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Validating the distinction between computer addiction and engagement: online game playing and personality

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This article considers validatory evidence for the previously made distinction between (pathological) computing-related addictions and (non-pathological) high engagement in computing activities, and an associated distinction between core and peripheral criteria for diagnosing computing-related addictions. Using data provided by 388 players of a massively multiplayer online role playing game (MMORPG) via an online questionnaire, psychometric measures of engagement and addiction to the MMORPG taking into account the distinction between core and peripheral addiction criteria are shown to be differentially related to personality factors (extraversion, emotional stability, agreeableness, negative valence, and attractiveness). Addiction scale scores are shown to increase as negativity on all five personality characteristics increases, with these characteristics predicting 20% of the variance in addiction scores, but the same pattern is shown to occur for only one characteristic (negative valence) for the engagement scale, with personality characteristics predicting only around 2% of the variance in engagement scores. It is concluded that there is reasonable support for the distinctions between addiction and engagement and between core and peripheral criteria. Implications are discussed.

Keywords: addiction; personality; computer games; computer attitudes

1. Introduction

1.1. Computer addiction and engagement

Two previous articles have discussed the difference between (pathological) computing-related addictions and (non-pathological) high engagement in computing activities (Charlton 2002; Charlton and Danforth 2007). The construct of high computing engagement first arose in the factor analytic study of the Computer Apathy and Anxiety Scale (Charlton and Birkett 1995), with high engagement being the other end of the apathy continuum, indicating a high degree of positive involvement in computing and being shown to be positively related to computing course performance. The crucial difference between the constructs of addiction and engagement is that, although two people might engage in a behaviour to the same extent, one might be considered to be addicted because they encounter negative consequences (and find it difficult to desist from the activity), but the other might be considered to be merely highly engaged because they do not encounter negative consequences (Charlton and Danforth 2007).

The articles of Charlton (2002) and Charlton and Danforth (2007) focused upon the use of criteria derived from Brown's (1991, 1993) scheme for identifying behavioural addictions, which have been previously used to classify people as addicted to computing activities (Griffiths 1995, 1996). Some of these criteria are similar to criteria derived from the criteria in the American Psychiatric Association's *Diagnostic and statistical manual of mental disorders* (DSM) for pathological gambling, which have also been used to label computing-related addictions (e.g. Young 1996, Griffiths and Hunt 1998).

In a first article focusing upon computing in general, obliquely rotated exploratory factor analysis on paper questionnaire data from a sample of 404 students at a higher education institution in northern England showed items tapping some of these criteria to be more highly related to high engagement than to addiction (Charlton 2002). The aforementioned criteria were labelled peripheral criteria and took the form of cognitive salience (the tendency to think about an activity to an increasingly greater extent), tolerance (spending an increasing amount of time performing an activity), and euphoria (gaining a buzz of excitement or a high from an activity). Items tapping these criteria were contrasted with those tapping core addiction criteria, which were confirmed as being central to the labelling of computer-related addictions; behavioural salience (domination of a person's life by a need to

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perform an activity), withdrawal symptoms (where cessation of an activity leads to the occurrence of unpleasant emotions or physical effects), conflict (where an activity leads to conflict with others or self-conflict), and relapse and reinstatement (resumption of an activity with the same vigour subsequent to attempts to abstain). These results were shown to hold in a second article, in which 442 players of a massively multiplayer online role playing game (MMORPG) entitled Asheron's Call® completed an online questionnaire via a website devoted to the game (Charlton and Danforth 2007). Wordings of items in the latter study, the factor pure items from which were used to form the addiction and engagement scales in this study, are given in the Appendix.

In concluding that it is not valid to use all of Brown's criteria for behavioural addictions (and by extension some of the DSM criteria for pathological gambling) in the classification of computer-related addictions, an important point made in both of the above articles was that, particularly because of high frequency of endorsement of criteria signalling high engagement, confusing addiction and high engagement can lead to people being classified as addicted when they are not, with the resultant over-estimates perhaps contributing to an unnecessary degree of alarm both among the research community and the general public.

This study compares personality correlates of psychometric measures of computer game addiction and engagement (as they specifically relate to the playing of Asheron's Call®) which take into account the distinction between core and peripheral facets of addiction by including the former facets but excluding the latter facets from an addiction scale. Until now, the above work on the distinction between computer-related addictions and engagement has only involved factor analysis of pools of items and therefore only factorial validity of psychometric measures of addiction and engagement that can be derived from the previous work can be claimed. In this article, an attempt is made to begin accumulating other validatory evidence for such measures by considering the extent to which they are differentially related to personality factors.

This work is useful given recent debate as to whether the DSM should move away from a categorical system towards a dimensional system. For example, Widiger and Samuel (2005) note that the current categorical system has been criticised on several grounds; comorbidity is so common that this suggests that many disorders have similar pathologies at their root; there are boundary disputes whereby many of the features of categories tend to overlap; it encourages clinicians to see disorders as 'qualitatively distinct from normal functioning' (Widiger and Samuel 2005, p. 494). It has therefore been suggested that it might be more useful to adopt a dimensional approach whereby people are placed upon continua, such continua possibly spanning normal and abnormal ranges. The categorical approach of the DSM has further been criticised on account of its atheoretical nature (Kline 2000). Thus, the groups of criteria in the DSM are only formed according to their utility in classifying people as having various psychiatric disorders or otherwise, the groups of criteria assembled lacking any theoretical underpinning. In keeping with a dimensional approach, and taking account of theory, in this article an attempt is made to validate a factor pure computer-related addiction scale by showing that scores on it are related to negative personality traits to an extent to which scores on a factor pure measure of (non-pathological) high engagement are not.

The general idea that personality traits should be differentially related to computer game addiction and engagement (particularly games that involve remote communication with other players or their avatars, such as is the case with MMORPGs) follows from Davis' (2001) cognitive-behavioural model of pathological Internet use (PIU). Currently, Davis' model appears to be the model which best lends itself to explaining why certain personality factors should be associated with Internet-related addictions. In the model, the ready availability of the Internet, pre-existing psychopathological factors such as depression or social anxiety, and situational cues providing reinforcement of Internet usage behaviours interact to produce maladaptive cognitions. Under certain circumstances (e.g. social isolation and/or lack of support), these cognitions result in Generalised Pathological Internet Use (Generalised PIU). This involves a global tendency to maladaptively use the Internet which would not occur in the Internet's absence, and involves behaviour such as compulsive use of the Internet's communicative features to avoid other responsibilities. Generalised PIU is contrasted with Specific PIU, which involves using the Internet for the maladaptive pursuit of activities that would still occur in the absence of the Internet's existence (e.g. gambling and compulsive use of pornography). Social isolation is viewed as an important factor in the genesis of Generalised PIU but not Specific PIU. In general, because Davis' model emphasises existing psychopathology and social reticence (both of which can be linked to personality) as causes of addiction, in the presently conducted analyses scores on a psychometric measure of addiction would be expected to increase as scores indicating greater negativity in personality characteristics increase and scores on personality characteristics indicating greater social reticence

increase. However, since engagement is hypothesised to be non-pathological, scores on a measure of this construct would not be expected to be as highly related to personality characteristics. In a later section we present a brief review of the literature on Internet usage and personality towards the end of developing personality-specific hypotheses and provide rationale for these hypotheses in terms of Davis' model. But in order to do this, it is first useful to consider some of the attributes of the specific activity studied.

1.2. The addictive potential of massively multiplayer online role playing games

For people whose psychological characteristics and/or life circumstances make them vulnerable to behavioural addictions, MMORPGs may be particularly addictive in several respects. For example, the games allow people to escape everyday real-world problems by immersing themselves in a fantasy world; a possibility that is particularly attractive to people whose personalities and social skills lead to problems in real-world environments (Attwood 2006). Also, players adopt the role of a character (represented by an avatar) in a virtual environment in which a story line evolves over time and in which various unexpected positive and negative events occur periodically within an uncertain time-frame and in the context of contingencies that are often uncertain. Games with such features have addictive potential because they induce operant conditioning via variable-ratio reinforcement (VR) schedules, which constitute a highly effective conditioning paradigm (Wallace 1999). VR schedules are also implicated in the addictive potential of other Internet-mediated activities. For example, Internet chat room communication takes place within a synchronous virtual environment (i.e. an environment in which people are online simultaneously and can respond to each other instantaneously), with rewards in the form of responses to one's input being provided according to a VR schedule (Wallace 1999). Such reward schedules would also explain anecdotal accounts of compulsive email checking currently to be found on the Internet. A final attribute of MMORPGs that gives them addictive potential is that other players also adopt avatars and the interaction between the avatars representing various players within the virtual environment often provides a source of acclaim and attention for players, thereby providing social reinforcement. Such reinforcement is another important feature of potentially addictive Internet activities (Wallace 1999; Morahan-Martin and Schumacher 2000).

A major assumption of this article is that, because social relationships are mediated by the Internet rather than being face-to-face, MMORPGs are likely to be particularly appealing to people who are ill at ease in face-to-face situations, those who are lacking in warm offline relationships, and those whose face-to-face personal relationships do not run smoothly. Such assumptions are consistent with Davis' (2001) model of PIU and are also evident in the writings of Steinkuehler and Williams (2006). While these latter authors generally view the socialising opportunities afforded by MMORPGs in a positive light, prominence is given to the ideas that the playing of such games can allow people to develop supportive and warm relationships that they may lack offline but without feeling threatened by each other and risking social entanglement.

1.3. Personality and addiction

Game playing is a form of Internet usage that is particularly associated with pathological Internet use (Morahan-Martin and Schumacher 2000). However, although a few Chinese studies exist (e.g. Wang and He 2000, Xuan *et al*. 2006), there is a lack of Western studies specifically correlating personality and game playing variables in the peer-reviewed literature. On the other hand, a number of studies have correlated personality variables with Internet usage and addiction more generally and some of these studies are now considered in deriving hypotheses, taking care to consider whether the findings reviewed are likely to generalise to the context of MMORPG playing.

In what follows the focus is upon three of the Big Five personality traits (extraversion, agreeableness, and emotional stability) and two other factors from a broad seven factor conception of personality resulting from Saucier's (1997) multi-language study of lexical personality descriptors. The remaining two of the Big Five personality traits (conscientiousness and openness – designated intellect in the personality questionnaire used presently) are not considered since, although it is possible to develop rationales for relationships involving these traits, such rationales are rather convoluted and, as such, testing of hypotheses involving these traits would not provide convincing validatory evidence concerning the addiction–engagement distinction. The two non-Big Five traits focused upon are attractiveness and negative valence. Since these two latter factors are less familiar than each of the Big Five traits, it is useful to describe them here. Thus, people characterised by high attractiveness believe that they are important, care about their appearance, are well groomed, neat and efficient, and are high in motivation. People low in attractiveness lack these characteristics, tend to feel that they are not special, and lack an urge to improve themselves. Negative valence concerns

undesirable personality traits and behaviours. Those characterised by high negative valence are often demanding, needy, and eager to impress, whereas people low in negative valence refrain from copying others, talking overly about themselves or interfering in others' business, as well as refraining from the previously mentioned behaviours. As will be seen below, both attractiveness and negative valence were included presently because they are likely to be related to self-esteem, which has been shown to be related to Internet usage.

As previously implied, the opportunities for obtaining social reinforcement that Asheron's Call® provides would be expected to make it particularly attractive to people whose personality traits or life circumstances limit their face-to-face interactions with other people and therefore limit their opportunities for obtaining social reinforcement. Hence, we might expect people who are introverted, shy, or lonely to be particularly attracted to the game and MMORPGs in general. Such expectations are consistent with previous findings: although there is generally a lack of robustness in findings relating personality variables to Internet usage, the most consistent observations seem to centre around the idea that people exhibiting greater introversion, shyness, and loneliness use the Internet for various activities to a greater extent than those who are more likely to engage in face-to-face communications (Morahan-Martin and Schumacher 2000; Moody 2001; Scealy *et al*. 2002; Chak and Leung 2004; Engelberg and Sjöberg 2004; Landers and Lounsbury 2006). For the former people then, the Internet in general seems to be useful in offering them an escape from their social isolation. Indeed, Davis' (2001) cognitive-behavioural model depicts social isolation as being a direct driver of Generalised PIU, with the Internet 'providing an individual's lifeline to the outer world' (p. 193). Presently, negative relationships between extraversion and addiction and engagement were hypothesised, but, since engagement is claimed to be non-pathological, as is the case for the remaining personality characteristics, a smaller relationship for engagement and extraversion was hypothesised.

Because the present data were collected via the Internet and it was deemed important not to discourage participation by overloading participants, this research was restricted to personality factors and did not include cognitive state measures, such as self-esteem, which have been shown to be related to personality (Matthews and Deary 1998). However, a second set of hypotheses was predicated upon the assumptions that the personality trait of attractiveness is highly related to self-esteem and that low self-esteem is a correlate of using the Internet for playing MMORPGs. The descriptors used to define attractiveness (the belief that one is important, that one is special, paying attention to one's appearance, etc.) appear to have much in common with descriptors and behaviours relating to self-esteem (broadly defined – for example by Bandura (1997) – as involving the extent to which a person likes or dislikes themselves). Low self-esteem is a major reason why people may be reluctant to engage in face-to-face interactions with others (Baumeister 1993). However, there is much research suggesting that low self-esteem is related to a need to make social connections with, and seek the approval of, others (Murray *et al*. 2002), and that social acceptance leads to enhancement of self-esteem (Mruk 1999). Putting these observations together, it is reasonable to expect that people harbouring low self-esteem should seek out opportunities to interact with people that do not involve face-to-face interactions: Internet-mediated interactions in general, and the playing of MMORPGs specifically, provide just such opportunities. There is some domain-specific evidence, which justifies this line of reasoning. Although Hills and Argyle (2003) found no relationship between Internet usage and self-esteem, Armstrong *et al*. (2000) found a relationship between Internet addiction and low self-esteem and noted that people with low self-esteem may engage in addictive behaviours as a means of escape from feelings of inadequacy and worthlessness (for more on escape motivations, see the references to Young (1998) and Yee (2005) below). All of the above is consistent with Davis' (2001) cognitive-behavioural model of PIU, which views cognitive distortions in the form of negative views of the self as causing people to use the Internet as a non-threatening medium through which they can obtain self-validation from positive interactions with other people. Given this, negative but differently sized relationships were hypothesised between attractiveness and addiction and engagement.

The assumption that people with low self-esteem need to maintain communications with others also led to the formulation of a further pair of hypotheses involving the negative valence personality factor. Although there appears to be no previous research examining this construct's relationships with Internet usage, as mentioned previously and as implied in the discussion of the relevance of Davis' (2001) model to the attractiveness hypotheses above, one of the properties of MMORPGs that makes them potentially addictive is that they provide a means of social reinforcement and the characteristics defining negative valence (being demanding, needy, eager to impress, and talking extensively about oneself) seem to signal a need for such reinforcement. Therefore, it was hypothesised that there would be positive relationships

between negative valence and both addiction and engagement, but that addiction would exhibit the greatest relationship.

With respect to neuroticism, it is often found that no relationship exists between this personality factor and involvement with the Internet (Hills and Argyle 2003, Landers and Lounsbury 2006, Nithya and Julius 2007). Other evidence is mixed, some authors finding that Internet usage is greater among more neurotic individuals (Tuten and Bosnjak 2001) but others finding a difference in the opposite direction (Swickert *et al*. 2002). With respect to this study, computer/electronic game playing addicts have been found to be higher in neuroticism than non-addicts (Wang and He 2000, Xuan *et al*. 2006), and a major factor in Internet addictions in general is the need to escape everyday reality (Young 1998). The latter is also true for the playing of MMORPGs in particular, with escape motivations being positively related to amount of time spent playing MMORPGs (Yee 2005). In addition, several studies have shown that, as opposed to problem-focused coping strategies, people scoring high in neuroticism have a tendency to prefer emotion-focused coping strategies involving distancing themselves from problems, the avoidance of problems, and engagement in wishful thinking (Bouchard 2003). Thus, it would appear that environments that allow people to escape from their problems, such as those provided by MMORPGs, should be particularly attractive to people characterised by neuroticism. It was therefore hypothesised that there should be negative relationships between emotional stability and addiction and engagement but again that this relationship would be greater for addiction. A hypothesis linking neuroticism (or, at the other pole, emotional stability) and addiction is consistent with Davis' (2001) model of PIU in that neuroticism is a broad factor that is associated with negative affective states such as depression (Matthews and Deary 1998), which are (distal) psychopathological causes of PIU via (more proximal) maladaptive cognitions in the model.

The final personality variable considered was agreeableness. Two studies have found relationships between agreeableness and Internet usage variables: negative relationships for overall Internet usage (Landers and Lounsbury 2006) and information exchange usage (Swickert *et al*. 2002). The authors of the former study mooted three (non-mutually exclusive) explanations for their result. First, it could be that people who find it difficult to form amicable relationships with others may actively choose Internet activities over inter-personal activities. Second, it may be that their personality characteristics make less agreeable people less sought after as social companions and therefore they have more time to engage in Internet activities (note that, again, there is a social isolation/lack of social support element to this explanation which is prominent in Davis' (2001) model of PIU). Third, because Internet activities do not involve face-to-face interactions, the Internet constitutes an environment where the need to behave in an agreeable manner is not at a premium. Certainly, the large amount of literature focusing upon disinhibition and behaviours such as flaming on the Internet (see e.g. Joinson 1998) would support this latter idea. Bearing all this in mind, and taking into account the idea that, although it is a social activity, MMORPG playing is done anonymously and allows interactions to take place remotely, thereby minimising the potential for personal factors to become problematic, negative relationships were hypothesised between agreeableness and addiction and engagement, but, again, it was expected that the relationship should be greater for the former measure.

To recapitulate briefly, the general broader hypothesis under which all of the personality-specific hypotheses were subsumed was that increasingly negative or socially reticent personality characteristics would be more highly related to scores on the psychometric addiction scale than those on the engagement scale, with this broader hypothesis implying that the total amount of variance explained by the personality variables in addiction scores during multiple regression analysis should be greater than the variance explained for engagement scores. As previously mentioned, rather than using the popular Big Five conception of personality (e.g. Costa and McCrae 1994), the study used a conception of personality based upon Saucier's (1997) multi-language study of lexical personality descriptors. Although Saucier's analysis indicated that two, three, five or seven factor solutions were viable descriptors of stable personality traits, an instrument based upon his broadest (seven factor) solution was used since it enabled consideration of relationships between the two self-esteem-related personality variables of attractiveness and negative valence and addiction and engagement.

2. Method

2.1. Design

Data were collected using an Internet-based data collection methodology. A correlational design was implemented, with Pearson's r coefficients being computed between the five personality variables (extraversion, agreeableness, emotional stability, attractiveness, and negative valence) and the game playing addiction and engagement measures. Also, simultaneous multiple regression analyses were performed, with the personality variables as predictors of addiction and engagement scores.

2.2. Participants

The Internet-based form was publicised to players of Asheron's Call® (either version 1 or 2) via a website devoted to the game (http://ac.xrgaming.net). To aid recruitment, players were offered the incentive of a raffle prize of 2 months' free game play (monetary value = US $26).

Data are reported for 388 participants[1] (overall mean age = 29.27 years, SD = 8.74 years) who played the game for a mean of 18.70 hours per week. Of the participants whose gender was known (these data were missing for two participants), males constituted the overwhelming majority (86%). The 332 males were in the age range 18 to 67 ($M = 28.60$ years, SD = 8.67 years) and played the game for a mean of 18.36 hours per week. Females formed 14% of participants ($n = 54$), with ages ranging from 18 to 50 ($M = 33.39$ years, SD = 8.21 years) and played the game for a mean of 20.81 hours per week. From the gender statistics, it is evident that the sample was composed largely of younger adult males, as would be expected given the nature of the activity under consideration.

Most participants were residents of the US and Canada ($n = 330$: 85.10%). Smaller numbers of respondents resided in Europe ($n = 36$: 9.28%), Australia and New Zealand ($n = 15$: 3.87%), and other countries ($n = 6$: 1.55%). Residency data were missing for one participant.

2.3. Materials

The Internet form was composed of two questionnaires. First, an instrument containing 24 randomly ordered factor pure items from the addiction–engagement portions of Charlton's (2002) earlier general computing questionnaire adapted to be specific to Asheron's Call® as reported in the study of Charlton and Danforth (2007). This instrument consists of positively and negatively phrased items. The addiction scale is composed of 12 items, seven of which tap the core addiction criteria identified by Charlton (2002) and Charlton and Danforth (2007). The items tapping core criteria are presented in Table 1. The other five items in the addiction scale are items that were included in the two aforementioned studies to round out an addiction factor. The 12-item engagement scale consists of items having an engagement factor loading upon them in the Charlton (2002) and Charlton and Danforth (2007) studies. Many of these items were adapted from Charlton and Birkett's (1995) Computer Apathy and Anxiety Scale (as previously mentioned, engagement being the other end of the apathy continuum). However, two of the items tap the peripheral euphoria (feeling a buzz of excitement) and cognitive salience (rarely think about playing) criteria that have previously been said to be indicative of addiction, but which the above studies have shown to have an engagement factor exclusively loading highly upon them. A complete listing of items for the two scales is presented in the Appendix. Responses were on a seven-point Likert-type scale ranging from completely agree to completely disagree. With item responses coded so that greater scale totals would indicate greater addiction and engagement, calculation of Cronbach's alpha coefficients confirmed the internal consistency of the scales (addiction scale alpha = 0.79 and engagement scale alpha = 0.80). After summation of responses for items in each scale, the possible minimum and maximum scores for both scales were 12 and 84, respectively. The questionnaire also contained questions asking how many hours per week were spent playing Asheron's Call® and asking for demographic information including gender, age, and country of residence.

Table 1. Items in the addiction scale tapping core behavioural addiction criteria from Charlton (2002) and Charlton and Danforth (2007).

Salience (behavioural): I often fail to get enough sleep because of playing Asheron's Call.
Conflict (with other activities): My social life has sometimes suffered because of my playing Asheron's Call.
Conflict (inter-personal): Arguments have sometimes arisen at home because of the time I spend playing Asheron's Call.
Conflict (with other activities): Playing Asheron's Call has sometimes interfered with my work.
Relapse and reinstatement: I have made unsuccessful attempts to reduce the time I spend playing Asheron's Call.
Salience (behavioural): I never miss meals because of playing Asheron's Call.
Withdrawal symptoms: When I am not playing Asheron's Call, I often feel agitated.

The second part of the Internet form was a personality measure based on Saucier's (1997) seven-factor conception of personality, although only data for five factors were used for reasons explained previously. The measures were part of the International Personality Item Pool (IPIP) developed by Goldberg (Goldberg 1999; see also Goldberg *et al.* 2006) as a public domain resource for personality researchers. Each IPIP scale consisted of 10 self-descriptive statements to which people again responded on a seven-point scale with responses ranging from completely agree to completely disagree. Maximum and minimum scores for each scale were 10 and 70, respectively. Higher scores were indicative of possession of more of the personality trait as expressed in the scale label. Again, for the present data set,

Cronbach's alpha coefficients for all of the personality measures were acceptable, these being as follows: extraversion, 0.84; agreeableness, 0.80; emotional stability, 0.88; attractiveness, 0.80; negative valence, 0.84.

2.4. Procedure

Prior to questionnaire completion, all participants viewed text giving a brief explanation of the study and informing them of their rights in accordance with the American Psychological Association's ethical principles for treatment of participants. Participants completed a single Internet-based form containing both instruments. Completion took less than 15 min and data were collected over a 2-week period. Debriefing was carried out via email. Subsequently, one participant was randomly selected to receive the prize.

3. Results

Descriptive statistics for all variables are shown in Table 2. Two sets of correlation and simultaneous multiple regression analyses were performed to assess the extent to which the five personality variables were correlated with, and predictive of, the psychometric measures of game playing addiction and engagement. However, before considering these relationships, it is important to remark upon relationships between the personality variables. The relevant correlations are shown in Table 3, from which it can be seen that there were some sizeable relationships between certain personality variables, these explaining differences between the zero-order Pearson's r coefficients and the semipartial correlations and beta coefficients for relationships between the personality variables and the two game playing measures in the subsequently reported analyses.

Table 2. Descriptive statistics for all personality and game playing variables ($N = 388$).

	Mean	SD	Min	Max	Range
Personality variables					
Extraversion	45.11	9.99	14	70	56
Agreeableness	52.14	7.97	20	70	50
Emotional Stability	48.07	10.29	19	70	51
Attractiveness	48.07	9.02	21	70	49
Negative Valence	34.59	9.54	10	64	54
Game playing variables					
Addiction	38.96	11.67	15	74	59
Engagement	60.87	8.62	37	84	47

The first set of correlation and multiple regression analyses involved the addiction criterion variable. Table 3 shows that addiction scores were significantly correlated with all personality variables in the hypothesised directions. However, effect sizes varied. The effect sizes for addiction's relationships with extraversion and agreeableness can be considered small (i.e. $r \approx 0.10$; Cohen 1988), addiction scores rising as extraversion and agreeableness became lower. There were medium effect sizes for emotional stability and negative valence (as defined by $r = 0.30$; Cohen 1988), although the coefficient for attractiveness was not quite as high. Addiction scores increased as emotional stability and attractiveness decreased, and as negative valence rose.

From Table 4, it can be seen that in the multiple regression context only emotional stability, attractiveness, and negative valence, the three most highly related variables in the bivariate correlational context, were significantly predictive of addiction. However, the semipartial correlations emphasise that even for these three variables, the overlap in variance of the personality variables resulted in smaller relationships between each personality variable and addiction in the regression context than was the case for the bivariate correlations. Together, the predictive utility of the personality variables was quite good, the variables accounting for around 20% of the variance in addiction scores, $R = 0.45$, $R^2 = 0.20$, and the variables as a whole being significantly predictive, $F(5,382) = 19.39$, $p < 0.01$.

Table 3. Correlations (Pearson's r) between the five personality variables and the two game playing variables ($N = 388$).

	Extraversion	Agreeableness	Emotional stability	Attractiveness	Negative valence	Addiction	Engagement
Extraversion	–						
Agreeableness	0.22**	–					
Emotional stability	0.40**	0.17**	–				
Attractiveness	0.51**	0.26**	0.40**	–			
Negative Valence	−0.13**	−0.19**	−0.41**	−0.05	–		
Addiction	−0.15**	−0.16**	−0.37**	−0.23**	0.35**	–	
Engagement	0.07	0.05	−0.02	0.02	0.08*	0.44**	–
Engagement (corrected)[a]	0.10	0.07	−0.03	0.03	0.11*	0.55**	–

*$p \leq 0.05$; ** $p < 0.01$ (one-tailed); $df = 386$.
[a]Corrected for restriction of range.

As hypothesised, Table 3 shows that the correlations between personality and engagement were smaller than those for addiction. In fact, for the most part, correlations were minimal, with only that for negative valence being significant and even this not representing a small effect (Cohen 1988). Apart from negative valence, signs of correlation coefficients for engagement were opposite to those for addiction (however, to provide equity between the tests for addiction and engagement, even though the signs of engagement coefficients were mostly opposite to expectations, one-tailed tests were used for both scales in testing the Pearson's *r* coefficients). A one-tailed test of the difference between the pair of dependent addiction and (uncorrected) engagement coefficients (Williams 1959) reported for negative valence in Table 3 showed the positive coefficient for addiction to be significantly greater than that for engagement, $t(385) = 5.33$, $p < 0.01$ (similar tests for the other personality variables were superfluous given that addiction correlations were significant and that signs of engagement correlations were in the opposite direction).

Looking at the descriptive statistics in Table 2, it might be thought that the very small correlations for engagement in comparison to those for addiction can be explained by restriction of range in engagement scores. While no estimate of the standard deviation of scores in the absence of range restriction was available for the engagement scale (as would usually be required in correcting correlations for range restriction) to allow assessment of the effects of the lower variability in engagement scores, it was reasonable to approximate this standard deviation by substituting the current standard deviation for the addiction scale. This was then used to correct the engagement–personality correlations for attenuation. The bottom row of Table 3 shows that, while these corrections had some effect, the corrected correlations being slightly larger than the uncorrected correlations, the size of the correlations still did not approach those for the addiction scale (and the signs of these coefficients were still generally in the opposite direction). Hence, range restriction in engagement scores was not a major explanation of the differing size of the correlations for engagement and addiction.

The multiple regression analysis for engagement showed that negative valence was not quite a significant predictor (see Table 5). As would be expected from the (uncorrected) correlation coefficients, overall predictivity by the set of personality variables was low, with only around 2% of the variance in engagement scores being accounted for, $R = 0.13$, $R^2 = 0.02$, and the variables as a whole not being significantly predictive, $F(5,382) = 1.39$, $p = 0.23$.

4. Discussion

The study sought to compare personality correlates of a measure of engagement with personality correlates of a measure of addiction that included items tapping core facets of addiction, but that was free from items tapping peripheral criteria, which have previously been shown to be more highly related to engagement than addiction. In the bivariate correlational context, consistent with the hypotheses forwarded, addiction scores increased with decreasing extraversion, agreeableness, emotional stability, and attractiveness and increased as negative valence scores increased. For engagement, rather than being similarly signed but smaller than the relationships for addiction as hypothesised, apart from a slight but significant effect whereby negative valence increased with engagement, relationships with personality variables were minimal and oppositely signed. Thus, the contrast between the results for addiction and engagement was generally starker than predicted. The generally minimal correlations for engagement did not appear to be because of range restriction in engagement scores. Rather, there

Table 4. Prediction of game playing addiction scores from five personality variables: simultaneous multiple regression statistics ($N = 388$).

	sr	*B*	SE	Beta	*T*	*p* (2-tailed)
Extraversion	0.05	0.07	0.07	0.06	1.01	0.31
Agreeableness	−0.05	−0.08	0.07	−0.06	−1.18	0.24
Emotional stability	−0.18	−0.26	0.06	−0.23	−4.01	<0.01
Attractiveness	−0.11	−0.18	0.07	−0.14	−2.50	0.01
Negative Valence	0.22	0.30	0.06	0.24	4.75	<0.01

sr, semipartial correlation.

Table 5. Prediction of game playing engagement scores from the five personality variables: simultaneous multiple regression statistics ($N = 388$).

	sr	*B*	SE	Beta	*T*	*p* (2-tailed)
Extraversion	0.08	0.08	0.05	0.09	1.52	0.13
Agreeableness	0.06	0.07	0.06	0.06	1.15	0.25
Emotional stability	0.00	0.00	0.05	0.00	−0.06	0.95
Attractiveness	0.00	−0.04	0.06	−0.04	−0.64	0.52
Negative valence	0.09	0.09	0.05	0.10	1.82	0.07

sr, semipartial correlation.

appears to be genuine differences in the extent to which personality is related to the extent of (non-pathological) engagement in the playing of MMORPGs on the one hand, and addiction to playing such games on the other, this being consistent with Davis' (2001) model of PIU and supporting both the differential validity of the two constructs and the way that they were currently measured.

Multiple regression analysis for addiction showed that only emotional stability, attractiveness, and negative valence were independent predictors. While there were small effects whereby extraversion and agreeableness decreased as addiction increased, the correlations for these two variables with addiction were the lowest of all the personality variables. Taken together with the fact that extraversion and agreeableness were correlated both with each other and with the other personality variables (such correlations between scores on personality dimensions are common – Costa and McCrae 1992, Goldberg 1993), this resulted in them providing little in the way of a unique contribution to the prediction of addiction during multiple regression analysis (as shown by very small semipartial correlations). The regression analyses reflected the difference in the size of the bivariate relationships between the two game playing indices and the personality variables, 20% of the variance in addiction being predicted and only 2% of the variance in engagement being predicted. Although the former percentage is respectable, suggesting that, as is consistent with Davis' (2001) model, personality factors may play a substantial role in the development of addictions to playing MMORPGs (but see the later discussion on directions of causality), it still leaves much room for the role of other factors in accounting for why some people become addicted to playing such games. In this connection, it is important to point out that this study only included personality traits as predictors of addiction, and this is likely to be one explanation for the observation of only small and medium effect sizes for correlations between the different personality characteristics and addiction. Personality traits often interact with situational variables to produce emotional and cognitive states which then result in certain types of behaviour (Matthews and Deary 1998). Thus, for example, coupled together, low (trait) attractiveness and social isolation might produce a cognitive state of loneliness, which in turn might result in a tendency to play MMORPGs to a greater extent so as to achieve communion with, and positive validation from, other players. This would be consistent with Davis' (2001) cognitive-behavioural model, which depicts situational factors such as social isolation and lack of social support as combining with maladaptive cognitions (all three of which can be associated with the currently studied personality traits) to be causative of Generalised PIU. See Brown (1997) and Orford (2001) for discussions of other factors, such as one's social milieu and changing life circumstances, which may cause vulnerability to behavioural addictions.

Continuous approaches such as the psychometric approach adopted here and by others (e.g. Brenner 1997, Caplan 2002, Davis *et al*. 2002, Pratarelli *et al*. 1999) avoid the problems with categorical approaches such as those currently used in the DSM discussed in Section 1 but have the disadvantages of being less familiar to clinicians and providing less clear nomenclature (American Psychiatric Association 2000) – although lack of clarity might actually be an advantage where category boundaries are indistinct in that it reflects reality and is not misleading. The present measure has the advantage that it has been specifically designed not to confuse mere high engagement with addiction and the present results attest to the validity and importance of this distinction, increasingly greater scores on the addiction scale being related to increases in personality characteristics that have often been shown to be related to addiction, but increasingly greater scores on the engagement scale not exhibiting such relationships. Making a distinction between addiction and engagement is important in ensuring that the alarm generated by the existence of Internet-related addictions is not disproportionate to the threat that they pose. In fact it has been argued that using the term 'addiction' in connection with non-chemically-related behaviours trivialises chemical addictions (Jaffe 1990). Despite the fact that some clinics in the US and Europe now offer treatments for Internet and computer gaming addictions, such an argument probably has particular force with respect to the playing of MMORPGs where in general the negative life outcomes for people classifiable as addicted are seldom likely to be as severe as those for people who are behaviourally addicted to activities such as gambling or those who display chemical addictions. Nevertheless, the playing of MMORPGs is an increasingly popular activity (for example, the World of Warcraft variant now has over 9 million subscribers) and therefore concerns about behavioural addiction to MMORPGs are likely to become increasingly prominent.

The playing of Asheron's Call® is a highly specific domain of computing activity and the vast majority of researchers are unlikely to want to utilise psychometric measures of addiction and engagement that are specific to this game. However, the game was merely used as a vehicle for validating the distinction between addiction and engagement. Having accomplished this, and bearing in mind previous findings showing similarity

in factor analytic results involving computing in general and Asheron's Call® specifically (Charlton 2002, Charlton and Danforth 2007), researchers can have some confidence in the generic properties of the scales. This should allow their adaptation for use with other computing activities, and possibly wider technology-related activities, by simply substituting the activities which they are focusing upon into item wordings. This said, it would be good practice for researchers to obtain further evidence of the validity of any such adapted scales.

The development of norms for different activities and demographic groups would appear useful. If norms were developed, clinical usage of the addiction scale might consist of assessing the extent to which people suspected of having problems score reliably higher than people in the normal range. Likewise, it would be possible to gauge the effectiveness of clinical treatments for computer-related addictions by considering whether individuals whose scores are initially elevated beyond the normal range fall back into this range (see e.g. Kline 2000). It might also be possible to build up a system of norms within the abnormal range to evaluate severity of impairment.

In general, the current measures of personality traits were not related to engagement. This is supportive of the idea that high engagement is not problematic and gives some support to Steinkuehler and Williams (2006) who emphasise the positive social aspects of playing MMORPGs and suggest that such virtual environments can function as social environments in the same manner as offline environments such as public houses and coffee shops do. However, it is possible that at least some people, who are highly engaged, but non-addicted, can be in the developmental process of becoming addicted, response frequencies in previous work supporting the existence of a sequence whereby peripheral phenomena more indicative of engagement than addiction tend to be experienced before the core phenomena (Charlton and Danforth 2007). Therefore, future longitudinal studies examining long-term outcomes for people shown to be highly engaged but non-addicted on the present engagement and addiction scales would be useful.

Although the main aim of the study was to validate the distinctions between addiction and engagement and the associated core and peripheral addiction criteria, and at the risk of such comments being considered circular in the context of a validation study, it is useful to discuss the implications of the findings that, as the validation hypotheses suggested, certain personality factors are related to pathological use of MMORPGs. Having mentioned differences between findings of the bivariate and regression analyses above, the bivariate findings will be emphasised here.

The fact that addiction increased as attractiveness became lower supports the idea that people with low self-esteem may be particularly likely to become addicted to playing MMORPGs because playing such games provides a way of interacting with people without having to engage in face-to-face interactions. Likewise, the positive relationship between negative valence and addiction lends some credence to the possibility that the opportunities which MMORPGs provide for social reinforcement may constitute an attractive feature for people with personality traits that make them have a high need for such reinforcement. Together, the results for attractiveness and negative valence are consistent with a previous finding that people with lower self-esteem exhibit greater addiction to Internet-mediated activities, with addictive behaviours being engaged in to escape from feelings of inadequacy and worthlessness (Armstrong *et al*. 2000).

The observation that emotional stability decreased with addiction was in line with the proposition that less emotionally stable, more neurotic, people may be prone to MMORPG addiction because the games provide a means of escape from real-world problems, neurotic people preferring such coping strategies to problem-focused coping strategies (Bouchard 2003). Indeed, rather than a sense of excitement, in some cases of addiction, it is the sense of oblivion provided by an activity that holds the attraction (Brown 1997).

A small but significant negative relationship existed whereby less agreeable people exhibited higher addiction scores. This bears out the ideas that, at least to some degree, some people may become highly involved with MMORPGs because their personality characteristics make it difficult for them to form offline relationships (Landers and Lounsbury 2006), and that such games have an allure because they allow social relationships to be formed remotely, thereby reducing the potential for personality factors to impinge negatively upon social interactions. Finally, addiction also decreased with extraversion, this being consistent with previous findings of greater addiction to Internet-related activities among more introverted, shy, and lonely people (Morahan-Martin and Schumacher 2000, Moody 2001, Scealy *et al*. 2002, Chak and Leung 2004, Engelberg and Sjöberg 2004, Landers and Lounsbury 2006).

In ending, it is necessary to make some general points about this research. First, the findings for the different personality characteristics supported the assumption of Davis' (2001) model of PIU that factors such as psychopathology, social isolation, and lack of social support (all of which can be linked to the personality characteristics considered) can lead to Internet-related addictions. Thus, the general assumption in this article has been that certain personality

traits can lead to problematic game playing behaviours. However, the possibility of the existence of causal processes in the opposite direction should not be ignored. Indeed, Brown's (1997) model of behavioural addictions emphasises the importance of feedback loops with, for example, low self-esteem predisposing people to engage in addictive behaviours as a means of alleviating dysphoria, self-esteem temporarily increasing during the onset of addictions, but, because addictive behaviours bring about internal conflict and conflict with significant others, self-esteem ultimately reducing to a level lower than it was initially, thereby leading to even greater dysphoria. Also, longitudinal research has shown that a high degree of Internet use can lead to increases in loneliness and depression (Kraut *et al*. 1998).

A final point that merits consideration is about the methodology currently employed, namely that participants were recruited, and data were collected, via the Internet. In certain circumstances, the use of the Internet as a research medium can result in biased sampling (Hewson *et al*. 2003), and by targeting a website which is dedicated to the specific activity under consideration, it is probable that researchers will sample a larger number of people who are classifiable as addicted than would otherwise be the case (Charlton and Danforth 2007). Nevertheless, it seems likely that any bias caused by using Internet recruitment methods in this study will have been less than in many other studies in which such methods are used because the population of Asheron's Call® players is necessarily one of sophisticated Internet users. It is also worth emphasising that the factor structure for the current addiction and engagement data has been shown to be similar to that for general computing addiction and engagement data where data were collected using more traditional data collection methods (Charlton 2002, Charlton and Danforth 2007).

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Note

1. To give comparability across all analyses, this number excludes three multivariate outliers ($z > \pm 3.00$), which were identified across regression analyses for both addiction and engagement.

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Appendix. Wordings of items in Charlton and Danforth (2007) used in the addiction–engagement questionnaire

Addiction

I sometimes neglect important things because of an interest in Asheron's Call

My social life has sometimes suffered because of me playing Asheron's Call

Playing Asheron's Call has sometimes interfered with my work

When I am not playing Asheron's Call I often feel agitated

I have made unsuccessful attempts to reduce the time I spend playing Asheron's Call

I am sometimes late for engagements because I am playing Asheron's Call.
Arguments have sometimes arisen at home because of the time I spend on Asheron's Call
I think that I am addicted to Asheron's Call
I often fail to get enough sleep because of playing Asheron's Call
I never miss meals because of playing Asheron's Call
I have never used Asheron's Call as an escape from socialising
I often feel that I spend more money than I can afford on Asheron's Call

Engagement

It would not matter to me if I never played Asheron's Call again
I feel happy at the thought of playing Asheron's Call
The less I have to do with Asheron's Call the better
Asheron's Call is unimportant in my life
I would hate to go without playing Asheron's Call for more than a few days
I rarely think about playing Asheron's Call when I am not using a computer
I pay little attention when people talk about Asheron's Call
It is important to me to be good at Asheron's Call
I often experience a buzz of excitement while playing Asheron's Call
I like the challenge that learning to play Asheron's Call presents
Asheron's Call jargon sounds stupid to me
I can't understand why people like Asheron's Call