Impulsivity, Reward Sensitivity and Motivations to Use Ecstasy: An Integrative Study.

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Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declaration</td>
<td>vii</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>viii</td>
</tr>
<tr>
<td>Abstract</td>
<td>ix</td>
</tr>
<tr>
<td>Introduction</td>
<td></td>
</tr>
<tr>
<td>Overview</td>
<td>1</td>
</tr>
<tr>
<td>Rash impulsivity and ecstasy use</td>
<td>5</td>
</tr>
<tr>
<td>Summary of impulsivity and ecstasy use; proposal</td>
<td>9</td>
</tr>
<tr>
<td>for a two factor model</td>
<td></td>
</tr>
<tr>
<td>Sensitivity to reward- Gray’s neurobiological model</td>
<td>10</td>
</tr>
<tr>
<td>Motivations to use ecstasy</td>
<td>13</td>
</tr>
<tr>
<td>Research aims</td>
<td>15</td>
</tr>
<tr>
<td>Hypotheses</td>
<td>17</td>
</tr>
<tr>
<td>Method</td>
<td></td>
</tr>
<tr>
<td>Participants</td>
<td>18</td>
</tr>
<tr>
<td>Materials</td>
<td>18</td>
</tr>
<tr>
<td>Drug History Questionnaire</td>
<td>19</td>
</tr>
<tr>
<td>The Impulsiveness, Venturesomeness, and Empathy</td>
<td>19</td>
</tr>
<tr>
<td>Scale (IVE) - Impulsiveness subscale</td>
<td></td>
</tr>
<tr>
<td>The Sensitivity to Punishment and Sensitivity to</td>
<td>20</td>
</tr>
<tr>
<td>Reward Questionnaire</td>
<td></td>
</tr>
<tr>
<td>Motivations for Drug Use Scale</td>
<td>21</td>
</tr>
<tr>
<td>The Positive and Negative Affect Schedule</td>
<td>22</td>
</tr>
<tr>
<td>Procedure</td>
<td>23</td>
</tr>
</tbody>
</table>

**Results**

Preliminary data analysis | 24

*Ever used versus never used ecstasy* | 25

Poly-drug use for users and non-users | 25

Internal consistency | 28

Personality and affect of ecstasy users vs. non-users | 29

*Personality, affect, and motivations for ecstasy use* | 32

Relationship between personality, motives and ecstasy use | 34

*Meditation hypotheses* | 37

Relationship between sensitivity to reward and the motive to use ecstasy to maintain social cohesion | 37

Mediation analysis: Rash impulsivity, negative affect, and motive to use ecstasy to reduce negative affect | 37

*Group Analysis; differences between light, heavy and non-users* | 41

Poly-drug use in the sample | 41

Personality differences between light, heavy, and non-users. | 43
Mediation hypothesis: rash impulsivity, negative affect, and motivation to use to reduce negative affect for heavy users

Discussion

Aims and findings 47
Sample and poly-drug use 47
Rash impulsivity 48
Reward sensitivity and sensitivity to punishment 50
Impulsivity and motivations to use ecstasy 54
Summary 57

Issue of Causality 58

Limitations of the present study and recommendations for future research 59

Theoretical and treatment implications 60

Conclusion 63

References 66

Appendix A

Questionnaire 78
List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1</td>
<td>Poly-drug use for non ecstasy user controls and those who have ever taken ecstasy</td>
<td>27</td>
</tr>
<tr>
<td>Table 2</td>
<td>Means, Standard deviations, and Cronbach alphas for all variables</td>
<td>29</td>
</tr>
<tr>
<td>Table 3</td>
<td>Means, standard deviations, effect sizes, and probabilities associated with the MANOVA for rash impulsivity, reward sensitivity, sensitivity to punishment, negative and positive affect for ecstasy users and non-users</td>
<td>31</td>
</tr>
<tr>
<td>Table 4</td>
<td>Correlations between personality variables, motives and ecstasy use for entire sample</td>
<td>33</td>
</tr>
<tr>
<td>Table 5</td>
<td>Correlations between personality variables, and positive and negative affect for non-users</td>
<td>35</td>
</tr>
<tr>
<td>Table 6</td>
<td>Correlations between personality variables, positive and negative affect, and motivations for use for ecstasy users</td>
<td>36</td>
</tr>
<tr>
<td>Table 7</td>
<td>Semi-partial correlations, unstandardised and standardised Beta coefficients, standard error, and significance levels for mediation between rash impulsivity, negative affect and motive to use ecstasy to reduce negative affect</td>
<td>39</td>
</tr>
<tr>
<td>Table 8</td>
<td>Poly-drug use for non ecstasy user controls, light and heavy ecstasy users</td>
<td>42</td>
</tr>
</tbody>
</table>
Table 9  Means, standard deviations, probabilities, and post hoc comparisons associated with the MANOVA for rash impulsivity, reward sensitivity, sensitivity to punishment, negative and positive affect for controls, light and heavy ecstasy users

List of Figures

<table>
<thead>
<tr>
<th>Figure 1</th>
<th>Mediation model for relationship between rash impulsivity and Motives to use ecstasy to reduce negative affect.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40</td>
</tr>
</tbody>
</table>
Declaration

I declare that this report does not incorporate, without acknowledgement, any material previously submitted for a degree in any University, College of Advanced Education, or other educational institution and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

I further declare that the ethical principles and procedures specified in the School of Behavioural and Social Sciences Human Research Ethics Committee document have been adhered to in the preparation of this report.

Sarah T Egan

30th May, 2006.
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Abstract

A number of studies have demonstrated a clear link between impulsivity and ecstasy use (e.g. Bobes et al., 2002; Butler & Montgomery, 2004), however there is a lack of consensus to what actually constitutes impulsivity. The primary aim of the present thesis was to utilise Dawe and Loxton’s (2004) proposal for a two facet model of impulsivity, by investigating both Eysenck’s (1967) rash impulsivity and Gray’s (1987) reward sensitivity in the initiation and maintenance of ecstasy use. The present study further aimed to integrate personality theory with cognitions by investigating how impulsivity influences the motivations to use the drug. The sample comprised 220 participants, 87 males and 133 females. Of this sample 109 reported never having taken ecstasy, whereas the remaining 111 participants reported having ever consumed the drug. Participants completed a battery of assessments including measures of rash impulsivity (I1), reward sensitivity and sensitivity to punishment (SPSRQ), motivations (MDUS), and affect (PANAS). Results indicated that ecstasy use was associated with high rash impulsivity, high reward sensitivity and reduced sensitivity to punishment. Motivations for use were also associated with these impulsive personality traits, in particular negative affect mediated the relationship between rash impulsivity and the motivation to use in order to reduce negative affect. Results are discussed within the context of the two-factor model of impulsivity and the implications of these findings for intervention programs are considered.
Overview

Throughout the past decade an alarming trend has emerged in the increased use of synthetic ‘designer drugs’ among adolescents and young adults. One such drug, Methyleneoxymethamphetamine (MDMA) colloquially known as ‘ecstasy’ belongs to a category of synthetic substances that produce stimulant and hallucinogenic properties and has emerged as a major contributor to substance abuse among young adults (Rivas-Vazquez & Delgado, 2002; Sydow, Lieb, Pfister, Höfler, & Wittchen, 2002). Over recent years, ecstasy has become increasingly popular in countries across the world. This is reflected in the literature investigating the precursors and effects of ecstasy use which have been particularly focused in the United Kingdom (e.g. Butler & Montgomery, 2004; Dughiero, Schifano, & Forza, 2001; Parrott, Sisk, & Turner, 2000), the United States of America (e.g. McCann, Eligulashvili, & Ricaurte, 2000; Moeller et al., 2002; Morgan, 1998 a, b; 2000), the Netherlands (e.g. Engels & ter Bogt, 2004), Germany (e.g. Tuchtenhagen et al., 2000), Spain (e.g. Bobes et al., 2002) and more recently Australia (e.g. Gowing, Henry-Edwards, Irvine, & Ali, 2002; Sydow et al., 2002; Topp, Barker, & Degenhardt, 2004; Travers & Lyvers, 2005).

Australia has seen a dramatic rise in the prevalence of ecstasy use. Surveys of the Australian general population reported 1% of the population had consumed the drug in 1990 (Commonwealth Department of Human Services and Health, 1996). However, this dramatically increased to 6.1% in 2001, further rising to 7.5% of a sample of nearly 30,000 in 2004 (National Drug Strategy Household Survey, 2005). Approximately 1.2 million Australians have reported having ever taking ecstasy, and ecstasy is now the third most used illicit substance in Australia following only cannabis and amphetamines.
Young adults aged 20-29 are the most common consumers of ecstasy, with 22% of this age group reporting having ever taken the drug (National Drug Strategy Household Survey, 2005).

As well as becoming increasingly popular, ecstasy is becoming more mainstream with substantial proportions of users indicating that they have used ecstasy in environments such as public places, at home, or at private parties (Degenhardt, Barker, & Topp, 2004; Duff, 2005; National Drug Strategy Household Survey, 2005). Reports indicate ecstasy use is not restricted to the environments with which it has stereotypically been associated, such as ‘raves’ or ‘dance parties’ (e.g. Gowing et al., 2002; Rivas-Vazquez, & Delgado, 2002; Travers & Lyvers, 2005).

It has been suggested this rise in prevalence and acceptance may be attributed to the misconception that ecstasy is a safe drug (Parrott, 2001). This is concerning in light of the range of adverse physical and psychological effects caused by the recreational use of ecstasy (e.g. Dafters, in press; Davidson & Parrott, 1997; Parrott et al., 2000). Reported short term adverse effects include feelings of lethargy, moodiness, insomnia, depression, irritability, hostility, somatisation, obsessionality, psychoticism and paranoia (Davidson & Parrott, 1997; Parrott et al., 2000). Long term cognitive deficits such as memory loss, damage to working and ‘day to day’ prospective memory, and executive functioning have repeatedly been found (Gouzoulis-Mayfrank, Thimm, Rezk, Hensen, & Daumann, 2003; Halpern et al., 2004; Heffernan, Jarvis, Rodgers, Scholer, & Ling, 2001). It has even been suggested that a category ‘ecstasy-induced cognitive disorder’ be included in the Diagnostic and Statistical Manual (DSM) due to the unique cognitive problems ecstasy users experience (Thomasius et al., 2005). Acute effects, including ecstasy induced
hypothermia (an elevation or reduction of body temperature) and hyponatraemia (a deficiency of sodium in the blood), are the most significant and life threatening effects associated with ecstasy use and account for many of the small number of ecstasy related mortalities reported in the United Kingdom and Australia (Gowing et al., 2002).

Personality traits have also been consistently been linked to recreational ecstasy use (e.g. Bobes et al., 2002; Butler & Montgomery, 2004). In a search for an ‘addictive’ personality, researchers have noted several aspects of personality that elevate risk for substance use, including behavioural disinhibition, risk taking, sensation seeking, a proneness to becoming bored, novelty seeking, sensitivity to reward, and a limited ability to delay gratification (Evenden, 1999; Petry, 2001). Each of these definitions are aspects of what is broadly known as impulsivity, thus these factors are often termed ‘impulsivity’ despite theoretical differences. Research has repeatedly exhibited an association between heavier exposure to the drug and higher levels of trait impulsivity (e.g. Bobes et al., 2002; Butler & Montgomery, 2004; McCann et al., 2000; Moeller, 2002; Morgan, 1998a, b; Parrott et al., 2000; Tuchtenhagen et al., 2000).

Although there seems to be a clear link between impulsivity and ecstasy use, there is no consensus on the definition of impulsivity. One variation of impulsivity frequently associated with ecstasy use is referred to as ‘rash impulsivity’ (e.g. Butler & Montgomery, 2004; Dawe & Loxton, 2004; Morgan, 1998 b, Parrott, 2000; Parrott et al., 2000). This is a tendency to engage in behaviour that is hasty, unplanned, and spontaneous (Dawe & Loxton, 2004). Recently, a two facet model of impulsivity was proposed in an attempt to understand the trait and its effects on addictive behaviour (Dawe & Loxton, 2004). The first of these facets relates to ‘rash impulsiveness’, that has
previously been utilised within ecstasy literature (Dawe, Gullo, & Loxton, 2004; Dawe & Loxton, 2004). Secondly, this model contains another conceptualisation of impulsivity, derived from J. A. Gray’s (1987) personality theory, which considers impulsivity as reflecting individual variations in the sensitivity to signals of reward. The relationship between reward sensitivity and ecstasy use is yet to be investigated. Moreover, rash impulsivity has never been associated with ecstasy use in an Australian sample.

Despite many studies linking impulsivity with ecstasy use (e.g. Bobes et al., 2002; Butler & Montgomery, 2004; Parrot et al., 2000), the process through which impulsivity influences addictive behaviours has received little attention. Research has suggested that cognitions play a role in guiding motivations to engage in drug taking behaviour. For example, outcome expectancies, that is, the beliefs about the beneficial consequences of an action, are highly correlated with drinking and drug use (Fromme, Katz, & Rivet, 1997; Katz, Fromme, & D’Amico, 2000). However, little is known regarding the role of cognitions in relation to personality and ecstasy use.

The following review will first evaluate the literature associated with the relationship between impulsivity and ecstasy use. Following this, Gray’s (1987) conceptualisation of impulsivity, reward sensitivity, will be discussed as it relates to drug use, along with discussion regarding the relevant neuropsychological systems and affect. The review will then focus on literature concerning cognitions, specifically motivations, and their relationship to personality and illicit substance use.

The aims of the present study are to investigate the effects of rash impulsivity and reward sensitivity on ecstasy use, and to explore the effect that expectancies or motivations may have on these relationships. This study is unique in that it is the first to
apply Dawe and Loxton’s (2004) two factor model of impulsivity (reward sensitivity and rash impulsivity) to ecstasy use. This is also the first study to explore the relationship between reward sensitivity and motivations to use ecstasy.

**Rash impulsivity and ecstasy use.**

Typically, the term impulsivity refers to behaviour that is hasty, unplanned and thoughtless, and which reflects a lack of consideration for potential consequences (Dawe & Loxton, 2004). Impulsivity has often been found to result in risky behaviours with negative consequences (Katz et al., 2000), so it is not surprising that impulsive behaviours have been found to be associated with negative emotions and feelings (Whiteside & Lynam, 2001). It is therefore important that this particular personality trait be recognised and understood. However, within the personality literature, there is little consensus regarding the components which are thought to constitute impulsivity (Dawe & Loxton, 2004; Evenden, 1999). There have been a variety of definitions used in the ecstasy literature, drawn from a number of theoretical frameworks. It has been suggested that the most prominent of these stem from the theories of Eysenck, Cloninger, Zuckerman, Barratt and Gray (Dawe & Loxton, 2004; Evenden, 1999). Eysenck (1967) postulates a narrow definition of impulsivity as associated with Psychoticism from his ‘Big Three’ theory of personality. Cloninger (1987) conceptualised impulsivity as an automatic tendency to seek out and explore novel stimuli. Zuckerman (1978, 1994; Horvarth, & Zuckerman, 1993) referred to his impulsivity dimension as sensation seeking where novelty is thought to be sought regardless of consequences. Finally, Barratt (1994) described his construct as containing aspects of acting without forethought, yet his conceptualisation derives from a more cognitive perspective than the aforementioned
theorists (Barratt, Lijiffijit, & Moeller, 2005). These conceptual differences, deriving from varying perspectives, have resulted in discrepant measures, which have created difficulties in drawing conclusions within the impulsivity literature (Dawe & Loxton, 2004; Evenden, 1999). Nonetheless, all such perspectives do contain similarities, as they seem to conceptualise impulsivity as behaviour that is rash, unplanned and inconsequential (Dawe & Loxton, 2004).

Eysenck’s (1976) measure of impulsivity (Eysenck, Pearson, Easting, & Allsopp, 1985) which quantifies rash, spontaneous behaviours has been frequently used in the ecstasy literature (e.g. Butler & Montgomery, 2004, Morgan, 1998 a, b; Parrott et al., 2000). In one such study by Morgan (1998 b), rash impulsivity was measured in 25 ecstasy consumers. Findings indicated elevated rash impulsivity in ecstasy users when compared to both non-drug controls and poly-drug controls. Results also indicated a positive linear relationship between self-reported impulsivity and ecstasy use. Furthermore, self-report findings were consistent with behavioural tasks which demonstrated ecstasy users tended to make more rapid errors than poly-drug controls. Further support for Eysenck’s model of impulsivity was demonstrated in another study comparing 12 heavy, 16 light, and 22 non ecstasy users (Parrott et al., 2000). Similarly, heavy ecstasy users, those who had consumed the drug 20 or more times, reported elevated impulsivity when compared to controls.

In another study, investigators measured both Eysenck’s (1976) rash impulsiveness, and Cloninger’s (1987) novelty seeking model of impulsivity in a sample of 254 undergraduates (Butler & Montgomery, 2004). This sample contained 28 light (less than 20 ecstasy tablets consumed in lifetime), and 18 heavy (20 or more) ecstasy users.
Results indicated impulsivity and novelty seeking behaviour was higher in the light ecstasy user sample than in non drug controls, and higher in the heavy ecstasy users than in those deemed light users. Further support for Cloninger’s model was demonstrated in another study of 43 high school age ecstasy users (Dughiero et al., 2001). Results showed those who have taken ecstasy reported higher novelty seeking scores than those who had never consumed ecstasy, but who may have consumed other substances.

Alternatively, researchers have measured impulsivity in ecstasy users using the sensation seeking concept derived from Zuckerman’s model (1978, 1994). The concept of sensation seeking was measured in one of the largest studies reported by researchers in the ecstasy area. Participants, 3,634 Spanish military conscripts, 284 of whom had consumed ecstasy in the previous year, were administered the Zuckerman Sensation Seeking Scale (Zuckerman, Eysenck, & Eysenck, 1978). This is a measure typifying risky behaviour irrespective of known consequences. Results found those who had consumed ecstasy in the year before the study exhibited higher levels of sensation seeking than others in the sample (Bobes et al., 2002).

In another study, Tuchtenhagen and colleagues (2000) measured sensation seeking in addition to non-planning rash impulsivity as conceptualised by Barratt (1994). This study investigating impulsivity and ecstasy differed from others as researchers excluded ecstasy users from the study if they consumed other substances (with the exception of cannabis), or heavily drank alcohol two or more times per month. Even after controlling for other drug use, ecstasy users were higher in sensation seeking and non-planning rash impulsivity than a control group of cannabis users and a group with no previous drug history. The method of excluding poly-drug users is questionable as it is highly
uncommon for ecstasy users to not consume other psychotropic substances (Degenhardt et al., 2004; Schifano, 2000, 2004; Sydow et al., 2002; Topp et al., 1999), making generalising results from this study to other ecstasy users difficult. However, results from this study are interesting as they demonstrate how personality can have an effect on ecstasy use excluding any possible effects from other substances. In another study measuring Barratt’s conceptualisation of impulsivity, 16 participants who reported using ecstasy within two weeks prior to testing were measured using behavioural and self-report measures of impulsivity (Moeller et al., 2002). Results indicated that the eight participants who were deemed heavy users, those who consumed ecstasy regularly and had a history of ecstasy use, were significantly more impulsive on both self-report and behavioural laboratory measures than those who have never used ecstasy.

To date, two studies have found incongruent results (McCann, Ridenour, Shaham, & Ricaurte, 1994; Travers & Lyvers, 2005). McCann and colleagues were the first to suggest that recreational ecstasy use was associated with differences in impulsivity. However, heavy ecstasy users reported lower impulsivity scores on the Multidimensional Personality Questionnaire (MPQ; Tellegen, 1982) than controls. This was surprising as the same sample were also found to have lower levels of serotonin, which is indicative of elevated trait impulsivity (e.g. Gerra et al., 2000; McCann et al., 2000; Parrott, 2000; Tuchtenhagen et al., 2000). This may suggest the MPQ’s ‘control’ subscale does not tap into the same construct as other measures of impulsivity. In an Australian study, researchers found no differences in rash impulsivity between 43 ecstasy using and 31 non using rave attendees (Travers & Lyvers, 2004). Methodological limitations may have contributed to this unusual finding. The sample in this study was unrepresentative as
participants were selected from two particular Brisbane raves. Furthermore, respondents were required to complete the questionnaire within two days of attending the events; this may have caused confounding variables, as participants were likely to be affected by the residual effects of psychotropic drugs and sleep deprivation (Curran & Travill, 1997). Researchers of both studies were unable to explain such results, and they are surprising in view of the abundance of research that has indicated impulsivity, as conceptualised within a variety of perspectives, to be elevated when compared to non ecstasy user controls (e.g. Bobes et al., 2002; Butler & Montgomery, 2004; Dughiero et al., 2001; Gerra et al., 2000; Moeller et al., 2002; Morgan, 1998b; Parrott et al., 2000; Tuchtenhagen et al., 2000).

Summary of Impulsivity and ecstasy use: Proposal for a two-factor model

Interestingly, despite incongruity between theoretical perspectives on the conceptualisation of impulsivity, the large majority of studies have associated ecstasy use with elevated impulsivity (e.g. Bobes et al., 2002; Butler & Montgomery, 2004; McCann et al., 2000; Morgan, 1998b; Moeller, 2002; Parrott et al., 2000; Tuchtenhagen et al., 2000). Reported results suggest that a range of impulsivity type traits are important in understanding ecstasy use. Due to this, the most comprehensive conclusions that can be drawn from such research is that ecstasy users are more likely to act spontaneously and without deliberation, prefer and seek out novel stimuli, may not consider possible consequences, and undertake in potentially dangerous behaviours than those who are generally less impulsive (Bobes et al., 2002; Butler & Montgomery, 2004; McCann et al., 2000; Morgan, 1998b; Moeller, 2002; Parrott et al., 2000; Tuchtenhagen et al., 2000). Recently, researchers have attempted to offer structure to the definition of impulsivity by
suggesting that these behaviours underpin one facet of impulsivity, and have termed it ‘rash impulsivity’ (Dawe et al., 2004; Dawe & Loxton, 2004). This theory was validated by factor analytic analysis that found the impulsivity measures derived from Eysenck, Cloninger, Zuckerman and Barratt form one distinct factor (Dawe & Loxton, 2004).

It is arguable, however, that substance abuse cannot be typified purely by rash impulsive behaviour, as forethought and planning are required to obtain and use illicit substances such as ecstasy (Evenden, 1999). In order to more fully understand the personality correlates of addictive behaviours, Dawe and Loxton (2004) have proposed a two factor model of impulsivity; containing both a behavioural disinhibition component (rash impulsivity) as previously discussed, in addition to a component thought to motivate the use of addictive substances due to heightened sensitivity to rewarding stimuli. The following discussion will consider the latter component, termed ‘reward sensitivity’ in relation to understanding substance use.

*Sensitivity to Reward: Gray’s neurobiological model.*

According to Gray (1987), a primary indicator of impulsivity is an underlying sensitivity to conditioned rewarding stimuli. Gray posited biological underpinnings of personality in which there are two motivational systems controlling behaviour and emotion. The Behavioural Activation System (BAS) and the Behavioural Inhibition System (BIS) are considered responsible for impulsivity and anxiety proneness respectively (Carver & White, 1994). The BAS and the BIS are thought to be associated with different types of reinforcements. The BAS is activated by conditioned stimuli that indicate reward or relief from punishment. Activation of the BAS is thought to increase approach behaviour and is highly active in individuals considered impulsive.
Alternatively, the BIS is activated by novel and conditioned stimuli, and is thought to be sensitive to signals of punishment. Activation of this system is believed to decrease an individual’s approach behaviour to novel stimuli and is highly active in anxious individuals. Gray’s personality theory stipulates that differences in personality stem from individual differences in sensitivity toward perceived positive and negative stimuli, and for this reason this model of personality has more recently been labelled Reinforcement Sensitivity Theory (RST; Pickering & Gray, 1999).

An important aspect of RST is its role in regulating motivation and affect. It has been proposed that the BAS is responsible for regulating responses to appetitive stimuli, whereas the BIS regulates inhibition responses in response to stimuli considered to be aversive (Dawe & Loxton, 2004; Pickering & Gray, 1999). Essentially, individuals with high BAS sensitivity are more likely to display approach behaviour and experience positive affect in situations that may stimulate reward within them. Alternatively, individuals with high BIS sensitivity are more likely to display avoidance or inhibited behaviour and experience negative affect in situations that stimulate signals of punishment (Dawe & Loxton, 2004; Gomez & Gomez, 2002; Pickering & Gray, 1999).

In recent years, associations have been found between reward sensitivity, as conceptualised by the RST framework, and other impulsive behaviours such as bulimia and substance use (Colder & O’Conner, 2002; Dawe & Loxton, 2001; Franken et al., in press; Jorm et al., 1999; Palfai & Ostafin, 2003). Results from alcohol studies indicate individuals who display hazardous drinking behaviour report higher BAS scores on self-report measures (e.g. Dawe & Loxton, 2001; Jorm et al., 1999) and frequently display elevated reward sensitivity in laboratory tasks, tending to focus attention on potentially
rewarding cues (e.g. Colder & O’Conner, 2002; Kambouropoulos & Staiger, 2001; Palfai & Ostafin, 2003). Although reward sensitivity has been found to be associated with other addictive substances, there have been no studies to date investigating the effects of reward sensitivity, or sensitivity to punishment in ecstasy users.

Given the evidence that reward sensitivity is associated with impulsive behaviours, and ecstasy use appears to be a behaviour undertaken by impulsive individuals, it is plausible that BAS may underpin one personality factor that is important in understanding ecstasy use (Butler & Montgomery, 2004; Franken et al., in press). Ecstasy is reportedly a highly pleasurable drug, producing feelings of elation and euphoria (Schifano, 2000). Given this, it can be argued that those who are biologically more sensitive to reward may experience such feelings more intensely. In light of this, it is expected that ecstasy users will be more sensitive to the positive aspects of taking the drug, which then may create the expectancy that taking ecstasy will lead to rewarding effects. This would indicate that those who experience heightened sensitivity to reward would be more likely to take substances that could be perceived as rewarding, such as the drug ecstasy.

It is also theoretically likely that sensitivity to punishment plays a role in understanding ecstasy approach behaviour. Aside from the euphoric and elative effects, there are also the residual effects of ecstasy use which produce feelings of depression, negative affect, and confusion (Parrott, 2001). It is likely that rash impulsivity in part is responsible for the lack of forethought regarding consequences. However it is also possible that the BIS contributes to this behaviour, as low BIS individuals are thought to be less sensitive to stimuli that signal punishment. The low BIS individual is unlikely to
restrain behaviour in situations that may be deemed punishing by those higher in BIS (Gray, 1987), such as the harmful and negative effects of ecstasy use. It is not surprising then, that it is thought that those who are more sensitive to reward, and expect positive outcomes of taking the drug, will also be less likely to inhibit behaviour in light of the negative after effects of taking the drug (Pickering & Gray, 1999). Thus, theoretically RST may play a part in determining whether individuals are likely to approach and maintain or avoid this risky behaviour, although no prior study has investigated such relationships.

Motivations to use ecstasy

A related component that may influence this relationship by contributing to approach behaviour and drug use is the expectations or motivations the individual holds. Expectations are cognitions that involve anticipation of the outcome of behaviour (Katz et al., 2000), in this case drug ingestion. Motivations to consume a substance are a reflection of the positive or negative expectancies held by the individual, and are highly important in understanding contributors to drug use. This is because the anticipation of outcomes for consuming a drug is highly likely to influence the decision to consume a substance (Newcomb, & Earleywine, 1996).

There have been a small number of studies investigating motives and ecstasy use (see for example Engels & ter Bogt, 2004; Fromme et al., 1997; Katz et al., 2000). In a recent study conducted in the Netherlands, the types of expectancies ecstasy users upheld were explored, as were the differences between users and non-users in expected outcomes of taking ecstasy (Engels & ter Bogt, 2004). This study investigated 844 ‘ravers’ from seven different dance parties, 543 of whom were reportedly ecstasy users. Results found
expectations differed between users and non-users. Those upholding the expectation that ecstasy would produce elevated self-insight and improve communication were more likely to consume ecstasy. Those who expected negative physical and emotional consequences were most likely to refrain from taking ecstasy. Results from this study are important as they demonstrate how cognitions motivate or inhibit ecstasy use.

One study has attempted to integrate personality traits with expectations to understand illicit drug use. In a longitudinal study, Katz, Fromme and D’Amico (2000) integrated personality theory, specifically Zuckerman’s (1978, 1994) sensation seeking, with cognitive expectancies regarding outcomes of a variety of impulsive behaviours. Results from this study offer evidence that biologically based personality traits may influence the salience and strength of expectations of outcomes for taking substances including alcohol and ‘illicit’ drug use. Furthermore, expectancies and sensation seeking independently predicted substance use at a six month follow up.

Results from these studies indicate that motives and expectancies are important in understanding why people use ecstasy. Furthermore, the latter study indicated that impulsive type traits may influence people’s perceptions of the outcomes for taking illicit substances which predicted drug use; however researchers did not specify which substances were included in the umbrella term ‘illicit’. Given these findings, it could be argued that there is an association between rash impulsivity and motives to use ecstasy specifically, although such a relationship has not been investigated. Furthermore, motives are theoretically linked with Gray’s (1987) construct reward sensitivity, as individuals higher in reward sensitivity may expect positive outcomes to occur from their approach behaviour which is thought to motivate addictive behaviour (Dawe & Loxton,
2004). Despite this clear theoretical relationship, an association between reward sensitivity and motives to use ecstasy have never been investigated.

Based on the preceding review, it would be expected that a rash impulsive individual would experience negative emotions which may motivate them to use ecstasy in an attempt to reduce this negative affect. Therefore, as reward sensitivity has been consistently associated with positive affect (Carver & White, 1994; Gomez & Gomez, 2002; Katz, 2001; Zelenski & Larsen, 1999) it would be expected that those who are more sensitive to rewarding stimuli would take ecstasy for more hedonistic reasons, such as to increase positive affect and creativity. Although these relationships are theoretically sound, no empirical study has investigated these proposals. Clearly further research is needed to investigate how impulsivity and motives interact to influence ecstasy taking behaviour.

Research aims

The present research aims to investigate two impulsive personality variables in conjunction with motivations to gain a better understanding for typical characteristics of ecstasy users and precursors for recreational ecstasy use. The present study will compare two groups of young Australians, an ecstasy using sample and a group of like individuals who refrain from taking ecstasy. Furthermore, this study intends to expand on previous literature that has demonstrated elevated rash impulsivity, the tendency to act spontaneously and without forethought for consequences, to be associated with ecstasy use. In accordance with previous literature, it is expected that ecstasy users would be higher in rash impulsivity than their non-using counterparts.
The present study will attempt to draw together two lines of research. Firstly, associations between rash impulsivity and negative affect (Whiteside & Lynam, 2001) and, secondly, associations between impulsivity and motivations or expectancies (Engels & ter Bogt, 2004; Fromme et al., 1997; Katz et al., 2000). Research shows rash impulsive individuals are more likely to approach novel and risky situations such as ecstasy use (e.g. Butler & Montgomery, 2004; Dughiero et al., 2001). Consequences of which may result in negative affect due to negative outcomes (Whiteside & Lynam, 2001), which may result in the use of ecstasy to reduce these negative emotions.

Another conceptualisation of impulsivity derived from Gray’s (1987) neurobiological theory has been termed reward sensitivity, a theoretical system motivating approach behaviour that conceptualises impulsivity as individual variation in sensitivity to reward (BAS; Pickering & Gray, 1999). Theoretically it seems likely that those high in BAS would be more sensitive to the pleasurable effects of taking ecstasy, and experience more positive affect than those low in BAS (Pickering & Gray, 1999); such relationships have been demonstrated in other addictive behaviours and with other substances (Colder & O’Conner, 2002; Dawe & Loxton, 2001; Franken et al., in press) yet such a relationship has yet to be determined in ecstasy users. It is expected that those who are more sensitive to rewarding stimuli would experience more positive affect (Gomez & Gomez, 2002), and therefore be motivated to use ecstasy for hedonistic reasons, such as increasing positive affect.

In line with research with other substances (e.g. Colder & O’Conner, 2002; Loxton & Dawe, 2001; Jorm et al., 1999; Palfai & Ostafin, 2003), it is thought that BAS would be higher in ecstasy users than in non-user participants. It is also thought that Gray’s BIS
may be a personality trait that contributes to the approach or avoidance of ecstasy use. BIS is a sensitivity to stimuli deemed punishing (Gray, 1987; Pickering & Gray, 1999), therefore it is expected that those who refrain from taking ecstasy be higher in sensitivity to punishment, and therefore actively avoid this behaviour. Furthermore, it is also thought that ecstasy users would be lower in BIS as they are less likely to be sensitive to the harsh residual effects of ecstasy use, thereby may be less likely to inhibit behaviour in light of these punishing effects.

**Hypotheses**

Based on the proceeding review it is hypothesised that;

1. Ecstasy users will have significantly higher rash impulsivity scores than non-users;

2. Ecstasy users will have significantly higher reward sensitivity scores, and significantly lower sensitivity to punishment scores than non-users;

3. Rash impulsivity will be positively associated with negative affect, and the motivation to use ecstasy to reduce negative affect. Specifically, it is expected that negative affect will mediate the relationship between rash impulsivity and the motive to use ecstasy to reduce negative affect.

4. Elevated reward sensitivity would be positively associated with positive affect, and the motivation to use ecstasy to enhance positive affect and creativity. Specifically, it is predicted that positive affect will mediate the relationship between reward sensitivity and the motive to use ecstasy to enhance positive affect and creativity.
Method

Participants

The sample comprised 220 Australian participants (87 males, 133 females) ranging in age from 18 through 50 (\(M=23.55, SD=5.24\)). Generally participants were highly educated as 26.8% (\(N=59\)) reported they had “completed tertiary” or “postgraduate” studies, 27.3% (\(N=60\)) had “incomplete tertiary” studies, 21.4% (\(N=47\)) indicated that they had completed “TAFE or diploma level” studies, 5.5% (\(N=12\)) reported having “trade qualifications”, 17.3% (\(N=38\)) had “completed secondary” studies, and only 1.8% (\(N=4\)) reported their highest education level completed as “some secondary” education.

Of the sample, 111 participants reported having ever taken ecstasy (108 of which had consumed ecstasy in the preceding 2 years), and 109 reported they had “never” taken the drug. Of the participants reporting ecstasy use 49 were male and 62 female; of the non-users there were 38 males and 71 females. With regard to dosage, 46.4% of ecstasy users reported that they would take one ecstasy tablet in one typical occasion (\(N=51\)), 24.5% reported they averaged 2 tablets (\(N=27\)), and 7.3% reported that they typically would have 3 in a night out (\(N=8\)). Other participant responses ranged from half a tablet to six in one night although were far less commonly reported.

Materials

Participants completed a questionnaire designed to measure drug taking behaviour, rash impulsivity, reward sensitivity, sensitivity to punishment, affect, and motivations for taking ecstasy. Demographic information was obtained including age, sex, and education level (see Appendix A for complete questionnaire).
**Drug History Questionnaire**

Four individual items were developed from methodology followed in similar studies to measure frequency, quantity, and total consumption of ecstasy use (Butler & Montgomery, 2004; Parrott et al., 2000). Questions included recency of last ecstasy consumption, an estimate of number of ecstasy tablets one had consumed over the lifetime and average dosage in a typical night out. Participants were also required to indicate which substances among a list of commonly taken drugs they have ever taken or smoked; an option was also included for the reporting of the consumption of ‘other’ drugs (Butler & Montgomery, 2004). This self-report method for drug use has been commonly used (e.g. Bobes et al., 2002; Butler & Montgomery, 2004; Gerra et al., 2000, 2002, 2004; Moeller et al., 2002; Parrot et al., 2000). Validation for self-reported drug use has been demonstrated in biological research demonstrating high correlations between self-reported drug use and drug use indicated in hair and urine samples (Thomasius et al., 2003).

*The Impulsiveness, Venturesomeness, and Empathy Scale (IVE) - Impulsiveness subscale (I_7).*

The Impulsiveness subscale of Eysenck’s Impulsiveness, Venturesomeness, and Empathy Scale was used to measure the participant’s level of rash impulsiveness (Eysenck et al., 1985). The I_7 comprises 19 items such as “Do you often buy things on impulse?” and “Do you usually make up your mind quickly?” Respondents are required to indicate with either a “yes” or “no” response whether they agree or disagree with the statement. Items 5, 16, and 17 are reverse-scored before “yes” responses are summed. Scores can range from 0 through 19 with higher scores a reflection of greater levels of
rash impulsiveness. Reliabilities for the I7 are high with studies reporting Cronbach alphas ranging from 0.83 to 0.84 (Eysenck et al., 1985). Convergent validity has been demonstrated in a number of studies with correlations with other impulsivity measures including the ‘Motor’ subscale from the Barratt Impulsivity Scale (10th revision), Dickman’s ‘Dysfunctional Impulsivity’ subscale (Caci, Nadalet, Baylé, Robert, & Boyer, 2003), and Sensation- seeking and Excitement seeking from Eysenck & Eysenck’s Venturesomeness scale (Heaven, 1991). Divergent validity has been demonstrated with Spielberg’s Trait-Anxiety Inventory (Caci et al., 2003).

The Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ)

The Sensitivity to Punishment and Sensitivity to Reward Questionnaire (Torrubia et al., 2001) is a relatively new measure that was specifically developed to quantify Gray’s (1987) BIS (sensitivity to punishment) and BAS (sensitivity to reward) constructs (Torrubia, Ávila, Moltó, & Caseras, 2001). The SPSRQ contains 48 items, 24 corresponding to the BAS and 24 designed to measure the BIS. An example item included in the BAS scale states “Do you often do things to be praised?” The BIS subscale contains the item “Are you often afraid of new or unexpected situations?” Respondents are required to indicate with either a “yes” or “no” response whether they agree or disagree with the statements and all “yes” responses are summed. Both scales have a possible range of 0 through 24 with higher scores indicating greater levels of the measured construct.

Very good convergent and discriminant validity has been demonstrated with a number of related measures. For example, the sensitivity to reward scale has been found to be positively related to Eysenck’s impulsiveness scale (Eysenck et al., 1985), and the

Furthermore, the sensitivity to punishment scale has been found to be positively related to Eysenck’s neuroticism scale, negatively related to extraversion, and positively related to the STAI-Trait scale (for a review see Torrubia et al., 2001). Internal consistency was demonstrated to be adequate for the sensitivity to reward subscale (ranging from $\alpha= 0.75-0.78$) and good for the sensitivity to punishment subscale (ranging from $\alpha=0.82-0.83$) (Torrubia et al., 2001).

**Motivations for Drug Use Scale (MDUS)**

The Motivations for Drug Use Scale (Newcombe, Chou, Bentler & Huba, 1988) was used to measure cognitive motivations, a reflection of outcome expectancies, for the use of ecstasy. This scale was initially developed to measure the motivations of adolescents for alcohol and cannabis use, and was modified for the current study to be applicable for ecstasy users. This was due to the lack of measures assessing motivations of drug use in the ecstasy/amphetamines area. Fourteen of the original 15 items in the scale were retained, as were the four subscales, which are ‘Reduce negative affect’ (e.g. “To stop boredom”), ‘Enhance positive affect and creativity’ (e.g. “To know myself better”), ‘Social cohesion’ (e.g. “To feel good around people”), and ‘Addiction’ (e.g. “I feel bad when I don’t use it”). One item “Helps me with problems”, originally part of the addiction subscale, was removed due to lack of relevance so as to not interfere with the face validity of the scale. In another item (“Helps me get through the day”), ‘day’ was substituted with ‘night’ as ecstasy is more often taken at night than during the day (Degenhardt et al., 2004).
Respondents were required to indicate on a three-point anchored rating scale whether they “have not or will not use ecstasy for this reason” (0), if they are “not sure” (1) or whether they “have used or might use ecstasy for this reason” (3). Scores for each subscale were summed with higher scores indicating ecstasy use is likely to be motivated by this factor. The possible range for the total scale is 0 to 28. Possible scores for the “Reduce negative affect” subscale range from 0 through 6; for the “Enhance positive affect and creativity” subscale the possible range is 0 to 10; for the “Social cohesion” subscale scores may range from 0 to 8; and for the “Addiction” subscale possible range of scores is 0 to 4. This scale has good construct validity with significant correlations found between those who reported more motivations to use drugs and actual reported drug use; this was found with a variety of drugs including cocaine and “hard drugs” (Newcombe et al., 1988).

*The Positive and Negative Affect Schedule (PANAS)*

The PANAS (Watson, Clarke & Tellegen, 1988) was used to assess participant’s mood states. This widely used measure contains 20 adjectives, 10 designed to measure positive feelings and emotions, and 10 to measure negative mood states. Participants are required to indicate “to what extent do you feel this way in general” to items such as “active”, and “excited”, designed to measure positive affect, whereas adjectives such as “scared”, and “nervous” are intended to measure negative affect. Each item is rated on a scale from 1 indicating “very slightly or not at all” to 5 representing “extremely”; with higher scores indicative of a higher level of the relevant mood state. Scores are summed to give a measure of positive and negative affect, with possible scores ranging from 10 to 50 for each subscale. Good construct validity has been demonstrated with positive
relationships between the negative affect subscale of the PANAS and the Hospital Anxiety and Depression Scale and the Depression Anxiety Stress Scales (Crawford & Henry, 2004). Similarly, associations were also found between the PANAS and the positive and negative affect subscales of the Global Mood Scale (Johan & Jolanda, 2006). Internal consistencies for the PANAS are reportedly very high, with reported alphas of .93 for positive affect, and .89 for negative affect (Gomez, Cooper, & Gomez, 2000).

**Procedure**

There were two forms of the questionnaire, a paper copy and an online questionnaire. The online questionnaire was available to participants via the ‘Surveyor’ program. Both forms of the questionnaire were identical and contained a battery of tests in the following order; demographic questions including drug history, the I7, SPSRQ, MDUS, and the PANAS.

Twenty one participants were recruited through the University’s research experience program, in which students are required to complete questionnaires as a requirement of their first year psychology studies. The remainder of the sample were obtained using the ‘snowball’ method, a widely used technique in the ecstasy field (e.g.: Davidson & Parrott, 1997; Dughiero et al., 2001; Parrott et al., 2000; Tuchtenhagen et al., 2000), and one which was created specifically to assess hard to access populations such as illicit drug users (Solowij, Hall, & Lee, 1992). ‘Snowballing’ requires people to distribute the questionnaire to friends, work colleagues and associates and requesting that they too forward it on to their social network (Solowij et al., 1992). Forty- two participants were recruited this way by distributing paper copies (with pre-paid envelopes), and others by emailing the link to associates of the researcher and requesting
the link be passed on. The link was also posted at two Melbourne universities, and on
Australian ‘message boards’ online for anyone to complete. Participants were informed
of the purpose of the study, the voluntary nature of the study, and ensured of the
anonymity of all responses given. Participants were advised that they could withdraw
from the study at any time. Informed consent was implied through the completion and
return of the questionnaire.

Results

Preliminary data analysis

The data were analysed using the Statistical Package for Social Sciences (SPSS)
version 11.5. Suitability of the data for further analysis was determined by a number of
preliminary analyses. Five participants completed the drug history questions,
demographics, and the I7, but not the other scales. These cases were retained to investigate
rash impulsivity in a large sample; this was thought particularly important to get an
accurate reflection of rash impulsivity in the population, given that previous literature had
reported very small sample sizes (Butler & Montgomery, 2004, Morgan, 1998 a, b;
Parrott et al., 2000). Furthermore, 10 participants completed all of the measures
excluding the PANAS. These participants were retained in the sample in order to
maintain a high sample size and as the information retained could still be valuable for
data analysis using the completed scales. To maintain consistency, all tables contain the
highest N value of the measures used in the analysis, although the number of participants
were slightly lower for results including the SPSRQ and MDUS (N=215) and PANAS
(N=205) than analysis excluding these scales (N=220). Maintaining these cases in the
analysis did not affect results in any way.
For discreet missing values in the I7 and SPSRQ and PANAS, item mean substitution was used. Missing data were not replaced for the motives scale because non-users often did not answer any questions from this scale. Examination of histograms and box-plots determined that there were no univariate outliers in the sample. The data were screened for multivariate outliers by computing Mahalanobis distance; four cases were higher than the critical value therefore were removed from any further analyses ($\chi^2 = 29.59, df= 10, p<.001$). The data for continuous measures in both groups were analysed for distributions of normality. Inspection of the histogram for the rash impulsivity variable for both groups demonstrated a slight positive skew; this was supported by significant Kolmogorov-Smirnov and Shapio-Wilks statistics. However, once the skewness score was converted to a z score it was just over the critical value of 2.58 ($z= 2.69, p<.01$), therefore was considered acceptable given the current sample size (Tabachnick & Fiddell, 2001). Two cases were found to have z scores above the critical value, and histograms demonstrated a mild negative skew for positive affect ($z = 5.85$) and a mild positive skew for negative affect ($z = 5.41$). It is expected that both positive and negative affect be skewed in the general population, as people are generally more likely to report more positive feelings and less negative feelings; therefore the variables remained untransformed.

**Ever used versus never used ecstasy**

*Poly-drug use for users and non-users*

Participants were divided into two groups; those who have never taken ecstasy (termed non-users) and those who had taken ecstasy at any point in their life (users)
(Schifano, 2000; Schifano, Di Furia, Forza, Minicuci, & Bricolo, 1998). Percentages of drug use for ecstasy users and non-users can be seen in Table 1.
Table 1

*Poly-drug use for non ecstasy user controls (N=109), and those who have ever taken ecstasy (N=111).*

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Non-user controls</th>
<th>Ecstasy users</th>
<th>$\chi^2$ (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>$M=23.37$</td>
<td>$M=23.69$</td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td>Male-38, Female-71</td>
<td>Male-49, Female-61</td>
<td></td>
</tr>
<tr>
<td><strong>Ecstasy use</strong></td>
<td></td>
<td>$M=57.44$, $SD=85.89$</td>
<td></td>
</tr>
<tr>
<td><strong>Usual tablets taken in a typical night</strong></td>
<td>$M=1.58$, $SD=1.00$</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other drugs (%users)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tobacco</td>
<td>73.4%</td>
<td>92.7%</td>
<td>14.57***</td>
</tr>
<tr>
<td>Alcohol</td>
<td>86.2%</td>
<td>95.5%</td>
<td>5.60*</td>
</tr>
<tr>
<td>Cannabis</td>
<td>54.1%</td>
<td>90.0%</td>
<td>35.06***</td>
</tr>
<tr>
<td>Amphetamine</td>
<td>6.4%</td>
<td>80.9%</td>
<td>126.74***</td>
</tr>
<tr>
<td>Cocaine</td>
<td>2.8%</td>
<td>59.1%</td>
<td>81.17***</td>
</tr>
<tr>
<td>GBH</td>
<td>-</td>
<td>7.3%</td>
<td>8.23**</td>
</tr>
<tr>
<td>LSD</td>
<td>1.8%</td>
<td>30.0%</td>
<td>32.35***</td>
</tr>
<tr>
<td>Magic Mushrooms</td>
<td>2.8%</td>
<td>30.9%</td>
<td>28.33***</td>
</tr>
</tbody>
</table>

*p<.05, **p<.01, ***p<.001.
Results from Table 1 show that those who have consumed ecstasy were significantly more likely to have consumed/taken tobacco, alcohol, cannabis, amphetamines, cocaine, GBH, LSD, and magic mushrooms than those who have never taken ecstasy. An independent groups t-test demonstrated that there was no significant differences in age between non-user controls and ecstasy users ($t(217)=-.35, p=.73$). There was also no difference in gender across groups ($\chi^2(1)= 2.14, p=.14$).

*Internal consistency*

Cronbach’s alpha coefficients were calculated to evaluate the internal consistency of the measures used in the study. With the exception of the ‘addiction’ subscale, comprising two items from the motivations measure, all of the self-report scales demonstrate good levels of internal consistency. Given this low reliability, the addiction subscale was excluded from any further analysis. Reliabilities, means and standard deviations for the scales can be seen in Table 2.
Table 2

*Means, Standard deviations, and Cronbach alphas for all variables.*

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rash impulsivity</td>
<td>7.41</td>
<td>4.37</td>
<td>.83</td>
</tr>
<tr>
<td>Reward Sensitivity</td>
<td>11.41</td>
<td>4.39</td>
<td>.78</td>
</tr>
<tr>
<td>Sensitivity to punishment</td>
<td>10.41</td>
<td>5.07</td>
<td>.83</td>
</tr>
<tr>
<td>Motive- reduce negative affect</td>
<td>.88</td>
<td>1.70</td>
<td>.78</td>
</tr>
<tr>
<td>Motive- enhance positive affect/creativity</td>
<td>2.05</td>
<td>2.69</td>
<td>.80</td>
</tr>
<tr>
<td>Motive- social cohesion</td>
<td>1.36</td>
<td>1.94</td>
<td>.68</td>
</tr>
<tr>
<td>Motive- addiction</td>
<td>.40</td>
<td>.83</td>
<td>.32</td>
</tr>
<tr>
<td>Positive affect</td>
<td>33.88</td>
<td>7.48</td>
<td>.90</td>
</tr>
<tr>
<td>Negative affect</td>
<td>18.58</td>
<td>6.66</td>
<td>.88</td>
</tr>
</tbody>
</table>

*N=220

*Personality and affect of ecstasy users vs. non-users*

A between groups One-way Multivariate Analysis of Variance (MANOVA) was performed to determine differences in personality and affect between the ecstasy users and non-users. Prior to testing, the assumptions of MANOVA were tested. Observations were independent of one another, and the data was free from multivariate outliers. The dependent variables were normally distributed, with the exception of positive and negative affect (as previously discussed). However, MANOVA was considered to be robust to the normality assumption in this case as the sample size was relatively equal across cells, the cells have large numbers of participants in relation to dependent variables, and the non-normality was caused by skewness rather than outliers.
(Tabachnick & Fiddell, 2001). A significant Box’s M demonstrated unequal variance-covariance across groups, though this test is highly sensitive and usually has minimal impact when the groups are approximately equal size (Tabachnick & Fiddell, 2001). The data was found to have equal variances when independent variables were tested for each dependent variable separately. Most of the variables were moderately correlated and linearly related, and for those not significantly related there was a theoretical relationship between the variables, therefore MANOVA was considered to be appropriate.

Rash impulsivity, sensitivity to reward, sensitivity to punishment, positive and negative affect for ecstasy users and non-users were compared. The MANOVA indicated a significant multivariate effect of personality on ecstasy use, Pillai’s Trace=.16, $F(5,199)=7.54$, $p<.001$, partial $\eta^2=.16$. Univariate tests showed significant group differences on rash impulsivity, $F(1,203)=10.28$, $p<.01$; reward sensitivity, $F(1,203)=16.63$, $p<.001$; sensitivity to punishment, $F(1,203)=9.94$, $p<.01$; and positive affect, $F(1,203)=14.61$, $p<.001$; but not for negative affect, $F(1,203)=.39$, $p=.53$. Table 3 contains the means and standard deviations for the personality and affect scores for ecstasy users and non-users.
Table 3

*Means, standard deviations, effect sizes, and probabilities associated with the MANOVA for rash impulsivity, reward sensitivity, sensitivity to punishment, negative and positive affect for ecstasy users and non-users.*

<table>
<thead>
<tr>
<th></th>
<th>Ecstasy use</th>
<th></th>
<th>Effect*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ever used</td>
<td>Never used</td>
<td>$\eta^2$</td>
</tr>
<tr>
<td>Rash impulsivity</td>
<td>8.23 4.43</td>
<td>6.33 4.04</td>
<td>.05</td>
</tr>
<tr>
<td>Reward Sensitivity</td>
<td>12.57 4.38</td>
<td>10.13 4.21</td>
<td>.08</td>
</tr>
<tr>
<td>Sensitivity to Punishment</td>
<td>9.21 4.90</td>
<td>11.41 5.07</td>
<td>.05</td>
</tr>
<tr>
<td>Positive affect</td>
<td>35.80 6.10</td>
<td>31.93 8.23</td>
<td>.07</td>
</tr>
<tr>
<td>Negative affect</td>
<td>18.33 6.39</td>
<td>18.91 6.92</td>
<td>.00</td>
</tr>
</tbody>
</table>

*Note:* Effect size and probability associated with univariate ANOVA.  
$N=220$
Results from the MANOVA demonstrated significantly higher rash impulsivity, reward sensitivity and positive affect in ecstasy users than non-users. Alternatively, sensitivity to punishment was significantly lower in ecstasy users than non-users. There was no difference in negative affect between those who had ever taken ecstasy and those who have not.

**Personality, affect, and motivations for ecstasy use.**

To investigate the relationships between the personality variables, affect, motives, and ecstasy use, Pearson’s correlation coefficients were produced for the entire sample (see Table 4).
Table 4

Correlations between personality variables, affect, motives and ecstasy use for entire sample.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rash impulsivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reward Sensitivity</td>
<td>.50*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity to Punishment</td>
<td></td>
<td>.04</td>
<td>.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive affect</td>
<td>-.02</td>
<td>.19*</td>
<td>.33*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative affect</td>
<td>.21*</td>
<td>-.03</td>
<td>.42*</td>
<td>.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motive- Reduce neg affect</td>
<td>.24*</td>
<td>.19*</td>
<td>-.10</td>
<td>.10</td>
<td>.18*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motive- Enhance pos affect/creativity</td>
<td>.21*</td>
<td>.25*</td>
<td>-.12</td>
<td>.19*</td>
<td>.03</td>
<td>.57*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motive-Social cohesion</td>
<td>.20*</td>
<td>.27*</td>
<td>-.06</td>
<td>.24*</td>
<td>.17*</td>
<td>.36*</td>
<td>.65*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifetime use</td>
<td>.05</td>
<td>.14*</td>
<td>-.11</td>
<td>.24*</td>
<td>-.07</td>
<td>.31*</td>
<td>.36*</td>
<td>39*</td>
<td></td>
</tr>
<tr>
<td>Night out</td>
<td>.20*</td>
<td>.28*</td>
<td>-.19*</td>
<td>.25*</td>
<td>-.01</td>
<td>.46*</td>
<td>.58*</td>
<td>.53*</td>
<td>.69*</td>
</tr>
</tbody>
</table>

* N=220

*p<.05, **p<.01.
As can be seen in Table 4, there were significant positive relationships between rash impulsivity and reward sensitivity, negative affect, all three motivations for ecstasy use (reduce negative affect, enhance positive affect/creativity, and social cohesion), and typical number of ecstasy tablets taken in a night out. With regard to reward sensitivity, there were significant positive relationships with positive affect, all three motivations to use ecstasy, lifetime use, and number of ecstasy tablets taken in a typical night out. There were no relationships between reward sensitivity and sensitivity to punishment, or negative affect.

*Relationship between personality, motives and ecstasy use.*

In order to examine the relationships between personality variables and affect for non-users, bivariate correlations were calculated, these can be seen in Table 5.
Table 5

*Correlations between personality variables, and positive and negative affect for non-users.*

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rash impulsivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reward Sensitivity</td>
<td>.37**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity to Punishment</td>
<td>.06</td>
<td>.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive affect</td>
<td>-.23*</td>
<td>.11</td>
<td>-.28**</td>
<td></td>
</tr>
<tr>
<td>Negative affect</td>
<td>.05</td>
<td>-.15</td>
<td>.39**</td>
<td>.10</td>
</tr>
</tbody>
</table>

*N=109
*p<.05, **p<.01

As can be seen, there was a significant moderate strength, positive relationship between reward sensitivity and rash impulsivity. There was also a significant negative relationship between rash impulsivity and positive affect. With regard to sensitivity to punishment, there was a significant negative relationship with positive affect and a significant positive relationship with negative affect. Correlations between personality, affect and motives for ecstasy use, for ecstasy users can be seen in Table 6.
Table 6

Correlations between personality variables, positive and negative affect, and motivations for use for ecstasy users.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rash impulsivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reward sensitivity</td>
<td>.55**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity to punishment</td>
<td>.14</td>
<td>.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive affect</td>
<td>.10</td>
<td>.16</td>
<td>-.31**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative affect</td>
<td>.40**</td>
<td>.14</td>
<td>.45**</td>
<td>-.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivation-reduce negative</td>
<td>.23*</td>
<td>.11</td>
<td>-.01</td>
<td>-.05</td>
<td>.28**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivation-enhance positive</td>
<td>.09</td>
<td>.12</td>
<td>.10</td>
<td>-.03</td>
<td>.11</td>
<td>.36**</td>
<td></td>
</tr>
<tr>
<td>Motivation-social cohesion</td>
<td>.11</td>
<td>.24*</td>
<td>.17</td>
<td>.11</td>
<td>.29**</td>
<td>.10</td>
<td>.36**</td>
</tr>
</tbody>
</table>

N= 111
*p<.05, **p<.01
In the ecstasy user sample, there was a significant positive relationship between rash impulsivity and negative affect, and rash impulsivity and the motivation to use ecstasy to reduce negative affect. Furthermore, there was a significant, positive relationship between reward sensitivity and the motivation to take ecstasy due to social cohesion.

**Mediation hypotheses**

*Relationship between sensitivity to reward and the motive to use ecstasy to maintain Social cohesion.*

Correlations between sensitivity to reward and positive affect were not significant. However as can be seen, sensitivity to reward explains 5.7% of the variance in the motivation to use ecstasy to enhance and maintain social cohesion.

*Mediation analysis: rash impulsivity, negative affect, and motive to use ecstasy to reduce negative affect.*

As rash impulsivity, negative affect and the motivation to take ecstasy to reduce negative affect were correlated, mediation analysis was conducted. Multiple regression was used to determine if negative affect mediates the relationship between rash impulsivity and the motivation to use to reduce negative affect. This was conducted in conjunction with Baron and Kenny’s (1986) recommendation for the use of multiple regression in testing for mediation. The assumptions of multiple regression were tested before the completion of the tests. All observations were considered to be independent of one another, scatterplots and P-P plots indicated that the assumptions of normality, linearity, and homoscedacity were met, and tolerance values indicated none of the
variables were redundant in the analysis. Examination of correlations between the variables determined there was no multicolinearity between the variables.

Three regressions analysis were conducted to assess this prediction. In the first, negative affect (the mediator) was regressed on to rash impulsivity (the independent variable). In the second regression, motives to use ecstasy to reduce negative affect (the dependent variable), was regressed on to rash impulsivity (the independent variable). Then, in the third equation motives to use ecstasy to reduce negative affect (the dependent variable) was regressed on both rash impulsivity (the independent variable) and negative affect (the mediator).

The first regression indicated that rash impulsivity was significantly related to negative affect, $F(1,100) = 19.27, p<.001$, with rash impulsivity accounting for 16.2% of the variance in negative affect. The second regression demonstrated a significant main effect, that is a significant relationship between rash impulsivity and motives to use to reduce negative affect, $F(1,102)=5.92, p<.05$. Results indicated that rash impulsivity accounted for 5.5% of the variance in motives to use to reduce negative affect. These relationships ensured that the first two criteria were met for mediation analysis, confirming further analysis was appropriate. In the final regression, with negative affect entered into the equation with rash impulsivity, the relationship between rash impulsivity and the motive to use ecstasy to reduce negative affect was reduced enough that it was no longer significant ($p=.09$). The semi-partial correlations, unstandardised and standardised Beta coefficients, standard error, and significance levels can be seen in Table 7. For a graphical representation of the mediation model see Figure 1.
Table 7

Semi-partial correlations, unstandardised and standardised Beta coefficients, standard error, and significance levels for mediation between rash impulsivity, negative affect and motive to use ecstasy to reduce negative affect.

<table>
<thead>
<tr>
<th>Stage</th>
<th>B</th>
<th>Standard error</th>
<th>Beta</th>
<th>$Sr^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rash Imp→ NA</td>
<td>.58</td>
<td>.13</td>
<td>.40**</td>
<td>.16</td>
</tr>
<tr>
<td>Stage 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rash Imp→ Motive</td>
<td>.11</td>
<td>.04</td>
<td>.23*</td>
<td>.05</td>
</tr>
<tr>
<td>Stage 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rash Imp→ Motive</td>
<td>.08</td>
<td>.05</td>
<td>.18</td>
<td>.03</td>
</tr>
<tr>
<td>NA → Motive</td>
<td>.07</td>
<td>.03</td>
<td>.21*</td>
<td>.04</td>
</tr>
</tbody>
</table>

Note. NA= negative affect, Motive= Motive to use ecstasy to reduce negative affect.

N=211

**p<.001, *p<.05
Figure 1. Mediation model for relationship between rash impulsivity and motives to use ecstasy to reduce negative affect.

Note: Numbers in bold typeface are estimates for the indirect effect when negative affect is included in the model, numbers in normal typeface are direct effects when negative affect is not included in the model.

**p<.001, *p<.05
**Group Analysis: Differences between light, heavy and non-users**

*Poly-drug use in the sample*

A summary of drug history for those who have never used ecstasy, light and heavy users was produced (see Table 8). Previous studies have employed cut off scores of 20-50 to determine what is considered ‘light’ and ‘heavy’ ecstasy use (e.g.: Butler, & Montgomery, 2004; Parrott, Sisk, & Turner, 2000). The current data revealed a median use of 30 tablets in lifetime; therefore, given the close correspondence with past research the median (30 or more ecstasy tablets consumed in lifetime) was used as the cut off for heavy use.
Table 8

Poly-drug use for non ecstasy user controls (N=109), light (N=55) and heavy (N=56) ecstasy users.

<table>
<thead>
<tr>
<th></th>
<th>Non-user controls</th>
<th>Light ecstasy users</th>
<th>Heavy ecstasy users</th>
<th>$\chi^2$ (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>$M= 23.37$</td>
<td>$M=23.52$</td>
<td>$M= 23.86$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$SD=5.56$</td>
<td>$SD=5.11$</td>
<td>$SD= 4.78$</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Male- 38</td>
<td>Female- 71</td>
<td>Male-21</td>
<td>Female- 33</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Male- 28</td>
<td>Female- 28</td>
</tr>
<tr>
<td><strong>Ecstasy use</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average lifetime use</td>
<td>-</td>
<td>$M=8.63$</td>
<td>$M=104.5$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$SD=6.23$</td>
<td>$SD= 99.94$</td>
<td></td>
</tr>
<tr>
<td>Usual tablets taken in a typical night</td>
<td>-</td>
<td>$M=1.13$</td>
<td>$M= 2.01$</td>
<td>$SD= 1.15$</td>
</tr>
<tr>
<td><strong>Other drugs (% users)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tobacco</td>
<td>73.4%</td>
<td>94.4%</td>
<td>91.1%</td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td>86.2%</td>
<td>98.1%</td>
<td>92.9%</td>
<td></td>
</tr>
<tr>
<td>Cannabis</td>
<td>54.1%</td>
<td>90.7%</td>
<td>89.3%</td>
<td></td>
</tr>
<tr>
<td>Amphetamine</td>
<td>6.4%</td>
<td>66.7%</td>
<td>94.6%</td>
<td></td>
</tr>
<tr>
<td>Cocaine</td>
<td>2.8%</td>
<td>42.6%</td>
<td>75.0%</td>
<td></td>
</tr>
<tr>
<td>GBH</td>
<td>-</td>
<td>5.6%</td>
<td>8.9%</td>
<td></td>
</tr>
<tr>
<td>LSD</td>
<td>1.8%</td>
<td>27.8%</td>
<td>32.1%</td>
<td></td>
</tr>
<tr>
<td>Magic Mushrooms</td>
<td>2.8%</td>
<td>25.9%</td>
<td>35.7%</td>
<td></td>
</tr>
</tbody>
</table>

*p<.05, **p<.01, ***p<.001.
Within the sample, light ecstasy users were more likely to have smoked tobacco, alcohol, and cannabis than heavy ecstasy users and non-user controls. Furthermore, heavy ecstasy users were more likely to have taken amphetamines, cocaine, GBH, LSD, and Magic Mushrooms. All group differences were significant.

**Personality differences between light, heavy, and non-users.**

To establish whether rash impulsivity, reward sensitivity, sensitivity to punishment, and positive and negative affect differed between light, heavy and non ecstasy users a Between groups One-way MANOVA was conducted. Preceding testing, the assumptions for MANOVA analysis were assessed and found to be met. Observations were thought to be measured independently, the dependent variables were found to be normally distributed (excluding negative and positive affect; see preliminary data screening for discussion), and had equal variances and covariance across groups. Correlations and scatterplots demonstrated moderate, linear relationships between the dependent variables.

Results from the MANOVA indicated a significant multivariate effect of personality and affect on ecstasy taking behaviour, Wilk’s Lambda= .83, \( F(10,5)=3.80 \), \( p<.001 \), \( \eta^2=.09 \). Univariate tests showed significant differences across groups for rash impulsivity, \( F(2,202)= 5.06, p<.05 \); reward sensitivity, \( F(2,202)=8.38, p<.001 \); sensitivity to punishment, \( F(2,202)=5.19, p<.05 \); and positive affect, \( F(2,202)=8.09, p<.001 \); but not for negative affect \( (p=.82) \). Table 9 presents the means, standard deviations, probabilities, and group differences for personality and affect variables.
Table 9

Means, standard deviations, probabilities, and Post Hoc comparisons associated with the MANOVA for rash impulsivity, reward sensitivity, sensitivity to punishment, negative and positive affect for controls (N=103), light (N=49) and heavy ecstasy users (N=53).

<table>
<thead>
<tr>
<th></th>
<th>Non-user controls (N)</th>
<th>Light ecstasy user (L)</th>
<th>Heavy ecstasy user (H)</th>
<th>ANOVA group effect</th>
<th>Tukey paired comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Rash impulsivity</td>
<td>6.35</td>
<td>4.06</td>
<td>8.39</td>
<td>4.29</td>
<td>8.08</td>
</tr>
<tr>
<td>Reward sensitivity</td>
<td>10.15</td>
<td>4.23</td>
<td>12.25</td>
<td>4.01</td>
<td>12.87</td>
</tr>
<tr>
<td>Sensitivity to</td>
<td>11.36</td>
<td>5.12</td>
<td>9.72</td>
<td>5.15</td>
<td>8.74</td>
</tr>
<tr>
<td>punishment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive affect</td>
<td>32.08</td>
<td>8.21</td>
<td>34.63</td>
<td>6.23</td>
<td>36.89</td>
</tr>
<tr>
<td>Negative affect</td>
<td>18.89</td>
<td>6.94</td>
<td>18.20</td>
<td>6.83</td>
<td>18.45</td>
</tr>
</tbody>
</table>

*Note. N= 205 (see preliminary data analysis)*
As Table 9 demonstrates, light ecstasy users are significantly higher in rash impulsivity than non-user controls. Although heavy ecstasy users tended to be higher in rash impulsivity than non-users, this difference was not significant. Furthermore, there was no significant difference between light and heavy users. With regard to reward sensitivity, both light and heavy ecstasy users were significantly higher in reward sensitivity than non-user controls. Although heavy users were slightly higher in reward sensitivity than light users, this difference was not significant. For sensitivity to punishment, non-user controls were significantly higher than heavy users, and there was no significant difference between light and heavy users. Significant group differences were found for positive affect, as heavy users were higher in positive affect than non-users. There was no difference between non-users and light ecstasy users in positive affect. Finally, there were no significant differences between non-user controls, light and heavy ecstasy users in negative affect.

Mediation hypothesis: Rash impulsivity, negative affect, and motivation to use to reduce negative affect for heavy users.

As rash impulsivity was not significantly higher in heavy users when compared with non-users, it was thought important to assure the aforementioned mediation hypothesis was still valid in the heavy user group. That is, to determine if negative affect mediated the relationship between rash impulsivity and the motivation to use to reduce negative affect for the heavy user group. In order to do so, multiple regression analysis was conducted using only those in the heavy ecstasy use group. Prior to testing, the assumptions were tested and found to be met. All observations were considered to be independent of one another, the assumptions of normality, linearity, and homoscedacity.
were met. Tolerance values indicated none of the variables were redundant in the
analysis, and examination of correlations between the variables determined there was no
multicolinearity between the variables.

The first regression indicated that rash impulsivity was significantly related to
negative affect, $F(1, 51)=8.22, \beta=.37, p<.05$, accounting for 13.9% of the variance in
negative affect. The second regression demonstrated a significant main effect, that is a
significant relationship between rash impulsivity and the motives to use ecstasy to reduce
negative affect, $F(1, 51)=8.75, \beta=.38, p<.05$. Results indicated that rash impulsivity
accounted for 14.6% of the variance in motives to use to reduce negative affect. These
relationships ensured that the first two criteria were met for mediation analysis,
confirming further analysis was appropriate. In the final regression, with negative affect
entered into the equation with rash impulsivity, the relationship between rash impulsivity
and the motive to use ecstasy to reduce negative affect was reduced albeit still significant,$F(2, 50)=5.77, \beta=.30, p<.05$. This indicates that for heavy users, negative affect partially
mediates the relationship between impulsivity and the motive to use ecstasy to reduce
negative affect.
Discussion

Aims and findings

The current thesis explored the relationship between impulsivity, motives to use ecstasy and ecstasy use. Specifically, the role of rash impulsivity and reward sensitivity in understanding ecstasy use was investigated utilising Dawe and Loxton’s (2004) two facet model of impulsivity. In addition, the present study aimed to explore the role of Gray’s (1987) sensitivity to punishment in inhibiting ecstasy use. The intention of present research was to establish a more integrated model of why people undertake ecstasy use by investigating the relationships between these two conceptualisations of impulsivity, sensitivity to punishment, affect, and motives for use.

As hypothesised, ecstasy users were higher than non-users in rash impulsivity and reward sensitivity and lower in sensitivity to punishment. Sensitivity to reward was not associated with positive affect as expected, rather results suggest reward sensitivity has a more direct relationship with motives to use ecstasy. Those who were sensitive to rewarding stimuli tended to use ecstasy to develop and maintain social cohesion with peers. Results supported the hypothesis that rash impulsivity was positively associated with negative affect, and the motivation to use ecstasy to reduce negative affect; furthermore, negative affect mediated the relationship between rash impulsivity and the motive to use ecstasy to reduce negative affect.

Exploratory analysis found more definitive results when the sample was statistically separated into three groups, including a group of ecstasy non-user controls, light, and heavier ecstasy users. Results showed that light users displayed elevated rash impulsivity when compared with non-users, although there was no difference in rash impulsiveness.
between light and heavy or heavy and non-user groups. Results also demonstrated that reward sensitivity was higher in the light and heavy ecstasy user groups when compared to non-users. Despite slightly higher reward sensitivity in heavy users than light ecstasy users there was no significant difference between these two groups. With regard to sensitivity to punishment non-users were significantly higher than heavy ecstasy users.

Sample and poly-drug use

Sample characteristics indicated that typically ecstasy users are in their early twenties, have taken ecstasy on average around nine tablets for light users or 105 tablets for heavy users, and tend to take one to two ecstasy tablets in a typical night out. Poly-drug use was common in ecstasy users. Light users were typically more likely to have ever smoked tobacco and cannabis, and consumed alcohol than the typical heavy ecstasy user. Alternatively, heavy users are more likely to have ever taken amphetamines, cocaine, GBH, LSD, and Magic mushrooms than light ecstasy users. Consistent with previous literature, results seem to support suggestions that light ecstasy users consume substances such as tobacco, alcohol and cannabis to cope with the residual effects of ecstasy use, whereas heavy users are more likely to experience tolerance therefore consume simulative (e.g., amphetamines) and psychotropic substances (e.g., cocaine, LSD) to enhance the effects of ecstasy (Topp et al., 1999). Results are also consistent with laboratory research that showed fewer heavy ecstasy users tested for marijuana than infrequent users, whereas heavier ecstasy users were more likely to have cocaine in urine samples (Moeller et al., 2000). Not surprisingly, those who refrain from taking ecstasy were less likely to consume any substances than ecstasy users, however use of tobacco, alcohol and cannabis was relatively high in this sample.
Rash impulsivity

As expected, and consistent with previous literature (e.g. Bobes et al., 2002; Butler & Montgomery, 2004; Dughiero et al., 2001; Moeller et al., 2002; Morgan, 1998b; Parrot et al., 2000; Tuchtenhagen et al., 2000), ecstasy users reported higher rash impulsivity than the non ecstasy using control group. Findings offer support for the contention that ecstasy users are likely to display behavioural disinhibition, act spontaneously, hastily and act without consideration for possible consequences (Bobes et al., 2002; Butler & Montgomery, 2004; Dughiero et al., 2001; Moeller et al., 2002; Morgan, 1998b; Parrot et al., 2000; Tuchtenhagen et al., 2000). As discussed, it is reported that after a brief period of elation on ecstasy, residual effects produce negative sequelae such as flashbacks, auditory hallucinations, energy loss, depression, hindered sleep, teeth problems and anxiety (Topp et al., 1999). Research has shown that ecstasy users are aware of the potential for harm associated with ecstasy use, yet approach this behaviour nonetheless (Allott & Redman, in press). This tendency to act without forethought may offer some explanation as to why some individuals take ecstasy in light of apparent negative sequelae.

Moreover, this finding demonstrates that Australian ecstasy users are similar to those studied internationally. Only one study previously had measured rash impulsivity in an Australian sample (Travers & Lyvers, 2005), although this study of Brisbane rave attendees found no differences in impulsivity between ecstasy users and non-users. However, it was thought that this finding was likely due to methodological concerns and limited sampling. The present study did not investigate a population from a subgroup such as rave attendees (Fendrich, Wislar, Johnson, & Hubbell, 2003) due to research that
has indicated the widespread and more mainstream use of the drug in Australia (Hansen, Maycock, & Lower, 2001).

Interestingly, the present study found a difference in rash impulsivity between light users and those who had never taken ecstasy. The majority of studies which have segregated their sample into three groups have demonstrated elevated rash impulsivity in heavy users when compared with non-using controls (see for example Moeller et al., 2002; Parrott et al., 2000), with the exception of Butler and Montgomery (2004) who found elevated novelty seeking in light users when compared with non-users. Interestingly, the difference in rash impulsivity found in the present research suggests that even those who have consumed ecstasy once tended to be more impulsive, spontaneous and think less about consequences than those who have never taken ecstasy (e.g. Butler & Montgomery, 2004).

Another interesting finding was that light users in this sample did not differ in rash impulsivity from heavy users. Contrary to previous findings (Butler & Montgomery, 2004; Parrott et al., 2000) heavy ecstasy users were not significantly higher in rash impulsivity than non-users. Therefore, a lack of consideration for consequences and behavioural disinhibition is likely to effect approach behaviour toward ecstasy in those who take it infrequently. However, it is possible that rash impulsivity plateaued in the heavier users and therefore did not distinguish between infrequent and frequent ecstasy users. This result suggest that rash impulsivity may not be the only personality characteristic important in understanding more frequent use. It seems that as use becomes heavier, appetitive behaviour becomes less motivated my rash impulsiveness, and more
goal directed. It is possible that a heightened sensitivity to the rewarding aspects of taking the drug is motivating use in heavier users.

*Reward sensitivity and sensitivity to punishment*

Analogous with rash impulsivity, Gray’s (1987) impulsivity construct reward sensitivity was elevated in ecstasy users. Although past literature found reward sensitivity to be associated with other substances and impulsive behaviours (e.g. Colder & O’Conner, 2002; Jorm et al., 1999; Loxton & Dawe, 2001; Palfai & Ostafin, 2003) this was yet to be examined in ecstasy users. Results suggest that ecstasy users are characterised by a hypersensitivity to rewarding cues, tending to perceive stimuli including ecstasy, as more rewarding which in turn motivates appetitive behaviour (Pickering & Gray, 1999). Theoretically, it is proposed that this is due to the underlying neural pathway of the BAS which utilises the dopaminergic system, particularly the mesolimbic dopaminergic pathway, which is heavily involved in underlying positive reinforcing effects of natural drives such as food and sex (Dawe & Loxton, 2004). Interestingly, the immediate use of ecstasy also stimulates dopamine release (Gerra et al., 2002). This has an effect of the reinforcing value of ecstasy, as dopamine increases pleasurable feelings. This causes the mesolimbic dopaminergic system to be more sensitive resulting in an increase in salience for drug cues; furthermore, neural systems which underlie learning by association increases the pleasure associated with taking the drug (Dawe et al., 2004). Therefore, as ecstasy users are hypersensitive in the BAS they tend to find taking the drug highly rewarding, and associate consumption with pleasurable outcomes.
This study has measured the system which is thought to underlie impulsivity (Pickering & Gray, 1999), whereas others have focused on purely measuring impulsive like behaviours (Bobes et al., 2002; Butler & Montgomery, 2004; McCann et al., 2000; Moeller, 2002; Morgan, 1998b; Parrot et al., 2000; Tuchtenhagen et al., 2000). Results were consistent with Dawe and Loxton’s (2004) two factor model of impulsivity which suggests that both of these conceptualisations of impulsivity are important for understanding why individuals initially approach and then maintain addictive behaviours. However, results are incongruent with their suggestion that rash impulsivity may be a maintaining factor in chronic drug use due to neurological adaptations in the frontal cortex (Dawe et al., 2004). If rash impulsivity was maintaining drug use in heavy ecstasy users we would expect elevated rash impulsivity in heavy users, which was not the case in the present sample.

Based on the current results it is proposed that rash impulsivity leads to initial consumption of the drug, as individuals approach this risky behaviour without forethought regarding negative consequences. This is further supported by elevated rash impulsivity in light users when compared with non-users yet no difference between heavy ecstasy users and controls. It seems likely that reward sensitivity may also attract those who are highly sensitive to rewarding stimuli to initiating ecstasy use. Moreover, results suggest that reward sensitivity may also maintain approach behaviour, as associations between drug use and pleasurable outcomes increase in salience over use (Dawe et al., 2004). This proposal of the role of reward sensitivity in initiation and maintenance of use was supported by elevated reward sensitivity in both light and heavy users when compared with non-user controls. This may suggest that for reward sensitive individuals,
ecstasy is perceived to be highly pleasurable and drug cues are highly salient which collectively motivate appetitive behaviour.

The other psychobiological system thought to be important in understanding addictive behaviour is Gray’s (1987) concept of the BIS, which is thought to inhibit behaviour in light of punishing outcomes. Ecstasy users were found to be less sensitive to punishment than those who have never consumed ecstasy. This follows Gray’s (1987) proposal, as ecstasy users were characterised by a reduced sensitivity to punishment which may explain their propensity to engage in ecstasy use, a behaviour associated with negative outcomes (Schifano, 2000; Topp et al., 1999). Moreover, findings may offer some explanation as to why individuals refrain from use. Non-users were more sensitive to punishment than ecstasy users, suggesting that expectations for taking the drug may provoke more anxiety in a non-user than someone less sensitive to punishing stimuli (Pickering & Gray, 1999). For those who have never taken the drug, results suggest that punishing cues may be more salient as they are more sensitive to punishing stimuli, inhibiting this behaviour. Alternatively, for those who undertake illicit drug use the rewarding effects may outweigh the possible punishments, therefore approach behaviour is maintained (Pickering & Gray, 1999).

Results offer some explanation as to why some individuals recreationally take ecstasy when similar individuals matched in age, sex and demographics do not. Thus the typical recreational ecstasy user appears to be highly rash impulsive and sensitive to rewarding stimuli, and is characterised by reduced sensitivity to punishment. Specifically, it seems ecstasy users are typically more sensitive to rewarding stimuli and are therefore highly driven to seek out activities that are fun and rewarding. They tend to
be less sensitive to potential punishments than non-users, who tend to view the drug as threatening which leads to defensive withdrawal (Pickering & Gray, 1999). Additionally, ecstasy users are unlikely to pause and reflect on potential outcomes, tending to act spontaneously. It seems that rash impulsivity is an important motivator in those who have taken the drug infrequently, whereas reward sensitivity is an important motivator for both infrequent and heavier users. Specifically, it seems heightened sensitivity to reward is more influential in motivating behaviour to use ecstasy in heavier users than rash impulsivity.

Motivations to use ecstasy

Another factor that contributed to the relationships between rash impulsivity, reward sensitivity and ecstasy use are motivations upheld by users. It was predicted that reward sensitivity would be associated with positive affect, and consequently with the motive to use ecstasy to increase positive affect. Results, however, were inconsistent with previous literature which indicated these associations (Carver & White, 1994; Gomez & Gomez, 2002; Katz, 2001; Zelenski & Larsen, 1999), as neither of these relationships was found in the present sample. Reward sensitivity has traditionally been associated with a positive bias in information possessing, and therefore positive affect (Gomez & Gomez, 2002). Overall in the sample of ecstasy users and non-users there was a relationship between sensitivity to reward and positive affect, however this was not evident in the ecstasy users exclusively. Results suggest that there is something unique to ecstasy users which may have an effect on the relationship between reward sensitivity and positive affect. This is particularly evident when observing positive affect in the ecstasy users overall, including those who were not reward sensitive, as they tended to
show higher levels of positive affect than non-users. Results suggest that those who do not take the drug theoretically function as past literature would suggest, as reward sensitivity was associated with positive affect in this group; yet this was not apparent in reward sensitive ecstasy users (Carver & White, 1994; Gomez & Gomez, 2002; Katz, 2001; Zelenski & Larsen, 1999).

This may be explained by the euphoric nature of ecstasy use. As ecstasy induces such an acute state of positive affect (Verheyden, Henry, & Curran, 2003), it is possible that general experiences throughout the everyday lives of reward sensitive individuals are not perceived as pleasurable in comparison. Generally throughout the course of the day, reward sensitive ecstasy users may actually perceive normally rewarding stimuli and situations as more mundane in comparison with the extreme elation and escalation of pleasurable emotions experienced whilst on the drug (Parrot, 2000; Verheyden et al., 2003). Moreover, it has been reported that ecstasy users experience subacute effects such as boredom, sadness, and unhappiness throughout the proceeding four days after self administration of the drug, which may have an effect on the general mood states of reward sensitive individuals (Curran & Travill, 1997). Therefore, ecstasy users are generally high BAS individuals, however these reward sensitive individuals are not generally experiencing high levels of positive affect as one would theoretically expect. This is of theoretical interest and future research addressing the relationship between BAS and affect in ecstasy users may explore this further. Specifically, future research may focus on to gain a better understanding about the interaction between personality and affect in those who use ecstasy recreationally.
Nonetheless, it was suggested that reward sensitive individuals may use ecstasy for hedonistic reasons as they are more sensitive to the positive components of taking the drug. This theory seems to still hold true as reward sensitive individuals tended to use ecstasy to maintain social cohesion. Therefore it seems that ecstasy users are sensitive to the rewards associated with having a strong social network, such as feeling positive around people and getting along well with friends (Newcomb et al., 1988). It appears ecstasy users expect that the drug will enhance these feelings of cohesion with peers which has a motivating effect on reward sensitive individuals to use ecstasy.

An alternate model was found for highly rash impulsive individuals. Drawing on two separate lines of research (Engels & ter Bogt, 2004; Fromme et al., 1997; Katz et al., 2000; Whiteside & Lynam, 2001), the present study found a positive relationship between rash impulsivity, negative affect, and the motivation to consume ecstasy in an attempt to reduce negative affect. Previously Katz and colleagues (2000) had found an impulsive like trait, sensation seeking, to be associated with positive expectations of outcomes for taking illicit substances. The present study looked at this relationship more specifically, and found that for ecstasy users rash impulsivity was positively associated with the motivation to use the drug to reduce negative affect.

Results also supported findings of research that suggests rash impulsivity is associated with negative affect (Whiteside & Lynam, 2001). It is known that impulsive individuals may approach risky situations (for example drug use, binge eating, risky sexual behaviour) without consideration for consequences (Katz et al., 2000). Such behaviours often have negative outcomes which culminate into negative feelings and emotions. In a unique finding, the present study showed this pattern of behaviour to be a
motivating factor for ecstasy use as elevated rash impulsivity predicted negative affect. Negative affect further motivated ecstasy use in an attempt to reduce negative emotions such as anxiety, boredom, sadness or feeling depressed (Newcomb et al., 1988). This suggests that rash impulsive ecstasy users may hold the expectation that ecstasy will provide them with some relief from negative emotions.

It is alarming to consider the implications for the cyclic nature of this model. It is proposed that rash impulsivity maintains and serves to promote the initial approach and development of use in some people. Rash impulsive individuals are likely to undertake an array of risky behaviours that produce negative outcomes (Katz et al., 2000). As reduction of negative affect is one reason some rash impulsive individuals take ecstasy, it can be seen how this trait may promote appetitive behaviour to the drug. Furthermore, in line with suggestions from other researchers (Bobes et al., 2002) this model may offer some explanation as to why individuals tend to continue approach behaviour once they have taken the drug once. As aforementioned, ecstasy produces negative sequelae which generally results in negative emotions. Results suggest that these feelings then motivate use in an attempt to diminish negative affect. However, as discussed, the aftereffects of ecstasy use then often result in negative emotions. This, according to the preceding model, further perpetuates the motivation to use the drug again (Parrott, 2000).

**Summary**

The current investigation identified two distinct models of motivation. It seems that those who are more reward sensitive are likely to be enticed by positive social aspects associated with use. On the other hand, rash impulsive individuals are motivated by the expectation that the drug will assist them in relief from negative emotions, which
may be apparent due to a tendency to be rash impulsive. Results suggested that some ecstasy users expect that ecstasy consumption will reduce negative feelings, and enhance social cohesiveness with peers. These findings offer some understanding as to why some individuals approach and maintain ecstasy use, and may have important implications for treatment. Particularly, as cognitions are thought to be more malleable and receptive to change than personality traits (Spinath, Spinath, Riemann, & Anglietner, 2003). The current research has offered preliminary empirical support for these theoretical models.

Issue of Causality

Although it is likely that pre-existing impulsive personality traits contribute to the initial use of ecstasy (Lyvers & Hasking, 2004), an increasing body of evidence suggests that the drug may also have neurotoxic effects on serotonin receptors which ultimately increases levels of impulsivity (e.g. Gerra et al., 2000; McCann et al., 2000; Parrot, 2000; Tuchtenhagen et al., 2000). MDMA, the psychoactive compound usually contained in ecstasy, indirectly causes serotonin release (Gerra et al., 2002; Green et al., 2003). An acute dose of MDMA is enough to release 80% of central serotonin stores (Green et al., 2003). As well as being involved in serotonin release, MDMA directly blocks serotonin reuptake inhibitors which can leave the neuron depleted in cases of repeated MDMA use or with an intense dosage (Ricaurte, Yuan, & McCann, 2000). This depletion results in lower levels of serotonin in the frontal cortex, which has been associated with behavioural inhibition and impulsive control (Gerra et al., 2000; Gerra et al., 2002; Ricaurte et al., 2000; Tuchtenhagen et al., 2000). Most studies acknowledge that causality is likely twofold (see for example Bobes et al., 2002; Gerra et al., 2000, 2002; Moeller et al., 2002; Morgan, 1998). It is thought that impulsive individuals are likely to undertake
risky behaviours initially due to a lack of concern for consequences and an impulsive temperament. Additionally, research suggests impulsivity is further exacerbated by the partially irreversible neurological alterations caused by the depletion of serotonin levels (Bobes et al., 2002; Gerra et al., 2000; Gerra et al., 2002; Morgan, 1998; Moeller et al., 2002; Tuchtenhagen et al., 2000). Therefore, although impulsivity was found to be associated with ecstasy use, without longitudinal replication we cannot determine to what extent impulsivity was a pre-existing trait or an effect caused by neurotoxic damage from drug use.

Limitations of the present study and recommendations for future research

There are constraints which limit the extrapolation of findings from the present study. A number of these limitations are characteristic of most research in this area. For example, drug histories were obtained retrospectively thus estimates of prior drug use may be inaccurate. A limitation often mentioned in self-report ecstasy literature is the possibility that ecstasy tablets contained substances other than MDMA. Despite this, studies have demonstrated that most ecstasy tablets do contain MDMA rather than other substances (Camilleri, & Caldicott, 2005; Schifano et al., 1998). With a large proportion of those which do not contain MDMA actually comprising MDA and MDE, both of which are neurochemically similar to MDMA producing similar physiological effects (Hegadoren, Baker, & Bourin, 1999). Furthermore, it has been shown that in self-reported ecstasy users, traces of MDMA were found in hair and urine samples (Thomasius et al., 2003). Nonetheless, the present study did not undertake biological analysis of drug use in participants therefore it is possible that there was an
overestimation of ecstasy use, due to the consumption of tablets that were thought to be MDMA but actually contained other substances.

Similarly, there was a high rate of poly-drug use in the sample, creating uncertainty of the influence of these substances on the variables. To investigate this, participants were statistically selected if they had consumed three or more substances other than ecstasy. Results found that this sample demonstrated identical group differences as previously discussed, suggesting there was unique characteristics to those who take ecstasy regardless of poly-drug use. The present study was limited due to a lack of scales validated for measuring constructs in ecstasy literature. The measure of motivations had to be developed from a scale which was not specifically designed for ecstasy users, due to lack of a more appropriate measure. Moreover, the present study was restricted to creating a measure of drug history based on methodology that others had undertaken, making replication difficult.

Future research may address such limitations by developing a reliable and valid drug history questionnaire that is specifically aimed at ecstasy users. This may aid in the replication of results and eliminate some of the effect of estimation of prior drug use. Furthermore, the development of an appropriate motivation measure may possibly further aid the understanding of cognitive reasons people undertake this risky behaviour. It is recommended that future research use poly-drug, and non-user control groups in ecstasy research as this technique offers two contrast groups, beneficial in determining the unique effect of ecstasy use. Behavioural studies further investigating findings from the present study may offer replication and further analysis that was outside the scope of present
research. Furthermore, studies in a clinical population may be beneficial to investigate these models in those who require treatment.

Theoretical and treatment implications

A theoretical implication arising from the present findings regards the relationship between rash impulsivity and ecstasy use. Consistent with previous literature, the present study demonstrated that elevated rash impulsivity was indicative of those who consume ecstasy (Bobes et al., 2002; Butler & Montgomery, 2004; Dughiero et al., 2001; Gerra et al., 2000; Moeller et al., 2002; Morgan, 1998b; Parrot et al., 2000; Tuchtenhagen et al., 2000). Extending on previous findings, the present study offers a model which integrated personality, affect and cognitions; whereby elevated rash impulsivity is associated with higher levels of negative emotions which in turn may lead to the motivation to undertake this risky behaviour in an attempt to minimise these negative feelings.

The second theoretical implication concerns reward sensitivity, considered another complimentary facet of impulsivity (Dawe & Loxton, 2004). Reward sensitivity was elevated in ecstasy users, and indicative of the motivation to use ecstasy to promote and enhance social cohesion within peer networks. Elevated reward sensitivity, combined with lower levels of sensitivity to punishment suggest ecstasy users possess a bias toward undertaking rewarding behaviours and a restricted ability to inhibit behaviour in light of negative consequences.

In addition to theoretical implications, the present study may offer some basis for therapeutic techniques targeted at reward sensitive and rash impulsive individuals. Given ecstasy users were found to have a heightened sensitivity to rewarding cues in conjunction with an increased tendency to be uninhibited, it is unlikely that prevention
efforts aimed at informing these individuals of the potential for harm associated with use will hinder approach behaviour (Dawe et al., in press). Particularly in light of recent evidence that suggests ecstasy users are well aware of harmful sequelae, yet continue to use the drug nonetheless (Allott & Redman, in press). Therefore, it is reasonable to propose that temperamental characteristics need to be considered when developing programs to aid those susceptible to taking this dangerous drug (Dawe et al., in press).

It has been suggested that individuals who show a lack of behavioural inhibition may be ideal targets for prevention given the implementation of training programs (Newcomb & Earleywine, 1996). Although impulsive personality traits are impervious to change (Spinath et al., 2003), the actions that follow impulses may be amended with increased self awareness. Furthermore, introspective insight and reflection may encourage alternate expectations regarding outcomes for taking the drug, discouraging the motivations for use (Newcomb & Earleywine, 1996).

Training programs designed to delay or reduce impulsive behaviour by encouraging the generation of several options before acting, may decrease problems associated with drug use (Newcomb & Earlywine, 1996). Such programs encourage the individual to formulate options for action as well as envisaging outcomes associated with each of these. For example, the individual may opt to ponder for 30 minutes before acting on an impulse to undertake a behaviour (including ecstasy use), which then may discourage the urge to act without forethought (Newcomb & Earlywine, 1996). However, this therapy alone may not offer enough positive reward to entice the reward sensitive individual to maintain such a technique.
Another therapeutic approach that may offer a solution to this problem by offering some pleasurable reward is a relatively new technique labelled ‘mindfulness cognitive therapy’ (Dawe et al., in press). Derived from Dialectical Behaviour therapy, this technique explicitly addresses impulsive personality traits in order to treat substance abuse disorders (Linehan et al., 1999). By training the individual to become aware of negative thoughts and recognise that they are in the mind, rather than given occurrences, the impulsive individual may learn to recognise the drive that is evident preceding drug use, thereby encouraging thoughtful awareness of the impulse without necessarily acting on it immediately. In doing this, the individual may become aware of cues that trigger them to desire the drug and employ options that inhibit approach behaviour. The focus of attention shifts away from cravings that often motivate impulsive actions to the individual’s immediate feeling state. It is evident such a technique may benefit those who take ecstasy due to a tendency to act hastily and without forethought by slowing down the process from the initial impulse to the actual behaviour. It has been suggested that such a meditative technique may also maintain reward sensitive individuals to this therapy, as mediation is known to produce positive emotions, and reward sensitive individuals are highly sensitive to pleasurable affect (Dawe et al., in press). The additional boost in positive affect that this therapy may provide could be beneficial in reward sensitive ecstasy users, who appear to be unlikely to experience positive affect in everyday life.

Conclusion

Results were congruent with Dawe and Loxton’s (2004) theory which highlighted the importance of considering both reward sensitivity and rash impulsivity in
understanding impulsive behaviours. Both rash impulsivity and reward sensitivity were elevated in ecstasy users. Moreover, Gray’s (1987) sensitivity to punishment was elevated in non-users when compared with those who had ever taken the drug. It seems that ecstasy users are typified by an increased sensitivity to the rewarding aspects associated with the drug, in conjunction with a lack of sensitivity to potential punishing sequelae and the tendency for to undertake behaviour that is rash and unconsidered.

This is the first study to investigate Gray’s (1987) neurobiological systems and the effects of these on ecstasy use, and the first to establish a relationship between rash impulsivity and ecstasy use in an Australian sample. The preceding review theoretically proposed negative affect to be the mechanism through which elevated rash impulsivity is associated with the motive to take the drug to reduce negative feelings and emotions; this study has provided preliminary empirical support for this contention. In contrast, reward sensitive individuals were likely to take the drug to enhance and maintain social cohesion with peers. It was proposed that this was due to a hyperactive BAS which increased sensitivity to the reinforcing value of the positive aspects of maintaining close relations with their social networks. The current study is unique in that it has integrated personality theory (impulsivity, BAS, BIS), affect, and cognitions (motivations) in understanding why some individuals approach this illicit behaviour that is known to produce both extreme euphoria but inevitably depressive symptomology and negative outcomes (Davidson & Parrot, 1997; Topp et al., 1999; Verheyden et al., 2003). Importantly, current results support the emerging assertion that impulsivity needs to be viewed as a multidimensional construct as it is likely that at least two facets (rash
impulsivity and reward sensitivity) are responsible in part for the initiation and maintenance of ecstasy use in Australian society.
References


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dioxymethamphetamine (ecstasy) on dopamine system function in humans.

*Behavioural Brain Research, 134, 403-410.*


Appendix A:

Project Title
Impulsivity and outcome expectancies as predictors of ecstasy use

Principal Investigators:

<table>
<thead>
<tr>
<th>Dr Nicolas Kambourooulos</th>
<th>Sarah Egan</th>
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<tbody>
<tr>
<td>Lecturer, Faculty of Life and Social Sciences, Swinburne UT Ph: 9214 5447</td>
<td>4th year Psychology honours student, Faculty of Life and Social Sciences, Swinburne UT</td>
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</tbody>
</table>

As a fourth year Psychology student, I am conducting an investigation to examine the links between certain personality characteristics, namely impulsivity, individual expectancies of the effects of ecstasy, and ecstasy use. It is anticipated that the results of this research will be beneficial in improving the understanding of how certain personality variables predict ecstasy use. If you agree to participate in the present study, you will be asked to fill in a questionnaire which will take approximately half an hour to complete. The questionnaire includes:

1) A set of questions measuring impulsivity.
2) A set of questions measuring an individual’s sensitivity to reward and punishment.
3) A set of questions measuring motivations for drug use or non use.
4) A set of questions measuring positive and negative emotions.

The completion of this questionnaire should involve little stress or risk to the individual. However, if at any stage during or after its completion, you feel any sort of distress, counseling services are available to you:

**Swinburne Psychological Services**

26 Wakefield Street
Hawthorn 3122 Ph: (03) 9214 8653

**Swinburne Student Counselling Service**

Hawthorn Campus:
Room 36W, 36 Wakefield Street Ph: (03) 9214 8025

Your participation in this study is completely voluntary. If you choose to withdraw your participation, any information collected from you will not be used. **Individual consent in this study is implied through return of the questionnaire.**

This research is conducted in accordance with the Swinburne University of Technology Policy on Research Ethics and the NHMRC guidelines as set out in the National Statement on Ethical Conduct on Research Involving Humans.
We do not require any identifying information for this project. Information relevant to this research project will be stored securely, and only available to the researchers. The findings from this study may be presented at conferences or published in scientific journals, however only group data will be presented, individual data will not be used. The anonymous questionnaire data will be stored for a minimum of five years and then destroyed. Should you want to obtain a copy of the main research findings, or have any questions regarding the project entitled “Impulsivity, Reward Sensitivity and motivations to use ecstasy; an integrative study.” please contact the Senior Investigator Nicolas Kambouropoulos of the School of Social and Behavioural Sciences on (03) 9214 5447.

**Complaint Procedure:**
If you have a concern or query that could not be satisfied by Nicolas Kambouropoulos please direct formal complaints to:
The Chair, SBS Research Ethics Committee
School of Social and Behavioural Sciences, Mail H24
Swinburne University of Technology
If you have a complaint about the way that you were treated during the study, please write to:
The Chair, Human Research Ethics Committee
Swinburne University of Technology, PO Box 218, Hawthorn, Victoria 3122

*Thank-you for participating and assisting with this research*

**Signed**

Nicolas Kambouropoulos          Sarah Egan
Demographics

1. **What is your gender?** (please tick)
   - [ ] Female
   - [ ] Male

2. **What is your age?** _____ years

3. **What is the highest educational level you have achieved or finished so far?**
   - [ ] Some secondary
   - [ ] Completed Secondary
   - [ ] Trade qualifications
   - [ ] TAFE or Diploma level
   - [ ] Incomplete tertiary (university)
   - [ ] Complete tertiary (university)
   - [ ] Postgraduate

4. **When was the last time you took ecstasy?**
   - [ ] never
   - [ ] in the last 2 years
   - [ ] in the last year
   - [ ] in the last 6 months
   - [ ] in the last month
   - [ ] in the last 2 weeks

5. **If you have taken ecstasy, how many pills would you estimate that you have consumed over your lifetime?** _____

6. **If you have taken ecstasy, how many tablets on average would you take on a night out?** _____

7. **Have you ever taken/smoked any of the following:** (please tick as many as needed)
   - [ ] tobacco
   - [ ] alcohol
   - [ ] cannabis
   - [ ] methamphetamines (speed)
   - [ ] cocaine
   - [ ] GBH
   - [ ] LSD
   - [ ] magic mushrooms
   - [ ] **Other** (please specify):
Please answer each question by putting a circle around the ‘YES’ or the ‘NO’ following the questions. There are no right answers, and no trick questions. Work quickly and do not think too long about the exact meaning of the question.

PLEASE REMEMBER TO ANSWER EACH QUESTION

1) Do you often buy things on impulse? _______________________________ YES  NO
2) Do you generally do and say things without stopping to think? _______ YES  NO
3) Do you often get into a jam because you do things without thinking? _____YES  NO
4) Are you an impulsive person?___________________________________ YES  NO
5) Do you usually think carefully before doing anything?_______________ YES  NO
6) Do you often do things on the spur of the moment?__________________ YES  NO
7) Do you mostly speak before thinking things out?____________________ YES  NO
8) Do you often get involved in things you later wish you could get out of?_ YES  NO
9) Do you get so ‘carried away’ by new and exciting ideas, that you never think of possible snags?______________________________ YES  NO
10)Do you need to use a lot of self-control to keep out of trouble?________ YES  NO
11)Would you agree that almost everything enjoyable is illegal or immoral?_ YES  NO
12)Are you often surprised at people’s reactions to what you do or say?_____ YES  NO
13)Do you think an evening out is more successful if it is unplanned or arranged at the last moment?______________________________ YES  NO
14)Do you usually work quickly, without bothering to check?_____________ YES  NO
15)Do you often change your interests?______________________________ YES  NO
16)Before making up your mind, do you consider all the advantages and disadvantages?______________________________ YES  NO
17)Do you prefer to ‘sleep on it’ before making decisions?_______________ YES  NO
18)When people shout at you, do you shout back?_____________________ YES  NO
19)Do you usually make up your mind quickly?________________________ YES  NO
Answer each question by circling "YES" or "NO" after each one. There are no right or wrong answers, or trick questions. Work quickly and don't think too much about the exact meaning of the questions.

REMEMBER THAT YOU MUST ANSWER ALL THE QUESTIONS

1. Do you often refrain from doing something because you are afraid of it being illegal? YES NO
2. Does the good prospect of obtaining money motivate you strongly to do some things? YES NO
3. Do you prefer not to ask for something when you are not sure you will obtain it? YES NO
4. Are you frequently encouraged to act by the possibility of being valued in your work, in your studies, with your friends or with family? YES NO
5. Are you often afraid of new or unexpected situations? YES NO
6. Do you often meet people that you find physically attractive? YES NO
7. Is it difficult for you to telephone someone you do not know? YES NO
8. Do you like to take some drugs because of the pleasure you get from them? YES NO
9. Do you often renounce your rights when you know you can avoid a quarrel with a person or an organisation? YES NO
10. Do you often do things to be praised? YES NO
11. As a child, were you troubled by punishments at home or in school? YES NO
12. Do you like being the center of attention at a party or a social meeting? YES NO
13. In tasks that you are not prepared for, do you attach great importance to the possibility of failure? YES NO
14. Do you spend a lot of time on obtaining a good image? YES NO
15. Are you easily discouraged in difficult situations? YES NO
16. Do you need people to show their affection for you all the time? YES NO
17. Are you a shy person? YES NO
18. When you are in a group, do you try to make your opinions the most intelligent or funniest? YES NO
19. Whenever possible, do you avoid demonstrating your skills for fear of being embarrassed?  
YES  NO

20. Do you often take the opportunity to pick up people you find attractive?  
YES  NO

21. When you are with a group, do you have difficulties selecting a good topic to talk about?  
YES  NO

22. As a child, did you do a lot of things to get people's approval?  
YES  NO

23. Is it often difficult for you to fall asleep when you think about things you have done or must do?  
YES  NO

24. Does the possibility of social advancement move you to action, even if this involves not playing fair?  
YES  NO

25. Do you think a lot before complaining in a restaurant if your meal is not well prepared?  
YES  NO

26. Do you generally give preference to those activities that imply an immediate gain?  
YES  NO

27. Would you be bothered if you had to return to a store when you noticed you were given the wrong change?  
YES  NO

28. Do you often have trouble resisting the temptation of doing forbidden things?  
YES  NO

29. Whenever you can, do you avoid going to unknown places?  
YES  NO

30. Do you like to compete and do everything you can to win?  
YES  NO

31. Are you often worried by things that you said or did?  
YES  NO

32. Is it easy for you to associate tastes and smells to very pleasant events?  
YES  NO

33. Would it be difficult for you to ask your boss for a raise (salary increase)?  
YES  NO

34. Are there a large number of objects or sensations that remind you of pleasant events?  
YES  NO

35. Do you generally try to avoid speaking in public?  
YES  NO

36. When you start to play with a slot machine, is it often difficult for you to stop?  
YES  NO

37. Do you, on a regular basis, think that you could do more things if it was not for your insecurity or fear?  
YES  NO

38. Do you sometimes do things for quick gains?  
YES  NO
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<tr>
<td><strong>39.</strong> Comparing yourself to people you know, are you afraid of many things?</td>
<td>YES  NO</td>
</tr>
<tr>
<td><strong>40.</strong> Does your attention easily stray from your work in the presence of an attractive stranger?</td>
<td>YES  NO</td>
</tr>
<tr>
<td><strong>41.</strong> Do you often find yourself worrying about things to the extent that performance in intellectual abilities is impaired?</td>
<td>YES  NO</td>
</tr>
<tr>
<td><strong>42.</strong> Are you interested in money to the point of being able to do risky jobs?</td>
<td>YES  NO</td>
</tr>
<tr>
<td><strong>43.</strong> Do you often refrain from doing something you like in order not to be rejected or disapproved by others?</td>
<td>YES  NO</td>
</tr>
<tr>
<td><strong>44.</strong> Do you like to be competitive in all of your activities?</td>
<td>YES  NO</td>
</tr>
<tr>
<td><strong>45.</strong> Generally, do you pay more attention to threats than to pleasant events?</td>
<td>YES  NO</td>
</tr>
<tr>
<td><strong>46.</strong> Would you like to be a socially powerful person?</td>
<td>YES  NO</td>
</tr>
<tr>
<td><strong>47.</strong> Do you often refrain from doing something because of your fear of being embarrassed?</td>
<td>YES  NO</td>
</tr>
<tr>
<td><strong>48.</strong> Do you like displaying your physical abilities even though this may involve danger?</td>
<td>YES  NO</td>
</tr>
</tbody>
</table>
Below is a number of possible motivations for ecstasy use. For each motive, please circle 0 if you “have not or will not use ecstasy for this reason”, 1 if you are “not sure”, or 2 if you “have used or might used ecstasy for this reason”.

<table>
<thead>
<tr>
<th>Have not used ecstasy for this reason</th>
<th>Not sure</th>
<th>Have used or might use for this reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To stop boredom.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. To get rid of anxiety or tension.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Because I was feeling sad, down or depressed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. To know myself better.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. To be more creative and original.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. To enjoy what I’m doing more.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. To understand things differently.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. To feel better about myself.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. To feel good around people.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. I feel pressure from friends to take it.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Because everybody around me is taking it.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Taking it means I get along better with friends.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. It helps me get through the night.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. I feel bad when I don’t use it.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The PANAS
(Positive Affect Negative Affect Schedule)

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way in general. Use the following scale to record your answers.

1 2 3 4 5
very slightly a little moderately quite a bit extremely or not at all

_______ interested
_______ irritable

_______ distressed
_______ alert

_______ excited
_______ ashamed

_______ upset
_______ inspired

_______ strong
_______ nervous

_______ guilty
_______ determined

_______ scared
_______ attentive

_______ hostile
_______ jittery

_______ enthusiastic
_______ active

_______ proud
_______ afraid

Thank you for your time, your participation is greatly appreciated…