

Excessive Internet Use: The Role of Personality, Loneliness and Social Support Networks in Internet Addiction

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Abstract

An online survey of 96 adults showed that, based on Young's (1998) criteria for the Internet Addiction Test, 40% of the sample could be classified as average internet users, 52% as problem over-users and 8% as pathologically addicted to the internet. The three groups differed on a range of factors, with over-users and addicts spending increasingly more time in online activities, being more neurotic and less extraverted, more socially anxious and emotionally lonely, and gaining greater support from internet social networks than average internet users. Further analysis revealed that only neuroticism and perceived support from online social networks were significant predictors of excessive internet use. In addition, over-users were found to be younger and less experienced in computer use than average or addicted users. Further research is needed to explicate the role of personality and track the possible pathways from novice over-use to eventual average use or pathological addiction.

Keywords: Internet addiction; excessive Internet use; personality; loneliness; social support networks

INTRODUCTION

Worldwide internet access has increased dramatically over the past decade, with an estimated 1,114,274,426 users in March 2007 (Internet World Stats 2007). The rapid growth of internet usage has spawned research on both the benefits and dangers of online activities. Early research warned of the negative social and psychological consequences of internet use (Kraut, Patterson, Lundmark, Kiesler, Mukopadhyay & Scherlis 1998), but follow-up studies suggested such consequences had dissipated over time (Kraut, Kiesler, Boneva, Cummings, Helgeson & Crawford 2002). The Kraut et al. studies indicated that the potential for negative psychological and social consequences reduced as society became more accustomed to using the internet.

Recent studies suggest that internet use has little negative impact on well-being (Biao-Bin, Man-Na, Bi-Qun & Yong-Hong 2006) and that participation in online activities can confer social and psychological benefits (Cummings, Sproull & Kiesler 2002; Shaw & Gant 2002). Brignall and Van Valey (2005) noted that young people who have grown up with the internet employ online activity as an important form of social interaction. Perse and Ferguson (2000) found social companionship to be the strongest motive for internet use and recent studies confirm that young people and adults alike use the internet to find friendship and romance (see for example, Hardie & Buzwell 2006; Whitty 2004). Online activities are also known to provide support, information and opportunities for social connection to marginalized and socially isolated groups such as same-sex attracted young people (Hillier & Harrison 2007), parents of disabled children (Blackburn & Read 2005), people with social anxiety (Campbell, Cumming & Hughes 2006; Erwin, Turk, Heimberg, Fresco & Hantula 2004) and those with medical problems (Fogel, Albert, Schnabel, Ditkoff & Neugut 2002; Kalichman, Benotsch, Weinhardt, Austin, Luke & Cherry 2003; Houlihan, Drainoni, Warner, Nesathurai, Wierbicky & Williams 2003).

Internet use may be beneficial or benign when kept to 'normal' levels, however high levels of internet use which interfere with daily life have been linked to a range of problems, including decreased psychosocial well-being, relationship breakdown and neglect of domestic, academic and work responsibilities (Beard 2002; Weiser 2001; Widyanto & McMurrin 2004; Yao-Guo, Lin-Yan & Feng-Lin 2006; Young 1998). A recent epidemiological study by Stanford University medical researchers (Aboujaoude, Koran & Game, 2006) suggests that problematic internet use is of growing concern. Their telephone survey of 2513 households revealed that one in eight Americans showed potential problem markers for excessive internet use.

While the amount of internet activity which is deemed 'excessive' is a subjective judgment, and the classification of heavy internet use as a clinical disorder may be controversial, some have argued that a pathological dependence on internet activities, or internet addiction, can be deemed a clinical disorder which meets DSM-IV criteria for substance dependence (see Nichols & Nicki 2004). Internet addiction was characterized by Young (1996;1998) as excessive internet over-use which disrupt a person's sleep patterns, work productivity, daily routines and social life. Young developed a diagnostic tool, the Internet Addiction Test (IAT), which has been shown to be a reliable and valid instrument for classifying internet users into three groups: Average Users who have complete control over their internet activities, Over-Users who experience frequent problems due to their internet activities and Internet Addicts who experience significant problems due to their dependence on internet activities (see Young 1998; also Widyanto & McMurrin, 2004). While these classification labels are open to debate, Young's terminology will be used in the present study.

It is clear that people of all ages now use the internet, but much research on excessive internet use has been based on small, mono-cultural student samples. For example, Engelberg and Sjoberg's (2004) study of internet addiction, loneliness and socio-emotional skills was based on a sample of 41 Swedish economics students. Shaw and Gant's (2002) study of internet use, loneliness and perceived support was based on 20 US undergraduate internet chat dyads. Likewise, Amichai-Hamburger and Ben-Artzi (2003) used a small sample of Israeli undergraduates in their study of personality, loneliness and internet use.

Some recent studies have used larger mono-cultural adolescent samples. Yao-Guo et al. (2006) surveyed 476 Chinese junior high school students and found that around 11% suffered from internet addiction disorder. When compared with their peers, adolescents addicted to the internet had more emotional and personality problems. In another Chinese study, Biao-Bin et al. (2006) surveyed 692 teenagers to explore associations between life satisfaction, emotions and internet use. That study concluded that adolescents' internet behaviour had little impact on subjective well-being, but it is not clear if these findings can be generalized to more culturally diverse adult samples.

Researchers have explored the links between excessive internet use and a variety of factors, including demographic characteristics such as gender (Amichai-Hamburger & Ben-Artzi 2003), personality traits such as neuroticism and extraversion (Wolfradt & Doll 2001), emotional states such as loneliness and anxiety (Caplan 2003; Moody 2001; Shepherd & Edelman 2005; Yao-Guo et al. 2006), inadequate social support networks (Cummings et al. 2002; Kraut et al. 2002) and specific types of internet activities (Widyanto & McMurrin 2004).

Several studies suggest that personality factors may underpin the relationship between internet use and emotional health. For example, Kraut et al.'s (2002) study showed that the personality factor of extraversion mediated the relationship between internet use and emotion. Those classed as extraverts tended to benefit from internet use, with frequent users showing lower levels of negative affect, less loneliness, and greater self-esteem. More introverted frequent users tended to have a contrasting pattern of greater loneliness, negative affect and lower self-esteem. Wolfradt and Doll (2001) found that personality traits influenced motives for internet use. In their study, the trait of neuroticism was associated with greater motivation to use the internet for purposes of entertainment and interpersonal communication. Extraversion was associated only with the interpersonal communication motive. In contrast to the above-mentioned studies, Engelberg and Sjoberg (2004) found no association between internet use and personality characteristics.

When the role of gender was considered along with internet use, Amichai-Hamburger and Ben-Artzi (2003) found that personality was associated with internet use for women, but not men. Their study showed that extraversion was negatively related, and neuroticism positively related, to the use of online social sites for women; but for men there was no significant relationship between personality and use of social websites.

Studies of internet use, emotional states and social support networks have yielded mixed findings. For example, several studies have shown links between internet use and loneliness (Matsuba 2006; Morahan-Martin & Schumacher 2003). Shaw and Gant (2002) found that greater internet use was associated with a decrease in loneliness and an increase in perceived social support. Cummings et al. (2002) also found a social support benefit, with active participation in an online newsgroup associated with social networking benefits such as finding people with similar experiences, and developing a stronger community orientation. In contrast, Engelberg and Sjoberg (2004) found frequent use of the Internet to be associated with greater loneliness, poorer social adaptation and emotional skills. Moody

(2001) found that high internet use was related to high levels of emotional loneliness, but low levels of social loneliness. Caplan (2003) found that lonely individuals can develop a preference for online social interaction which can lead to problematic internet use. Similarly, Erwin et al. (2004) found that socially anxious individuals develop a preference for internet activities. Those with the most severe social interaction anxiety spent the most time online.

Each study mentioned above has yielded interesting results, but none has included a full suite of psychosocial factors. Questions remain about the relative influence of age, gender, personality, emotion, support networks and types of online activities on internet use, particularly problematic levels of excessive internet use.

The aim of the present study was to survey a diverse sample of adult internet users about their internet use. Participants over the age of 18 were recruited through internet chat rooms, online forums and networks known to the researchers. Thus, participants were self-selected from the global internet community. This strategy avoided the limitations of student-only samples or the mono-cultural bias of many previous studies, although the sample was confined to those with English language skills. Respondents answered a series of questions about personality, emotions, social networks and internet activities.

The study addressed three research questions:

What proportions of adult respondents could be classified as normal users, over-users or internet addicts?

Do the three groups differ in terms of age, gender, internet activities, extraversion, neuroticism, social and emotional loneliness, social anxiety, online and offline social support networks?

Which of these demographic, personality, emotion, social support and internet activity factors best predict excessive internet use?

METHOD

Participants

There were 96 respondents (49 females, 44 males and three unspecified) ranging in age from 18 to 72 years, ($M = 26.9$, $SD = 9.28$, Median, Mode = 23.0). The sample was biased toward younger adults, with 33% of the sample aged 18-22, 42% aged 23-29, and 25% over the age of 30. In terms of education, 25% had completed secondary school level, 5% had trade or vocational qualifications, 30% had incomplete tertiary qualifications, 25% had completed a tertiary degree and 15% had postgraduate qualifications. With regards to employment status, 10% were unemployed, 19% had part-time employment, 31% were students, and 40% were in full-time employment.

Materials and Procedure

The online survey was posted using Opinio software. Participants were recruited via IRC (Internet Relay Chat) chat rooms, internet forums and personal networks of the researchers. The survey included a set of demographic questions and a battery of self-report scales assessing internet addiction, personality, emotion, online and offline support networks and internet activities.

Internet Addiction was assessed with Young's (1996) 20-item Internet Addiction Test. Widyanto and McMurrin (2004) report that scale items reflect six underlying dimensions of

internet addiction: salience, excessive use, neglect of work, anticipation, lack of control and neglect of social life. Items are rated on a 5-point scale, where 1 = very rarely and 5 = very frequently. Total Internet Addiction scores were calculated according to Young (1996), with possible scores for the sum of 20 items ranging from 20 to 100. The scale showed very good internal consistency, with an alpha coefficient of .93 in the present study.

Neuroticism represents the level of emotional maladjustment in an individual, while extraversion represents degree of sociability. The personality traits of Extraversion and Neuroticism were measured using two subscales from the International Personality Item Pool (Goldberg 1999). The 20 extraversion items and 20 neuroticism items were each rated on a 5-point scale, indicating how accurately the item described the participant (1 = Very Inaccurate, 5 = Very Accurate). Each subscale score had a possible range from 20 to 100, with higher scores indicating stronger levels of the personality trait. Very good internal consistency was reported by Goldberg (1999), with alpha coefficients of .91 for both the neuroticism and extraversion subscales. In the present study, alphas were very similar, at .92 for neuroticism and .93 for extraversion.

Wittenberg's Emotional and Social Loneliness Scale (1986 cited in Robinson, Shaver & Wrightsman 1991) was used to distinguish emotional isolation (lack of a close, intimate attachment to another person) from social isolation (lack of a network of social relationships with friends who share common interests and activities). The scale comprises two 5-item subscales reflecting emotional loneliness (for example, "There is no one I have felt close to for a long time") and social loneliness (for example, "I don't get much satisfaction from the groups I participate in"). Items were rated on a 5-point scale indicating how often he/she has felt that way (1 = Never, 5 = Often). Each subscale had a possible range of scores from 5 to 25, with higher scores indicating greater loneliness. Wittenberg reported alpha coefficients of .78 for emotional loneliness and .76 for social loneliness, indicating good reliability for both subscales. In the present study, alphas were .83 and .80, respectively, for emotional and social loneliness.

The 6-item Social Anxiety subscale of the Self-Consciousness Scale (Feningstein, Scheire & Buss 1975, cited in Robinson et al. 1991) was used to measure an individual's discomfort in the presence of others. Each item was answered on a 5-point scale where the participant rated the degree to which the item was characteristic of him/her (1 = Extremely Uncharacteristic, 5 = Extremely Characteristic). The scale had a possible range of scores from 6 to 30, with higher scores indicating greater anxiety. The scale items measure not only subjective anxiety, but also social reticence and performance difficulties, for example, "It takes me time to overcome my shyness in new situations". Feningstein et al. (cited in Robinson et al. 1991) reported an alpha reliability of .70 for this measure. In the present study, alpha was .79.

Online activity questions assessed the number of years of computer use as well as the amount of time per week spent in a range of activities, including use of news groups, chat rooms, Multi-User Dungeons (MUDs), and bulletin board systems (BBS). To assess time spent in all internet activities without requiring participants to self-disclose their personal activities, one question simply asked for amount of time per week spent in favourite internet activities.

Online and offline social support networks were measured with two sets of questions developed by Moody (2001). Six items assessed support from Face-to-Face (F2F) social networks and six items assessed support from Internet social networks. Items were rated on a 5-point scale (1 = not like me, 5 = a lot like me) and summed to reflect total support scores. Scores could range from 6 to 30, with higher scores indicating greater support from that

network. The F2F support scale showed moderate internal reliability ($\alpha = .73$), while the Internet support scale showed good reliability ($\alpha = .85$) in the present study.

RESULTS AND DISCUSSION

The strategy for analysis was as follows. First, respondents were classified into groups of normal users, over-users and internet addicts using Young's (1998) cut-off criteria for Internet Addiction Test scores. Next, group differences in age, gender, internet activities, extraversion, neuroticism, social and emotional loneliness, social anxiety, online and offline social support networks were examined using ANOVA or Chi-square analysis. Finally, a 5-step hierarchical multiple regression analysis was conducted to explore the relative influence of demographic, personality, emotion, social support and internet activity factors on IAT scores.

It should be noted that, although these findings are based on an adult sample with greater diversity than most previous studies of student samples, at $N = 96$ the sample was relatively small. These findings should be treated as preliminary until they can be replicated on larger, culturally diverse adult samples.

Classification into IAT Groups

On average, the sample reported a moderately high mean Internet Addiction score of 46.43 (SD 16.39). Although this score fell below the scale mid-point of 60, it was within Young's (1996) recommended range of scores indicating excessive internet use. According to Young's criteria, total IAT scores between 20 and 39 represent average users with complete control of their internet use, scores of 40 to 69 represent over-users with frequent problems caused by their internet use, and scores between 70 and 100 represent internet addicts with significant problems caused by their internet use. It is worth noting that information about Young's IAT has recently been published on an internet addiction website which recommends slightly different cut-offs (50 - 79 over-use, 80 - 100 addiction; see www.netaddiction.com/resources/internet_addiction_test.htm). Since this web page cites Widyanto and McMurrans' (2004) report as evidence of the sound psychometric properties of the IAT, and no justification is given for the new cut-off criteria, it was decided to retain Young's original cut-offs as recommended by Widyanto and McMurrans.

Classification of the 96 respondents by their total IAT scores yielded a group of 38 average users (40% of the sample), a group of 50 over-users (52%), and a small group of 8 internet addicts (8%). It is worth noting that, had the newer, undocumented cut-off scores of the internet addiction website (www.netaddiction.com) been applied, this sample would have yielded 58 average users, 34 over-users and just 4 addicts. Although these cut-offs yield fewer problem users than Young's cut-offs, group comparisons on all study variables yielded a similar pattern of results to those reported below.

Comparison of IAT Groups

There was an unexpected age difference among the IAT groups ($p < .01$), showing that average users tended to be in their late 20s, over-users in their mid 20s, and addicts in their mid 30s. This U-shaped trend showed an age dip among the middle over-use group, with slightly older respondents in the average group and much older respondents in the addict group. There was a parallel U-shaped trend in years of computer use which did not reach statistical significance ($p > .05$). The average group reported a mean of 10 years computer experience, the over-users a mean of 8.68 years experience and the addicts reported a

mean of 15.75 years computer use. Perhaps the younger, less experienced middle group over-used the internet because it was still a (relatively) new experience for them. It may be that newer users engage in over-use for a time, but for some the novelty eventually wears off (reducing to average use), while for others it may grow into a more serious problem (escalating to addiction). A shift toward normal use over time would be consistent with Kraut et al.'s (2002) findings, but a shift toward excessive use is not readily explained. Longitudinal research is needed to track the pathways of newer internet users to eventual average or excessive use.

There was no association between gender and group, with similar gender proportions in each of the three IAT groups (Chi-square, $df = 2$, $p = .66$). For this sample, women and men were equally likely to engage in average, excessive and addictive internet use.

As shown in Table 1, the three IAT groups differed significantly in the amount of time spent in various internet activities ($p < .001$). Compared to addicts and over-users, the average users reported the lowest hours per week spent on the internet, engaged in favourite internet activities, in MUDs and BBS, and engaged in interactive communication. The over-user group reported higher levels of these activities, while the small group of addicts reported very high levels of all these activities. In contrast to Widyanto and McMurrin (2004), who found no associations between types of internet activities and IAT scores, these findings showed greater engagement in all types of internet activities relative to IAT classification groups.

Table 1. Mean time spent in online activities for groups of average users, over-users and internet addicts.

| | Average Users (n = 38) | Over-Users (n = 50) | Internet Addicts (n = 8) |
|--|---------------------------|------------------------|-----------------------------|
| | Mean (SD) | Mean (SD) | Mean (SD) |
| Hours per week on the Internet*** | 21.84 (20.28) | 35.70 (23.42) | 68.88 (56.02) |
| Hours per week Interactive Communication*** | 3.29 (4.68) | 16.32 (21.82) | 29.50 (45.29) |
| Hours per week MUDs or BBS*** | 0.58 (1.89) | 3.24 (7.04) | 20.00 (30.82) |
| Hours per week spent in favourite Internet activities*** | 8.45 (8.29) | 20.16 (24.55) | 49.00 (45.19) |

Notes: *** denote a statistically significant difference between groups, $p < .001$

The three IAT groups were compared on personality, emotion and social support factors (see Table 2). The groups differed on the personality trait of neuroticism ($p < .01$), with addicts reporting the highest levels of neuroticism, over-users reporting moderate levels and average users the lowest neuroticism scores. Since higher levels of neuroticism are generally associated with maladjustment and poor impulse control (Costa & McCrae 1992) it is perhaps not surprising that internet addicts, followed by over-users, had the highest neuroticism scores. This was consistent with previous research showing that neuroticism was positively associated with greater internet use (Wolfradt & Doll 2001). In contrast, extraversion was

negatively associated with internet use. Average users reported the highest levels of extraversion, over-users reported moderate levels and addicts reported the lowest levels of extraversion ($p < .05$). Thus, excessive internet users appeared to have increasingly problematic personality profiles, with a tendency toward lower sociability and greater negative affect among over-users which was magnified among the internet addict group.

Table 2. Mean personality, emotion and social support scores for groups of average users, over-users and Internet addicts.

| | Average Users (n = 38) | Over-Users (n = 50) | Internet Addicts (n = 8) |
|----------------------------|-----------------------------------|--------------------------------|-------------------------------------|
| | <i>Mean (SD)</i> | <i>Mean (SD)</i> | <i>Mean (SD)</i> |
| Neuroticism** | 47.53 (13.84) | 55.20 (14.08) | 65.75 (13.63) |
| Extraversion* | 68.66 (14.61) | 61.58 (12.53) | 58.00 (20.70) |
| Social Anxiety** | 16.95 (5.15) | 19.76 (4.48) | 22.25 (5.52) |
| Emotional Loneliness* | 9.71 (4.73) | 12.84 (5.50) | 13.00 (5.68) |
| Social Loneliness (ns) | 10.34 (3.83) | 11.88 (4.04) | 11.88 (4.97) |
| F2F Social Support (ns) | 19.76 (4.68) | 17.32 (5.26) | 18.38 (5.25) |
| Internet Social Support*** | 13.13 (5.58) | 18.96 (5.03) | 22.25 (5.47) |

Notes: ** $p < .01$, * $p < .05$, (ns) = denotes no statistically significant difference between groups ($p > .05$)

Significant group differences were found for two of the three emotion factors. The IAT groups differed in social anxiety ($p < .01$), with average internet users reporting lower levels of social anxiety, while over-users and addicts reported increasingly higher levels of social anxiety. Many previous authors have noted that excessive internet use is associated with social anxiety (for example, Erwin et al. 2004). Since social anxiety represents discomfort in the presence of others, and these results showed that greater social anxiety was linked to higher levels of internet use, the present findings are consistent with previous studies (for example, Campbell et al. 2006) suggesting that the internet provides a medium for social interaction without the discomforting presence of others.

IAT group differences were also found for emotional loneliness ($p < .05$). Average internet users reported lower levels of emotional loneliness, while over-users and addicts reported higher levels of emotional loneliness. This was consistent with Moody's (2001) finding that higher levels of internet use were associated with greater emotional loneliness. In the face of emotional isolation, interaction with others on the internet may provide the illusion of intimacy and close attachment which is lacking in one's offline life.

No group differences were found for social loneliness ($p > .05$). All IAT groups reported similarly moderate levels of social loneliness, regardless of internet use. This was not consistent with Moody's (2001) finding of an association between greater internet use and less social loneliness. Social loneliness represents an absence of social relationships with persons who share common interests and activities, but these common interests are often the basis for internet communication and online friendships. In line with Cummings et al. (2002), who found that participation in an online newsgroup led to social benefits, perhaps the excessive internet users in this sample helped ward off social loneliness by spending

time in internet communication activities, while the average users in the sample avoided social loneliness by spending time in offline social activities.

Group differences were found for only one of the two support network variables (see Table 2). No differences were found for offline F2F social support ($p > .05$), with all three IAT groups reporting similar levels of support from their face to face social networks. Significant group differences ($p < .001$) were found for online support from internet social networks. Average internet users reported the lowest levels of support from internet social networks, while over-users reported more internet support, and addicts reported the greatest support from online internet social networks. Again, consistent with Cummings et al. (2002), greater internet use was associated with the social benefit of internet support networks. However, in light of the earlier finding that over-user and addict groups in this sample reported the highest levels of emotional loneliness and social anxiety, it appears that these high levels of online support from internet social networks did not alleviate emotional loneliness or reduce social anxiety.

Hierarchical Multiple Regression Analysis: Predicting Excessive Internet Use

In light of the somewhat arbitrary cut-off scores used to form average, over-use and internet addiction groups, and the resultant uneven group sizes, it was decided to treat IAT scores as a continuous variable in a hierarchical regression analysis. The aim of this analysis was to identify significant predictors of excessive internet use. Sets of demographic, personality, emotional, support networks and internet activity predictor variables were entered at each step of equation building to assess their relative contributions to the criterion variable, internet addiction scores. These results are shown in Table 3.

Table 3. Results of a 5-step hierarchical regression analysis using demographic, personality, emotional, social support and internet activity factors to predict internet addiction scores.

| | Step 1 Beta | Step 2 Beta | Step 3 Beta | Step 4 Beta | Step 5 Beta |
|--------------------------------------|----------------|----------------|----------------|----------------|----------------|
| Age | 0.01 | 0.04 | 0.09 | 0.14 | 0.08 |
| Gender | 0.02 | -0.03 | -0.03 | -0.12 | -0.06 |
| Neuroticism | | **0.39 | **0.34 | **0.31 | *0.23 |
| Extraversion | | 0.06 | 0.15 | 0.13 | 0.02 |
| Social Anxiety | | | 0.24 | 0.15 | 0.15 |
| Social Loneliness | | | -0.06 | 0.02 | 0.02 |
| Emotional Loneliness | | | 0.21 | 0.06 | 0.03 |
| F2F Social Support | | | | 0.01 | 0.05 |
| Internet Social Support | | | | ***0.55 | ***0.48 |
| Hours on the Internet | | | | | -0.02 |
| Hours Interactive Communication | | | | | 0.08 |
| Hours in MUDs, BBS | | | | | 0.12 |
| Hours in Favourite Internet Activity | | | | | 0.19 |
| Years of Computer Use | | | | | 0.09 |

Notes: Beta = standardized beta coefficient, *** $p < .001$, ** $p < .01$, * $p < .05$

At step 1, the demographic characteristics of age and gender were entered into the equation to predict addiction scores. This set of predictors did not explain a significant proportion of variance in addiction scores ($R^2 = .001$, F , df 2, 91 = .024, $p = .976$). At step 2, when the personality traits of neuroticism and extraversion were added to the equation, there was a significant improvement in the prediction of addiction scores (R^2 change = .183, F change, df 2, 89 = 9.971, $p < .001$). The model which included demographics and personality was significant (F , df 4, 89 = 5.00, $p = .001$). This combined set of variables explained 18% of the variance in addiction, but only neuroticism was found to be a unique, independent predictor (see Table 3).

At step 3 the model did not significantly improve with the inclusion of the emotional factors, social anxiety, social loneliness and emotional loneliness (R^2 change = .041, F change, df 3, 86 = 1.522, $p = .215$). Inclusion of social and face to face support networks at step 4 did, however, improve the model (R^2 change = .267, F change, df 2, 84 = 22.004, $p < .001$). Support from internet networks was shown to be a highly significant independent predictor of internet addiction, while the combined set of demographic, personality, emotion and social network factors accounted for 49% of the variance in addiction scores (F , df 9,84 = 9.001, $p = .002$

At the final step, inclusion of the internet activity factors further improved the prediction of addiction (R^2 change = .087, F change, df 5, 79 = 3.244, $p = .01$). The full theoretical model, with all demographic, personality, emotion, social network and activity factors included, was significant ($R^2 = .578$, F , df 14, 79 = 7.725, $p < .001$). The set of predictor variables combined accounted for nearly 58% of the variance in internet addiction scores, with only two factors found to be unique independent predictors of internet addiction (see Table 3). High levels of neuroticism accounted for 2.6% of the variability in internet addiction scores, while the degree of perceived social support from internet networks accounted for a very substantial 18% of the variance in internet addiction scores.

The findings of this regression analysis demonstrated the relative importance of personality and social support networks; and, conversely, the relative unimportance of age, gender, emotional factors and specific internet activities in predicting excessive, problematic levels of internet use. The IAT group differences reported in Tables 1 and 2 might have suggested that the time spent in various internet activities, high levels of social anxiety, emotional loneliness and neuroticism, and low levels of extraversion contributed to internet addiction. Groups of average users, over-users and internet addicts were distinguished by significant differences on these factors, but when all factors were entered into a regression equation which controlled for the overlap between factors, only high levels of neuroticism and online support made significant independent contributions to excessive internet use.

Factors such as loneliness and social anxiety which have previously been linked to greater use of the internet did not account for a substantial proportion of the variation in scores on Young's IAT measure of problematic internet use in the present study. This is consistent with the view that high levels of internet use may not always be a problem. For some, particularly the socially isolated or anxious, internet activities can be highly beneficial and provide important opportunities for information, support and social interaction (for example, Fogel et al. 2002; Kalichman et al. 2003; Hillier & Harrison 2007; Perse & Ferguson 2000). For others, however, high levels of internet use may result in dependency and dysfunction, including neglect of work, family and social life.

Previous studies have shown that social companionship is a strong motive for internet use (for example, Perse & Ferguson, 2000). The current results suggest that those with a neurotic personality who gain support from their online social networks are more likely to

become dependent on using the internet. Taken together with the finding that those in the middle group of over-users tended to be younger and less experienced in computer use than their average and addicted counterparts, this research suggests that personality tendencies combined with support from online social networks may predispose some novice users to become dependent on the internet. Further research is needed to explore the development of internet addiction.

SUMMARY AND CONCLUSION

This study showed that when Young's (1996;1998) internet addiction criteria were applied to a diverse sample of 96 adults, 40% could be classified as average internet users, 52% as over-users with frequent problems caused by their internet use, and 8% as having a pathological dependence on the internet. All groups reported similar levels of support from their face to face social networks and moderate levels of social loneliness. The groups differed on a range of factors, with over-users and addicts reporting increasingly greater hours engaged in online activities, more support from their internet social networks, higher levels of neuroticism and lower levels of extraversion, greater social anxiety and more emotional loneliness than the average internet users. Further analysis revealed that just two factors, a neurotic personality and high levels of perceived support from online social networks, predicted degree of excessive internet use. Over-users were found to be younger and less experienced in computer use than the average or addicted users. Further research is needed to explicate the role of personality and track the possible pathways from novice over-use to eventual average use or pathological addiction.

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