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Alexithymia and alcohol: The roles of punishment sensitivity and drinking motives

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Abstract

Alexithymia refers to difficulties identifying and describing feelings. It is suspected of being a risk factor for problematic drinking, an idea examined by the present study. In 178 women and 84 men alexithymia was associated with male gender, coping motives for drinking and sensitivity to punishment. Individuals with alexithymia reported stronger coping motives and sensitivity to punishment compared to those with borderline or no alexithymia. Path analysis indicated the relationship between the alexithymia dimension difficulties identifying feelings and coping motives was mediated by sensitivity to punishment, and the relationship between sensitivity to punishment and risky drinking was mediated by coping motives. These results suggest that alcohol may be used by individuals with alexithymia to help them cope with anxiety or other negative affect.

Keywords: alexithymia, alcohol, alcoholism, drinking motives, anxiety

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In Australia, alcohol use is the second largest cause of drug-related hospitalisations or deaths (after tobacco), and is the main cause of death on Australian roads (Australian Bureau of Statistics [ABS], 2005). Heavy alcohol consumption can cause memory lapses, strokes, hypertension, cancers, liver damage, brain deficits, and psychological distress (National Health and Medical Research Council [NHMRC], 2009). The potential danger of excessive alcohol consumption warrants investigation into the risk factors for heavy drinking. Factors pertaining to increased alcohol consumption include drinking motives (Cooper, 1994), reward sensitivity (Feil & Hasking, 2008; Lyvers, Czerczyk, Follent, & Lodge, 2009; Lyvers, Duff & Hasking, 2011), and alexithymia (Kauhanen et al., 1992; Thorberg, Young, Sullivan, Lyvers, Connor, & Feeney, 2010). However, how these factors work together to predict alcohol consumption has not been adequately investigated to date.

Alexithymia refers to difficulties identifying feelings and difficulties describing feelings, difficulties distinguishing feelings from bodily sensations, and a lack of imagination as well as an externally oriented thinking style (Nemiah, Freyberger & Sifneos, 1976). Individuals with alexithymia tend to be preoccupied with details of external events and, perhaps due to their inability to effectively communicate emotional distress, typically fail to enlist others' help or comfort (Meganck, Vanheule, Inslegers, & Desmet, 2009). Alexithymia may be a predisposing risk factor for eating disorders (see Taylor et al., 1997) and alcohol use disorders (see Thorberg, Young, Sullivan, & Lyvers, 2009a). Alexithymic symptomatology is often co-morbid with anxiety and depression and has reportedly shown improvement with the resolution of a depressive disorder in some cases (Honkalampi, Hintikka, Saarinen, Lehtonen & Vilnamaki, 2000). A state rather than trait interpretation of alexithymia has thus been proposed (Haviland, Hendryx, Shaw & Henry, 1994). On the other hand, factor analytic work has indicated that depression is a distinct construct from alexithymia (Mueller, Buehner & Ellgring, 2003), and a substantial body of evidence supports a developmental and/or genetic

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etiology of alexithymia as a personality trait (see review by Thorberg, Young, Sullivan & Lyvers, 2011).

Between 45% and 67% of those with alcohol dependence have clinical levels of alexithymia (see Thorberg et al., 2009a), as compared to 5-13% of the general population (Franz et al., 2008; Mattila, Salminen, Nummi, & Joukamaa, 2006). Difficulties in identifying and describing feelings have been significantly associated with preoccupation, obsessions, and compulsive behaviours regarding alcohol consumption (Thorberg, Young, Sullivan, Lyvers, Connor, & Feeney, 2011a). Similarly, in a large population study ($n = 2297$), Kauhanen and colleagues (1992) noted that quantity and frequency of alcohol consumption as well as “binge drinking” were strongly associated with alexithymia. Moreover, recent research on outpatients undergoing treatment for alcohol dependence found more intrusive alcohol-related thoughts and impulses, impaired ability to control such thoughts and impulses, and increased alcohol problem severity among alexithymics compared to non-alexithymics (Thorberg et al., 2011a). Further, alcohol dependent clients presenting with alexithymia report a younger age of drinking onset and longer duration of abuse as well as more interpersonal difficulties (Thorberg et al., 2009ab; Uzun, Ates, Cansever, & Ozsahin, 2003).

Alcohol may be used by individuals with alexithymia to cope with high levels of stress (de Timary, Emmanuel, Luminet, Fillee & Mikolajczak, 2008) and/or to improve poor interpersonal functioning (see Thorberg et al., 2009a). The anxiolytic and disinhibiting effects of alcohol might conceivably help alexithymics overcome their inability to experience or express emotion (Apfel & Sifneos, 1979; Finn, Martin, & Phil, 1987; Sifneos, 1973). This idea was supported in a recent study (Thorberg et al., 2011b) indicating that the relationship between alexithymia and alcohol dependence was partially mediated by expectations of affective change and assertion. This suggests that alcohol dependent alexithymics drink

alcohol in order to experience stronger feelings and to be more outgoing and confident. Perhaps for these functional reasons, alcohol dependent patients presenting with alexithymia report significantly shorter periods of abstinence compared to those without alexithymia (Loas et al., 1997; Ziolkowski, Gruss & Rybakowski, 1995). Together, such evidence may suggest that alexithymia is associated with an inherent vulnerability to alcohol use disorders and that motives for drinking vary with respect to alexithymia.

Drinking motives influence drinking through the anticipation of valued outcomes (Cooper, 1994; O'Brien, Hunter, Kypri, & Ali, 2008). Conceptualised as the decisive mechanism of whether or not an individual drinks (Kuntsche, Knibbe, Gmel, & Engels, 2006), motives are more proximal to actual drinking behaviour than drinking expectancies (Cooper, 1994; Kuntsche, Knibbe, Gmel, & Engels, 2005; Lyvers, Hasking, Hani, Rhodes & Trew, 2010; Neighbors, Larimer, Geisner, & Knee, 2004), regardless of situational, social (O'Brien et al., 2008), or personal factors (Jasinski & Ford, 2007). Derived from past experience, drinking motives may be used to justify certain styles of alcohol consumption (Kuntsche et al., 2006). Social motives reflect anticipation of social rewards (Lyvers et al., 2010), including social facilitation (Stewart & Chambers, 2000), and to enjoy social events (Neighbors et al., 2004). Enhancement motives represent the anticipation of enhanced mood (Stewart & Chambers, 2000) and drinking for kicks (Neighbors et al., 2004). Through social and enhancement motives, positive reinforcement in the form of positive affect is sought through external or internal rewards, respectively (Kuntsche et al., 2005). Coping motives reflect anticipated negative reinforcement through the removal of negative affect (Stewart & Chambers, 2000). Coping motives represent an avoidance strategy, the lack of more adaptive coping methods, and a high alcohol dependence risk (Gire, 2002).

Enhancement and coping motives significantly predict heavy drinking and drinking problems (Kuntsche et al., 2005), with enhancement motives most strongly predicting heavy

drinking and coping motives most strongly predicting alcohol-related problems (Cooper, 1994). Social motives are generally not thought to be strongly related to drinking frequency, quantity, or risky drinking (Kuntsche, Stewart & Cooper, 2008), however a recent study has indicated that in young adults, social motives may be positively associated with alcohol-related problems (Lyvers et al., 2010). Interestingly, alexithymia has been reported to be positively related to coping and social motives in university undergraduates (Stewart, Zvolensky, & Eifert, 2002).

Gray's model of personality (1982, 1987) posited two fundamental motivational systems of the brain, the Behavioral Activation System (BAS) and Behavioral Inhibition System (BIS), both of which should influence motives for drinking alcohol but in different ways. BAS reflects a desire to approach rewarding situations and is mediated by dopaminergic pathways, and should thus be related to increased drinking. BIS reflects a desire to avoid punishment and is related to fear and anxiety. The Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ; Torrubia, Avila, Molto & Caseras, 2001) was designed to measure the influence of these two motivational systems on an individual's behavior, with the Activation system assessed by the Sensitivity to Reward (SR) scale and the Inhibition system assessed by the Sensitivity to Punishment (SP) scale. SR has been shown to be positively associated with adolescent substance abuse (Genovese & Wallace, 2007), and Lyvers et al. (2009, 2011) similarly found a positive relationship between SR and risky alcohol consumption in university undergraduates. Furthermore, SR is negatively associated with age of onset of weekly drinking (Lyvers et al., 2009, 2011), meaning that those high in reward sensitivity tend to begin drinking regularly at an earlier age. By contrast, the other SPSRQ dimension, SP, related to anxiety and neuroticism (Torrubia et al., 2001), has not been found to be consistently associated with alcohol use by young adults (Lyvers et al., 2009, 2011). However, anxiety and neuroticism may be more likely to be associated with

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heavier alcohol consumption in older adults (Feil & Hasking, 2008; Kambouropoulos & Staiger, 2004), and might plausibly be related to coping motives for drinking among those who drink to alleviate anxiety or other negative emotion.

In the present study alexithymia was examined in relation to drinking behaviour, motives for drinking, and SR and SP as assessed by the SPSRQ. Based on previous evidence that alcohol use may be a coping mechanism for dealing with negative affect and poor interpersonal functioning among those with combined alexithymia and alcohol dependence (see Thorberg et al., 2009a), alexithymia was hypothesised to positively relate to coping and social motives for drinking as well as with risky alcohol use in a non-clinical sample. Alexithymia was also expected to be associated with the SP dimension of the SPSRQ given the association of alexithymia with anxiety and stress (DeGucht, Fischler & Heiser, 2004; de Timary et al., 2008). Based on the associations observed in previous research we proposed that the relationship between alexithymia and alcohol-related risk is mediated by both sensitivity to punishment and motives for drinking. Specifically we expected the relationship between alexithymia and drinking motives to be mediated by SP, while coping motives in turn would predict risky drinking.

Method

Participants

The sample consisted of 178 women and 84 men aged 20-57 years ($M = 26.83$ years, $SD = 8.34$) who were recruited for this study at two different Australian locations. We examined only those 20 years or older as by age 20 most drinkers have presumably developed well-established motives for drinking given that the legal drinking age in Australia is 18 years. The majority of participants were born in Australia (71.6%), with others originating from Malaysia (6.1%), the UK (5.0%) and New Zealand (4.2%). Of the participants, 72 were non-student members of the local community and 190 were university

students. Twenty-eight community participants were recruited via direct solicitation at a shopping mall with the incentive of a raffle ticket to have a chance of winning a \$50 shopping voucher. The remainder were recruited by responding to advertisements posted in local businesses. In addition, participants were invited through a dedicated Facebook page directing interested persons to the URL for completion of the online survey. All participants reported at least occasional use of alcohol. Community and student samples did not differ in gender composition, age, or any of the variables under investigation, however given possible, unmeasured differences between these groups student status was statistically controlled in our analyses.

Materials

Demographic questionnaire. This brief self-report questionnaire assessed participant age, gender, country of origin, student status, and education as well as whether the prospective participant drinks alcohol. Those who responded “no” to the latter question were not eligible for participation.

Toronto Alexithymia Scale (TAS-20). The TAS-20 is a 20-item self-report questionnaire designed to yield an overall alexithymia score as well as three subscale dimensions: Difficulties Identifying Feelings (DIF), Difficulties Describing Feelings (DDF) and Externally Oriented Thinking (EOT) (Bagby, Parker, & Taylor, 1994). Items are rated on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*); response summation produces a total score ranging between 20 and 100 with a higher score indicating higher levels of alexithymia. Seven items measure DIF (e.g., ‘I have feelings that I can’t quite identify’), five items measure DDF (e.g., ‘it is difficult for me to find the right words for my feelings’), and eight items measure EOT (e.g., ‘I prefer talking to people about their daily activities rather than their feelings’). Cut-off scores have been established suggesting that scores of 61 or higher reflect clinical levels of alexithymia, 52 to 60 indicate borderline alexithymia and

scores of 51 and below indicate no alexithymia (Bagby, Taylor, & Parker, 1994). The TAS-20 has shown acceptable construct, discriminant and convergent validity in clinical and analogue populations. Internal consistency (Cronbach's alpha) has been reported to range from 0.83 for the total scale to 0.81 (*DIF*), 0.77 (*DDF*) and 0.66 (*EOT*) for the subscales (Bagby, Parker et al., 1994; Bagby, Taylor et al., 1994; Parker, Shaughnessy, Wood, Majeski & Eastabrook, 2003; Thorberg et al., 2010).

Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ). The SPSRQ (Torrubia et al., 2001) is a 48 yes-no response item questionnaire consisting of two scales: Sensitivity to Punishment (SP; 24 items, e.g. "Are you often afraid of new or unexpected situations?"), and Sensitivity to Reward (SR; 24 items, e.g. "Do you sometimes do things for quick gains?"). Dichotomous responses of either "yes" (1) or "no" (0) yield a score for each scale which is a summation of all affirmative responses. The magnitude of the score indicates the level of SR and SP. Both scales demonstrate high levels of internal consistency and three month test-retest reliability (O'Connor, Colder, & Hawk, 2004; Torrubia et al., 2001). Construct validity has been demonstrated in a two factor solution (O'Connor et al., 2004). SR has been found to be positively related to extraversion ($r = .48$) and Gray's BAS scale ($r = .43$), and SP related to neuroticism ($r = .70$) and Gray's BIS scale ($r = .50$) (Sava & Sperneac, 2006), consistent with the theoretical underpinnings of the SPSRQ.

Drinking Motives Questionnaire (DMQ). The DMQ (Cooper, Russell, Skinner & Windle, 1992) consists of 15 items designed to assess the motivations for drinking using three factors: social, enhancement and coping motives. Each drinking motive has five associated test items and is assessed on a 4-point Likert scale ranging from never/almost never to always/almost always. Social motives reflect external positive reinforcement (enhance external social rewards), enhancement reflects internal positive reinforcement (enhance positive affect) and coping reflects internal negative reinforcement (deal with

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negative emotions). The internal consistency of the subscales for the DMQ is .66, .83 and .85 for the social motives, enhancement and coping motives respectively (Stewart, Zeitlin & Samoluk, 1996).

Alcohol Use Disorder Identification Test (AUDIT). The AUDIT is a 10-item self-report questionnaire developed as a screening device to facilitate early alcohol dependence interventions (Donovan, Kivlahan, Doyle, Longabaugh, & Greenfield, 2006; Karno, Granholm, & Lin, 2000) and has been normed on Australian and American samples (Saunders, Aasland, Babor, de la Fuente & Grant, 1993). Item scores range from 0 to 4, with a possible total score between 0 and 40 (Saunders et al., 1993). Scores of 0-7 indicate low risk drinking, 8-15 hazardous drinking, and 16 and above harmful drinking (Saunders et al., 1993). Sensitivity for detecting problematic alcohol consumption ranges between 0.60 and 0.95, and specificity ranges from 0.84 to 0.96 (Karno et al., 2000). The AUDIT has good internal consistency ($\alpha = 0.87- 0.95$; Conley, 2001; Karno et al., 2000; O'Hare, Sherrer, LaButti, & Emrick, 2004; Pal, Jena, & Yadav, 2004). Temporal stability has been established with good test-retest reliabilities over a one-week period ($r = 0.89$; Rubin et al., 2006) and a one-month period ($r = 0.69$; Selin, 2003). Concurrent validity has been established with the Alcohol Use Scale (AUS; O'Hare et al., 2004), the Michigan Alcoholism Screening Test (MAST; Bohn, Babor, & Kranzler, 1995; Conley, 2001), the MAST short version (SMAST; Pal et al., 2004), the MacAndrew Alcoholism Scale, and blood-alcohol level screening tests (Bohn et al., 1995).

Procedure

After receiving ethical approval participants were recruited by researchers at two Australian universities. All participants gave informed consent prior to participating. Students at the first site volunteered to participate by responding to an explanatory statement posted on the psychology research participation board, which outlined testing sessions and

corresponding rooms. Upon arrival to the testing session, participants were given another copy of the explanatory statement and the questionnaire battery. Participants were notified of their right to withdraw without penalty and the principle of anonymity. They were instructed to complete the questionnaires as quickly and as accurately as possible, and to place completed questionnaires in a large envelope. At the second site, undergraduate psychology students were directed to a URL to complete the questionnaire online, while other students responded to advertisements placed around campus. Psychology students from both sites were awarded partial course credit for participating in the study.

The community sample was derived from a shopping mall and by responses to an advertisement through invitations on Facebook. After gaining written permission from the shopping centre manager, potential participants were approached to participate to enter a draw to win a \$50 shopping voucher. After giving consent, participants were verbally reminded that they were free to withdraw at any time. Participants were given the explanatory statement and questionnaire battery with the instructions to complete the questionnaires as accurately and as quickly as possible, and to place completed questionnaires into a large envelope. Participants were alternatively given the opportunity to take the questionnaire away and were supplied with a reply-paid envelope. The remaining community data came from an online survey website, SurveyMonkey, via a link on Facebook. No incentive was offered for this subsample.

Results

All analyses were conducted using PASW Statistics 18 (SPSS Inc.).

Preliminary analyses

Of the total sample, 47 (17.9%) were classified as having clinical levels of alexithymia based on TAS-20 scores above 60, which was higher than expected based on other estimates of alexithymia prevalence described above. As expected based on previous work, chi-square

test showed that alexithymia status (non-alexithymic, borderline alexithymic, alexithymic) as defined by TAS-20 score was significantly associated with gender, $\chi^2(2) = 7.67, p = .02$. As shown in Table 1, only 24% of the non-alexithymic group were male, compared to 38% of the borderline alexithymic group and 45% of the alexithymic group. No gender differences were observed in alcohol-related risk (Low Risk, Hazardous, Harmful drinking), $\chi^2(2) = 4.03, p = .13$. High rates of Hazardous or Harmful drinking (53%) as defined by AUDIT scores of 8 or higher were observed in this sample.

Intercorrelations were calculated for all continuous variables. TAS-20 total scores were significantly positively correlated with coping motives on the DMQ, $r = .19, p = .004$, and positively correlated with SP on the SPSRQ, $r = .33, p < .0001$. For clarification of such relationships further intercorrelations were calculated using the TAS-20 subscale scores instead of the total score (see Table 2). Older participants were less likely to have Difficulties Identifying Feelings (DIF), more likely to have an Externally Oriented Thinking (EOT) style and less likely to drink for enhancement. Contrary to expectations alexithymia was not related to risky drinking as measured by AUDIT. However, DIF and DDF were associated with coping motives for drinking and both SP and SR, while EOT was associated with enhancement motives.

Group comparisons

A multivariate analysis of covariance (MANCOVA) was conducted with TAS-defined alexithymia groups (non-alexithymic, borderline alexithymic, alexithymic) and gender as independent variables and drinking motives, SP, SR, and AUDIT scores as dependent variables. Age was entered as a covariate given its significant correlations with some of the variables of interest (see Table 2), as was student status. There was a significant multivariate effect of alexithymia group, $F(12,356) = 4.12, \lambda = 1.00, p < .0001, \eta^2 = .12$. Univariate effects were significant for coping motives, $F(2, 182) = 9.75, p < .0001, \eta^2 = .10$, and SP, $F(2,$

182) = 13.67, $p < .0001$, $\eta^2 = .13$. Alexithymic participants scored significantly higher on coping motives than both borderline, $F(1,183) = 7.54$, $p < .01$, and non-alexithymic participants, $F(1,183) = 17.56$, $p < .001$. Similarly, alexithymic participants scored significantly higher on SP than both non-alexithymic participants, $F(1,183) = 25.82$, $p < .001$, and borderline alexithymic participants, $F(1,183) = 4.93$, $p = .03$; the latter scored higher on SP than non-alexithymic participants, $F(2,184) = 9.91$, $p < .01$.

Although gender did not exert a significant direct effect on the combined dependent variables ($p = .07$), there was a significant interaction between alexithymia group and gender, $F(6,177) = 2.01$, $\lambda = .95$, $p < .01$, $\eta^2 = .07$. Univariate interactions were significant for coping motives, $F(2, 182) = 6.35$, $p = .002$, $\eta^2 = .07$, and SR, $F(2, 182) = 4.72$, $p < .01$, $\eta^2 = .05$. One-way ANOVAs revealed no relationship between alexithymia and coping motives for women ($p = .99$), however differences across the groups were evident for men, $F(2,72) = 11.64$, $p < .001$. Specifically, alexithymic men reported stronger coping motives than both borderline, $F(1,72) = 10.51$, $p < .01$, and non-alexithymic men, $F(1,72) = 22.84$, $p < .001$.

Alexithymia was significantly related to SR in men, $F(2, 71) = 5.49$, $p = .01$, $\eta^2 = .13$, but not in women ($p = .49$). Alexithymic men scored significantly higher on SR than both non-alexithymic men, $F(1,71) = 8.67$, $p < .01$, and borderline alexithymic men, $F(1,71) = 8.42$, $p < .01$.

Regression analyses

As alexithymia as measured by TAS-20 was not related to risky drinking as measured by AUDIT in this sample, regression analyses focused on the mediating roles of sensitivity to punishment and reward in the relationship between alexithymia and drinking motives. Three regression analyses (one for each drinking motive) were conducted. Demographic variables of gender, age, and sample (student vs. community) were entered in the first step, and the DIF, DDF and EOT scales of the TAS-20 were entered in the second. Sensitivity to

punishment and reward (SP and SR) were entered in the third step. As seen in Table 3, SR was the only variable related to social motives, $\beta = .24, p < .01$. EOT was a negative predictor of enhancement motives, $\beta = -.21, p < .05$, while SR was a positive predictor after controlling for the other variables, $\beta = .25, p < .001$. Only DIF, $\beta = .25, p < .01$, contributed unique variance to the prediction of coping motives. After controlling for DIF, DDF and EOT, SP, $\beta = .15, p < .05$, and SR, $\beta = .22, p < .01$, were both positive predictors of coping motives. Of note, the relationship between DIF and coping motives was no longer significant at this step. Sobel analyses confirmed that the relationship between DIF and coping motives was mediated by SP, $Z = 2.10, p = .04$, but not by SR ($p = .10$). Given the relationship between DIF, SP, and coping motives, and the relationships between SP, coping motives and risky drinking, we tested a path analysis proposing that the relationship between DIF and coping motives is mediated by SP, and the relationship between SP and risky drinking is mediated by coping motives (see Figure 1). As age was the only demographic variable related to the variables in the model only age was included. This model proved to be an acceptable fit to the data, $\chi^2(6) = 12.76, p = .05$, NFI = .94, CFI = .97, RMSEA = .06.

Discussion

The high rates of alexithymia found in clinical samples of alcohol dependent patients (see Thorberg et al., 2009a) suggest either that alcohol dependence leads to alexithymia or, perhaps more plausibly, that alexithymia is associated with increased vulnerability to alcohol dependence. In the present study using a nonclinical sample, scores indicative of alexithymia were associated with coping motives for drinking and with sensitivity to punishment. However contrary to expectations there was no direct relationship between alexithymia scores and AUDIT scores.

Overall, the TAS-20 alexithymia dimension of difficulty identifying feelings was positively related to coping motives for drinking, whereas the dimension externally oriented

thinking was negatively related to enhancement motives. Sensitivity to reward was related to all drinking motives, consistent with its strong link to risky drinking as reported in other recent work (Lyvers et al., 2009; 2011). As expected, sensitivity to punishment was positively related to coping motives but was not related to the other drinking motives. Of note, the relationship between difficulty identifying feelings and coping motives was mediated by sensitivity to punishment, consistent with the strong link between difficulty identifying feelings and anxiety as reported by Marchesi et al. (2000). High sensitivity to punishment often manifests as anxiety (Gray, 1982), thus individuals with high sensitivity to punishment may drink in order to cope with anxious feelings that they may not be able to successfully regulate. Importantly, the relationship between sensitivity to punishment and AUDIT was mediated by coping motives in the present study. The results of our path analysis therefore begin to hint at the possible mechanisms underlying the often-observed direct relationship between alexithymia and risky drinking (Kauhanen et al., 1992; Uzun et al., 2003), and the high rates of alexithymia observed in people dependent on alcohol (Thorberg et al., 2009a). Alexithymia is commonly associated with anxiety and stress (DeGucht et al., 2004; de Timary et al., 2008), hence the tendency to drink to cope with aversive states may be one reason for the strong association between alexithymia and alcohol dependence. The results of the path analysis, although unable to support directionality of the relationships in this cross-sectional sample, do suggest this to be a plausible explanation.

The relationship between difficulty identifying feelings and coping motives for drinking suggests that individuals with alexithymia may drink for the anxiolytic properties of alcohol. Individuals who have difficulties identifying feelings have trouble regulating emotion and dealing with stressful events (Taylor et al., 1997), as the first step in successfully regulating emotion is to be able to identify the emotion of interest. In a stressful situation such individuals may turn to alcohol in an attempt to regulate distressing emotions. The finding

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that sensitivity to punishment was related to coping motives supports this assertion. Drinking to cope with anxious feelings may lead to an increased risk of alcohol problems or dependence later in life, as indicated by a recent prospective study (Schmidt, Buckner & Keough, 2007). The predominance of young adults in the present sample may account for the absence of the expected direct relationship between alexithymia and risky drinking in the present study.

The relationship between difficulty identifying feelings and coping motives for drinking further suggests that the high rates of alexithymia reported in samples of alcohol dependent patients (Thorberg et al., 2009a), as well as the higher likelihood of relapse in alexithymics following treatment for alcohol dependence compared to non-alexithymics with alcohol dependence (Loas et al., 1997; Ziolkowski et al., 1995a), may at least in part reflect the enduring difficulties encountered by many alexithymics in managing negative emotions and coping with stress via self-regulation or interpersonal means rather than by self-medication with alcohol. Such issues are likely to render young adults with alexithymia more vulnerable to lifetime alcohol problems than non-alexithymics. The fact that coping motives for drinking are associated with a high risk of subsequent alcohol dependence (Gire, 2002; Schmidt et al., 2007) suggests that young adults with alexithymia may be at an elevated risk of eventual problematic drinking.

Our path analysis suggests that alexithymia influences drinking behaviour via its effect on sensitivity to punishment and coping motives, however the failure to find a direct relationship between alexithymia and risky drinking was unexpected. The young adult university student status of most participants may account for this anomaly. There is some evidence that risky drinking by university students may more strongly reflect social influences than internal factors such as coping needs or alexithymia (Casswell et al., 2002; Read, Wood, Kahler, Maddock & Palfai, 2003). Future research exploring motives for risky

drinking among university students and members of the general community would shed light on factors to be targeted in educational campaigns to reduce risky drinking.

The current, cross-sectional study does not allow an examination of the causal mechanisms underlying the reported relationships between alexithymia and risky or problematic drinking, however the current results do suggest that alexithymia may be indirectly related to risky drinking in non-clinical samples through sensitivity to punishment and coping motives for drinking. Future studies with both clinical and non-clinical samples are required to clarify these relationships.

The present study also found a substantial gender bias in that alexithymia and borderline alexithymia were more common in men than in women, consistent with other findings (Matilla et al., 2006) and with the similar gender difference in alcoholism rates favouring men (Cloninger, 1987). This finding is also consistent with the significant overlap between alexithymia and Asperger's disorder (Fitzgerald & Belgrove, 2006; Hill, Berthoz, & Frith, 2004), suggesting that alexithymia may reflect an exaggeration of traits that are genetic in origin (see Jorgensen, Zachariae, Skytthe & Kyvik, 2007) and more common in males. Nevertheless there is evidence to support both developmental (Thorberg, Young, Sullivan & Lyvers, 2011) and state as opposed to trait accounts of alexithymia (Haviland et al., 1994; Honkalampi et al., 2000), hence alternative interpretations must be considered.

A possible limitation of the present study concerns the use of a self-report measure of alexithymia, a condition which involves deficient introspective self-awareness of one's own emotional states (Taylor & Bagby, 2004). However, both observer ratings of alexithymia using the Observer Alexithymia Scale (Haviland, Warren, & Riggs, 2000) and TAS-20 scores produced comparable results in a sample of alcohol dependent patients (Thorberg et al., 2010). Another limitation concerns the nature of the convenience sample, which included university students recruited from two different Australian universities as well as non-student

members of the community recruited off-campus. The sample was characterized by high levels of risky drinking (i.e., 53% reported Hazardous or Harmful drinking by AUDIT criteria) as well as alexithymia. Although over half of the sample consisted of risky drinkers by AUDIT criteria, this was in line with other samples of young Australian adults including university students (e.g., Lyvers et al., 2010). The 17.9% rate of alexithymia as defined by TAS-20 cut-off in the present sample was intermediate between the very high rates of 45-67% reported in alcohol-dependent samples (Thorberg et al., 2009a) and the 5-13% estimates of alexithymia prevalence in the general population of European countries (Franz et al., 2008; Matilla et al., 2006). However the current sample of mostly young adults and university students was obviously not representative of the general Australian population, in which the rate of alexithymia is not known.

The findings of the present study suggest that young adults who have difficulty identifying their emotional feelings are more likely to be sensitive to aversive stimuli, and in turn more likely to be motivated to drink to cope with negative affect. As coping motives for drinking are associated with a high risk of later alcohol dependence, the high rates of alexithymia reported in alcohol-dependent samples, and the association of alexithymia with the tendency to relapse in such samples, may reflect an enduring reliance on alcohol as a coping mechanism in those with alexithymic characteristics. However, further research is needed to elucidate the nature of the relationship between alexithymia and alcohol use.

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Table 1. Gender composition of TAS-20-defined alexithymia groups.

Alexithymia group	Female (n)	Male (n)	Total (N)
Non-alexithymic	87	28	115
Borderline alexithymic	42	26	68
Alexithymic	26	21	47
Total	155	75	

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Table 2. Intercorrelations among variables.

Variable	Mean(sd)	Age	DIF	DDF	EOT	SOC	COP	ENH	SP	SR	Audit
Age	26.83 (8.34)	-									
DIF	15.26 (5.67)	-.18**	-								
DDF	12.55 (3.65)	-.07	.65***	-							
EOT	23.44 (4.78)	.20**	.29***	.40***	-						
SOC	18.33 (6.22)	.03	-.05	-.01	-.06	-					
COP	10.97 (4.80)	-.03	.26***	.22**	-.03	.52***	-				
ENH	15.21 (6.25)	-.19**	.03	-.06	-.26***	.63***	.58***	-			
SP	11.04 (5.37)	-.22**	.37***	.32***	.09	.10	.27***	.12	-		
SR	11.24 (4.74)	-.29***	.14*	.05*	-.01	.21**	.25***	.29***	.24**	-	
Audit	9.37 (6.16)	-.04	.04	-.01	-.02	.54***	.50***	-.03	-.03	.27***	-

*p < .05 **p < .01 ***p < .001

DIF: Difficulties Identifying Feelings; DDF: Difficulties Describing Feelings; EOT: Externally Oriented Thinking; SOC: social motives; COP: coping motives; ENH: enhancement motives; SP: sensitivity to punishment; SR: sensitivity to reward; Audit: Alcohol Use Disorders Identification Test

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Table 3. Regression analyses

	Social motives						Coping motives						Enhancement motives						
	B	β	R	R ²	ΔR^2	F	B	β	R	R ²	ΔR^2	F	B	β	R	R ²	ΔR^2	F	df
Step 1			.11	.01	.01	.88			.14	.02	.02	1.36			.24	.06	.06	3.90**	3, 199
Age	.03	.04					-.01	-.02					-.14	-.16*					
Gender	-.64	-.05					.43	.04					-.01	.00					
Sample	1.12	.10					1.19	.14					1.75	.15*					
Step 2			.14	.02	.01	.63			.37	.14	.16	5.04 [†]			.31	1.0	.04	3.39**	6, 199
DIF	-.09	-.08					.21	.25**					.16	.14					
DDF	.16	.09					.22	.17					-.08	-.05					
EOT	-.05	-.04					-.12	-.12					-.27	-.21*					
Step 3			.29	.08	.06	2.17 [†]			.46	.21	.07	6.30 [†]			.40	.16	.06	4.46 [†]	8, 199
SP	.10	.09					.13	.15*					.07	.06					
SR	.31	.24**					.22	.22**					.33	.25 [†]					

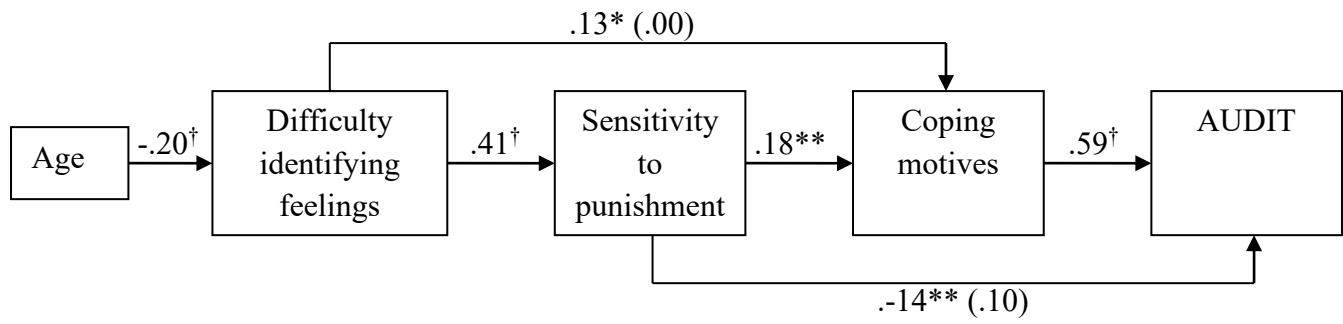
* $p < .05$ ** $p < .01$ [†] $p < .001$

DIF: Difficulties Identifying Feelings; DDF: Difficulties Describing Feelings; EOT: Externally Oriented Thinking; SOC: social motives; COP: coping motives; ENH: enhancement motives; SP: sensitivity to punishment; SR: sensitivity to reward; Audit: Alcohol Use Disorders Identification Test

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* $p < .05$ ** $p < .01$ † $p < .001$

Figure 1. Path analysis of the relationships between difficulty identifying feelings, sensitivity to punishment, coping motives and risky drinking as measured by AUDIT (indirect effects shown in brackets).