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Differential associations with addiction-linked traits**

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Disordered Social Media Use and Risky Drinking in Young Adults: Differential Associations with
Addiction-Linked Traits

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Abstract

Background. Excessive or compulsive use of social media has been likened to an addiction, similar to other behavioural addictions such as pathological gambling or internet addiction. This investigation sought to determine the degree to which personality traits associated with such disordered social media use overlap with those known to predict problematic substance use, with use of the most commonly abused legal substance alcohol as an example of the latter. **Method.** Well-known indices of disordered social media use, risky or problematic alcohol use, and the personality traits alexithymia, reward sensitivity, narcissism, and impulsivity were administered online to 143 men and women aged 18-35 who were regular users of social media. The traits examined had previously been linked to substance misuse for a variety of substances, including alcohol, as presumed predisposing factors. **Results.** After controlling for age, gender and social desirability in hierarchical regressions, disordered social media use was predicted by narcissism, reward sensitivity and impulsivity, whereas risky alcohol use was predicted by narcissism, alexithymia and impulsivity. The ability of narcissism to predict disordered social media use was mediated by reward sensitivity, which was not the case for risky drinking. **Conclusions.** Present results point to similarities and differences in addiction-linked traits when comparing disordered social media use to risky or problematic substance use.

Keywords: addiction, alcohol, internet use, personality, social media

A majority of the Australian population are active on social media (Cowling, 2017). This technology has enabled many to maintain and extend relationships with peers, friends and family, regardless of location, and to share personal experiences, images, interests and opinions with large numbers of others. Examples of social media include online blogs, internet forums, and Social Networking Sites (SNS) such as Facebook and Instagram (Hawn, 2009). However, along with the increasing importance and popularity of SNS and other forms of social media has come the recognition that excessive or compulsive social media use can resemble addiction, sharing features such as craving, impaired control, development of tolerance and withdrawal symptoms, attempts to deny and conceal use-related problems, adverse consequences for other life domains, and lowered life satisfaction (Andreassen, Pallesen & Griffiths, 2017; Chakraborty, 2017; Griffiths, Kuss, & Demetrovics, 2014; Kuss & Griffiths, 2011; Sahin, 2017). Such disordered social media use is thus sometimes claimed to be a form of behavioural addiction, similar to other excessive or compulsive non-drug behaviours such as compulsive shopping, work or exercise, as well as pathological gambling, sex addiction, and internet addiction (Grant, Potenza, Weinstein & Gorelick, 2010). For at least some behavioural addictions, brain pathways implicated in substance addictions appear to be involved (Alavi et al., 2012; Turel, He, Xue, Xiao & Bechara, 2014). Evidence has also pointed to comorbidity of substance and behavioural addictions; e.g., those who meet criteria for internet addiction are at an elevated risk of developing a substance addiction (Grant et al., 2010; Petry, 2001).

Certain personality variables have been reported to be related in similar ways to both substance and behavioural addictions, and are thus often regarded as potential predisposing factors. For example, comorbidity of pathological gambling with substance addictions has been attributed to high trait impulsivity (Petry, 2001). Further, those identified as having internet addiction are reported to show elevated levels of several traits that are similarly elevated in those with substance abuse or addiction (e.g., Kandri, Bonotis, Floros & Zafiropoulou, 2014; Lyvers, Karantonis, Edwards & Thorberg, 2016; Mahapatra & Sharma, 2018). Such traits include rash impulsiveness, or

acting without appropriate consideration of consequences (Spinella, 2007); reward sensitivity, or the degree to which behaviour is motivated by the prospect of access to positive reinforcers (Dawe, Gullo & Loxton, 2004); and alexithymia, a trait characterized by difficulties in identifying and verbalizing the emotional feelings of self and others, as well as an overly concrete or externalized cognitive style (Preece, Becerra, Allan, Robinson & Dandy, 2017). As disordered social media use involves the internet, this form of internet use has recently received attention in relation to personality or other potential predisposing factors (e.g., Andreasson et al., 2017), especially with regards to Facebook use (Chakraborty, 2017; Ryan & Xenos, 2011). An investigation by Correa, Hinsley and Gil de Zúñiga (2010), involving a large nation-wide U.S. sample, examined the Big Five Factors in relation to intensity of social media use; extraversion, neuroticism and openness were associated with more frequent use of social media overall, with these relationships varying by gender and age. By contrast, in a much smaller undergraduate sample Skues, Williams and Wise (2012) found no relationship of those traits with Facebook use, whereas Ryan and Xenos (2011) found a positive association of extraversion with Facebook use in an Australian sample. There have thus been somewhat mixed findings on the Big Five Factors in relation to social media use, depending on the nature of the sample and the form of use. When considering disordered social media use as a possible behavioural addiction, however, a focus on more specific traits that have been previously linked to more widely recognized forms of addiction seems warranted.

Aside from the broad Big Five Factors, narcissism is perhaps the trait that has been most frequently investigated in the context of social media use. Narcissism refers to grandiose self-regard and a strong need for admiration from others; it has been consistently and positively associated with intensity of social media use (Andreasson et al., 2017; Buffardi & Campbell, 2008; Eskisu, Hosoglu & Rasmussen, 2017; Marshall, Lefringhausen & Ferenczi, 2015; Ryan & Xenos, 2011), and has also shown positive associations with alcohol use in young adults (Luhtanen & Crocker, 2005) as well as internet gaming addiction (Kim, Namkoong, Taeyun & Kim, 2008). These associations are typically interpreted by researchers as reflecting use of different means to enhance or reinforce

narcissistic feelings of superiority and grandiosity. As mentioned earlier, research has indicated that several other traits are similarly elevated in those with behavioural addictions as in those with substance abuse or addiction, including rash impulsiveness, reward sensitivity and alexithymia (Kandri et al., 2014; Lyvers et al., 2016). Dawe et al. (2004) differentiated between reward sensitivity and rash impulsiveness in terms of purported roles as predisposing factors in substance misuse, with the former promoting onset of use and the latter maintaining compulsive use in addiction. Reward sensitivity is presumed to reflect activity of the dopaminergic Behavioural Activation System, or BAS, in Gray's (1987) neurobiological theory of motivation, whereas rash impulsiveness reflects the impaired self-control associated with deficient executive functioning and is presumed to reflect prefrontal cortical processes based on a wide variety of evidence (Turel et al., 2014). Executive dysfunction can additionally manifest as alexithymia (e.g., Lyvers, Makin et al., 2014), which has been consistently linked to alcohol dependence and various other forms of substance abuse and addiction as a likely risk factor (Cruise & Becerra, 2018; Lyvers, Hinton et al., 2014; Thorberg et al., 2009).

The present study examined narcissism, reward sensitivity, rash impulsiveness, and alexithymia in relation to disordered use of social media, as well as to risky or problematic use of alcohol (for comparison purposes), in an online sample of men and women aged 18-35 years. Participants were thus young adults (as defined by the Australian Bureau of Statistics [ABS], 2012), and comprised the adult age group that uses social media most frequently (Fergie, Hunt & Hilton, 2016). Reported use of any form of social media or SNS was considered social media use. The aim was to evaluate the degree to which the potential predisposing traits of interest are not only associated with elevated risk of problematic substance use (with the most commonly abused substance - alcohol – the most convenient example for present purposes), but also with disordered social media use, after controlling for age, gender, and social desirability. The personality traits examined here, known from previous work to be significantly associated with risky or problematic use of alcohol and various other drugs as described earlier, were anticipated to show similar

associations with disordered social media use in young adults. This expectation was based on an interpretation of substance and behavioural addictions as manifestations of similar underlying brain-behavioural processes (Turel et al., 2014).

Method

Participants

Initially 147 participants from diverse backgrounds across Australia were recruited using the online survey hosting website Qualtrics. Participation criteria were specified as those aged 18-35 years who use social media and at least occasionally consume alcohol. Identification of four multivariate outliers using Mahalanobis Distance ($p < .001$) resulted in deletion of those cases from the dataset, yielding a final sample of 143 participants (74 men, 69 women) aged 18-35 years ($M = 26.09$, $SD = 4.75$) with 63% of the sample reporting their ethnicity as Caucasian, 22% as Asian, and the remaining 15% as either Aboriginal, African or Other. The largest proportion of participants (41%) reported using social media 7 to 14 hours per week; 27.3 % used it for less than 7 hours per week, whereas 16.5% used it for 14 to 21 hours per week, and 15.1% used it for more than 21 hours per week. Facebook was the primary form of social media use reported (77%). Participants stated that smartphones were the primary device used to access social media.

Materials

Demographics. Age, gender, ethnicity, time spent on social media, primary form of social media used and usual device for accessing it were assessed via corresponding questions.

Social Media Disorder Scale (SMDS; Van den Eijden, Lemmens & Valkenburg, 2016). The SMDS measures compulsive use of social media such as Facebook, SnapChat, Twitter, Instagram, Pinterest, forums and weblogs via 9 items based on Diagnostic and Statistical Manual of Psychiatric Disorders Fifth Edition (DSM-5; American Psychiatric Association, 2013) criteria for internet addiction; e.g., “During the past year, have you tried to spend less time on social media, but failed?” Respondents indicate whether each statement applied to them in the past year by ticking “yes” or “no.” Convergent validity was indicated by positive correlations with the Compulsive

Internet Use Scale (CIUS) and with self-reported social media addiction (Meerkerk et al., 2009). In the present sample the SMDS showed good internal consistency reliability as measured by Cronbach's alpha ($\alpha = .81$).

Narcissistic Personality Inventory Brief Version (NPI-16; Ames, Rose, & Anderson, 2006). This brief version of the NPI-40 (Raskin & Hall, 1981) has 16 items. Each item consists of a pair of statements where participants endorse the statement that best represents them. Narcissism-consistent responses are scored as 1 (e.g., "I like to be the centre of attention") whereas narcissism-inconsistent responses are scored as 0 (e.g., "I prefer to blend in with the crowd"). Higher scores indicate higher levels of trait narcissism. The NPI-40 is a widely used instrument to measure narcissism, however, its length and duration of completion can render it unsuitable in situations where time is a constraint, hence the short form was used in this study. The NPI-16 was reported by the authors to be highly correlated with the NPI-40 ($r = .90$). In the present sample the NP-16 showed acceptable internal consistency reliability ($\alpha = .77$).

Alcohol Use Disorders Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders & Monteiro, 2001). The AUDIT is a widely used screening tool for risky or harmful alcohol use and consists of questions assessing frequency of alcohol consumption (3 items), signs of alcohol dependence (3 items), and alcohol-related problems (4 items). Items 1 to 8 are scored on a five-point Likert scale from 0 to 4, with each question having differing anchors. Items 9 and 10 use a three-point Likert scale with options of 0 (no), 2 (yes, but not during the last year) and 4 (yes, during the last year). Each item score ranges from 0 to 4, thus total scores on this 10-item scale can range from 0 to 40. Scores of 8 or more are considered to indicate risky or harmful drinking (Saunders, Aasland, Babor, Fuente, & Grant, 1993). The AUDIT showed high internal consistency reliability in the present sample ($\alpha = .91$).

Toronto Alexithymia Scale (TAS-20; Bagby, Parker & Taylor, 1994). The TAS- 20 was developed to assess alexithymia via 20 items with response options on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). There are three subscales corresponding to

the facets of alexithymia: Difficulty Describing Feelings (DDF), or problems related to expressing emotions verbally; Difficulty Identifying Feelings (DIF), or problems related to detecting and understanding one's own emotional feelings; and Externally-Oriented Thinking (EOT), an index of concrete thinking and lack of imagination. Summing all items yields a total score that can range from 20 to 100, with higher scores indicating higher levels of alexithymia. Scores of 61 or higher indicate high alexithymia, whereas scores below 52 suggest low or no alexithymia, and scores of 52-60 are considered borderline (Bagby, Taylor & Parker, 1994). Convergent validity of the TAS-20 has been supported by expected correlations with the Bermond-Vorst Alexithymia Questionnaire (Zech et al., 1999) and the Toronto Structured Interview for Alexithymia (Bagby et al., 2006). The TAS-20 showed good internal consistency reliability in the present sample ($\alpha = .82$).

Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ; Torrubia, Avila, Molto & Caseras, 2001). The SPSRQ is designed to assess the degree to which an individual's behaviours are influenced by the Behavioural Activation and Behavioural Inhibition Systems (BAS/BIS) postulated in Gray's (1987) neurobiological theory. BAS responsivity is indexed by the Sensitivity to Reward (SR) scale, whereas BIS responsivity is indexed by the Sensitivity to Punishment (SP) scale; each scale consists of 24 yes-no items (e.g., SR item "Does the good prospect of obtaining money motivate you strongly to do some things?"). SR was the scale of interest for the purposes of the present study as the index of reward sensitivity recommended by Dawe et al. (2004). The validity and two-factor structure of the SPSRQ have been consistently supported (Vandegweghe et al., 2016). Internal consistency reliability of SR was good in the present sample ($\alpha = .86$).

Barratt Impulsivity Scale brief version (BIS-15; Spinella, 2007). The BIS-15 is a short form of the widely used Barratt Impulsivity Scale 11th version (BIS-11), which was developed by Patton, Stanford and Barratt (1995) and considered a good index of rash impulsiveness by Dawe et al. (2004). The BIS-15 consists of 15 items rated via a four-point Likert scale, with response options ranging from 1 (Rarely/Never) to 4 (Always/Almost always). The BIS-15 maintains the three-factor

structure of the BIS-11, encompassing attentional, motor, and non-planning impulsiveness via five items each. A total score is obtained by summing all items and can range from 15 to 60, with higher scores indicative of higher levels of rash impulsiveness. Internal consistency reliability was acceptable in the present study ($\alpha = .74$).

Marlowe-Crowne Social Desirability Scale brief version (MCSDS-13). The 13-item brief version of the Marlowe-Crowne Social Desirability Scale (MCSDS; Crowne & Marlowe, 1960) was used to assess the degree to which participants responded in a socially desirable manner. It consists of 13 true or false items and yields a score ranging 0 to 13, with higher scores indicating more socially desirable responding. Strahan and Gerbasi (1972) developed three different shorter versions of the MCSDS; Reynolds (1982) assessed their psychometric properties and concluded that the 13-item version was the best substitute for the full version as indicated by psychometric indices, including its high correlation with the original ($r = .92$).

Procedure

Approval was obtained from the university ethics committee prior to conducting this study. Participants were recruited from the Qualtrics research participant pool; a project manager was enlisted to organize the recruitment process. Participants were obtained from throughout Australia. They read an explanatory statement that appeared at the start of the online survey explaining the purposes of the study, the voluntary nature of their involvement, and the anonymity of their responses. Continuation beyond this point indicated that consent had been granted. Questionnaire order was uniquely randomized per participant. Completion of the online battery, which took approximately 30 minutes, was rewarded with points that corresponded to a small cash amount and could be exchanged for a gift card once sufficient points were accumulated.

Results

Although men scored somewhat higher on the SMDS index of disordered social media use ($M = 4.00$, $SD = 2.79$) than women ($M = 3.20$, $SD = 2.78$), the difference was not significant, $t(141) = 1.71$, $p = .09$. On the other hand, as is typically the case in young adult samples, men scored

significantly higher on the AUDIT index of risky drinking ($M = 12.88$, $SD = 9.68$) than did women ($M = 7.57$, $SD = 8.39$), $t(141) = 3.50$, $p = .001$. Bivariate correlations of continuous variables are shown in Table 1. Disordered social media use was significantly negatively correlated with age and social desirability, and was significantly positively correlated with risky drinking, the SR index of reward sensitivity, the BIS-11 index of rash impulsiveness, TAS-20 alexithymia, and NPI-16 narcissism, as per expectations.

A hierarchical linear regression was conducted on SMDS disordered social media use scores. Control variables of age, gender, and social desirability were entered at step 1, accounting for a significant 7.3% of variance, $F(3, 139) = 3.63$, $p = .015$. Age was the only significant predictor at this step (see Table 2). Narcissism was added at Step 2, as this trait has been consistently reported to show positive associations with social media use as described earlier. Narcissism explained a significant 6.3% of additional variance, $F_{change}(1, 138) = 10.09$, $p = .002$, with age also significant at this step. At step 3 the traits shown in previous work to be consistently positively related to risky or problematic alcohol and other substance use were added to the model, i.e., reward sensitivity, rash impulsiveness, and alexithymia. The addition of these variables accounted for a significant 24% of additional variance in disordered social media use, $F_{change}(3, 135) = 17.33$, $p < .0001$. The final model was significant, $F(7, 135) = 11.63$, $p < .0001$, accounting for 38% of the variance in disordered social media use. In descending order of importance, reward sensitivity, rash impulsiveness and age were the significant predictors in the final model (see Table 3). Narcissism was no longer a significant predictor; Sobel test indicated that this was due to full mediation by reward sensitivity, $z = 2.78$, $p = .005$. In other words, high narcissism was characterized by high reward sensitivity, which was the strongest predictor of disordered social media use in the final model; hence adding reward sensitivity to the model accounted for the predictive ability of narcissism at the previous step.

For comparison purposes a hierarchical linear regression with the same predictors was conducted on the AUDIT index of risky or problematic drinking. Control variables of age, gender,

and social desirability were entered at step 1, accounting for a significant 10% of variance, $F(3, 139) = 5.19, p = .002$. Gender was the only significant predictor (see Table 2). The addition of narcissism at step 2 explained a significant 13% of additional variance, $F_{change}(1, 138) = 24.03, p < .0001$. At step 3 the addition of reward sensitivity, rash impulsiveness and alexithymia to the model accounted for a significant 16% of additional variance, $F_{change}(3, 135) = 11.57, p < .0001$. The final model accounted for 39% of the variance in risky drinking, $F(7, 135) = 12.37, p < .0001$. In descending order of importance, narcissism, rash impulsiveness, alexithymia and gender were the significant predictors. Note that, unlike the regression on disordered social media use, in the regression on risky drinking narcissism was a significant predictor but reward sensitivity was not.

Discussion

The primary aim of the present study was to see if disordered social media use is associated with similar personality traits as risky or problematic alcohol use, based on the notion of underlying similarities between behavioural and substance addictions in terms of predisposing traits. Results indicated that the SMDS index of disordered social media use – which was based on DSM-5 addiction criteria - was positively correlated with trait measures of narcissism, reward sensitivity, rash impulsiveness and alexithymia as expected. Interestingly, the final hierarchical regression models accounted for nearly identical (and substantial) amounts of variance in both disordered social media use and risky or problematic drinking. Reward sensitivity and rash impulsiveness were significant, positive predictors in the final model of disordered social media use, with age a negative predictor (such that younger participants reported more disordered use). By contrast, in the final model of risky or problematic drinking, narcissism, rash impulsiveness and alexithymia were significant positive predictors; gender was also significant, reflecting the typically higher AUDIT risky drinking scores of men. There were thus both similarities in and differences between the respective models.

Previous work has indicated a positive association of trait narcissism with intensity of social media use (Andreassen et al., 2017; Eskisu et al., 2017; Marshall et al., 2015; Skues et al., 2012). This was reinforced in the present study by the significant positive correlation between narcissism and disordered social media use, and by the finding that narcissism was a significant positive predictor of disordered social media use after controlling for age, gender and social desirability (i.e., at step 2 of the corresponding hierarchical regression). In the final model, however, narcissism was no longer significant due to the mediating role of reward sensitivity, which presumably reflects the elevated BAS activity associated with narcissism (Spencer, Foster & Bedwell, 2017). High reward sensitivity thus appeared to explain the link between narcissism and disordered social media use, suggesting that the disordered social media use of those high in narcissism is likely driven by the prospect of positive social reinforcements such as praise and respect. On the other hand, in the final regression model of risky drinking narcissism remained a significant positive predictor even after adding reward sensitivity, in addition to the independent contributions of rash impulsiveness and alexithymia. The alcohol results were consistent with previous reports of trait narcissism as a positive predictor of alcohol use (Luhtanen & Crocker, 2005) and with the consistently reported positive associations of alexithymia and rash impulsiveness with risky or problematic alcohol or other substance use in previous studies (Cruise & Becerra, 2018; Dawe et al., 2004; Thorberg et al., 2009).

Dawe et al. (2004) proposed that the role of reward sensitivity in substance misuse is to promote initiation of use, whereas rash impulsiveness maintains compulsive use in addictions. Present results appear to be consistent with that interpretation for risky or problematic drinking, which was predicted by rash impulsiveness but not reward sensitivity in this sample according to the corresponding final model. By contrast, both reward sensitivity and rash impulsiveness were significant positive predictors of disordered social media use. The apparent role of reward sensitivity in disordered social media use may simply reflect the level of anticipation of positive experiences that users have regarding social media, with stronger positive expectations motivating

more intense use - especially among those high in narcissism. The apparent role of rash impulsiveness in disordered social media use, on the other hand, presumably reflects executive dyscontrol, perhaps the most important factor in addictions (Lyvers, 2000). The BIS-11 index of rash impulsiveness shows strong positive associations with other self-report indices of executive dysfunction such as Grace and Malloy's (2001) Frontal Systems Behavior Scale, and has been shown to predict poorer performance on the Iowa Gambling Task, a neuropsychological test of executive function (Lyvers, Basch, Duff & Edwards, 2015). The apparent role of rash impulsiveness as a behavioural sign of executive dyscontrol in disordered social media use thus fits with the concept of behavioural addiction.

The present sample was recruited online by a widely-used survey hosting company, Qualtrics, which recruits internet users across Australia to participate in online survey research. Generalisability of the present findings may nevertheless be questioned. TAS-20 alexithymia scores were unusually high in this Australian sample compared to what has been reported for the general adult population in other countries (e.g., Mattila, Salminen, Nummi & Joukamaa, 2006); however, as Qualtrics recruits people online, the sample may have been somewhat biased toward those who spend relatively more of their time online - as highly alexithymic individuals have been reported to do (e.g., Lyvers et al., 2016) - hence the relatively high overall scores on this trait. AUDIT scores were also high, with the mean score at a level indicative of hazardous drinking (Saunders et al., 1993), but such scores may be typical for young Australian adults, especially men (e.g., Bowring, Gouillou, Hellard & Dietze, 2013). In any case future work should attempt to replicate the present findings in larger, more representative samples. Although much previous work has focused on Facebook use specifically (as discussed earlier), and Facebook was the primary form of social media used by the present sample, the possibility of variation in the personality traits associated with disordered use of different types of social media might also be worth examining in future work - though in the case of problematic substance use, the associated traits appear to be similar across different substances as described earlier. There is also the possibility of variation in findings for

different means of accessing social media, e.g., smartphone vs. PC, which might also merit investigation. Finally, an inherent limitation of the present findings concerns the inability to draw conclusions regarding causal relationships given the correlational design, which renders interpretation of relationships among variables as necessarily speculative. Although the traits examined are known to be fairly stable across time, a longitudinal approach would nevertheless be most informative in regard to causation issues.

Tentatively, the present findings point to both similarities and differences between risky or problematic alcohol use and disordered social media use when considering personality traits as possible risk factors. The well-established role of alexithymia as a trait associated with problematic drinking (Cruise & Becerra, 2018; Thorberg et al., 2009) was supported in the present sample, such that alexithymia was a significant independent predictor of risky drinking in the final regression model along with rash impulsiveness and narcissism. By contrast, although alexithymia was significantly positively correlated with disordered social media use in the present sample, it was not a significant predictor of such use in the final regression model; instead, the two forms of impulsivity proposed by Dawe et al. (2004) were the main predictors. Future work is needed to further elucidate both the similarities and the differences in risk factors between substance and behavioural addictions, with a longitudinal approach recommended where possible. Results would be potentially informative for clinicians involved in the treatment of those exhibiting such disordered behaviours. For example, based on the present results, targeting impulsiveness and other signs of executive dyscontrol may be as relevant to successful treatment of disordered social media use as for disordered substance use, whereas for clients high in narcissism, targeting the drive for positive social reward might prove particularly useful in treating disordered social media use. In any case, research outcomes are likely to inform the issue of whether disordered social media use can be meaningfully regarded as a form of addiction.

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