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## Traits associated with internet addiction in young adults: Potential risk factors

Michael Lyvers<sup>a,\*</sup>, James Karantonis<sup>a</sup>, Mark S. Edwards<sup>a</sup>, Fred Arne Thorberg<sup>b,c</sup>

<sup>a</sup> School of Psychology, Bond University, Gold Coast, QLD 4229, Australia

<sup>b</sup> National Centre for Dual Diagnoses, Innlandet Hospital Trust, Brumunddal, Norway

<sup>c</sup> Department of Behavioural Sciences in Medicine, Institute of Basic Medical Sciences, Faculty of Medicine, University of Oslo, Oslo, Norway

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### ABSTRACT

The present study sought to determine whether certain personality traits associated with problematic substance use may also characterize young adults who report problematic internet use. An index of internet addiction as well as measures of traits previously linked to problematic substance use were administered to a sample of 86 young adults aged 18–30 years. Measures included the Internet Addiction Test (IAT), Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ), Depression Anxiety and Stress Scales (DASS-21), Toronto Alexithymia Scale (TAS-20), and the Fear of Intimacy Scale (FIS). Results indicated that IAT scores were significantly positively correlated with TAS-20, DASS-21, SPSRQ and FIS scores, as predicted. When age, gender and negative mood were controlled in a hierarchical regression, sensitivity to punishment (SP), sensitivity to reward (SR) and FIS significantly contributed to variance in IAT in the final model. SP partially mediated the relationship between TAS-20 and IAT, whereas no such mediation was indicated for SR or FIS. Present findings suggest that alexithymia and reward sensitivity may be important risk factors for internet addiction as for problematic substance use, whereas sensitivity to punishment may account for at least part of the association between alexithymia and problematic use of the internet.

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The notion that compulsive or problematic use of the internet is a variant of addictive behaviour is somewhat controversial, however the term “internet addiction” (IA) has gained currency (Beard, 2005; Moreno, Jelenchick, & Christakis, 2013; Winkler, Dörsing, Rief, Shen, & Glombiewski, 2013; Young, 1998, 2004). IA is said to be characterized by uncontrollable and compulsive internet use, resulting in problems such as poor academic and professional performance, diminished sleep quality and hygiene, and relational maladjustment (Scimeca et al., 2014). University students are said to be at especially high risk of developing IA (Frangos, Frangos, & Kiohos, 2010; Young, 2004). A review by Chakraborty, Basu, and Kumar (2010) suggested that IA manifests predominantly in young adults, with estimated prevalence rates ranging up to 38% across a variety of populations sampled.

IA can be viewed as a behavioural addiction or impulse control disorder not otherwise specified, like compulsive shopping or compulsive gambling, the latter of which has reportedly shown neurobiological commonalities with substance addictions (see Recupero, 2008). The present study examined potential commonalities in terms of specific traits that have consistently been found to be associated with substance problems. In young adults, traits associated with problematic substance

use (e.g., Lyvers, Duff, Basch & Edwards, 2012) as well as substance dependence (Lyvers, Hinton, Gotsis, Roddy, Edwards & Thorberg, 2014) include reward sensitivity and alexithymia, the latter defined as a difficulty identifying and describing emotional feelings as well as an externalized thinking style (Taylor & Bagby, 2000). The former trait dimension is hypothesised to reflect the functioning of the brain's Behavioral Activation System (BAS; Torrubia, Avila, Molto, & Caseras, 2001) and was recently linked to IA (Dong, Hu, & Lin, 2013), whereas punishment sensitivity is hypothesised to reflect the Behavioral Inhibition System (BIS; Torrubia et al.) and has been found to mediate associations between alexithymia, drinking motives and problematic drinking (Lyvers, Hasking, Albrecht & Thorberg, 2012). Alexithymia has been reported to be very strongly associated with substance problems in both clinical (Lyvers, Hinton et al., 2014; Thorberg, Young, Sullivan, & Lyvers, 2009) and non-clinical samples (e.g., Lyvers, Onuoha, Thorberg & Samios, 2012) and has also been linked to obsessive substance-related thoughts and susceptibility to craving (Lyvers, Lysychka & Thorberg, 2014; Thorberg, Young, Sullivan, Lyvers, Connor et al., 2011). Recent work has also documented associations of alexithymia with IA in young adults (Kandri, Bonotis, Floros, & Zafropoulou, 2014), although the nature of this relationship remains unclear given that alexithymia is commonly associated with anxiety and depression as well as social and interpersonal difficulties (e.g., Thorberg, Young,

\* Corresponding author.

E-mail address: [mlyvers@bond.edu.au](mailto:mlyvers@bond.edu.au) (M. Lyvers).

Sullivan, Lyvers, Hurst et al., 2011). In the present study alexithymia, sensitivity to reward (SR) and sensitivity to punishment (SP) were assessed in a sample of young adults in relation to their scores on the Internet Addiction Test (IAT; Young, 1998). Anxiety, depression, stress, and fear of intimacy were also assessed given their hypothesised roles in the development of substance problems (e.g., Thorberg & Lyvers, 2006a, b) as well as problematic internet use (Douglas et al., 2008) and relationships with alexithymia as noted above. Based on extrapolation from previous research cited above on trait correlates of problematic substance use and substance dependence, alexithymia, SR, SP, fear of intimacy, and negative moods were all expected to show positive relationships with IAT scores. Further, SP was predicted to mediate the relationship between alexithymia and IAT scores given that SP was previously reported to mediate the relationship between alexithymia and problematic drinking (Lyvers, Hasking et al., 2012).

## 1. Method

### 1.1. Participants

The initial sample of 86 young adults included university students and members of the local community. The former were 61 students recruited from the university research participant pool for the incentive of one course credit point for psychology subjects, whereas the remaining 25 were recruited via advertisement in a local newspaper for the incentive of an electronic \$25 gift voucher. Three cases were subsequently removed as their values for Mahalanobis distances were above the critical value relevant for the number of variables in the analysis ( $\chi^2 = 27.88$ ,  $p < .001$ ; Tabachnik & Fidell, 2014), resulting in a final sample size of 83. Participants were aged between 18 and 30 years ( $M = 22.66$  years,  $SD = 4.04$ ), and included 20 males and 63 females. Participants indicated how the majority of their time on the internet in an average week was spent, including using the internet for online gaming (6; 7%), online shopping (2; 2%), social media (34; 41%), watching movies and television online (21; 25%), and for homework, employment, or research related activities (20; 24%).

### 1.2. Materials

#### 1.2.1. Demographics questionnaire

This questionnaire asked for participant details such as age, gender, country of origin, and education level.

#### 1.2.2. Depression Anxiety and Stress Scales (DASS-21; Lovibond & Lovibond, 1995)

The widely used DASS-21 consists of three subscales with seven items each measuring depression (e.g., "I felt I had nothing to look forward to"), anxiety (e.g., "I felt scared without any good reason") and stress (e.g., "I found it hard to wind down"). Answers to statements are scored on a 4-point scale, from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*). Higher scores indicate higher levels of depression, anxiety or stress. The Cronbach's alpha reliability indexes for the DASS-21 were .82 for Stress, .80 for Depression, and .81 for Anxiety in the current study.

#### 1.2.3. Fear of Intimacy Scale (FIS; Descutner & Thelen, 1991)

The FIS is a 35 item self-report measure that aims to examine one's level of anxiety concerning close and personal relationships (e.g., "There are things I have done in previous relationships that prevent me from getting close"). Questions are rated on a 5-point scale (1 = *not characteristic of me at all* to 5 = *extremely characteristic of me*). Of the 35 items, 15 items are reverse scored (e.g., "I would feel comfortable expressing my true feelings to person X"). A high score is indicative of a greater fear of intimacy. Scores on the FIS have demonstrated significant associations with a sense of loneliness, social intimacy, and

reluctance to self-disclose (Lutwak, Panish, & Ferrari, 2003). The Cronbach's alpha reliability index was .65 in the current study.

#### 1.2.4. Internet Addiction Test (IAT; Young, 1998)

The IAT is a self report measure consisting of 20 questions assessing the extent to which internet usage interferes with one's daily routine, sleeping patterns, emotional feelings, and social life. Dysfunction is assessed on a 6-point Likert scale (0 = *does not apply* to 5 = *always*), with higher scores denoting a higher level of problems related to internet use. Those who score under 39 are classified as typical internet users, a score between 40 and 69 suggests that use is causing a moderate level of problems, and a score of 70 or greater suggests that internet use is causing a severe level of problems (Young, 1998). Factor analysis of the IAT by Widyanto and McMurrin (2004) yielded six factors (salience, excessive use, neglecting work, anticipation, lack of control, and neglecting social life) with all factors reportedly showing good internal consistency and concurrent validity. They concluded that the IAT is a valid and reliable instrument for research on IA. The Cronbach's alpha reliability index was .92 in the current study.

#### 1.2.5. Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ; Torrubia et al., 2001)

The SPSRQ is a self report measure consisting of 48 questions, of which half measure sensitivity to punishment (SP; e.g., "How often do you refrain from doing something because you're afraid of it being illegal?"), whereas the other half measure sensitivity to reward (SR; e.g., "Does the prospect of obtaining money motivate you strongly?"). Questions are answered by a yes or no response, with affirmative responses summed to produce a score on SP or SR. The Cronbach's alpha reliability index was .81 for SP and .79 for SR in the current study.

#### 1.2.6. Toronto Alexithymia Scale (TAS-20; Bagby, Parker, & Taylor, 1994)

The TAS-20 is a 20 item self-report questionnaire assessing the level of alexithymia. Questions are answered via a 5-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*). The TAS-20 has three subscales: difficulty identifying feelings (DIF; e.g., "I am often confused about what emotion I am feeling"), difficulty describing feelings (DDF; e.g., "It is difficult for me to find the right words for my feelings") and externally oriented thinking (EOT; e.g., "I prefer to analyse problems rather than just describe them"). After reverse scoring five items, a total alexithymia score is obtained by summing the ratings for the 20 items. A total score that is equal to or less than 51 indicates no alexithymia, scores between 52 and 60 indicate borderline alexithymia, and scores equal to or greater than 61 indicate high levels of alexithymia. The Cronbach's alpha reliability index for the total TAS-20 was .76 for the present sample.

### 1.3. Procedure

Ethics approval for this study was granted by the university research ethics committee prior to data collection. Communication with interested respondents was conducted via email. An explanatory statement informed them of the purpose of the study, the inclusion criteria (age 18–30 years and at least an occasional internet user), the requirements of participation, and the contact details of the researchers if the participant had any queries. Additionally, participants were made aware of their right to withdraw at any stage, and the confidential nature of data collection. The link to the online survey was then sent to them.

Data were collected by means of an online survey created using the website [Qualtrics.com](http://Qualtrics.com). The first page of the survey contained a copy of the original explanatory statement. To begin the survey, participants were required to click a statement that confirmed that they had read the explanatory statement, understood what was required of them, consented to participation, and that data collection was confidential. The survey consisted of six questionnaires in the following order: demographics questionnaire, IAT, TAS-20, DASS-21, SPSRQ, and FIS. All questions required an answer before the participant could continue.

Upon completing the survey, participants were presented with a final screen thanking them for their time, and a list of helplines if they felt any distress or the need to seek help from services relevant to the content of the survey. In addition, the researchers answered any questions participants had regarding the study via email. University student participants were awarded a psychology credit point via a credit slip, whereas community participants were sent an electronic \$25 gift voucher.

## 2. Results

Collinearity diagnostics indicated that the assumption of multicollinearity was not violated. There were no major deviations from normality. Based on suggested IAT cutoff scores (see above), 17 (21%) of participants reported normal internet use, 53 (64%) reported a moderate level of IA, and 13 (16%) reported a severe level of IA. Chi square test indicated no association ( $p = .70$ ) between IA severity categories and primary reason for internet use in this sample, with social media the most commonly cited reason for internet use in all three IA categories. Chi square test also indicated no association between gender and primary reason for internet use in this sample,  $p = .12$ , with social media cited as the most common reason for use by both males and females. Chi square test additionally indicated no relationship between gender and IA severity categories,  $p = .28$ . Chi square test did however indicate a strong association between IA severity categories and alexithymia categories based on the TAS-20,  $\chi^2(4) = 14.97$ ,  $p = .005$ , such that 38% (5/13) of those classified by the IAT as having severe IA were classified as having high levels of alexithymia by TAS-20 cut-off scores (see above), versus only 9% (5/53) of those classed as having a moderate level of internet related problems and 0% (out of 17) of those classed as normal internet users.

### 2.1. Correlations

The relationships between IAT, TAS-20, FIS, SR, SP, and DASS-21 were investigated using Pearson's product-moment correlation coefficients as shown in Table 1. As predicted, IAT and TAS-20 were significantly and positively correlated with each other and with the other measures.

### 2.2. Hierarchical regression

A hierarchical linear regression was used to assess the ability of TAS-20, SP, SR, and FIS scores to predict IAT scores after controlling for the influences of age, gender, and negative mood. Age and gender were entered at step 1, followed by Depression, Anxiety, and Stress scores of the DASS-21 at step 2, SP and SR at step 3, TAS-20 at step 4 and FIS at step 5. At step 1, gender and age accounted for 4.4% of the variance in IAT scores and the model was not significant,  $F(2, 76) = 1.76$ ,  $p = .18$ . At step 2, the addition of Depression, Anxiety, and Stress scores of the DASS-21 significantly improved the prediction of IAT scores,  $F_{\text{change}}(3, 73) = 5.85$ ,  $p = .001$ , accounting for an additional 18.5% of variance,  $F(5, 73) = 4.35$ ,  $p = .002$ . The inclusion of SP and SR scores at step 3 significantly improved the prediction of IAT scores,

$F_{\text{change}}(2, 71) = 9.60$ ,  $p < .001$ , accounting for an additional 16.4% of the variance,  $F(7, 71) = 6.58$ ,  $p < .001$ . Both variables significantly and uniquely explained variance in IAT scores at this step. Addition of TAS-20 in step 4 did not produce a significant increase in variance, explaining an additional 2.6% of the variance in IAT scores,  $F_{\text{change}}(1, 70) = 3.09$ ,  $p = .083$ , and the model remained significant,  $F(8, 70) = 6.31$ ,  $p < .001$ . In the final step, the inclusion of FIS significantly contributed 4.5% variance to the model,  $F_{\text{change}}(1, 69) = 5.79$ ,  $p = .019$ , and the model remained significant,  $F(9, 69) = 6.64$ ,  $p < .001$ . With all predictors in the final model, 39.4% of the variance in IAT scores was explained. The relevant statistics for the hierarchical linear regression are shown in Table 2.

Additional regressions were used to test the hypothesis that SP would mediate the association between TAS-20 and IAT scores. In a standard regression predicting IAT from TAS-20, the latter accounted for significant variance in IAT,  $R^2 = .23$ ,  $F(1, 81) = 23.57$ ,  $p < .001$ ,  $\beta = .47$ . In a standard regression predicting SP from TAS-20, the latter accounted for significant variance in SP,  $R^2 = .10$ ,  $F(1, 79) = 8.66$ ,  $p = .004$ ,  $\beta = .31$ . A multiple regression was subsequently conducted predicting IAT: TAS-20 was entered at step 1 and SP was entered at step 2. SP explained an additional 9.8% variance in IAT,  $F_{\text{change}}(1, 78) = 11.20$ ,  $p = .001$ ,  $\beta = .33$ . When SP was entered in step 2, the coefficient for TAS-20 decreased yet remained significant. Sobel test indicated that the decrease in the coefficient for TAS-20 was significant ( $t = 2.21$ ,  $p = .03$ ), consistent with partial mediation (Baron & Kenny, 1986). Thus the prediction that SP would mediate the association between TAS-20 and IAT was supported. The direct and mediated pathways are presented in Fig. 1.

Two exploratory analyses were also conducted to see if SR or FIS would be further mediators. In a standard regression predicting SR from TAS-20, the latter accounted for significant variance in SR,  $R^2 = .05$ ,  $F(1, 79) = 4.23$ ,  $p = .04$ ,  $\beta = .23$ . A multiple regression was subsequently conducted predicting IAT: TAS-20 was entered at step 1 and SR was entered at step 2. SR explained a further 4.1% of variance in IAT,  $F_{\text{change}}(1, 78) = 4.28$ ,  $p = .042$ ,  $\beta = .21$ . When SR was entered in step 2, the coefficient for TAS-20 decreased yet remained significant. Sobel test indicated that the decrease in the coefficient for TAS-20 was non-significant ( $t = 1.47$ ,  $p = .14$ ), suggesting no mediation by SR.

In a standard regression predicting FIS from TAS-20, the latter accounted for significant variance in FIS,  $R^2 = .18$ ,  $F(1, 77) = 17.04$ ,  $p < .001$ ,  $\beta = .43$ . Subsequently, a multiple regression was conducted predicting IAT: TAS-20 was entered at step 1 and FIS was entered at step 2. FIS explained a further 1.4% of variance in IAT,  $F_{\text{change}}(1, 76) = 1.36$ ,  $p = .248$ ,  $\beta = .13$ . When FIS was entered in step 2, the coefficient for TAS-20 decreased yet remained significant. Sobel test indicated that the decrease in the coefficient for TAS-20 was non-significant ( $t = 1.12$ ,  $p = .26$ ), suggesting no mediation by FIS.

## 3. Discussion

As predicted based on the notion that there are underlying commonalities between behavioural and substance addictions, TAS-20, SR, SP,

**Table 1**  
Intercorrelations among the variables Age, IAT, TAS-20, SP, SR, Depression, Anxiety, Stress, and FIS (N = 83).

	Age	IAT	TAS20	SP	SR	Depression	Anxiety	Stress	FIS
IAT	-.08	–							
TAS-20	.08	.47**	–						
SP	.02	.44**	.31*	–					
SR	-.11	.30*	.23*	.18	–				
Depression	.12	.41**	.54**	.37*	.10	–			
Anxiety	.07	.34**	.36*	.34*	.08	.73**	–		
Stress	.13	.30*	.46**	.42**	.23*	.73**	.68**	–	
FIS	.11	.30*	.43**	.22	.09	.10	.07	.29*	–

Note. IAT = Internet Addiction Test; TAS-20 = Toronto Alexithymia Scale; SP = Sensitivity to Punishment; SR = Sensitivity to Reward; FIS = Fear of Intimacy Scale.

\*  $p < .05$ .

\*\*  $p < .001$ .



**Table 2**

Regression analyses with variables Age, Gender, Depression, Anxiety, Stress, SR, SP, TAS-20, and FIS.

	B	$\beta$	R	R <sup>2</sup>	$\Delta R^2$	F	95% CI for B
Step 1			.21	.02	.04	1.76	
Age	-.61	-.16					[-1.49–.26]
Gender	-6.10	-.18					[-13.99–1.79]
Step 2			.48	.18	.19*	4.35*	
Depression	1.84	.34					[-.14–3.82]
Anxiety	.56	.12					[-1.03–2.15]
Stress	-.03	-.01					[-1.31–1.25]
Step 3			.63	.33	.16*	6.31**	
SR	.73	.22*					[.08–1.39]
SP	1.09	.36*					[.46–1.71]
Step 4			.65	.35	.03	5.01**	
TAS-20	.24	.21					[.03–.51]
Step 5			.68	.39	.05*	6.64**	
FIS	.17	.26*					[.03–.31]

Note. TAS-20 = Toronto Alexithymia Scale; SP = Sensitivity to Punishment; SR = Sensitivity to Reward; FIS = Fear of Intimacy Scale.

\*  $p < .05$ .\*\*  $p < .001$ .

DASS-21 and FIS scores – all of which were previously found to be positively associated with problematic substance use and dependence – were significantly positively correlated with the IAT measure of internet addiction. The positive associations of the negative mood indices with IAT scores are consistent with previous research in young adult and student populations (Frangos et al., 2010). For example, Chang, Chiu, Lee, Chen, and Miao (2014) found that depression predicted the initiation and persistence of IA in students. When age, gender and negative moods were controlled in a hierarchical regression model in the present study, SP, SR and FIS significantly contributed to variance in IAT. Further the association between TAS-20 and IAT was partially mediated by SP, paralleling previous findings of SP mediation of the relationship between alexithymia as measured by TAS-20 and problematic drinking (Lyvers, Hasking et al., 2012). The positive association between IAT and TAS-20 in young adults replicates other recent work (Kandri et al., 2014), but the present findings additionally suggest that SP may be a crucial factor in this relationship.

The present finding of a positive relationship between FIS and IAT would appear to suggest that for an individual with a fear of intimacy, the internet may provide a more comfortable alternative to face-to-face interaction. Perhaps more importantly, inclusion of the FIS in the present study was based on previous work implicating fear of intimacy as indexed by the FIS in the development of substance disorders (Thorberg & Lyvers, 2006a). The present findings thus suggest similar potential involvement of this trait in the development of problematic internet use. The present findings also indicated a positive relationship between SR and IAT scores. Previous work on the role of biologically based traits in IA has emphasised the role of reward sensitivity in IA using different measures (Dong, Huang, & Du, 2011; Dong et al., 2013), however in the present study both SP and SR were unique predictors of variance in IAT scores. Present results thus suggest there may be multiple pathways to IA, perhaps varying depending on the primary purpose for which the internet is used to excess. For example,

punishment sensitivity may motivate internet use for purposes of escape via fantasy, such as taking on internet gaming roles, whereas reward sensitivity may be more likely to motivate internet gambling or use of internet pornography (which was not examined in the present study). These possibilities merit further investigation in future studies using larger samples.

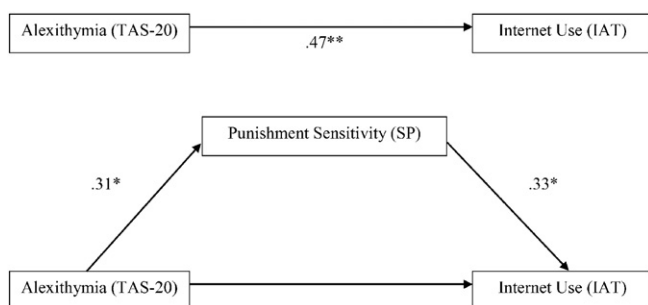
The limitations of this study include the relatively small sample, the majority of which consisted of psychology undergraduates and females. Males are reportedly more likely to develop IA, as is the case for substance problems (Chakraborty et al., 2010; Yu, Kim, & Hay, 2013). Although the potential impact of gender was controlled in the present study via hierarchical regression, and there were no differences between males and females in IA severity nor in their primary reason for using the internet in the present sample, large-scale surveys have indicated that more males use the internet for gaming and pornography, whereas more females use the internet for social media (e.g., Pew Research Center, 2013, 2015). The present investigation only asked for the primary reason for internet use, and did not ask participants to estimate the amount of time spent on the internet for particular purposes, which was beyond the scope of the study. Nevertheless social media was the most commonly cited reason for internet use for both genders. Despite these limitations, the present study has indicated significant parallels between excessive use of the internet and problematic substance use in terms of associated traits including alexithymia, sensitivity to reward and punishment, and fear of intimacy, suggesting commonalities among the pathways to different types of addictive behavior.

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**Fig. 1.** The direct and mediated pathways between TAS-20 and IAT. \* $p < .05$ ; \*\* $p < .001$ .

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