Is Emotional Intelligence Impaired in Ecstasy-Polydrug Users?

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Abstract

Rationale. Previous findings report use of the drug ecstasy (MDMA) to be associated with lower emotional intelligence (EI), and compromised functioning in brain areas responsible for emotion. This study explored the relationship between ecstasy use, EI, mood, and parenting styles. *Design*. Questionnaire measures of drug use, lifestyle, parenting style, and EI were obtained, with separate IQ measures for fluid intelligence (Ravens matrices) and pre-morbid intelligence (NART). Current mood measures were obtained from an adjective checklist. *Method*. The sample comprised 78 ecstasy/polydrug users, 38 cannabis only users, and 34 non-drug users. Drug use was categorised at three levels (non-user, cannabis-only user, and ecstasy polydrug user). *Results*. Factorial ANOVA using drug use as an independent variable showed no significant group effects in EI. EI showed significant correlations with current mood which were positive for arousal, and negative for both anxiety and depression. EI was also significantly and positively correlated with the perceived degree of parental control. Regression analyses revealed that these relationships remained significant with IQ, age, gender, and ecstasy use controlled. Adverse mood effects specifically associated with ecstasy use were significantly related to lower EI, and were independent of IQ, age and gender. Higher EI was significantly associated with ecstasy related precautions used when taking this drug. *Conclusions*. Contrary to earlier findings, ecstasy polydrug users did not differ from non-users on EI. However, self-reported ecstasy related mood disturbances were related to lower EI, with the compromising of orbitofrontal cortical functioning being possible here.

3,4-Methylenedioxymethamphetamine (MDMA; 'Ecstasy') is a psychostimulant drug producing heightened mood and facilitated social communication. Animal studies have demonstrated the neurotoxic effects of ecstasy on serotonergic transmitters (Battaglia et al 1987; Hatzidimitriou et al, 1999); however research of this kind is not so readily available for human participants. Those studies that do exist suggest that MDMA exposure in humans can cause decreased tissue stores of serotonin and therefore some of the behavioural effects could be caused by a massive release and subsequent depletion of brain serotonin (Kish et al, 2000). Functional depletion can remain for a long time after use, with abstinent users showing a lower density of 5-HT transporters (Parrott, 2002) causing problems such as a loss of appetite and sexual interest (Parrott et al 2001). Studies from our own laboratory reveal that ecstasy users perform worse on measures of executive functioning, associative learning, and reasoning compared to non-user controls (Fisk et al, 2005; Montgomery et al, 2005a; 2005b). Other researchers have also found evidence of ecstasy-related deficits in various aspects of cognition, for example in learning and memory performance (e.g., Gouzoulis-Mayfrank et al 2000), working memory and executive functioning (e.g., Fox et al 2001; 2002) and everyday memory (e.g., Heffernan et al 2001).

With regard to social and emotional functioning, using low resolution electromagnetic tomography, Frei et al (2001) found that administration of 1.7mg/kg of MDMA[1] to human volunteers gave rise to a widespread decrease of slow and medium frequency activity and an increase of fast frequency activity in the anterior temporal and posterior orbital cortex. Volunteers also completed a mood adjective rating scale. MDMA administration significantly boosted the scores associated with

extraversion, well-being (heightened mood and self confidence), emotional excitability and anxiety. The activation of frontotemporal areas suggests that the observed enhancement of mood and the increased extroversion are a consequence of the action of MDMA on the limbic orbitofrontal and anterotemporal structures known to be involved in emotional processing (Frei et al 2001).

Given these substantial effects of MDMA on emotional processing, it may be the case that emotional intelligence (EI) is affected by ecstasy use. Over time the potentially neurotoxic effects of ecstasy use might impair aspects of emotional expression and appraisal. From an alternative perspective individuals who have pre-existing low EI might be more likely to use ecstasy. EI scores have been found to be negatively correlated with measures of alcohol and tobacco use (Trinidad & Johnson, 2002). Furthermore, using multiple regression and logistic regression, Trinidad et al (2004) found that higher EI scores were associated with more negative perceptions concerning smoking and with a reduced intention to smoke over the coming year. With regard to illicit substances, individuals in a substance abuse treatment programme were found to have significantly lower levels of EI compared to a control group (Schutte et al, 1998). Furthermore, EI has been found to be negatively correlated with reported drug and alcohol-related problems. Regression analysis revealed that EI accounted for 13% of the variance in reported alcohol-related problems and 17% of the variance in reported drug-related problems. Those scoring higher on the EI measure reported fewer problems (Riley & Schutte, 2003).

An important, if not the only determinant of EI is thought to be parenting practices. Utilizing path analysis Martinez-Pons (1998) found that indicators of parental modelling, facilitation, and encouragement were positively associated with children's EI scores. Furthermore EI scores were positively related to measures of

social functioning. Correlational analysis revealed that the managing emotions component of EI was positively and significantly associated with the degree of perceived parental support (Lopes et al, 2003). In subsequent analyses, statistical regression revealed that this association remained significant following controls for individual differences in personality and verbal intelligence (Lopes et al, 2003). In more recent research, secure attachment relationships with both parents and peers have been found to be significantly related to aspects of adolescent emotional expressiveness, emotional awareness and social competence (Laible, 2007). Similar findings linking aspects of attachment relationships and EI have been reported by Scharfe (2000), Hall et al (2004), Kim (2005), and Kafetsios (2004). In all these studies secure attachment patterns are positively associated with EI.

Interestingly, research with substance misusers has found that they retrospectively rate their parents as more rejecting, more restrictive, and lower on warmth than do non-drug using controls (Emmelkemp & Heeres, 1988; Schweitzer & Lawton, 1989). In a recent study from our laboratory we found that ecstasy-polydrug users were more likely to rate their parents' style as neglectful (lacking in control and warmth) compared to nonusers (Montgomery et al, in press). Assuming that their subjective perceptions are accurate, this raises the possibility that ecstasy users might exhibit deficits in EI as a consequence of impaired parenting practices and not as a direct result of ecstasy use.

It is important to understand the basis of individual differences in EI since these appear to have implications for mood and well being. A number of studies from different countries with college and high school students have demonstrated that higher scores on the EI measure are associated with lower levels of anxiety and depression. For example, Wang (2002) found that EI scores were negatively

correlated with outcomes on anxiety and depression measures. Utilizing hierarchical regression, Fernández-Berrocal et al (2006) found that the EI measure uniquely accounted for 11% of the variance in depression scores (as measured by the BDI) and 22% of the variance in anxiety (as measures by the STAI). Bastian et al (2005) also reported an association between EI scores on the one hand and anxiety and life satisfaction on the other. However in this case EI uniquely accounted for no more than 7% of the variance in question. It is possible therefore, that differences in EI between ecstasy users and nonusers might be a factor in accounting for ecstasy-related problems in psychological health. For example, ecstasy-polydrug users have been found to exhibit negative psychological affect. In an internet based study in which almost 300 ecstasy users took part, the level of ecstasy use was found to be significantly associated with depression, anxiety and mood fluctuations (Parrott et al 2002). While effect sizes are not reported in this study, 65% of heavy users reported depression as a consequence of ecstasy use compared with 33% of novice users. The equivalent figures for anxiety were 60% for heavy users and 32% for novice. Similarly, in a large scale European based study, ecstasy use was significantly associated with phobic anxiety, and non-specific anxiety, and a range of other adverse psychiatric symptoms in a dose related manner (Parrott et al 2001), although again it must be conceded that effect sizes were not reported.

Thus it is possible that individual differences in EI may be associated with ecstasy use due to the psychopharmacological action of MDMA on the orbito-frontal cortex. Alternatively the association may be as a result of pre-existing differences between users and nonusers (e.g., in aspects of perceived parenting style) which adversely affect EI and increase the likelihood of substance use perhaps as a form of self medication. In either case the adverse effects on mood associated with ecstasy use

might be entirely mediated by individual differences in EI. Despite the possible links between ecstasy use and EI there has been relatively little research addressing these issues. In an important recent study, Reay, et al (2006) investigated a group of polydrug ecstasy users and polydrug non-ecstasy users on a variety of central executive tasks and background measures. The aim of the research was to assess the potential impact of MDMA use specifically on the social and emotional judgement processes mediated by the prefrontal cortex. Ecstasy-polydrug users achieved significantly lower scores on an EI questionnaire, and the ecstasy-related deficit remained apparent even after controlling for the use of other drugs. Reay et al argue that social and emotional processing may be substantially impaired as a consequence of the consumption of illicit substances, in particular ecstasy. However, some limitations of this study need to be attended to, in particular the small sample size of the experimental group and the disparity in the level of cannabis consumption between the experimental and control groups. While cannabis use was apparently not directly associated with EI it is possible that the two drugs (ecstasy and cannabis) might have interacted to produce an effect in the experimental group.

The present study differs from that of Reay et al in that a substantially larger sample will be tested including ecstasy-polydrug users, cannabis-only users and nonusers of illicit drugs. Indices quantifying ecstasy and other drug use will be collected, and in addition to assessing the role of EI, a perceived rating of parenting style will be included in order to explore how this may mediate the relationship between EI and drug use. We also intend to explore whether or not differences in psychological affect among drug users and nonusers are related to EI. Aside from the possibility of differences between users and nonusers, we also plan to explore whether differences in EI within the ecstasy-using group are associated with differences in

perceptions regarding how the drug has changed their mood, emotional expression and drug related behaviours.

It was predicted that ecstasy-polydrug users would score lower on the measure of EI, with non users scoring the highest. Furthermore the possibility that parenting practices might mediate differences in EI between drug users and nonusers resulting in group differences in psychological affect was to be explored.

Method

Design

The independent variable (IV) was drug use (non-user, cannabis only user and polydrug user). The dependent variable (DV) was EI. The basis of any drug-related differences in EI will be explored though analysis of covariance with the parenting measures (control and warmth), and measures of general intelligence as covariates. Drug related differences in the measures of psychological affect will also be explored with drug use (as defined above) as the IV and the measures of psychological affect (anxiety, arousal, depression/hedonic tone) as DVs. The source of any drug-related differences in the psychological affect measures will be further explored using ANCOVA with the EI and the parenting measures as covariates.

In order to corroborate the research findings set out in the introduction linking EI with psychological affect and EI with aspects of substance use, additional analyses were also conducted: first we examined the relationship between EI and respectively parental warmth, control, the psychological affect measures and the other measures of general intelligence using correlational analysis. It was expected that EI would be negatively correlated with parental warmth and control and with the psychological affect measures. Where correlations were statistically significant the relationship between EI and these other variables was further explored through hierarchical

regression analysis. Second, the relationship between users' perceptions of how ecstasy had affected their feelings and their EI scores was explored through correlational analysis. It was predicted that increases in negative feelings attributed to ecstasy use would be inversely associated with EI. Where correlations were statistically significant the relationship between EI and perceptions of ecstasy use was further explored through hierarchical regression analysis. Third we explored whether those who engage in a particular protective behaviour (e.g., monitoring fluid intake) differ in terms of EI from those who do not. The presence or absence of the behaviour was the IV, with EI as the DV.

Participants

Participants were recruited via direct approach to university students, and the snowball technique. Participants were requested to refrain from ecstasy use for at least 7 days prior to testing and were also requested not to use any other illicit drug for at least 24 hours prior to testing. Ecstasy users have been shown to experience a depressed mood state in the 3 to 4 days following last use (Curran & Travill, 1997) and therefore the 7 day abstinence period was deemed appropriate.

Data were available for 161 participants. Of these 34 (28 female) were non-users of illicit substances, 38 (27 female) used cannabis only, and 78 (35 female) were polydrug users all of whom had consumed two or more illicit drugs one of which was ecstasy. Background data including age, general intelligence, indicators of alcohol and tobacco use are reported in Table 1. Indicators of illicit drug use for the two drug using groups are set out in Table 2. It is worthy of note that cannabis was also popular amongst ecstasy/polydrug users who reported higher levels of use than the cannabis-only group.

<<Insert Tables 1 and 2 here>>

Materials

Patterns of drug use and other relevant lifestyle variables were investigated via means of a background questionnaire. Ecstasy users were asked if they believed that since using ecstasy they had changed in any way. They responded to each of the following words: caring, paranoid, alert, depressed, sociable, aggressive, happy, healthy, moody, patient, irritable, confident, sad, loving, and confused, using a five point scale: much more 5, more 4, no change 3, less 2, and much less 1 (see Murphy et al 2006). Ecstasy users also responded 'Yes' or 'No' to the following questions: 'Do you take any sort of precautions when using ecstasy?', 'When under the influence of ecstasy do you take rest breaks when dancing?', 'When under the influence of ecstasy do you monitor your fluid intake?', and 'Is there a maximum number of ecstasy tablets you will take in one session?'

In relation to drug use, participants were asked a range of questions including duration of use, and the last time that they had used each drug. Participants were also questioned concerning their history of drug use, and these data were used to estimate total lifetime use for each drug. Average weekly dose for each drug was also assessed.

Parental Warmth and Control: To assess both of these dimensions, we used the acceptance/involvement and strictness/supervision scales of the Parenting Style Questionnaire (Lamborn et al 1991). The acceptance/involvement scale measures the extent to which a participant perceives their parents as loving, responsive and involved (e.g. "I can count on them to help me out when I have a problem"; "When they want me to do something, they explain why"). This subscale contains 10 items. The strictness/supervision scale assesses parental monitoring and control of the participant (e.g. "How much do your parents try to know where you are at night?" "How late were you allowed to stay out on a school night?"). This subscale contains 9

items. Participants were asked to reflect back to their teenage years, when they were living at home and in full time education. Thus their judgements were retrospective in nature.

For both scales, some of the items were in a true/false format, while others were on a Likert scale (ranging from three to 10 points). Following the procedure adopted by Lamborn et al (1991), the items were weighted to adjust for differences in scaling, and then the scores for the items in each dimension were summed to form composite indices for warmth and control (with high scores being indicative of high warmth/control). The validity and reliability of the scales have been documented in previous research (Alvarez et al, 2003; Lamborn et al, 1991; Slicker et al 2004).

Emotional Intelligence. EI was measured by the questionnaire developed by Schutte et al (1998) which in turn was based on the model developed by Salovey and Mayer (1990). This measure is shown to have good internal consistency (Cronbach alpha = 0.87) and test-retest reliability (r=.78) (Schutte et al, 1998). Predictive and discriminant validity (Schutte et al, 1998) and construct validity in general have been thoroughly investigated in subsequent research (e.g., Schutte et al 2002). The measure contains 33 items, three of which are reverse scored. For each item the participant responds on a five point scale, 1 strongly disagree, 2 somewhat disagree, 3 neither agree nor disagree, 4 somewhat agree, 5 strongly agree. Items include, for example, 'I am aware of my emotions as I experience them' and 'I like to share my emotions with others'. A high score is indicative of high EI.

General Intelligence. Fluid intelligence was measured via Raven's Progressive Matrices (Raven et al, 1998), and premorbid intelligence was assessed via the National Adult Reading Test (NART, Nelson, 1982). These measures were included

as controls to ensure that any correlations between EI and the other variables of interest were not mediated by individual differences in general intelligence.

Mood adjective checklist: Anxiety, depression/hedonic tone, and arousal were measured by means of a mood adjective checklist (see Matthews et al, 1990; Wareing et al, 2000). Of the 18 words on the checklist, six words mapped onto each of these three constructs. For each word participants rated themselves as either: not at all, slightly, moderately, very, or extremely. The items covering anxiety were: tense, calm*, contented*, uneasy, worried, relaxed*; those covering arousal were: fatigued*, alert, full of energy, lifeless*, lively, tired*; those covering depression/hedonic tone were: enthusiastic*, sad, gloomy, depressed, happy*, cheerful*. Asterisked items were reverse scored. Maximum and minimum scores on the measures range from 6 to 30 with a midpoint of 18, and a total score for each measure was calculated by summing the responses (taking into account the reverse scoring). High scores are indicative of higher levels of perceived arousal, anxiety, and depression.

Procedure

Participants were informed of the general purpose of the experiment, and written informed consent was obtained. The tests were administered under laboratory conditions in the following order: mood adjective checklist, background drug use questionnaire, Ravens progressive Matrices, NART, and EI. Participants performed various other pencil and paper and computer based tasks, the results of which have been reported elsewhere (e.g., Montgomery et al 2005a; in press). Participants were fully debriefed, paid £15 in store vouchers, and given drugs education leaflets. The study was approved by the Ethics Committee of Liverpool John Moore's University, and was administered in accordance with the ethical guidelines of the British Psychological Society.

Results

Inspection of Table 1 reveals that contrary to prediction, there were no substantial group differences in EI. Consistent with this, between-participants ANOVA with EI as the dependent variable and the drug groups as independent variables yielded $F(2,147) = .020$, $p > .05$. Thus there were no statistically significant group differences in EI. Also apparent in the results set out in Table 1, ecstasy-polydrug users reported lower levels of parental warmth and control compared to the other two groups. The group related differences in parenting style have been analysed and reported elsewhere (Montgomery et al, in press). The purpose of including these measures of parental warmth and control in the present study had been to establish the extent to which they mediated group differences in EI. However, since no group differences in EI were found this was not possible.

While we had expected that the groups would differ in terms of the psychological affect measures, none of the drug-related differences in anxiety, arousal and depression/hedonic tone were statistically significant, $F<1.37$ in all cases. In view of the absence of group differences on these measures, the planned ANCOVAs were not conducted.

Focussing on the ecstasy-polydrug group, inspection of Table 3 reveals that there was a statistically significant negative correlation between the EI scores and scores in relation to paranoia, depression, and sadness. Specifically those users who said that ecstasy had made them more paranoid, depressed or sad tended to score lower on the EI measure. Similarly EI was found to be positively correlated with patience. The correlations with scores on the other items were non-significant. Further examination of these statistically significant correlations revealed that the modal response was ‘no change’. Thus more users indicated that ecstasy had resulted in no

change in paranoia (n=29), depression (n=39), patience (n=47), and sadness (n=52). However in each case a substantial minority indicated that ecstasy had made them more paranoid (n=27), more depressed (n=21), less patient (n=13), and more sad (n=8). In all cases those who experienced adverse effects of ecstasy had lower mean EI scores, with the EI scores significantly lower in the case of depressed $t(58) = 3.50$, $p<.001$; and sadness $t(58) = 2.84$, $p<.01$.

<<Insert Table 3 here>>

The significant correlations between the users' perceptions of how ecstasy had changed them (in relation to paranoia, depression, patience and sadness) and the EI measure were noteworthy. However, it is possible that other variables such as general intelligence, age, gender, length of ecstasy use and lifetime dose may be related to users' perceptions and that the relationship with EI may not be statistically significant when the effects of these other possibly confounding variables are taken into consideration. To address this possibility a number of hierarchical regressions were conducted. The dependent variable was the user's perception of how ecstasy had changed them (separate regressions were run for paranoia, depression, patience and sadness). In the first step of the hierarchy, gender, age and the two measures of intelligence (Ravens progressive matrices and the NART) were entered as independent variables; in the second step, total ecstasy use and the length of ecstasy use were entered. In the final step the EI measure was entered. For each step the increment in the R squared value was evaluated and the regression coefficients for the full model were considered. The results are set out in Table 4. In relation to the paranoid, depressed and sad perceptions, EI was a statistically significant predictor in the full model and was associated with a statistically significant increment in the R squared value following control for all other variables. Of the other predictors only

the Ravens (in the regressions of the paranoid and patient change perceptions) and NART (in the regression of the patient change perceptions) measures were statistically significant in the full model.

<<Insert Table 4 here>>

We also classified users according to whether or not they indicated that they took precautions or rest breaks when using ecstasy and whether or not they monitored their fluid intake or restricted the number of tablets taken is a single session. The results set out in Table 5 revealed that those users who indicated that they took regular rest breaks when dancing or who indicated that they monitored their fluid intake scored significantly higher on EI than those who did not. Furthermore this difference remained statistically significant following control for differences in the Raven's and NART measures.

<<Insert Table 5 here>>

Within the ecstasy-polydrug using group, it appears that the significant relationship between the perceptions associated with ecstasy use and EI is independent of the outcomes on the other measures of intelligence. Thus individual differences in EI reflect personal characteristics which appear to be unrelated to traditional measures of intelligence. Consistent with this proposition, and focussing on the whole sample, inspection of Table 3 reveals that the EI measure was not significantly correlated with either of the other two IQ measures. Since ecstasy-polydrug, cannabis only, and nonusers did not differ on the EI measure it appears that this variable does not mediate group differences in psychological affect. In fact inspection of Table 1 reveals that the three groups scored similarly in terms of anxiety, arousal and depression/hedonic tone. However, it is clear from Table 3 that EI was significantly correlated with all three measures of psychological affect. People

with higher EI reported higher levels of arousal, and lower levels of anxiety and depression. Inspection of Table 3 also reveals that parental control (but not parental warmth) was significantly correlated with EI. Those participants who perceived their parents as exhibiting more control tended to score higher on the EI measure.

As was the case for the significant correlations between EI and the perceptions of the effects of ecstasy use, a number of hierarchical regressions were conducted exploring the relationship between EI and respectively the psychological affect measures and parental control. Separate regressions were run with anxiety, arousal, depression/hedonic tone and parental control respectively as dependent variables. In the first step of the hierarchy, gender, age and the two measures of intelligence (Ravens progressive matrices and the NART) were entered as independent variables; in the second step, ecstasy use was entered with users coded as 0 and nonusers as 1. In the final step the EI measure was entered. For each step the increment in the R squared value was evaluated and the regression coefficients for the full model were considered. The results are set out in Table 6. In all of the analyses, EI was a statistically significant predictor in the full model and was associated with a statistically significant increment in the R squared value following control for all other variables. Of the other predictors only gender was statistically significant in the full model (in the regression of parental control).

<<Insert Table 6 here>>

Discussion

Contrary to prediction we found no significant differences in EI between ecstasy/polydrug users, cannabis-only users and non-users. Our findings may be contrasted with those of Reay et al (2006) who found that ecstasy users scored lower than drug using controls on this particular measure. Reay et al's sample (N = 30) was

considerable smaller than ours (N=150) and may have differed in terms of lifetime exposure or frequency of use of ecstasy. For example Reay et al's users consumed an average of 11.1 tablets per month for an average of 4.3 years yielding an estimated lifetime dose of 593 tablets compared with the mean for our sample which was 316 tablets. Thus it is possible that EI deficits emerge as a consequence of greater lifetime exposure to ecstasy. Furthermore, the average age of Reay et al's ecstasy users was older compared with our ecstasy/polydrug group and they appear to have used ecstasy for marginally longer. It is also worthy of note that the mean period of abstinence for our sample was almost 30 weeks (although the median was appreciably less at 3.5 weeks) and since equivalent figures are not available for Reay et al's sample the two may have differed in this respect also. It is also worthy of note that a large proportion of our ecstasy/polydrug group used cocaine in addition to the other drugs, while as far as can be established cocaine use was relatively rare among Reay et al's group. Thus it is possible that the characteristics of the population from which our polydrug group was drawn differed in other potentially important respects from that of Reay et al's.

However, alongside the overall trend, a minority of our ecstasy/polydrug users did produce significantly lower EI scores compared to the majority of users. These were individuals who reported negative side effects associated with ecstasy use. Thus a further possibility is that Reay et al's sample inadvertently included a disproportionate number of individuals with negative perceptions regarding ecstasy use. In our sample, these negative perceptions all involve aspects of emotional processing (depression, sadness, patience and paranoia) which are known to involve the orbitofrontal cortex (Davidson et al 2000). Furthermore, this region of the brain is known to be acutely affected by ecstasy use (Frei et al, 2001). Among our participants these negative perceptions were attributed to ecstasy use, suggesting that they had

arisen after the onset of use and did not directly reflect some pre-existing condition. This raises the possibility that a subset of users may experience negative emotional reactions as a possible consequence of MDMA neurotoxicity and that these individuals are also more likely to manifest impaired EI. It remains unclear why all ecstasy users are not affected in this way.

An additional finding from the present study was that ecstasy users who failed to take protective measures (e.g., taking rest breaks and monitoring fluid intake) while on drug had significantly lower EI scores. It might be that those users who do not take protective measures do not care about the consequences of ecstasy use and are as a consequence more susceptible to orbitofrontal damage and consequent negative affect and reduced EI. However, this proposition is clearly speculative and further research is clearly called for. Indeed, users may be uncertain as to what are effective protective measures. For example, monitoring fluid intake is less than straight forward since while keeping cool and drinking water reduces the risk of hyperthermia, excessive fluid intake may lead to hyponatraemia (Burgess et al, 2000; Gowing et al, 2002). Thus users need to be properly informed of the risks associated with taking ecstasy and how to minimise them.

Switching the focus away from ecstasy/polydrug users to the sample as a whole, some interesting associations were observed between the EI measure and various other constructs. First high EI was associated with lower reported levels of anxiety, depression and arousal. These results are consistent with studies of individual differences among college students where low EI was associated with an increased an likelihood of depression and anxiety (Bastian et al, 2005; Fernández-Berrocal et al, 2006; Wang 2002). We also found that higher levels of perceived parental control among our sample were associated with higher levels of EI. Again this is consistent

with Lopes et al's (2003) study in which higher levels of parental support were associated with higher levels of EI. Interestingly in the present study perceived parental warmth was not associated with EI suggesting that it is the control aspect of parental support which may be associated with positive outcomes in terms of EI.

The regression analyses revealed that the relationship between EI and respectively the psychological affect measures and parental control was robust and remained statistically significant following prior controls for the effects of age, gender, general intelligence and ecstasy use. Indeed these outcomes demonstrate that individual differences in EI are related to the quality of prior relationships with parents as might be expected and have predictable implications for psychological affect. Taken together with the non-significant correlations between EI and the other measures of intelligence the present results complement those which demonstrate that the EI measure captures potentially important aspects of individual variation which are distinct from those reflected in other measures of intelligence. While the findings reported here may further enhance the construct validity of the EI measure it is necessary to be cautious in this regard, since clearly we have only explored the pattern of inter-relationships within the current sample consisting as it does primarily of recreational drug users.

Some limitations of the present study need to be acknowledged. First our participants were predominantly university students and therefore not wholly representative of the general population. Furthermore females were over-represented in the sample, constituting 60% thus future research would benefit from using a more balanced sample in terms of gender. Important aspects of our results rely on correlational and regression analyses. In the case of the perceptions of the effects of ecstasy use the sample size was less than might be considered desirable when wishing

to draw inferences concerning the importance of individual predictors (Tabachnick & Fidell, 2001). Furthermore, clearly these results cannot demonstrate causality. While lower levels of EI have been associated with raised levels of anxiety and depression in this and other studies, it does not follow that low EI causes mood impairments. It is also worthy of note that the parenting style measures were retrospective in nature and also subjective, rather than representing an objective assessment of parental practices. While this is a common limitation in research exploring the relationship between parenting practices and subsequent adult behaviour (egs. Emmelkamp & Heeres, 1988; Schweitzer & Lawton, 1989) it cannot be ignored. An additional important limitation was that our drug use data was obtained entirely by self-report and was, therefore, subject to biases and limitations of memory. While, such self-report data is common to all such research dealing with substance misusers in the community it would have been desirable to have had toxicological samples so as to ensure that individuals were not intoxicated at the time of testing. Furthermore longer term patterns of use would have been more reliably assessed through the analysis of hair samples. Clearly future research would benefit from the inclusion of these measures.

In conclusion, contrary to previous findings, the present study found that young adult ecstasy/polydrug users did not differ significantly in levels of EI compared to cannabis-only users and to nonusers of illicit drugs. However, among ecstasy/polydrug users those who attributed adverse emotional reactions to ecstasy use had lower levels of EI. Equally those scoring lower on the EI measure were less likely to engage in protective behaviours while on drug. The possibility was raised that a particular sub-group of ecstasy users might be at increased risk of sustaining damage to the orbitofrontal cortex resulting in impaired emotional processing. Clearly further research is needed to explore this possibility.

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Table 1. Parental Warmth and Control, Indicators of Psychological Affect, Intelligence, and the Use of Alcohol and Tobacco for Nonusers, Cannabis-Only Users and Ecstasy/Polydrug Users.

	Nonusers			Cannabis-Only Users			Ecstasy/Polydrug Users			Total		
	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.	n
Age (years)	20.53	1.62	34	20.71	1.69	38	21.78	2.04	78	21.23	1.95	150
Parental Warmth	12.05	2.31	31	12.05	2.25	37	11.06	2.91	76	11.53	2.66	144
Parental Control	6.92	1.47	32	6.37	1.60	37	5.84	1.83	76	6.21	1.74	145
Psychological Affect												
Arousal	20.15	2.99	34	18.92	4.47	38	19.70	3.67	76	19.60	3.76	148
Anxiety	12.65	2.70	34	12.76	2.22	38	13.04	3.90	76	12.88	3.27	148
Depression/Hedonic Tone	12.68	2.32	34	12.74	2.62	38	13.50	3.26	76	13.11	2.91	148
Intelligence												
Emotional	119.35	13.32	34	118.95	13.48	38	119.49	12.31	78	119.32	12.76	150
Ravens	47.97	5.50	34	49.74	5.09	38	47.28	5.90	75	48.07	5.67	147
NART	27.26	5.11	34	28.39	5.42	38	28.16	6.04	77	28.01	5.66	149
Alcohol												
Weeks since first use	300.50	111.20	32	339.09	128.46	35	403.53	123.19	76	364.70	128.70	143
Weeks since last use	1.52	4.87	32	0.37	0.39	35	0.44	0.88	77	0.66	2.41	144
Units per week	10.93	9.80	29	16.96	12.20	38	20.74	12.21	78	17.79	12.29	145
Tobacco												
Weeks since first use	230.80	128.76	5	327.25	150.66	24	412.19	165.74	54	376.70	166.65	83
Weeks since last use	16.83	18.60	5	9.84	31.31	25	11.03	48.76	54	11.02	42.67	84
Cigarettes per day	1.50	2.12	2	7.82	3.34	11	9.83	7.16	40	9.09	6.61	53

Table 2 Indicators of Illicit Drug Use for the Two Drug Using Groups.

	Cannabis-Only Users			Polydrug Users			Total		
	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.	n
Average Dose (per week)									
Amphetamine (grams)	.	.	0	0.32	0.54	16	0.32	0.54	16
Cannabis (joints)	2.33	3.29	23	7.63	10.46	57	6.10	9.30	80
Cocaine (grams)	.	.	0	0.26	0.33	28	0.26	0.33	28
Ecstasy (tablets)	.	.	0	1.71	1.73	78	1.71	1.73	78
Lifetime Dose									
Amphetamine (grams)	.	.	0	61.64	108.44	19	61.64	108.44	19
Cannabis (joints)	542.61	1056.12	23	2629.71	3898.14	60	2051.36	3480.78	83
Cocaine (grams)	.	.	0	57.99	99.16	30	57.99	99.16	30
Ecstasy (tablets)	.	.	0	316.49	476.74	78	316.49	476.74	78
Weeks since first use									
Amphetamine	.	.	0	289.52	170.64	25	289.52	170.64	25
Cannabis	207.58	140.55	38	326.88	142.78	64	282.43	152.69	102
Cocaine	.	.	0	184.10	108.10	61	184.10	108.10	61
Ecstasy	.	.	0	209.23	131.65	78	209.23	131.65	78
Weeks since last use									
Amphetamine	.	.	0	124.60	135.59	25	124.60	135.59	25
Cannabis	40.49	80.19	38	32.98	91.49	64	35.78	87.12	102
Cocaine	.	.	0	16.36	43.91	60	16.36	43.91	60
Ecstasy	.	.	0	29.71	61.21	78	29.71	61.21	78

Table 3 Correlation Coefficients Between Emotional Intelligence and Parental Warmth and Control, Psychological Affect and Intelligence Measures, and Self Perceptions of Ecstasy Use Scores.

	Emotional Intelligence		Emotional Intelligence
All Participants		Ecstasy/Polydrug Users Only	
Parental Warmth	.084	Ecstasy has made participant more:	
Parental Control	.192*	Caring	.071
Psychological Affect		Paranoid	- .330**
Arousal	.294***	Alert	- .037
Anxiety	- .243**	Depressed	- .351**
Depression/Hedonic Tone	- .310***	Sociable	- .062
Intelligence		Aggressive	- .104
Ravens	.107	Happy	.209
NART	.035	Healthy	.200
		Moody	- .074
		Patient	.255*
		Irritable	- .199
		Confident	.046
		Sad	- .318*
		Loving	- .013
		Confused	- .104

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

Table 4

Outcomes for the Hierarchical Regressions of Perceptions of the Effects of Ecstasy Use, with Gender, Age, Intelligence Scores, Aspects of Ecstasy Use, and Emotional Intelligence as Predictors

F value/R squared value Predictor	Dependent Variable			
	Paranoid	Depressed	Patient	Sad
F (7,52) Full Model	2.74*	2.18[a]	2.11[b]	2.38*
R^2 Full Model	.269	.226	.222	.242
Gender (β)[c]	-.019	-.119	-.043	-.194
Age (β)	.154	-.009	.084	-.043
Ravens (β)	-.310*	-.040	.340*	.202
NART (β)	-.035	-.061	.298*	-.239
R^2 Increment	.160*	.050	.156*	.071
Total ecstasy consumed (β)	.203	.099	-.169	-.087
Length of ecstasy use (β)	-.094	.213	-.071	.280
R^2 Increment	.034	.053	.038	.038
Emotional intelligence (β)	-.284*	-.365**	.171	-.378**
R^2 Increment	.075*	.124**	.027	.133**

a) p=.052
b) p=.058
c) in all cases, β refers to the standardised regression coefficient for the full model.

** p<.01; * p<.05

Table 5 Emotional Intelligence Scores for Ecstasy Users According to Whether or Not they take Precautions, Rest Breaks, Monitor Fluid Intake and Restrict the Number of Tablets Taken When Taking Ecstasy.

	No			Yes			F	F with Ravens and NART scores as Covariates
	Mean	S.D.	n	Mean	S.D.	n		
Do you take any sort of precautions when using ecstasy?	118.92	12.62	51	120.56	11.85	27	F<1	F<1
When under the influence of ecstasy do you take rest breaks when dancing?	112.81	13.36	21	122.05	11.10	56	F(1,75) = 9.46, p<.01	F(1,70) = 6.84, p<.05
When under the influence of ecstasy do you monitor your fluid intake?	113.74	12.61	19	121.43	11.80	58	F(1,75) = 5.88, p<.05	F(1,70) = 6.34, p<.05
Is there a maximum number of ecstasy tablets you will take in one session?	118.43	16.34	21	119.95	10.68	56	F<1	F<1

Table 6

Outcomes for the Hierarchical Regressions of the Psychological Affect Measures and Parental Control, with Gender, Age, Intelligence Scores, Ecstasy Use, and Emotional Intelligence as Predictors

	Dependent Variable			
	Anxiety	Arousal	Depression	Parental Control
F (6,148) Full Model	2.02[a]	2.67*	3.55**	4.08***
R^2 Full Model	.076	.098	.126	.144
Gender (β) [b]	-.013	-.122	-.072	.200**
Age (β)	-.052	.039	-.058	.012
Ravens (β)	-.108	-.074	-.057	-.075
NART (β)	-.023	-.009	.014	-.003
R^2 Increment	.027	.013	.030	.089**
Ecstasy User/Nonuser (β)	-.045	.022	-.121	.168 [c]
R^2 Increment	.001	.000	.010	.020[d]
Emotional intelligence (β)	-.220**	.294***	-.296***	.186*
R^2 Increment	.047**	.085***	.086***	.034*

a) p=.066
b) in all cases β refers to the standardised regression coefficient for the full model.
c) p=.050
d) p=.069
*** p<.001; ** p<.01; * p<.05

[1] Morgan (2000) indicates that the average recreational dose is between 0.75 and 4.00 mg/kg.