Dysfunctional eating in an Australian community sample: The role of emotion regulation, impulsivity, and reward and punishment sensitivity

Stapleton, Peta; Whitehead, Melissa

Published in:
Australian Psychologist

DOI:
10.1111/ap.12070

Published: 01/01/2014

Document Version:
Peer reviewed version

Licence:
Other

Dysfunctional Eating in an Australian Community Sample: The Role of Emotion Regulation, Impulsivity and Reward and Punishment Sensitivity

Abstract

This study aimed to examine the role of emotion regulation and reinforcement sensitivity in dysfunctional eating behaviours. Two hundred and twenty eight adults from the Australian community completed self-report inventories assessing the variables. Dysfunctional restrained eaters differed from those who did not engage in restrained eating in terms of their emotion regulation, impulsivity and sensitivity to reward. Difficulties in emotion regulation, low impulsivity and sensitivity to reward predicted engagement in restrained eating. Emotional eaters significantly differed from those who did not engage in dysfunctional levels of emotional eating in terms of their emotion regulation, impulsivity and sensitivity toward reward, and difficulties in emotion regulation predicted emotional eating. Finally, dysfunctional external eaters differed from non-dysfunctional external eaters in terms of their emotion regulation, impulsivity, sensitivity toward reward as well as sensitivity toward punishment; and difficulties with emotion regulation and sensitivity toward reward predicted external eating. These findings highlight the importance of the inclusion of emotional functioning in models of development and maintenance of eating disorders, and support the potential implementation of treatment interventions that address emotion regulation and include strategies to cope with impulsivity and reinforcement sensitivities.

Word count: 186

Keywords: disordered eating, eating disorders, emotion regulation, impulsivity, reinforcement, sensitivity

Dysfunctional Eating in an Australian Community Sample: The Role of Emotion Regulation, Impulsivity and Reward and Punishment Sensitivity

There is an increasing prevalence of dysfunctional eating behaviours within the Australian community, such as sub-clinical eating disorders (ED) and dieting, with prevalence rates of sub-clinical disordered eating estimated between 20 to 30% (Grigg, Bowman, & Redman, 1996; National Eating Disorders Collaboration, NEDC, 2012). The prevalence of subclinical Anorexia Nervosa among American teens may be as high as 15%, and at any given time the rate of Bulimia may be 5% (Stice, 2002). Dsyfunctional eating has been found to be associated with low psychosocial functioning, including: poor social adjustment, relationship difficulties, decreased life satisfaction and impaired educational or occupational status (Grilo, 2002; Striegel-Moore, Seeley, & Lewinsohn, 2003). Emotion regulation and reinforcement sensitivity may impact dysfunctional eating however, there are currently no studies that examine both emotion regulation and reinforcement sensitivity within eating disorders or dysfunctional eating syndromes.

Dysfunctional eating refers to the engagement in disordered eating behaviours, including any behaviours that related to the consumption (or non-consumption) of food, such as restricting, binging and purging (Loxton & Dawe, 2001). In previous studies, individuals who engage in dysfunctional eating have included those who obtain clinically elevated levels on measures, such as the Drive for Thinness and Bulimia subscales of the Eating Disorders Inventory (EDI; Garner & Olmsted, 1984), or those who report clinically elevated engagement in behaviours that reflect the diagnostic criteria of eating disorders (Kane, Loxton, Staiger & Dawe, 2004; Loxton & Dawe, 2001). This study aimed to specifically investigate restricting behaviour and two types of eating that are linked with dysfunctional eating: emotional eating and external eating.

Emotional eating occurs in response to negative emotional arousal states such as anger, fear or anxiety. This may be a consequence of the inability to distinguish hunger from other aversive internal states, or is a learnt behaviour of using food to reduce emotional distress (Konttinen et al., 2010). Loss of appetite is the normal response to emotional arousal or stress, as emotional arousal inhibits gastric motility which leads to the suppression of gastric movement and the liberation of sugar from the liver into the blood stream (Schachter, Goldman, & Gordon, 1968). This is similar to the feeling of satiety and therefore, emotional arousal and stress typically lead to a decrease in appetite and eating, and if prolonged, weight loss (Van Strien, 2010). Similarly to emotional eating, people who engage in external eating are thought to be unable to detect signals of hunger or satiety (Van Strien, 2010). Externality theory proposes that eating is determined by the external environment, that is, food-related cues such as the sight and smell of food (Schachter et al., 1968). Schachter and Rodin (1974) proposed that sensitivity to external cues is generally not specifically to eating behaviours, but rather is a general personality trait.

Tull, Gratz, Latzman, Kimbrel and Lejuez (2010) proposed that emotion regulation may be particularly relevant to how the mechanisms of reward and punishment sensitivity may increase the risk of psychopathology, particularly in disordered eating behaviour (Bijttebier, Beck, Claes, & van der Eycken, 2009). Reinforcement Sensitivity Theory (RST) proposes that two independent motivational systems, reward sensitivity and punishment sensitivity, are related to the personality traits of impulsivity and anxiety (Corr, 2004). Impulsivity and anxiety are mediated by two biologically-based motivational systems: the Behavioural Approach System (BAS) which regulates response to appetitive and non-aversive stimuli; and the Behavioural Inhibition System (BIS) which regulates an inhibited response to aversive or non-rewarding stimuli (Gray, 1964). RST predicts that individuals with high impulsivity are most sensitive to signals of reward (both conditioned and

unconditioned), as opposed to individuals with low impulsivity; and that individuals with high anxiety are most sensitivity to signals of punishment, novel stimuli, and frustrative non-reward, as opposed to individuals with low anxiety (Tull et al., 2010).

Since publication of the RST, a revised RST has proposed an interaction with the Flight-Flight-Freeze response (FFFS). The FFFS differs from BIS in that the FFFS results in the experience of fear or anger, while activation of the BIS results in the experience of anxiety. As FFFS is a relatively new concept, it has not yet been incorporated specifically within measures of RST, and further work is needed to consolidate the role of the FFFS within personality (Corr, 2004). Therefore, this study focuses specifically on the BIS and BAS within the original RST.

The BAS is believed to involve the mesolimbic dopaminergic pathways, including projections from the ventral tegmental area to structures including the nucleus accumbens, amygdala, and the prefrontal cortex (Gray, 1990). This is also one of the critical pathways that underlies the reinforcing effects of foods and drugs of abuse (Di Chiara, 1995). The BAS is thought to operate as a feedback loop where the environment is continuously monitored for signals of reward. Once a reward is identified, BAS is activated and motor output is increased to promote approach behaviour (Gray, 1991). BIS is involved in the inhibition of behaviour and increasing arousal and attention in response to aversive cues. Similarly to BAS, BIS is thought to operate as a feedback loop but instead monitors the environment for cues of punishment, frustrative non-reward and novel stimuli. Previous experiences are stored and are used to predict the world to which BIS compares to actual events while monitoring motor output. When predicted and actual states are congruent, the BIS continues to monitor the environment without cuing changes to motor output. When the two states are incongruent, the disparity is evaluated by the cessation of approach behaviour and increased arousal (Gray, 1991). This cessation of approach behaviour and increase in arousal is when anxiety is

experienced. Gray and McNaughton (2000) proposed a provision to the original RST, which suggested that the BIS does not function independently of the BAS, but rather the BIS becomes activated if a desired goal includes some risk and approach-avoidance conflict occurs. The BIS is associated with the septohippocampal system, including the hippocampus proper, the dentate gyrus, entorhinal cortex, subicular area, posterior cingulate cortex and the septumdiagonal band complex (Gray & McNaughton, 2000).

Individual variations in BIS and BAS sensitivity have been theorized to underlie a wide range of psychopathology, including anxiety, mood, substance abuse, eating and personality disorders (Bijttevier et al., 2009; Gray, 1991; Kimbrel, 2008). However, the mechanisms of reward and punishment sensitivity that increase the risk of psychopathology remain unclear (Bijttervier et al., 2009). Tull and colleagues (2010) proposed that emotional regulation (ER) may be one mechanism that may be particularly relevant to this link. Both reinforcement sensitivity and ER difficulties have been implicated in the pathogenesis of many forms of psychopathology (Linehan, 1993), and both were of interest in this study.

Impulsivity has been found to be associated with bingeing and/or purging behaviours (Steiger & Bruce, 2007) and has been considered a defining trait of obese individuals who have difficulty losing weight (Nederkoorn, Smulders, Havermans, Foefs & Jansen, 2006). Researchers (Guerrierri, Stanczyk, Nederkoorn & Jansen, 2012) have suggested that there are important associations between impulsivity and obese or overweight populations. It appears that there is an important interaction between the environment and psychological traits, particularly impulsivity, which contribute to future weight gain (Nederkoorn et al., 2006; Guerrierri et al., 2012; Nasser, Gluck, & Geliebter, 2004). Guerrierri et al. (2012) suggested that impulsivity is particularly high within the obesogenic environment, such as a sedentary job (Swinburn, Egger, & Raza, 1999). There is a high prevalence of emotional and external

eating behaviours in individuals who are overweight, and many engage or have previously engaged in restrained eating in an attempt to lose weight (Van Strien, 2010).

In summary, research suggests that individuals with EDs are likely to be higher in BIS, while individuals who engage in binge eating and/or purging behaviours are likely to be also sensitivity to BAS and have a higher level of impulsivity. In contrast, individuals who engage purely in restricted eating behaviours are not likely to be high on BAS or impulsivity, with the implication that impulsivity may in fact be low in those who restrain due to their high levels of cognitive control (Yeomans et al., 2008). In relation to the development of EDs in the context of RST, Harrison et al. (2010) suggested that the differences between healthy controls and individuals with eating disorders may not represent inherent personality traits, but rather that reward sensitivity may develop as a result of the illness (Salvy & McCargar, 2002). The most recent systematic review of impulsivity in EDs supports that that impulsivity may be a risk factor for the development of EDs in women (Waxman, 2009).

Specifically, this study aimed to look at the association between emotion regulation difficulties, reinforcement sensitivity, impulsivity and three types of dysfunctional eating behaviours: restrained, emotional and external eating. These three types of eating behaviours were of interest as they are indicators of clinical dysfunction when they are at an excessive level. Restriction of food intake, emotional eating and external eating predict binge-eating (Chen, McCloskey, & Keenan, 2009), obesity (Cleary & Crafti, 2007; Van Strien, 2010), low psychological well-being (Lindeman, 2001), eating disorders (Van Strien, 2010) as well as non-ED psychopathologies (Vitousek & Manke, 1994). In addition, the engagement in these behaviours is related to the understanding and regulation of internal states, and therefore may be affected by how emotions are regulated, and how people are sensitive to reinforcement. Due to the increasing prevalence of dieting, sub-clinical disordered eating, and obesity within

the Australian population, this study explored specific dysfunctional eating behaviours in a community sample.

Specifically, it was predicted that:

1) Individuals who engaged in dysfunctional eating would differ from those who did not engage in dysfunctional eating in terms of their emotion regulation, impulsivity, reward sensitivity and punishment sensitivity.
2) Greater engagement in restrained eating behaviours would be associated with higher levels of difficulties with emotion regulation, greater levels of punishment sensitivity; and lower levels of impulsivity. It was predicted that reward sensitivity would contribute to the model in predicting restrained eating behaviours, but this sensitivity would not be elevated or reduced in relation to this eating behaviour.
3) Greater engagement in emotional eating behaviours would be associated with higher levels of difficulties with emotion regulation, greater levels of punishment sensitivity; greater levels of reward sensitivity; and greater levels of impulsivity.
4) Greater engagement in external eating behaviours would be associated with higher levels of emotion regulation, greater levels of reward sensitivity, greater levels of punishment sensitivity; and greater levels of impulsivity.

Method

Participants

Two-hundred and twenty-three Australian adults participated in this study, including 25% males (*N* = 56*)* and 75% (*N* = 167) females aged between 18 and 79 (M = 38.695, SD = 16.717). Each participant's Body Mass Index (BMI) was calculated using their self-reported

height and weight, and ranged from 13.06 to 52.86 (M = 24.289, SD = 5.425). The average income was under $50,000 (<50,000 = 64%; 50,000 – 75,000 = 22%, 75,000-100,000 = 9%, >100,000 = 5%). The participants were from the Australian wide community, including 21% from Queensland, 18% from New South Wales, 18% from Victoria, 36% from South Australia, 3% from Western Australia, 2% from the Northern Territory, 1% from the Australian Capital Territory, and 1% from Tasmania. Table 1 presents the baseline characteristics of participants at the time of recruitment.

Insert Table 1

Self-Report Measures

A demographic questionnaire gathered background information about each participant. This required participants to specify their gender, age, state of residence, income level before tax, height and weight.

Dutch Eating Behavior Questionnaire. The Dutch Eating Behavior Questionnaire **(**DEBQ; Van Strien, 2010) is a 32-item self-report scale designed to assess dysfunctional eating behaviours, specifically emotional, external and restrained eating. The Emotional eating scale includes two subscales: 1) eating in response to diffuse emotions and, 2) eating in response to clearly labelled emotions, and assesses eating behaviours that occur in response to emotional arousal states such as fear, anger or anxiety. The External scale assesses eating behaviours in response to external food cues, such as the sight or smell of food. The Restrained scale assesses dietary restraint behaviours. Summing the scores on items and dividing the sum by the number of items on the scale result in a total score for each scale, with high scores reflecting a higher degree of eating behaviour relevant to the scale. These scores are then compared to norm ranges, which range from very high to very low. Scores in the high and very high range are considered indicative of significant engagement in

dysfunction eating, as these scores are above two standard deviations from the mean (Van Strien, 2010). The DEBQ has demonstrated good psychometric properties, with Cronbach's Alpha presented for both men and women (Van Strien, 2010). Test-retest reliability for the scales range from .68 to .91 (Schlundt, 1995).

Difficulties in Emotion Regulation Scale. The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) is a 36 item self-report scale measuring emotion regulation. The participant is asked to rate their responses across a 5 point scale from (1) *almost never (0-10%),* (2) *sometimes (11-35%),* (3) *about half the time (36-65%),* (4) *most of the time (66-90%)* and (5) *almost always (91-100%).* There are 6 separate yet interconnected subscales, as well as a total score. Higher scores indicate greater difficulties with emotion regulation. The 6 subscales are: Non-acceptance; Goals; Impulsiveness; Awareness; Strategies; and Clarity. Cronbach's alpha for the total score has been found to range from 0.91 to 0.93, while item-total correlations ranged from r =.16 to r =.69 (Gratz & Roemer, 2004). It has also demonstrated good psychometric properties within an Australian sample, with Cronbach's alphas ranging from .83 to .91 across the scales (Williams & Grisham, 2012). The DERS has also demonstrated good test-retest reliability over a period ranging from four to eight weeks ($\rho_I = 0.88$, $p < 0.01$; Gratz & Roemer, 2004).

Barratt Impulsiveness Scale. The Barratt Impulsiveness Scale (BIS-11; Patton, Stanford, & Barratt, 1995) is a 30 item scale that yields a total score, and scores for six first order factors or three second order factors. The first order factors include: Attention, Motor, Self-control, Cognitive complexity, Perseverance, and Cognitive instability. The three second order factors are Attentional, Motor and Non-planning. This instrument was designed to assess multi-dimensional impulsiveness, including personality and behavioural constructs of impulsiveness. Participants rate each statement on a 4-point scale: (1) Rarely/Never, (2) Occasionally, (3) Often or (4) Almost Always. Scores are summed to obtain a total score,

while relevant items are summed to obtain a total score for each scale and subscale. Total scores range from 30 to 120, and a total score of 72 or above has been used to classify an individual as highly impulsive (Stanford et al., 2009). Scores between 52 and 71 are thought to be within the normal limits of impulsiveness, while scores below 52 are usually representative of an individual that is either extremely over controlled (Knyazev & Slobodskaya, 2006) or who has not honestly completed the questionnaire (Helfritz & Stanford, 2006; Stanford et al., 2009).

The BIS-11 has demonstrated good psychometric properties. Cronbach's alpha for the Total Score has been found to be 0.83, with Cronbach's alpha ranging from 0.59 to 0.74 among the second-order subscales (Stanford et al., 2009). It has also been shown to have good test-retest reliability with a coefficient of $r = 0.60$ over one year (Luengo, Carrillo-de-la-Pena & Otero, 1991).

Behavioural Inhibition System/Behavioural Approach System Scale. The Behavioural Inhibition System/Behavioural Approach System Scales (BIS/BAS; Carver & White, 1994) is a 20-item self-report scale that measures sensitivity to reward (BAS) and sensitivities to punishment (BIS). Each item is rated on a four-point Likert scale, ranging from (1) Strongly Disagree to (4) Strongly Agree. This scale includes four filler items and all but two items are reversed scored, with higher scores indicate higher sensitivities on their respective scale. The BIS scale comprises seven items (e.g. Criticism or scolding hurts me quite a bit) and scores range from seven to 28. The BAS scale comprises of 13 items and three subscales. The Fun-S subscale measures the tendency to impulsively pursue enjoyment (e.g. "I crave excitement and new sensations"); the Drive subscale assesses motivation to approach goals (e.g. "I go out of my way to get what I want"); and the Reward Responsiveness subscale measures the degree of positive response to rewards (e.g. "When I get what I want, I feel excited and energized"). The BAS total score is calculated by totalling

the three subscale scores and ranges from 13 to 52.

Good internal consistency has been found for the BIS scale with Cronbach's α from .78 (Carver & White, 1994) to .83 (Cooper, Perkins, & Corr, 2007). Reliability coefficient alphas have for the BAS have been reported as .77 (BAS Total), .66 (Fun-Seeking), .76 (Drive) and .73 (RR; Carver & White, 1994; Gomez, Cooper, & Gomez, 2005). The scale has demonstrated good test-retest reliability for the BIS scale, with a correlation of $r = .81$, $p < .001$ and moderate test-retest reliability for the BAS total scale with a correlation of $r = .5$, $p < .01$ (Meyer, Johnson & Winters, 2001).

Marlowe Crowne Social Desirability Scale (MCSDS). The Marlowe-Crown Social Desirability Scale – Short Form was used (MCSDS; Strahan & Gerbasi, 1972) to measure social desirability and screen for response tendency. The MCSDS had eight items which participants responded to in a true-false format (e.g. "Are you always courteous, even to people who are disagreeable?"). The scores from each item are summed to obtain a total score, and high scores are considered representative of respondents who desire to present themselves in a favourable light (Marlowe & Crowne, 1960).

In Australian samples, the short form of the MCSDS has had a Cronbach's alpha of .77 in a sample of 2000 participants (Ray, 1984). In Strahan and Gerbasi's (1972) initial publication of the short from of the MCSDS, there was a strong positive correlation of .87 between the original and the short form. The short form has demonstrated good test-retest reliability, with a reliability coefficient of .7 over a three to six month period (Ray, 1984). The MCSDS has demonstrated concurrent validity, with strong correlations with the validity scales of the Minnesota Multiphasic Personality Inventory (Marlowe & Crowne, 1960) as well as the Balanced Inventory of Desirable Responding (Paulhus, 1991).

Procedure

Ethical approval was obtained from the Bond University Human Research Ethics Committee. Participants were recruited through advertisement and participant referrals, and anonymously completed an online survey or paper questionnaire package.

Results

Prior to the main data analyses, the data was examined to identify any potential errors or missing data, of which there was none. Descriptive statistics of the variables are presented in Table 2. Using the sample of 223 participants and an alpha of .05 with a medium effect size (0.3), the power of the study was 0.999.

Insert Table 2

Preliminary data analysis was conducted by running a series of one-way ANOVA's to investigate whether any demographic variables (age, income level, state of residence) covaried with the predictor variables or criterion variables. This analysis indicated that some of the demographic variables were related to the criterion or predictor variables. Pearson product-moment correlations were then performed to provide further insight into bivariate relationships between the variables. Both age and gender had significant correlations among the independent and dependent variables, and therefore these two demographic variables were controlled for, by entering them into Step 1, within the Multiple Regression analyses. Table 3 presents the correlations among the demographic variables, gender, Total Score for the DEBQ subscales (restrained, emotional and external), Total Score for DERS, Total Score for BIS/BAS and the Total Score for BIS-11, along with their levels of significance.

Insert Table 3

Differences in emotion regulation, impulsivity, BIS and BAS between dysfunctional eaters differ from non-dysfunctional eaters. In order to determine whether there were differences in the independent variables on the dependent variables (e.g did

dysfunctional eaters differ from non-dysfunctional eaters in terms of their emotion regulation, BIS, BAS and impulsivity), a Multivariate Analysis of Variance (MANOVA) was run for each of the three dysfunctional eating behaviours: restrained, emotional and external. Several univariate outliers were identified upon inspection of boxplots, however these were retained as these cases had standardised residuals of less than 3.

A one-way between-groups MANOVA was performed to investigate differences in restrained eating behaviour and emotion regulation, impulsivity, behaviour inhibition and behaviour activation. Four dependent variables were used: emotion regulation, impulsivity, behaviour inhibition, and behaviour activation. The independent variable was restrained eating behaviours. Box's Test of Equality of Covariance Matrices indicated that the assumption of homogeneity of variance-covariance matrices was violated (Box's M = 33.441, p <.001). However, Tabachnick and Fidell (2007) suggest that MANOVA is robust to violations of homogeneity. A Levene's Test of Equality of Error Variances revealed that the Emotion Regulation scale had violated the assumption of equality of variance. Therefore, a more conservative alpha of .025 was set for that variable. There was a statistically significant difference between dysfunctional and non-dysfunctional restrained eating behaviours on the combined dependent variables, F (4, 218) = 9.528, p = <.001; Wilk's Lambda = .851; partial eta squared = .149. When results for the dependent variables were considered separately, the only variables to reach statistical significance, using a Bonferroni adjusted alpha level of .025, was emotion regulation, F (1, 221) = 14.14, p = <.001; partial eta squared = .06. An inspection of mean scores indicated the clinical levels of dysfunctional restrained eaters reported higher levels of difficulties with emotion regulation (M = 98.504, SD = 2.684) than non-dysfunctional levels in restrained eaters (M = 83.868, SD = 2.819).

A one-way between-groups MANOVA was then performed to investigate differences in emotional eating behaviour and emotion regulation, impulsivity, behaviour inhibition and

behaviour activation. Four dependent variables were used: emotion regulation, impulsivity, behaviour inhibition, and behaviour activation. The independent variable was emotional eating behaviours. There was a statistically significant difference between dysfunctional and non-dysfunctional emotional eating behaviours on the combined dependent variables, F (4, 218) = 3.9, p = <.05; Wilks' Lambda = .933; partial eta squared = .067. When results for the dependent variables were considered separately, emotion regulation (F (1, 221) = 6.838, p = <.05; partial eta squared = .03), impulsivity (F (1, 221) = 11.607, p = .001; partial eta squared = .05) and behavioural activation (F (1, 221) = 5.074, p = <.05; partial eta squared = .022) were significant. An inspection of mean scores indicated the dysfunctional levels of emotional eaters reported higher levels of difficulties with emotion regulation (M = 94.287, SD = 2.235) than non-dysfunctional levels of emotional eaters (M = 81.816, SD = 4.213). Dysfunctional levels of emotional eaters reported higher levels of impulsivity (M = 66.638, SD = .852) than non-dysfunctional levels of emotional eaters (M = 60.449, SD = 1.605). Finally, the mean scores indicated that dysfunctional levels of emotional eaters reported higher levels of being sensitive towards behavioural activation (M = 38.569, SD = .314) than non-dysfunctional levels of emotional eaters (M = 37.061, SD = .591).

A one-way between-groups MANOVA was then performed to investigate differences in external eating behaviour and emotion regulation, impulsivity, behaviour inhibition and behaviour activation. Four dependent variables were used: emotion regulation, impulsivity, behaviour inhibition, and behaviour activation. The independent variable was external eating behaviours. There was a statistically significant difference between dysfunctional and non-dysfunctional external eating behaviours on the combined dependent variables, F (4, 218) = 4.359, p = <.05; Wilks' Lambda = .926; partial eta squared = .074. When results for the dependent variables were considered separately, emotion regulation (F (1, 221) = 6.845, p = <.05; partial eta squared = .03), impulsivity (F (1, 221) = 8.291, p = .001; partial eta squared

= .036) , behavioural activation (F (1, 221) = 10.139, p = <.05; partial eta squared = .044), and behavioural inhibition (F (1, 221) = 6.145, p = <.05; partial eta squared = .027) were significant. An inspection of mean scores indicated that individuals who engaged in dysfunctional levels of external eaters reported higher levels of difficulties with emotion regulation (M = 94.861, SD = 28.916) than those who did not engage in dysfunctional levels of external eaters (M = 81.816, SD = 30.845). Individuals who engaged in dysfunctional levels of external eating also reported higher levels of impulsivity (M = 66.677, SD = 11.864) than those who did not engage in clinical levels of dysfunctional external eating (M = 61.8779, SD = 9.832). Finally, the mean scores indicated that those with dysfunctional levels of external eating reported slightly higher levels of being sensitive towards behavioural activation (M = 38.798, SD = 4.05) than non-dysfunctional levels of emotional eaters (M = 36.877, SD = 4.196), as well being more sensitive towards behavioural inhibition (M = 20.082, SD = 2.179) than non-dysfunctional levels of external eaters (M = 19.246, SD = 2.537).

The relationship between restrained eating, emotion regulation, impulsivity, BIS and BAS. Hierarchical multiple regression (HMR) was used to assess the ability of the four predictive measures, emotion regulation, impulsivity, behavioural activation and behavioural inhibition to predict levels of restrained eating behaviours, in order to explore the relationships between the dependent variables in their contribution to the independent variables. Table 4 displays the unstandardised regression coefficients (β) and intercept, the standardised regression coefficients (b), the semi-partial correlations (sr^2), and R, R^2, and adjusted R^2 after entry of the seven independent variables.

Insert Table 4

Social desirability, age and gender were entered at Step 1 and explained a significant 4.7% of the variance in restrained eating behaviours. After the entry of Emotion Regulation,

Impulsivity, BIS and BAS at Step 2 the total variance explained by the model as a whole was 33.7%, *F* (7, 215) = 17.113, *p* <.001. The three control measures explained 18%, after controlling for age, gender and socially desirable responding, *R* squared change = .337, *F* change (4, 215) = 25.981, *p* <.001. In the final model, the control measures (age, gender and social desirability) were greater than .05 and were therefore not statistically significant. Of the independent variables, Emotion Regulation, BAS and Impulsivity were significant, with the Emotion Regulation scale recording a higher beta value (*beta* = .497, *p* <.001) than the Impulsivity Scale (*beta* = -.459, *p* <.001) and BAS scale (*beta* = .158, *p* <.05). The BIS scale was not significant (*beta* = .042, *p* >.05).

The relationship between emotional eating, emotion regulation, impulsivity, BIS and BAS. HMR was used to assess the ability of the four predictive measures, Emotion Regulation, Impulsivity, Behavioural Activation and Behavioural Inhibition to predict levels of emotional eating behaviours. Table 5 displays the unstandardised regression coefficients (β) and intercept, the standardised regression coefficients (b), the semi-partial correlations (sr^2), and R, R^2, and adjusted R^2 after entry of the seven independent variables. Social desirability, age and gender were entered at Step 1 and explained 19% of the variance in emotional eating behaviours. After the entry of the Emotion Regulation, Impulsivity, BIS and BAS Scales at Step 2, the total variance explained by the model as a whole was 31.1%, *F* (7, 215) = 15.333, *p* <.001. The four independent variables explained 14.3%, after controlling for gender, age and socially desirable responding, *R* squared change = .143, *F* change (4, 215) = 11.542, *p* <.001. In the final model, only Emotion Regulation (*beta* = .394, *p* <.001) and the control variable, Social Desirability (*beta* = .205, *p* =.001), were significant. The BAS scale (*beta* = .092, *p* >.05), BIS scale (*beta* = -.071, *p* >.05), and Impulsivity Scale (*beta* = .025, *p* >.05) were not significant.

Insert Table 5

The relationship between external eating, emotion regulation, impulsivity, BIS and BAS. HMR was used to assess the ability of the four predictive measures, Emotion Regulation, Impulsivity, Behavioural Activation and Behavioural Inhibition to predict levels of external eating behaviours. Table 6 displays the unstandardised regression coefficients (β) and intercept, the standardised regression coefficients (b), the semi-partial correlations (sr^2), and R, R^2, and adjusted R^2 after entry of the seven independent variables. Social desirability, age and gender were entered at Step 1 and explained 17% of the variance in external eating behaviours. After the entry of the Emotion Regulation, Impulsivity, BIS and BAS Scales at Step 2, the total variance explained by the model as a whole was 24%, F (7, 215) = 9.69, p <.001. The four control measures explained 6.3%, after controlling for gender, age and socially desirable responding, R squared change = .108, F change (4, 215) = 4.471, p <.001. In the final model, Gender (*beta* = -.137, p <.05), Age (*beta* = -.187, p <.05), Social Desirability (*beta* = .184, p <.05), and BAS (*beta* = .188, p <.05) were significant, while Emotion Regulation (*beta* = .127, p >.05), Impulsivity (*beta* = .022, p >.05) and BIS (*beta* = .031, p >.05) were not significant.

Insert Table 6

Discussion

The aim of this study was to expand upon Tull et al.'s (2010) study which explored the role of emotion regulation within reinforcement sensitivity theory. Dysfunctional eating behaviours were examined as these are key behaviours within clinical EDs and potential precursors to full ED syndromes, and are also highly prevalent within the community. Individuals with EDs are more likely to have difficulties with emotion regulation as well as greater sensitivities towards reward and punishment, however there are currently no studies that examine both emotion regulation and reinforcement sensitivity within EDs. In addition to

applying Tull and colleagues (2010) recommendations, this study also expanded this research through the inclusion of a multi-dimensional measure of impulsivity.

It was found that there were significant differences between dysfunctional and non-dysfunctional restrained, emotional and external eaters across the dependent variables (emotion regulation, impulsivity, behavioural activation and behavioural inhibition). Dysfunctional restrained eaters had more difficulties with emotion regulation than non-dysfunctional eaters. Dysfunctional emotional eaters had more difficulties with emotional regulation, had higher impulsivity, and were more sensitive towards reward than non-dysfunctional emotional eaters. Similarly, dysfunctional external eaters had more difficulties with emotion regulation, were more likely to be impulsive, were more sensitive towards reward than non-dysfunctional external eaters, and in addition, were also more sensitive towards punishment than non-dysfunctional external eaters.

Restrained eating behaviours have previously been associated with high levels of emotion regulation difficulties (Harrison et al., 2010a), low levels of impulsivity (Waxman, 2010), heightened sensitivity towards punishment (Harrison et al., 2010b) and lower sensitivity toward reward (Harrison et al., 2010b), in comparison to healthy controls. In this study higher levels of emotion regulation difficulties were associated with restrained eating, with a medium effect size, as were low levels of impulsivity and a heightened sensitivity to punishment, with a small effect size. In addition, a heightened sensitivity to reward was also associated with restrained eating, with a small effect size. After controlling for the effects of gender, age and social desirability, the model (including emotion regulation difficulties, impulsivity, reward sensitivity and punishment sensitivity) accounted for 18%, with emotion regulation difficulties being the greatest predictor of restrained eating, followed by low levels of impulsivity and heightened sensitivity toward reward. Sensitivity toward punishment was not statistically significant in contributing towards the model. These findings suggest that

individuals who have difficulty regulating their emotions, also have low levels of impulsivity and a heightened sensitivity toward reward and may be more likely to engage in restrained eating behaviour.

It was proposed that emotion regulation difficulties would contribute the most towards predicting emotional eating behaviour, followed by impulsivity, sensitivity to reward and then sensitivity to punishment. Higher levels of emotion regulation difficulties were associated with emotional eating, with a large effect size, as were high levels of impulsivity and a heightened sensitivity to reward, with a small effect size. However, a heightened sensitivity to punishment was not associated with emotional eating. Emotion regulation difficulties was the greatest predictor of emotional eating, suggesting that individuals who have difficulty regulating their emotions are more likely to engage in emotional eating behaviour.

The final hypothesis in this study considered external eating behaviour, specifically that emotion regulation difficulties would contribute the most towards predicting external eating behaviour. Sensitivity toward reward was associated with external eating, with a medium effect size, as were difficulties with emotion regulation, heightened levels of impulsivity and a heightened sensitivity to punishment, with a small effect size. After controlling for the effects of gender and social desirability, the model (including emotion regulation difficulties, impulsivity, reward sensitivity and punishment sensitivity) accounted for 6%, with sensitivity to reward being the greatest predictor of external eating, followed by emotion regulation difficulties. This suggests that individuals who have a heightened sensitivity to reward and have difficulty regulating their emotions are more likely to engage in external eating behaviour.

Difficulties in emotion regulation were associated with greater levels of each type of dysfunctional eating measured in this study. This is consistent with Harrison's et al. (2010a)

findings that higher levels of difficulties in regulation emotions are common across all eating disorders. Harrison et al. (2010) considered that these difficulties may precipitate disordered eating, or that these difficulties develop as the course of the eating disorder progresses. This remains unclear and may be an area to further research, such as using a longitudinal design.

Sensitivity to reward was significantly higher in individuals who engaged in dysfunctional restrained eating in the present study. This may indicate that successful engagement in restrained eating behaviour may act as a reward. Emotional and external eating behaviours are thought to be related to binge eating behaviours, as it is also thought that emotional states (resulting in emotional eating behaviours) and/or external cues (resulting in external eating behaviours) are triggers to binge eating (Lacey, 1986; Polivy & Herman, 1993). Binge eating is commonly associated with high levels of impulsivity, high reward sensitivity and high punishment sensitivity. Therefore, the result that external eating was associated heightened sensitivity to reward and heightened sensitivity to punishment was consistent with previous findings.

In relation to impulsivity, Waxman's (2010) review of impulsivity within the eating disorders summarised that AN was associated with low levels of impulsivity in comparison to healthy controls while BN was associated with higher levels of impulsivity. Therefore the finding that restrained eating behaviours in this community sample were associated with low levels of impulsivity was consistent with the findings relating to AN. Additionally, the finding that emotional and external eating was related to high impulsivity was consistent with Waxman's findings relating to binge eating (e.g., BN).

Strengths and Limitations. While this study accounted for social desirability bias through the use of a social desirability questionnaire, the use of self-report measures imposes limitations on validity. The use of a community sample imposes limits on the clinical generalisability of the information found by this study. The findings of this study provide

guidance to EDs and other psychopathologies, however the use of a non-clinical sample means that these findings may not be directly applicable to these specific populations. The use of the DEBQ restraining, emotional and external scales provided information on specific eating behaviours, however limits the generalisability of the findings across EDs. These findings could have been strengthened by the inclusion of assessment measures to assess more relevant information such as: current and historical dieting, and specific eating behaviours (e.g., frequency of eating). Using an assessment measure for eating disorders, such as the Eating Disorder Inventory (EDI-3; Garner, 2004) would have increased the validity in classifying participants as dysfunctional or non-dysfunctional eaters, and enabled greater generalisation of the results to the clinical ED population. While reflective of gender differences among the EDs and general community eating behaviours, the unequal distribution of gender is another limitation within this study.

In contrast, the use of a community sample may also be considered to be a strength, as the results of this study can be generalized across the community as well as have implications for clinical samples. Furthermore, the use of a community sample enabled a large sample size, which is frequently a limitation in ED research. In addition, the sample size meant that this study had adequate power.

Conclusion. A large proportion of individuals who were classified as dysfunctional eaters within this study highlighted that the prevalence of dysfunctional eating behaviours within the community is high (the prevalence of dysfunctional eating ranging from 52 to 78% in eating behaviours examined). These high rates of sub-clinical disordered eating within the community highlight the need for community based interventions particularly addressing eating behaviours and body image.

This study is indicative that individuals who have difficulties with emotion regulation and have heightened sensitivity to reward and/or punishment, and are either high or low in

impulsivity and may be at a greater risk of engaging in dysfunctional elating behaviours. Further, this study highlights that individuals who are engaging in dysfunctional eating behaviours are more likely to have difficulty with emotion regulation, reward and punishment sensitivity and may be high or low in impulsivity.

References

Bijttebier, P., Beck, I., Claes, L., & van der Eycken, W. (2009). Gray's Reinforcement Sensitivity Theory as a framework for research on personality–psychopathology associations. *Clinical Psychology Review*, *29*(5), 421-430. doi: 10.1016/j.cpr.2009.04.002

Bruch, H. (1973). *Eating disorders.* New York: Basic Books. doi: 10.1001/jama.1973.03220360051028

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology*, 67, 319-319. doi: 10.1037/0022-3514.67.2.319

Chen, E. Y., McCloskey, M. S., & Keenan, K. E. (2009). Subtyping dietary restraint and negative affect in a longitudinal community sample of girls. *International Journal of Eating disorders*, *42*(3), 275-283. doi: 10.1002/eat.20661

Cleary, J. M., & Crafti, N. (2007). Basic need satisfaction, emotional eating, and dietary restraint as risk factors for recurrent overeating in a community sample. *E-Journal of Applied Psychology*, *3*(2), 27-39. doi: 10.7790/ejap.v3i2.90

Cooper, A. J., Perkins, A. M., & Corr, P. J. (2007). A confirmatory factor analytic study of anxiety, fear, and behavioral inhibition system measures. *Journal of Individual Differences*, *28*(4), 179-187. doi: 10.1027/1614-0001.28.4.179

Corr, P. J. (2004). Reinforcement sensitivity theory and personality. *Neuroscience & Biobehavioral Reviews*, *28*(3), 317-332. doi: 10.1016/j.neubiorev.2004.01.005

Depue, R. A., & Iacono, W. G. (1989). Neurobehavioral aspects of affective disorders. *Annual Review of Psychology*, *40*(1), 457-492. doi: 10.1146/annurev.ps.40.020189.002325

Di Chiara, G. (1995). The role of dopamine in drug abuse viewed from the perspective of its role in motivation. *Drug and Alcohol Dependence*, *38*(2), 95-137. doi: 10.1016/0376-8716(95)01164-T

Garner, D. M. (2004). *Eating disorders Inventory – 3: Professional Manual.* Odessa, FL: Psychological Assessment Resources, Inc. doi: http://dx.doi.org/10.1037/024590

Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment*, *26*(1), 41-54. doi: 10.1023/B:JOBA.0000007455.08539.94

Gray, J., & McNaughton, N. (2000). *The Neuropsychology of Anxiety: An enquiry into the functions of the septo-hippocampal system* (2nd Eds.). Oxford: Oxford University Press. doi: 10.1093/acprof:oso/9780198522713.001.0001

Gray, J. A. (1964). *Pavlov's typology*. New York: Macmillan. doi: 10.1016/B978-0-08-010076-0.50004-9

Gray, J. A. (1990). Brain systems that mediate both emotion and cognition. *Cognition & Emotion*, *4*(3), 269-288. doi: 10.1080/02699939008410799

Gray, J. A. (1991). The neuropsychology of temperament. In J. Strelau & A. Angleitner (Eds.), *Explorations in Temperament* (pp. 105-128). New York: Plenum. doi: 10.1007/978-1-4899-0643-4_8

Grigg, M., Bowman, J., & Redman, S. (1996). Disordered eating and unhealthy weight reduction practices among adolescent females. *Preventive Medicine,* 25(6), 748-756. doi: 10.1006/pmed.1996.0115

Grilo, C. M. (2002). Binge eating disorder. In C. G. Fairbun & K. D. Brownell (Eds.) *Eating disorders and obesity: A comprehensive handbook* (2nd ed., pp 178-182). New York, NY: Guilford. doi: 10.1007/s11113-008-9073-x

Guerrieri, R., Stanczyk, N., Nederkoorn, C., & Jansen, A. (2012). Reward-sensitive women overeat in a varied food environment, but only when hungry. *Eating Behaviors*, *13*(4), 317-333. doi: 10.1016/j.eatbeh.2012.05.003

Harrison, A., O'Brien, N., Lopez, C., & Treasure, J. (2010a). Sensitivity to reward and punishment in eating disorders. *Psychiatry Research*, *177*(1), 1-11. doi: 10.1016/j.psychres.2009.06.010

Harrison, A., Sullivan, S., Tchanturia, K., & Treasure, J. (2010b). Emotional functioning in eating disorders: Attentional bias, emotion recognition and emotion regulation. *Psychological Medicine*, *40*(11), 1887-1897. doi: 10.1017/S0033291710000036

Harrison, A., Tchanturia, K., & Treasure, J. (2010). Attentional bias, emotion recognition, and emotion regulation in anorexia: State or trait? *Biological Psychiatry*, *68*(8), 755-761. doi: 10.1016/j.biopsych.2010.04.037

Helfritz, L. E., & Stanford, M. S. (2006). Personality and psychopathology in an impulsive aggressive college sample. *Aggressive Behavior, 32*(1), 28-37. doi: 10.1002/ab.20103

Herman, C. P., & Polivy, J. (1980). Restrained eating. In A. Stunkard (Ed.) *Obesity* (pp. 208-225) Philadelphia, PA: Saunders. doi: 10.1001/archpsyc.1980.01780230045006

Kimbrel, N. A. (2008). A model of the development and maintenance of generalized social phobia. *Clinical Psychology Review*, *28*(4), 592-612. doi: 10.1016/j.cpr.2007.08.003

Knyazev, G. G., & Slobodskaya, H. R. (2006). Personality types and behavioural activation and inhibition in adolescents. *Personality and Individual Differences*, *41*(8), 1385-1395. doi: 10.1016/j.paid.2005.11.035

Konttinen, H., Männistö, S., Sarlio-Lähteenkorva, S., Silventoinen, K., & Haukkala, A. (2010). Emotional eating, depressive symptoms and self-reported food consumption. A population-based study. *Appetite*, *54*(3), 473-479. doi: 10.1016/j.appet.2010.01.014

Lacey, J. H., & Evans, C. (1986). The Impulsivist: A multi-impulsive personality disorder. *British Journal of Addiction*, *81*(5), 641-649. doi: 10.1111/j.1360-0443.1986.tb00382.x

Lindeman, M. (2001). The state of mind of vegetarians: Psychological well-being or distress? *Ecology of Food and Nutrition*, *41*(1), 75- 86. doi: 10.1080/03670240212533

Linehan, M. (1993). *Cognitive-Behavioral Treatment of Borderline Personality Disorder*. New York, NY: The Guilford Press.

Loxton, N. J., & Dawe, S. (2001). Alcohol abuse and dysfunctional eating in adolescent girls: The influence of individual differences in sensitivity to reward and punishment. *International Journal of Eating disorders*, *29*(4), 455-462. doi: 10.1002/eat.1042

Luengo, M. A., Carillo-de-la-Pena, M. T., & Otero, J. M. (1991). The components of impulsiveness: A comparison of the Impulsiveness Questionnaire and the Barratt Impulsiveness Scale. *Personality and Individual Differences*, *12*, 657-667. doi: 10.1016/0191-8869(91)90220-6

Marlow, D., & Crowne, D.P. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting and Clinical Psychology. 24*(4):349-354. doi: 10.1037/h0047358

Meyer, B., Johnson, S. L., & Winters, R. (2001). Responsiveness to threat and incentive in bipolar disorder: Relations of the BIS/BAS scales with symptoms. *Journal of Psychopathology and Behavioral Assessment*, *23*(3), 133-143. doi: 10.1023/A:1012731520781

National Eating disorders Collaboration (2012). *Clarity in complexity: Strategic communication to support the prevention and early identification of eating disorders.* New South Wales: The Butterfly Foundation.

Nederkoorn, C., Smulders, F. T., Havermans, R. C., Roefs, A., & Jansen, A. (2006). Impulsivity in obese women. *Appetite, 47*(2), 253-256. doi: 10.1016/j.appet.2006.05.008

Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt impulsiveness scale. *Journal of Clinical Psychology*, *51*(6), 768-774. doi: 10.1002/1097-4679(199511)51:6<768::AID-JCLP2270510607>3.0.CO;2-1

Paulhus, D. L. (1991). Measurement and control of response bias. In J. P., Robinson, P. R., Shaver, L. S. Wrightsman (Eds), *Measures of personality and social psychological attitudes* (pp.17 – 59). San Diego, CA: Academic press. doi: 10.1016/B978-0-12-590241-0.50004-6

Polivy, J., & Herman, C. P. (1993). Etiology of binge eating: Psychological mechanisms. In C. G. Fairburn & G. T. Wilson (Eds.), *Binge Eating: Nature, assessment and treatment* (pp. 317 – 360). New York: The Guilford Press. 6 doi: 10.1016/0272-7358(94)90031-0

Ray, J. J. (1984). The reliability of short social desirability scales. *The Journal of Social Psychology*, *123*(1), 133-134. doi: 10.1080/00224545.1984.9924522

Salvy, S., & McCargar, L. (2002). Nutritional interventions for individuals with bulimia nervosa. *Eating and Weight Disorders, 7*(4), 258-267. doi: 10.1007/BF03324971

Schachter, S., Goldman, R., & Gordon, A. (1968). Effects of fear, food deprivation, and obesity on eating. *Journal of Personality and Social Psychology, 10*(2), 91-97. doi: 10.1037/h0026284

Schachter, S., & Rodin, J. (1974). *Obese humans and rats.* Chichester: John Wiley & Sons Ltd.

Schlundt, D. G. (1995). Assessment of specific eating behaviors and eating style. In D. B. Allison (Ed.), *Handbook of assessment methods for eating behaviors and weight related problems: Measures, theory and research* (pp. 241-302). Thousand Oaks, CA: Sage.

Stanford, M. S., Mathias, C. W., Dougherty, D. M., Lake, S. L., Anderson, N. E., & Patton, J. H. (2009). Fifty years of the Barratt Impulsiveness Scale: An update and review. *Personality and Individual Differences*, *47*(5), 385-395. doi: 10.1016/j.paid.2009.04.008

Steiger, H., & Bruce, K. R. (2007). Phenotypes, endophenotypes, and genotypes in bulimia spectrum eating disorders. *Canadian Journal of Psychiatry*, *52*(4), 220-227.

Stice, E. (2002). Risk and maintenance factors for eating pathology: A meta-analytic review. *Psychological Bulletin, 128*, 825-848. doi: 10.1037/0033-2909.128.5.825

Strahan, R., & Gerbasi, K. C. (1972). Short, homogeneous versions of the Marlowe-Crowne Social Desirability Scale. *Journal of Clinical Psychology*, *28*(2),191-193. doi: 10.1002/1097-4679(197204)28:2<191::AID-JCLP2270280220>3.0.CO;2-G

Striegel-Moore, R. H., Seeley, J. R., & Lewinsohn, P. M. (2003). Psychosocial adjustment in young adulthood of women who experienced an eating disorder during adolescence. *Journal of the American Academy of Child & Adolescent Psychiatry*, *42*(5), 587-593. doi: 10.1097/01.CHI.0000046838.90931.44

Swinburn, B., Egger, G., & Raza, F. (1999). Dissecting obesogenic environments: the development and application of a framework for identifying and prioritizing environmental interventions for obesity. *Preventive Medicine, 29*(6), 563-570. doi: 10.1006/pmed.1999.0585

Tabachnik, B. G., and Fidell, L. S. (2007). *Using multivariate statistics* (6th Ed.).

New York: Harper & Row. doi: 10.1007/978-0-387-73508-5

Tull, M. T., Gratz, K. L., Latzman, R. D., Kimbrel, N. A., & Lejuez, C. (2010). Reinforcement Sensitivity Theory and emotion regulation difficulties: A multimodal investigation. *Personality and Individual Differences*, *49*(8), 989-994. doi: 10.1016/j.paid.2010.08.010

Van Strien, T. (2010). *Dutch Eating Behavior Questionnaire manual.* Amsterdam, The Netherlands: Boom test uitgevers.

Vitousek, K., & Manke, F. (1994). Personality variables and disorders in anorexia nervosa and bulimia nervosa. *Journal of Abnormal Psychology, 103*(1), 137. doi: 10.1037/0021-843X.103.1.137

Waxman, S. E. (2009). A systematic review of impulsivity in eating disorders. *European Eating disorders Review*, *17*(6), 408-425. doi: 10.1002/erv.952

Williams, A. D., & Grisham, J. R. (2012). Impulsivity, emotion regulation, and mindful attentional focus in compulsive buying. *Cognitive Therapy and Research*, *36*(5), 451-457. doi: 10.1007/s10608-011-9384-9

Yeomans, M. R., Leitch, M., & Mobini, S. (2008). Impulsivity is associated with the disinhibition but not restraint factor from the Three Factor Eating Questionnaire. *Appetite*, *50*(2), 469-476. doi: 10.1016/j.appet.2007.10.002

3 key points

What is already known about this topic

- There is an increasing prevalence of dysfunctional eating behaviours within the Australian community
- Dsyfunctional eating has been found to be associated with low psychosocial functioning
- Sensitivity to reinforcement may have implications for the development of difficulties with emotion regulation

What this topic adds

- This study found dysfunctional external eaters had more difficulties with emotion regulation, were more likely to be impulsive, were more sensitive towards reward than non-dysfunctional external eaters, and in addition, were also more sensitive towards punishment than non-dysfunctional external eaters

- Individuals who have difficulty regulating their emotions, also have low levels of impulsivity and a heightened sensitivity toward reward and may be more likely to engage in restrained eating behaviour
- Individuals who have a heightened sensitivity to reward and have difficulty regulating their emotions are more likely to engage in external eating behaviour