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Distinguishing Addiction and High Engagement in the Context of Online Game Playing^a

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Abstract

This study considered whether the distinction between core and peripheral criteria for behavioral addiction, previously drawn with respect to computing activities in general, applies in the specific area of Massively Multiplayer Online Game playing. Questionnaire items were administered over the Internet to 442 game players. Factor-analysis of the data supported the previous findings for computing in general. An addiction factor loaded on items tapping previously identified core criteria (conflict, withdrawal symptoms, relapse and reinstatement and behavioral salience) and a (non-pathological) engagement factor loaded on items tapping previously identified peripheral criteria (cognitive salience, tolerance and euphoria). Analysis of response frequencies supported the existence of a developmental process whereby peripheral criteria are met before core criteria. Players who might be considered addicted using a monothetic classification system involving only the core criteria were shown to spend a significantly greater amount of time playing per week than those endorsing only the peripheral criteria. It is concluded that the study supports the idea that it is inappropriate to use some of the previously used criteria for addiction when researching or diagnosing computer-related addictions. Implications of the present findings for Internet-mediated data collection methodologies are also discussed.

Keywords: Addiction; Impulse Control Disorders; Computer Games; Computer Attitudes; Taxonomies

1. Introduction

In the past few years much has been written about the idea that some people's involvement with the Internet can become so intense as to be pathological (e.g. Beard & Wolf, 2001; Brenner, 1997; Caplan, 2002; Davis, 2002; Davis, Flett, & Besser, 2002; Griffiths, 1998; Griffiths, Davies, & Chappell, 2003; Morahan-Martin & Schumacher, 2000; Pratarelli, Browne & Johnson, 1999; Pratarelli & Browne, 2002; Shapira, Lessig, Goldsmith, Szabo, Lazoritz, Gold, & Stein, 2003; Young, 1996). The term adopted in describing this behavior has varied, problematic Internet use, pathological Internet use and Internet addiction being but three names used. Usage of the term addiction has been considered controversial. For example, the DSM-IV-TR (APA, 2000) does not include the term either in connection with the ingestion of drugs, where terms such as substance dependence and substance abuse are preferred, or in connection with behaviors such as gambling, where the term pathological gambling is preferred (see Charlton [2002] and Holden [2001] for further discussion of this issue). However, Brown (e.g. 1991, 1997) has argued that the concept of addiction is useful and that it should not be restricted to the ingestion of substances. Because Brown's work is fundamental to the present study, for the most part we will write in terms of addiction here.

Charlton's (2002) study considered the viability of a scheme adopted by Griffiths in discussing behavioral addictions in general (Griffiths, 1996) and technological addictions (including computer games) in particular (Griffiths, 1995). This scheme was based largely on Brown's (1991, 1993) criteria for behavioral addiction and had much in common with schemes used for studying computer-related addictions that have been adapted from DSM criteria for pathological gambling (e.g. Griffiths & Hunt, 1998; Young, 1996).

Briefly, the six criteria of Brown adopted by Griffiths in his above articles can be summarized as follows: salience – domination of a person's life by the activity; euphoria – a 'buzz' or a 'high' is derived from the activity; tolerance – the activity has to be undertaken to a progressively greater extent to achieve the same 'buzz'; withdrawal symptoms – cessation of the activity leads to the occurrence of unpleasant emotions or physical effects; conflict – the activity leads to conflict with others or self-conflict; relapse and reinstatement – resumption of the activity with the same vigor subsequent to attempts to abstain (Charlton, 2002; Griffiths, 1996). Brown's system of classification adopts a monothetic format in that all specified criteria have to be met for a positive diagnosis to be made. This can be contrasted with polythetic systems, such as that adopted in the DSM-IV-TR, in which endorsement of a certain number of criteria from a larger set is required for a positive diagnosis.

The notion of computer-related addictions can be contrasted with the concept of high computer engagement introduced by Charlton and Birkett (1995) and shown to be a positive attribute by Charlton and Birkett (1999). Although high engagement involves a high degree of computer usage, this usage is non-pathological in that it does not have negative consequences for the individual, the existence of negative consequences being a

crucial feature in defining excessive appetitive behaviors in general (Orford, 1985), pathological Internet use (Beard & Wolf, 2001; Caplan, 2002; Morahan-Martin & Schumacher, 2000), and impulse control disorders in the DSM-IV-TR. Thus, it is possible that exactly the same high degree of computer use exhibited by two people might be considered either pathological or non-pathological depending upon the impact that this has upon their life. Nonetheless, usage is likely to be higher in a population of addicted individuals than in a population of highly engaged individuals, since, all other things being equal, negative effects should rise with usage.

High engagement should not be confused with the concept of positive addiction forwarded by Glasser (1985) since the latter features withdrawal symptoms, such as guilt and anxiety, when a behavior (such as running or meditation) is not performed according to schedule. These withdrawal symptoms compel an individual to perform a behavior in order to relieve the symptoms, although the behaviors have positive effects in the form of increasing self-esteem rather than negative outcomes such as conflict. With high engagement, the absence of withdrawal symptoms means that the individual is not compelled to perform the behavior towards the end of symptom alleviation, but rather engages in the behavior in pursuit of enjoyment.

Charlton (2002) argued that over-estimation of the frequency of computing-related addictions, including Internet-related addictions, can occur because some previously used addiction criteria might only indicate high engagement, and that this is particularly problematic when researchers adopt the DSM's polythetic diagnostic system for classifying pathological computer-related behaviors. Specifically, factor analysis showed that items tapping Brown's tolerance and euphoria criteria, and a subset of salience criteria concerning cognition, had both an addiction factor and an engagement factor loading highly upon them, with the latter factor loading more highly (these criteria were labeled 'peripheral' criteria). In contrast, items tapping Brown's, relapse and reinstatement, conflict and withdrawal criteria, and a subset of salience criteria concerning behaviors, all had the computer addiction factor loading uniquely upon them (these were labeled 'core' addiction criteria in the sense that they were taken as being central to the diagnosis of addiction). Charlton argued that only the core criteria are unambiguously indicative of computer-related addictions, and that either these criteria alone should be used when classifying cases as addicted, or that at least they should be given a greater weighting during such classification.

The above findings partially support the arguments of Beard and Wolf (2001) that certain diagnostic criteria for Internet addiction should be considered necessary but not sufficient for a diagnosis of Internet addiction. Commenting upon the adapted pathological gambling classification criteria adopted by Young (e.g. 1996), these authors argued that being preoccupied with something (cognitive salience) and wanting to spend an increasing time on something (tolerance) are not necessarily characteristics of Internet addiction, and Charlton's results supported this. On the other hand, Charlton's study was not supportive of Beard and Wolf's similar arguments with respect to unsuccessfully cutting back on a behavior (relapse and reinstatement), and experiencing dysphoria when not engaging in a behavior (withdrawal symptoms).

1.1. The present study

Recently attention has begun to focus upon the addictive possibilities of Internet-mediated games. For example, college students endorsing a greater number of indicators of pathological Internet use have been shown to play online games more than those endorsing fewer or no indicators (Morahan-Martin & Schumacher, 2000). Also, in a study of the socio-demographic characteristics of online game players, Griffiths, Davies & Chappell (2003) analyzed data provided by players of the game Everquest. This is a variant of a group of games that have come to be referred to as Massively Multiplayer Online Role-Playing Games (MMORPGs). In this survey it was found that 25% of players played for more than 41 hours per week, and the authors suggested that these people may well have been addicted since playing to this extent would be highly likely to have an impact upon other aspects of a person's life. MMORPGs may be particularly addictive because they are characterized by a combination of two features. First, in MMORPGs players take-on the role of a character in a virtual environment in which a story line evolves over time and the time frame in which an event will occur is unpredictable. Thus, these games may be addictive because they are particularly good at inducing operant conditioning via variable-ratio reinforcement schedules (a highly effective conditioning paradigm [Wallace, 1999]). Second, since other players are also online and interacting with the character one has adopted, the acclaim and attention of others provides social reinforcement: another important feature of potentially addictive Internet activities (Morahan-Martin & Schumacher, 2000; Wallace, 1999).

One limitation of Charlton's (2002) work was that it was only able to infer implications for Internet-related behaviors since it considered computing addiction and engagement in general, rather than focusing upon any specific Internet-mediated activity. Furthermore, in the aforementioned study respondents were higher education students and few truly computer addicted respondents would have been expected to be contained in the sample obtained given that the frequency of computer-related addictions in the general population is likely to be very low (Charlton, 2002; Griffiths, 1998). The present study sought to address these limitations, asking whether Charlton's observations hold in a population of individuals who engage in a potentially addictive Internet-mediated pursuit: the playing of a specific type of MMORPG. If this were found to be the case, this would validate the argument that peripheral criteria (euphoria, tolerance and cognitive salience) should not play a great role in the classification of computing-related addictions.

The study set out to replicate Charlton's (2002) factor analytic results by adapting his general computing items to focus upon a MMORPG entitled Asheron's Call: a type of computing activity which may be particularly addictive in that it combines the provision of rewards according to a variable-ratio reinforcement schedule and possibilities of social reinforcement. By using a web-based data collection methodology to collect data from a geographically diverse group of respondents who engaged in a potentially addictive computing activity, the study targeted a population that would be expected to contain a large number of addicted people (however that may be defined). Although, as previously discussed, playing time would not be expected to have isomorphic relationships with addiction and high engagement, brief attention was also paid to the extent to which players who might be said to be addicted spend a greater amount of their time playing

than those appearing to be highly engaged. It was anticipated that this might constitute one means of validating the distinction between core and peripheral addiction criteria.

Attention was also paid to the notion that a developmental process might exist in which high engagement precedes addiction (Charlton, 2002). Here it was expected that there would be an asymmetry whereby players who endorsed high numbers of core addiction criteria would endorse high numbers of peripheral criteria, but that players who endorsed high numbers of peripheral criteria would not necessarily endorse high numbers of core criteria.

Finally, in its use of an online data collection method, the study also had implications for the literature concerning the viability of such methods (e.g. Buchanan, 2001; Buchanan & Smith, 1999). Hence, an interesting aspect of the study centered upon whether the factor analytic results obtained by Charlton using a pencil and paper methodology would be replicated using an online data collection method.

To put the present research into context, it is useful to note that it differs from that of authors such as Caplan (2002), Davis *et al.* (2002), Morahan-Martin and Schumacher (2000), Pratarelli *et al.* (1999), and Pratarelli and Browne (2002). Some of these authors have included items that appear to tap aspects of high engagement in factor analyses and, in common with the present authors, often stress the idea that pathological Internet usage is signaled by the presence of negative consequences. However, in contrast to the present work, none of these authors have specifically aimed to delineate pathological and non-pathological indicators of Internet-related cognitions and behaviors by considering the implications of the results when items explicitly tapping high engagement are factor analyzed along with items tapping criteria previously used in the classification of pathological Internet usage as pathological. Rather, the aforementioned authors have variously used factor analysis to identify the constructs underlying computer and Internet addiction (Pratarelli *et al.*, 1999), to model the relationship between Internet addiction, using the Internet for sexual gratification and miscellaneous other purposes (Pratarelli & Browne, 2002), to measure and consider procrastination, diminished impulse control, loneliness and depression, and social comfort as elements of problematic Internet use (Davis, *et al.*, 2002), to develop an instrument to measure different dimensions of problematic Internet usage (Caplan, 2002), and to examine relationships between pathological Internet use and Internet behavior and attitudes (Morahan-Martin & Schumacher, 2000).

2. Method

2.1. Design

Factor analysis was used to examine the loadings of factors on 29 items aiming to tap Asheron's Call engagement and addiction. Since some complex items were expected, exploratory factor analysis was preferred to confirmatory factor analysis.

2.2. Participants

Participants were players of Asheron's Call (either version 1 or 2) accessing the Crossroads of Dereth website (<http://ac.xrgaming.net>). Participants were self-selecting through completion of a web-based questionnaire. Responses were solicited on the website with a raffled prize incentive of two months free game-play (monetary value = US \$26).

Five-hundred and eight sets of questionnaires were collected, 66 of which were excluded for various reasons such as failure to answer two or more questions, providing obviously meaningless responses, or, for ethical reasons, respondents being under 18 years of age.

Males constituted the vast majority (85.7%) of the 442 participants providing valid data sets. The 379 males were in the age range 18 to 67, with a mean age of 28.83 years, and SD of 8.86 years. Females formed 13.8% of participants (n= 61), with ages ranging from 18 to 50, a mean age of 32.87 years and SD of 8.12 years. Gender data for two participants was missing.

The majority of participants resided in the US and Canada (n = 378: 85.5%), followed by those living in Europe (n = 42 : 9.5%), Australia and New Zealand (n = 15: 3.4%), and a small number from other countries (n = 6: 1.4%). Residency data from one participant was missing.

Excluding one person who claimed to play for 100 hours per week, participants played Asheron's Call for a mean of 18.64 hours per week (SD = 11.79 hours).

2.3. Materials

The wider project, of which the issues considered here were part, used two measures: an Asheron's Call-specific Addiction – Engagement questionnaire and Saucier's (1997) IPIP Seven Factor Personality Scale. Since the data from this latter 70 item instrument is not discussed in the present paper, this scale is not described further.

The Addiction – Engagement questionnaire was a 29 item instrument modified to be Asheron's Call specific from the Addiction – Engagement portions of Charlton's (2002) general computing questionnaire. For example, the statement 'The less I have to do with computers the better' (Charlton, 2002, p.336), became 'The less I have to do with Asheron's Call the better'. One engagement statement ('I like to watch documentaries about computers on television' [Charlton, 2002, p. 336]) was omitted because there were no Asheron's Call documentaries for the modified version to refer to. Because of their limited relevance, the Anxiety – Comfort items in Charlton's original questionnaire were not included in the present study. To increase variability in responding, the original five-point Likert-type agree – disagree response format was changed to a seven-point format, with responses ranging from Completely Agree to Completely Disagree. Statements designed to tap Brown's addiction criteria are presented in Table 1 (the prefixes AP and AC indicate which items tap Charlton's [2002] peripheral and core criteria respectively). The questionnaire also contained questions relating to Asheron's Call usage, including items asking whether version 1 or 2 was played mainly and how many hours per week in total were spent playing. Finally, demographic information including gender, age, and country of residence was requested.

---- Table 1 Here ----

2.4. Procedure

Participants completed a web-based questionnaire including both the Addiction – Engagement questionnaire and the personality scale. The whole task took less than 15 minutes to complete. Data was collected over a two week period. Before completing the questionnaire all participants viewed a brief explanation of the study and were informed of their rights as participants, in accordance with the American Psychological Association’s Ethical Principles for treatment of participants (APA, 1992). Participants were debriefed through e-mail.

3. Results

3.1. Factor analysis

An initial Principal Components Analysis produced a scree plot suggesting the presence of two components. Subsequently, Principal Axis Factoring (PAF), with Direct Oblimin (oblique) rotation was performed with two factors specified.

The two factors in the PAF analysis accounted for around 32% of item variance. Factor 1 accounted for around 25% of variance and Factor 2 for around 7%. A correlation of $-.327$ between the two factors showed that oblique rotation was warranted. Table 2 shows rotated factor pattern loadings and communalities after extraction. In the table, items prefixed A are items aimed at rounding out an addiction factor but not at tapping Brown’s criteria, items prefixed AC are items tapping Brown’s criteria which were labeled core criteria by Charlton (2002), items prefixed AP are items tapping Brown’s criteria labeled peripheral by Charlton, and items prefixed E are items aimed at tapping engagement.

---- Table 2 Here ----

The first factor was labeled Addiction since it corresponded closely with Charlton’s (2002) Addiction factor. Here, 12 out of 14 ‘A’ and ‘AC’ variables had the Addiction factor loading highly (greater than $\pm .32$) upon them, with the remaining two (A17 and A16) being loaded highly by the second factor. The second factor corresponded well with Charlton’s previous Engagement factor, although algebraic signs of loadings were reversed and the factor was interpretable as Low Engagement (or apathy). Thirteen of the 15 ‘E’ and ‘AP’ variables loading Charlton’s (2002) Engagement factor had this factor loading highly upon them. However, one of the previous engagement items (E11) had the Addiction factor loading highly upon it and neither of the factors loaded highly upon another of the engagement items (E3).

Despite the slight differences observed, the above analysis offered unqualified support for Charlton’s previous substantive findings. Thus, items tapping conflict with other activities (items AC6 and AC10), inter-personal conflict (AC9), withdrawal symptoms (AC14), relapse and reinstatement (AC12) and behavioral salience (items AC5

and AC13) were all factor pure and all had the Addiction factor loading highly upon them. This validated the idea that these items were tapping core addiction criteria. Items tapping tolerance (AP1), euphoria (AP2) and cognitive salience (AP3) all had the Engagement factor loading highly upon, thereby validating the idea that these items tapped criteria which are peripheral to addiction. The non-complex nature of the two latter items (Addiction loadings less than +/- .32) represented the only slight deviations from Charlton's substantive results.

3.2. Frequency analyses

To assist consideration of the impact that the above findings are likely to have upon addiction classification decisions, it was useful to examine the frequencies with which each of the 10 items tapping Brown's criteria were endorsed. Responses for each item were dichotomized across lower and upper halves of the seven-point Likert-type scale into responses (putatively) characterizing addiction and non-addiction (with mid-scale responses being discarded). It was reasoned that the higher the frequency of endorsement of items tapping the three peripheral criteria, the greater the impact of including these items in a classification scheme may be. The resulting frequencies are shown in Figure 1.

---- Figure 1 Here ----

In the main, Figure 1 shows that items tapping the three peripheral criteria were more likely to be endorsed than any of the seven items representing the core criteria. To shed light upon the implications of these frequencies for classification issues and to assist consideration of possible developmental processes, a further analysis of endorsement frequencies considered patterns of endorsement jointly across the two groups of criteria. These patterns are shown in Table 3 which represents a cross-tabulation of respondents endorsing relatively low (none or 1) and high (2 or 3) numbers of peripheral criteria, and respondents endorsing relatively low (0, 1, 2 or 3) and high (4, 5, 6 or 7) numbers of core criteria. Not surprisingly given that the factors in the factor analysis were correlated, a chi-square test showed a significant association between endorsement of a high number of peripheral criteria and a high number of core criteria ($\chi^2=16.13$, $df=1$, $P <.001$). As will be discussed, this observation tempers some of the conclusions which might otherwise be drawn from the present data.

With respect to possible developmental processes, the most important cells to consider in Table 3 are those in the diagonal consisting of the top right and bottom left cells, showing the number of respondents endorsing a high number of peripheral criteria but a low number of core criteria and the number endorsing a high number of core criteria but a low number of peripheral criteria. If respondents tend to proceed through a stage of high engagement prior to addiction, the frequency in the former cell would be expected to be larger than that in the latter cell, as is the case. Application of McNemar's Change Test to the frequencies in these two cells showed that this response asymmetry was significant ($\chi^2=178.60$, $df=1$, $P <.001$). Another way of considering this asymmetry is to compare frequencies across the rows of the table. Here, people endorsing a high number of peripheral criteria but a low number of core criteria constitute around 62% of the total

number of people endorsing a low number of core criteria, but people endorsing a low number of peripheral criteria but a high number of core criteria constitute around 15% of the total number of people endorsing a high number of core criteria. The overall pattern of frequencies in Table 3 also explains why Figure 1 shows that more peripheral criteria were endorsed than core criteria: people endorsing core criteria tended to endorse peripheral criteria to a greater extent than people who endorsed peripheral criteria tended to endorse core criteria.

---- Table 3 Here ----

3.3. *Time spent playing*

As mentioned in the Introduction, in general one would expect addicts to perform an activity for a greater amount of time than those who are highly engaged, albeit that degree of usage should not be used as a basis for classifying individuals as addicted. Therefore, it was useful to consider differences in time spent game playing between people who may be considered to be addicted to playing Asheron's Call and those who may be considered to be merely highly engaged. In order to do this, two groups were formed. Using the data as dichotomized for the previously reported frequency analyses an 'addicted' group was formed consisting of those players who endorsed items concerning all four core criteria (withdrawal, relapse and reinstatement, at least one of the three conflict items and at least one of the two behavioral salience items). For the purposes of argument only, these players were categorized as addicted irrespective of their responses to items tapping the three peripheral criteria (cognitive salience, tolerance and euphoria). A second group of highly engaged players was then formed consisting of players who endorsed all three of the peripheral criteria but who had not endorsed any of the four core criteria.

A comparison of the amount of time spent playing Asheron's Call by the two above groups of people showed that those classified as addicts (mean playing time = 31.92 hours per week, SD = 22.72 hours, n = 13) played for 15.84 hours per week longer than those classified as highly engaged (mean playing time = 16.08 hours per week, SD = 7.61 hours, n = 13)¹. A Mann-Whitney test (used because of non-normal time distributions for both groups) showed that this difference in the hypothesized direction was significant (mean rank for addicts = 16.08, mean rank for highly engaged = 10.92, $U = 51$, $P = .045$ one-tailed).

4. Discussion

The pattern of factor loadings in the present study showed that the general computing observations of Charlton (2002) were replicable for a specific Internet-mediated activity with addictive properties. As in the earlier study, the present Addiction factor loaded uniquely upon items tapping Brown's (1991, 1993) conflict, behavioral salience,

¹ The person previously mentioned as claiming to play for 100 hours per week did not fall into either of the two groups formed.

withdrawal and relapse and reinstatement criteria for behavioral addiction. On the other hand, the present Engagement factor loaded more highly than the Addiction factor upon items tapping tolerance, euphoria and cognitive salience criteria. This pattern was exactly the same as that observed in Charlton's study. However, a minor difference was that the present Addiction factor had a much lower loading on the item tapping euphoria (.13 here versus .39 in Charlton's study). Thus, with respect to this criterion, the present findings are slightly more pronounced than those of Charlton: in the context of Internet-related activities that have particularly addictive properties, euphoria may be only very weakly related to addiction.

The present more pronounced finding concerning euphoria may be explained by Brown's (1997) work in which he incorporated Apter's (1982) theory of psychological reversals into his Hedonic Management Model of Addiction. Here addiction is said to involve the discovery that a certain behaviour can consistently and reliably allow hedonic tone and arousal to be manipulated to achieve a desired state. Brown further noted that in some instances of addiction it is oblivion rather than excitement that is sought. Griffiths has acknowledged this, suggesting that using the Internet can be rewarding because it allows people to become deeply immersed in an alternative environment. He therefore emphasizes the criterion of mood modification rather than euphoria in his writings on Internet addiction (Griffiths, e.g. 1998, 1999). Hence, in addition to the operant conditioning and social reinforcement possibilities that the playing of MMORPGs affords, the addictive potential of adventure games such as Asheron's Call may also lie in their immersive properties, and future work in the present mould might consider this possibility.

Despite the above qualification, as far as the substantive point of the present research is concerned, the study supported the idea that the criteria of tolerance, euphoria and cognitive salience are of limited use in the classification of people as behaviorally addicted to computing behaviors. In addition to having implications for the work of authors such as Griffiths and Hunt (1998) and Young (1996) as discussed by Charlton (2002), this finding has implications for the later work of Davis and colleagues. Here, based upon 'a cognitive-behavioral model of pathological Internet use' developed by Davis (2001), Davis, Flett and Besser (2002) developed the Online Cognition Scale (OCS). The OCS was said to measure four dimensions of problematic Internet use: Diminished Impulse Control, Loneliness/Depression, Distraction and Social Comfort. From inspection of the items making up each of the four subscales, it appears as though three of the 10 items in the Diminished Impulse Control subscale may tap cognitive salience ('I often keep thinking about something I experienced online well after I have logged off', 'When I am not online I often think about the Internet', and 'I can't stop thinking about the Internet'). Other items on this subscale may be said to tap euphoria ('When I am on the Internet, I often feel a kind of rush or emotional high.'), self-conflict ('I use the Internet more than I ought to'), inter-personal conflict ('People complain that I use the Internet too much'), and relapse and reinstatement ('Even though there are times when I would like to, I can't cut down on my Internet use')². Davis *et al.* presented the results of a confirmatory factor analysis showing that a latent variable, which they termed Problematic Internet Use, loaded upon each of the four subscales. However, no analysis

² Additionally, one item in the loneliness/depression subscale ('I am bothered by my inability to stop using the Internet so much') may tap relapse and reinstatement.

of the internal factor structure of the OCS was presented, and based upon the present evidence it can be argued that these authors' Diminished Impulse Control subscale consists of a mixture of items tapping core pathological indicators (whether these be labeled in terms of addiction, problematic Internet use, or one of the many other terms that have been used to indicate pathology in this area), and peripheral non-pathological (engagement) indicators.

Following Charlton (2002), with variables dichotomized as mentioned in connection with the frequency and usage analyses reported in the Results section, a comparison was made of the number of respondents who might be classified as addicted using a scheme similar to that previously used by authors such as Griffiths and Hunt (1998). Using a cut-off of 5 out of 10 responses as a criterion for addiction (which was proportionately the same as that used by the aforementioned authors and the same as that used for comparison by Charlton [2002]), 38.7% (171) of participants in the present study would have been classified as addicted. These figures are greater than the 8.4% of general computer users who would have been classified as addicted using exactly the same scheme in Charlton's study, and the 16% apparently so classifiable in the Griffiths and Hunt study of computer game players. The differences in these percentages illustrate the obvious points that the nature of the population targeted and the method of data collection used can have a great impact upon the number of people who might be said to be behaviorally addicted to any activity. Thus, the present study identified more possible game playing addicts by collecting data from users of a web site dedicated to the computer game under consideration, than was the case in Charlton's study with respect to possible general computer use addicts where data were collected from student computer users on a broad range of higher education courses. Griffiths and Hunt's study, which collected data from adolescent computer game players using paper questionnaires distributed at a comprehensive school, is also likely to have identified fewer possible addicts relative to the present study for a similar reason.

Across participants as a whole, examination of the frequency with which the 10 items tapping Brown's criteria were endorsed showed that for the most part items concerning the three peripheral criteria were endorsed more frequently than those tapping the core addiction criteria. However, the implications of the high degree of endorsement of peripheral criteria are ameliorated by the observation that players endorsing higher numbers of core criteria also tended to endorse higher numbers of peripheral criteria, but that players endorsing higher numbers of peripheral criteria did not necessarily endorse higher numbers of core criteria.

Taking only the seven items tapping core criteria into account and using a cut-off that is proportionately the same as that for the calculations above, the criterion for addiction is endorsement of 3.5 items. (While obviously nonsensical for practical purposes, involving as it does allocation of half the people endorsing three core items to the 'addicted' group, use of such a criterion allows direct comparison with the previously mentioned classification figures.) With this criterion, 28.7% (127 people) would be classified as addicted. Thus, relative to the criterion involving items tapping both core and peripheral criteria there is a 10 percentage point decrease (44 people) in players classifiable as addicted.

From the above we can conclude that the classification status of people endorsing a large number of the core criteria and also endorsing the peripheral criteria is not at

issue. It is the status of those people (forming 10% of the sample in this study) who are at the borderline or just below the borderline that is at issue. Such people may be classified as addicted based largely upon the fact that they meet (peripheral) criteria that are characteristic of many game players, and that are indicative of high engagement rather than addiction.

Considering the implications of the present data for a monothetic classification system, then, in Charlton's (2002) study none of the 404 respondents were classifiable as addicted under such a system, which required endorsement of all Brown's behavioral addiction criteria (the three peripheral criteria, and the four core criteria, including the withdrawal and relapse and reinstatement items and at least one of the behavioral salience items, together with at least one of the conflict items in the latter group of criteria). For the present data, 1.8% of respondents (8 out of 442) would have been categorized as addicted using such a scheme. The greater number of respondents classifiable as addicted under such a scheme in the current study can again be attributed to the nature of the population targeted and to the data collection methodology used.

Although a longitudinal study would be more emphatic, the present data provided some support for the idea of a developmental sequence whereby people tend to experience the peripheral phenomena before the core phenomena (Charlton, 2002). If one considers the nature of the peripheral criteria this seems entirely logical. While experiencing great excitement when game playing, having one's thoughts dominated by game playing and engaging in game playing for increasing amounts of time are not problematic in themselves, if the high involvement with a game that these criteria signal remains high, eventually this may well lead to the problems encompassed by the core criteria. The theoretical paper of Davis (2001) provides some pointers as to why some people proceed from high engagement to addiction while others do not. This author developed a cognitive-behavioral model of pathological Internet use in which the availability of, and awareness of, the Internet, pre-existing psychopathology (such as depression, social anxiety or substance abuse) and situational cues providing reinforcement of Internet usage behaviors, interact to produce maladaptive cognitions. Under certain circumstances (e.g. social isolation and / or lack of support), these cognitions result in Generalized Pathological Internet Use (Generalized PIU). Davis contrasted Generalized PIU with Specific PIU. The former constitutes global maladaptive use of the Internet where pathology would not exist in the absence of the Internet (e.g. compulsive use of the Internet's communicative features – chat rooms, bulletin boards, e-mail – to avoid other responsibilities), and the latter, use of the Internet as a medium for engagement in activities that would be pursued maladaptively irrespective of the Internet's existence (e.g. gambling, compulsive use of pornography). Whereas social isolation is viewed as an important factor in the genesis of Generalized PIU, this is not the case with Specific PIU. There is some support for this in that people classified as pathological Internet users have been found to be more lonely than people exhibiting no symptoms or limited symptoms (Morahan-Martin & Schumacher, 2000). Although such issues are beyond the scope of the present paper, using classification schemes of the type presently discussed, we are presently comparing the extent to which personality differences exist between Asheron's Call players who may be considered to be addicted on the one hand and highly engaged on the other. Using the addiction – high engagement distinction in this way should help elucidate the extent to which models such as that of

Davis can be expanded to include personality factors such as introversion and neuroticism as causes of social isolation and loneliness.

A final point of discussion involving the substantive issues presently addressed is that a test comparing the time spent playing Asheron's Call by those characterized by all four core addiction criteria and by those characterized only by the three peripheral criteria showed a significant difference whereby on average the former people played the game for an amount of time equivalent to almost two working days per week more than the latter. This supports the contention that the two presently considered types of criteria are qualitatively different.

Moving on to secondary issues, the study confirmed that online gaming is largely a male preserve, the observation that around 85% of respondents were male being exactly in accordance with the recent socio-demographic analysis of MMORPG players by Griffiths *et al.* (2003). Also, the present replication of Charlton's findings adds to literature showing that it is possible to obtain equivalent factor analytic results using traditional pencil and paper and Internet data collection methodologies (e.g. Buchanan & Smith, 1999). The study also showed that findings using traditional methodologies can be replicated via the Internet even where the topic under examination is computing-specific. Although it might be expected that replication difficulties will occur when '...the constructs being tested...interact with the testing medium' (Buchanan, 2001, p.61), the present findings show that this is not necessarily the case. However, researchers still need to consider the effects that their sampling methodology may have upon the conclusions that they draw. For example, as the previous comparison of the present percentages with those of Charlton (2002) and Griffiths and Hunt (1998) implied, by targeting a web site dedicated to a particular game researchers are likely to recruit a particularly high number of individuals who may be addicted to that game. Hence, studies seeking to assess the prevalence of a psychological phenomenon and using data collection methods that respectively interact and do not interact with that phenomenon are likely to reach widely varying conclusions as to its prevalence. This adds a new dimension to the point that studies specifically aiming to recruit people considering themselves to be 'Internet addicts' are bound to obtain samples in which pathological Internet users are over-represented (Morahan-Martin & Schumacher, 2000; Wallace, 1999).

4.1. Conclusions

There are currently no agreed criteria for defining pathological Internet use, or other types of pathological computer use (Morahan-Martin & Schumacher, 2000), but work of the present type can be useful in helping to foster a consensus by identifying clusters of pathological and non-pathological symptoms.

The present replication, performed in the context of online game playing, of the previous finding for computing behaviors in general reinforces Charlton's (2002) conclusions that there is an important distinction between indicators of addiction and indicators of high engagement, and that mistaking the latter for the former is likely to lead to over-estimates of the prevalence of pathological computer-related behaviors, particularly when using polythetic classification systems. The study also reinforces

Charlton's conclusion that it would be useful for researchers into other types of addictive behaviors to consider this distinction.

The results concerning factor analytic non-complexity and complexity of items imply that researchers should exclude items tapping cognitive salience and euphoria when devising systems for the classification of pathological Internet use, and either exclude or give a lower weighting to items tapping tolerance. However, such recommendations are not quite as straightforward as they seem since in some instances the operational definitions of criteria appear blurred. Thus, as Griffiths (1998) has remarked, there appear to be problems with some of the items in Brenner's (1997) questionnaire attempting to measure 'Internet Related Addictive Behavior' using items said to be based upon the DSM-IV criteria for substance abuse / dependence. For example, an item worded 'If it has been a while since I last logged on, I find it hard to stop thinking about what will be waiting for me when I do' was said to tap withdrawal symptoms. But with respect to withdrawal both the DSM-IV (APA, 1995) and DSM-IV-TR emphasize physiological symptoms and their behavioral and cognitive concomitants, albeit that a craving to ingest a substance to relieve symptoms is said to be a virtually universal feature of withdrawal. Thus, a rather large inferential leap is needed to claim that this item is measuring withdrawal: rather it could be argued that such an item involves cognitive salience. In a similar vein, an item phrased 'I have been told I spend too much time on the net' was said to tap tolerance. In the context of substance dependence, the DSM-IV-TR refers to tolerance as involving either the need to ingest increasing amounts of a substance to achieve the desired effect or the experiencing of a diminished effect from the same amount of a substance. Thus, again many assumptions have to be made to claim that the above item represents tolerance. The two aforementioned items (the latter one slightly amended) also appear in Morahan-Martin and Schumacher's (2000) questionnaire measuring pathological Internet use, it appearing probable that these authors included the items as indicators of withdrawal and tolerance. These points illustrate that in considering the implications of the current results for the past and future literature it is necessary to go beyond the construct labels that researchers attach to questionnaire items and to consider the meaning of the items themselves since different labels can mean different things to different researchers.

In ending, it is worth noting that the present findings are broadly supportive of recent suggestions by Shapira *et al.* (2003). These authors have moved away from the use of criteria adapted from the DSM criteria for the impulse control disorder of pathological gambling (e.g. Griffiths & Hunt, 1998; Young, 1996), towards the derivation of criteria specifically formulated to address problematic Internet use, paying attention to the general features of impulse control disorders contained in the DSM-IV-TR. In doing this, Shapira *et al.* have proposed criteria for the diagnosis of problematic Internet use that avoid reference to euphoria and tolerance and only involve cognitive salience insofar as this leads to significant problems. The present work suggests that this represents a step forward relative to much previous DSM-related work in this area.

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Figure 1. Percentage of respondents endorsing each item tapping one of Brown's criteria (items relating to the three peripheral criteria are presented first).

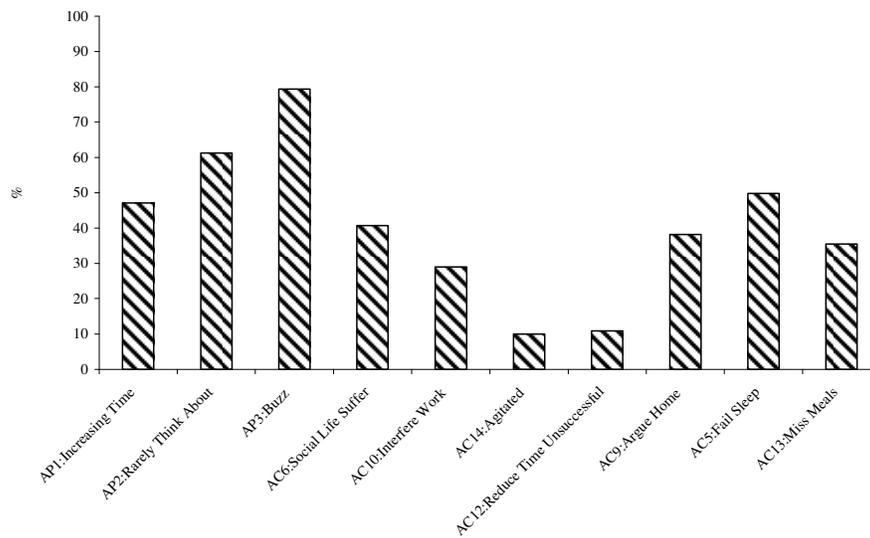


Table 1

Items modified from Charlton (2002) tapping Brown's behavioral addiction criteria

- AP1: Tolerance: I tend to want to spend increasing amounts of time playing Asheron's Call.
- AP2: Euphoria: I often experience a buzz of excitement while playing Asheron's Call.
- AP3: Salience (cognitive): I rarely think about playing Asheron's Call when I am not using a computer.
- AC5: Salience (behavioral): I often fail to get enough sleep because of playing Asheron's Call.
- AC6: Conflict (with other activities): My social life has sometimes suffered because of my playing Asheron's Call.
- AC9: Conflict (inter-personal): Arguments have sometimes arisen at home because of the time I spend playing Asheron's Call.
- AC10: Conflict (with other activities): Playing Asheron's Call has sometimes interfered with my work.
- AC12: Relapse and reinstatement: I have made unsuccessful attempts to reduce the time I spend playing Asheron's Call.
- AC13: Salience (behavioral): I never miss meals because of playing Asheron's Call.
- AC14: Withdrawal symptoms: When I am not playing Asheron's Call, I often feel agitated.

Table 2

Oblique factor pattern loadings and communalities for the PAF analysis

	Factor 1	Factor 2	h^2
Factor 1 – Addiction			
A7. I sometimes neglect important things because of an interest in Asheron's Call	.74	-.04	.56
AC6. My social life has sometimes suffered because of me playing Asheron's Call	.69	-.02	.48
AC10. Playing Asheron's Call has sometimes interfered with my work	.66	.06	.41
AC14. When I am not playing Asheron's Call I often feel agitated	.62	-.07	.39
AC12. I have made unsuccessful attempts to reduce the time I spend playing Asheron's Call	.62	.08	.35
A4. I am sometimes late for engagements because I am playing Asheron's Call	.55	-.18	.39
AC9. Arguments have sometimes arisen at home because of the time I spend on Asheron's Call	.54	-.11	.34
A8. I think that I am addicted to Asheron's Call	.53	-.31	.48
AC5. I often fail to get enough sleep because of playing Asheron's Call	.53	-.17	.37
AC13. I never miss meals because of playing Asheron's Call	-.46	-.03	.20
A15. I have never used Asheron's Call as an escape from socializing	-.41	-.09	.15
E11. I feel a sense of power when I am playing Asheron's Call	.39	-.15	.21
A11. I often feel that I spend more money than I can afford on Asheron's Call	.37	.01	.14
Factor 2 – (Low) Engagement			
E5. It would not matter to me if I never played Asheron's Call again	.04	.69	.46
E6. I feel happy at the thought of playing Asheron's Call	.08	-.67	.49
E4. The less I have to do with Asheron's Call, the better	.30	.63	.36

E9.	Asheron's Call is unimportant in my life	-.10	.61	.42
E10.	I would hate to go without playing Asheron's Call for more than a few days.	.19	-.51	.36
A17.	I spend little of my spare time playing Asheron's Call	-.15	.50	.32
E7.	When I see Asheron's Call, I feel drawn towards it	.34	-.49	.47
AP3.	I rarely think about playing Asheron's Call when I am not using a computer	-.27	.49	.39
E8.	I pay little attention when people talk about Asheron's Call	-.02	.43	.19
AP1.	I tend to want to spend increasing amounts of time playing Asheron's Call	.36	-.42	.40
E1.	It is important to me to be good at Asheron's Call	.14	-.42	.23
AP2.	I often experience a buzz of excitement while playing Asheron's Call	.13	-.40	.21
E2.	I like the challenge that learning to play Asheron's Call presents	-.02	-.38	.14
A16.	I try to make my Asheron's Call play sessions last as long as possible	.28	-.37	.28
E12.	Asheron's Call jargon sounds stupid to me	.02	.34	.11
E3.	I can't understand why people like Asheron's Call	.10	.22	.04

Table 3
Cross-tabulation of numbers of players endorsing low and high numbers of core and peripheral criteria

	Number of Peripheral Criteria		Total
	Low	High	
Number of Core Criteria			
Low	132	219	351
High	14	77	91
Total	146	296	442