doi:10.1556/2006.5.2016.042
- Richards, C., & Barker, M. (2013). *Sexuality and gender for mental health professionals: A practical guide*. London, UK: Sage.
- Robillard, G., Bouchard, S., Fournier, T., & Renaud, P. (2003). Anxiety and presence during VR immersion: A comparative study of the reactions of phobic and non-phobic participants in therapeutic virtual environments derived from computer games. *CyberPsychology & Behavior, 6*(5), 467–476. doi:10.1089/109493103769710497
- Rothbaum, B. O., Hodges, L., Smith, S., Lee, J. H., & Price, L. (2000). A controlled study of virtual reality exposure therapy for the fear of flying. *Journal of Consulting and Clinical Psychology, 68*(6), 1020–1026. doi:10.1037/0022-006X.68.6.1020
- Rowniak, S., & Chesla, C. (2013). Coming out for a third time: Transmen, sexual orientation, and identity. *Archives of Sexual Behavior, 42*(3), 449–461. doi:10.1007/s10508-012-0036-2
- Strittmatter, E., Kaess, M., Parzer, P., Fischer, G., Carli, V., Hoven, C. W., Wasserman, C., Sarchiapone, M., Durkee, T., Apter, A., & Bobes, J. (2015). Pathological Internet use among adolescents: Comparing gamers and non-gamers. *Psychiatry Research, 228*(1), 128–135. doi:10.1016/j.psychres.2015.04.029
- Suissa, A. J. (2015). Cyber addictions: Toward a psychosocial perspective. *Addictive Behaviors, 43*, 28–32. doi:10.1016/j.addbeh.2014.09.020
- Van Caenegem, E., Wierckx, K., Elaut, E., Buysse, A., Dewaele, A., Van Nieuwerburgh, F., De Cuypere, G., & T'Sjoen, G. (2015). Prevalence of gender nonconformity in Flanders, Belgium. *Archives of Sexual Behavior, 44*, 1281–1287. doi:10.1007/s10508-014-0452-6
- Wilkinson, N., Ang, R. P., & Goh, D. H. (2008). Online video game therapy for mental health concerns: A review. *International Journal of Social Psychiatry, 54*(4), 370–382. doi:10.1177/0020764008091659
- Wylie, K., Barrett, J., Besser, M., Bouman, W. P., Bridgeman, M., Clayton, A., Green, R., Hamilton, M., Hines, M., Ivbijaro, G., Khoosal, D., Lawrence, A., Ward, D., Lenihan, P., Loewenthal, D., Ralph, D., Reed, T., Stevens, J., Terry, T., Thom, B., Thornton, J., Walsh, D., Ward, D., Coleman, E.,

- Di Ceglie, D., Martin, E., McGarry, P., Messenger, A., Reid, R., Sethi, S., Sutcliffe, P., Wilson, D., Carr, S., Davies, D., Dean, T., Ellis, M., Ferguson, B., Skinner, D., Williams, V., Brechin, S., Lucey, J., & Rathbone, M. (2014). Good practice guidelines for the assessment and treatment of adults with gender dysphoria. *Sexual and Relationship Therapy, 29*(2), 154–214. doi:[10.1080/14681994.2014.883353](https://doi.org/10.1080/14681994.2014.883353)
- Zhou, J. N., Hofman, M. A., Gooren, L. J., & Swaab, D. F. (1995). A sex difference in the human brain and its relation to transsexuality. *Nature, 378*(6552), 68–70. doi:[10.1038/378068a0](https://doi.org/10.1038/378068a0)
- Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica, 67*(6), 361–370. doi:[10.1111/j.1600-0447.1983.tb09716.x](https://doi.org/10.1111/j.1600-0447.1983.tb09716.x)