Decision Making Skills Among Individuals with Disorders of Affect Regulation

by

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Introduction

Decision making is defined as the process by which a preferred option or course of action is chosen from a set of alternatives based on certain criteria. There is growing evidence that affect plays a key role in decision making (Raghunathan & Pham, 1999; Werner, Duschek & Schandry, 2009; Yuen & Lee, 2003). There is also clinical suggestion that individuals with disorders of affect regulation—borderline personality disorder (BPD), post-traumatic stress disorder (PTSD), depression, and anxiety—have difficulty with decision making (Bazanis et al., 2002; Haaland & Landrø, 2007; Hopper et al., 2008; Lewicka, 1997; Monroe, Skowronski, Macdonald, & Wood, 2005; Pietromonaco & Rook, 1987). However, there is little scientific work systematically characterizing the nature and breadth of these decision difficulties. The present work assesses the decision competencies of individuals who have experienced significant trauma, one antecedent to affect dysregulation. The research considers both the performance of trauma-exposed individuals in decision making tasks relative to general population norms, as well as how performance might be related to co-morbid symptoms of traumatic stress, borderline personality, depression, and anxiety. The specific goal of this research endeavor is to assess the decision competencies of individuals with trauma-related disorders of affect regulation. Future goals are to integrate the findings from clinical populations with other decision research towards elaborating the cognitive and affective bases of decision making, and to better understand the sources of individual differences in decision making from a component process (that is, considering components of cognitive and affective systems) perspective.

In the remainder of the introduction, I present four common disorders of affect regulation associated with trauma experience: posttraumatic stress disorder, borderline personality disorder, depression, and anxiety. For each, I describe the symptomology of the disorder, I introduce the nature of the disorder in terms of behavioral studies of cognitive and affective processes, and I present existing empirical studies of decision making among individuals with the disorder. Initial diagnosis and descriptive information about each disorder comes from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR, 2000) unless otherwise noted. The introduction provides a background in which to present a behavioral laboratory study of decision making among trauma-exposed individuals. Note that while many studies reviewed here define affect-regulation disorders categorically (e.g., one either does or does not meet diagnostic criteria for depression), in my own research, traumatic stress, borderline personality, depression, and anxiety were assessed as continuous measures to better deal with the issue of co-morbidity (i.e., an individual presenting symptoms of multiple disorders).

Posttraumatic stress disorder

Description of disorder. Posttraumatic stress disorder is a disorder of emotion regulation that follows exposure to a traumatic event. Diagnostic criteria for PTSD include heightened arousal, avoidance and emotional numbing, and re-experiencing of the trauma. The DSM-IV-TR describes a traumatic event as one in which the person "experienced, witnessed, or was confronted with an event that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others." To fit the diagnosis for PTSD, a person's response to such an event must also

involve intense fear, helplessness, or horror. Re-experiencing the traumatic event can involve recurrent and intrusive distressing recollections or dreams of the event, avoidance involves a numbing of general responsiveness and efforts to avoid activities, places, people, thoughts, or feelings that are associated wit the trauma, and increased arousal can include difficulty falling or staying asleep or outbursts of anger. The duration of the disturbance must be more than 1 month, and the disturbance must cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.

PTSD is also further specified as acute if the symptoms last less than 3 months, chronic if the symptoms last more than 3 months, and with delayed onset if the onset of symptoms is at least 6 months after the traumatic event. The likelihood of developing PTSD may increase as the intensity and physical proximity to a traumatic event increase. Individuals with PTSD may also describe painful guilt feelings about surviving when others did not or about the things they had to do to survive. The lifetime prevalence of PTSD is approximately 8% of adults in the United States, and there is some evidence of a heritable component to PTSD. In particular, a history of depression in first-degree relatives has been related to an increased vulnerability to developing PTSD. PTSD is associated with increased rates of a number of comorbid disorders, most notably major depressive disorder, substance abuse related disorders, and panic disorder.

Cognitive impairments. The majority of research conducted with patients with PTSD points to impairments in a number of cognitive areas. One recent study of particular interest investigated the impact of emotion on cognition in patients with

PTSD. Mueller-Pfeiffer et al. (2010) used the affective Stroop task to measure the impact of positive, negative, and neutral emotional distractors in patients with PTSD, trauma-exposed patients with various anxiety disorders, healthy trauma-exposed participants, and healthy controls. For the affective Stroop task, participants were presented with a distractor and then a display containing the number 3, 4, 5, or 6 either three, four, or five times. They then determined how many numbers were presented as fast as possible. Participants with PTSD were significantly slower to respond in trials involving negative distractors relative to neutral distractors, while there was no such difference in any other group. Patients with PTSD were also significantly slower to respond in trial involving negative distractors than participants without PTSD. Additionally, higher levels of anxiety during the task were significantly associated with slower responding speed in both patients with PTSD and trauma-exposed participants with anxiety disorders. These results could indicate that people with PTSD are hypersensitive to negative and threat-related stimuli, which induces anxiety and disrupts cognition during the Stroop task (Mueller-Pfeiffer et al., 2010). Moreover, according to a theory of processing efficiency, anxiety is hypothesized to result in intrusive thoughts that compete for working memory resources (Eysenck & Calvo, 1992), which could account for the correlation between higher anxiety levels and slower response speed in patients with PTSD. This study also suggests that more than the mere exposure to a traumatic event leads to the observed deficits on the affective Stroop task, since impairments weren't found in trauma-exposed participants without PTSD.

Vythilingam et al. (2007) comparably found that participants with PTSD showed increased interference for negative but not positive distractors on the affective Stroop task, leading to decreased performance compared to healthy controls. Furthermore, participants completed an emotional lexical decision task in which they had to judge whether a briefly presented letter string was a word or a non-word. Healthy people are typically significantly faster and/or more accurate to recognize emotional letter strings (e.g. 'murder') as words relative to non-emotional letter strings. In this study, participants with PTSD showed increased facilitation in response to highly negative stimuli on the emotional lexical decision task compared to healthy controls. The authors suggest that together, these results demonstrate that people with PTSD display increased emotional attention due to increased emotional responding to threat information, which can both facilitate and hinder task performance (Vythilingam et al., 2007).

While a number of studies utilizing participants with PTSD report to examine executive functioning, the term 'executive functioning' encompasses a wide range of abilities, not all of which may be relevant to decision-making. A study by Koso and Hansen (2006) tested Bosnian war veterans with PTSD and healthy controls on a number of measures, including the Trail Making Test Part B, which assesses cognitive flexibility, and the Hayling Sentence Completion Test, which assesses response initiation and suppression. Participants with PTSD were slower on the Trail Making Test Part B and needed more time to respond on the Hayling Sentence Completion Test than healthy controls. Participants with PTSD were also much worse at suppressing habitual responses on the Hayling Sentence Completion Test. These

results suggest that patients with PTSD are less cognitively flexible and less able to both initiate and inhibit responses. Another study by LaGarde, Doyon, and Brunet (2010) tested PTSD patients, trauma-exposed participants without PTSD, and healthy controls on attentional and executive functioning through Part A and B of the Trail Making Test, direct and indirect conditions of numerical and spatial span tests, the Stroop task, and the Tower of London task. Lower level attention and processing speed was comparable across groups, but PTSD participants performed significantly worse then the trauma-exposed participants without PTSD on almost every measure of higher-level attentional processes, working memory, and executive function. It is possible that these deficits could contribute to impairments in the ability to process relevant information and to make well-informed decisions.

Interestingly, multiple studies suggest that increased intellectual resources may buffer the development of PTSD (Twamley, Hami, & Stein, 2004; Vasterling et al., 2002). In a study by Vasterling et al (2002), Vietnam veterans with and without PTSD were tested on a battery of attention and memory measures including the Rey Auditory Verbal Learning Test, the WCST, and the Continuous Visual Memory Test. The participant's premilitary IQ (EPIQ) was estimating using the Information and Vocabulary subtests of the WAIS-R. Veterans with PTSD showed impairments on tasks related to sustained attention and encoding, but did not differ from other veterans on the capacity to shift or focus. Veterans without PTSD also performed more proficiently than veterans with PTSD on intellectual tasks thought to reflect naïve intellectual potential. Although PTSD was associated with cognitive

impairment independent of intellectual functioning, greater intellectual resources may constitute a protective factor for PTSD development.

Similarly, Twamley et al. (2004) examined the performance of trauma-exposed college students with and without PTSD, along with healthy controls, on a battery of neuropsychological tasks. The Controlled Oral Word Association Test assessed word generation ability, the WAIS-III digit span and letter-number sequencing subtests assessed attention and working memory, the Digit Vigilance Test measured sustained visual attention, Part A of the Trail-Making Test assessed psychomotor speed, and both the Wisconsin Card Sorting Test (WCST) and Part B of the Trail-Making Test assessed executive functioning. Participants with PTSD did not differ significantly from trauma-exposed participants without PTSD or healthy controls on the vast majority of tasks. The few differences that were significant were small in magnitude, with one favoring healthy controls and another favoring participants with PTSD. The authors propose that the study sample could be, on average, less severe than treatment-seeking individuals in terms of current PTSD symptoms and that cognitive deficits relate to the 'dose' of trauma exposure. Additionally, premorbid cognitive resources may influence coping style, which may in turn influence the development of PTSD symptoms, including cognitive impairments. Thus, increased intellectual abilities may act as a buffer in college students, decreasing the severity of symptoms. It is also possible that increased cognitive deficits in this population will emerge over time, but it currently appears that young people with trauma exposure but able to attend college may represent a relatively resilient group.

Decision making research. Only one known study has directly addressed decision making in individuals with PTSD. A study by Hopper et al. (2008) used a probabilistic spinner task to examine reward function in patients with PTSD and trauma-exposed individuals without PTSD. Three different spinner types were randomly presented to participants, each with the possibility of gaining or losing different amounts of money. For each trial, participants were shown a spinner and then asked to rate how positive they expected the outcome of that trial to be on a scale of 1-100. After the spinner was spun and participants either gained or lost money, they were asked how happy they were with the outcome. Participants with PTSD were found to have lower expectancies of receiving rewards, lower satisfaction with the rewards they received, and failed to experience the additional satisfaction normally felt when an unexpected reward is received. These results suggest that PTSD is associated with deficient reward functioning, which could potentially alter decisions made by patients with PTSD. If patients with PTSD expect to be rewarded less, and are less satisfied with the rewards they do receive, they may make fewer risky decisions even when the potential reward is high.

Borderline personality disorder

Description of disorder. Borderline personality disorder (BPD) is a clinical disorder characterized by a history of instability of interpersonal relationships, self-image, and affect, as well as marked impulsivity. BPD is indicated by five or more of the following symptoms: (1) frantic efforts to avoid real or imagined abandonment; (2) a pattern of unstable and intense interpersonal relationships characterized by alternations between extremes of idealization and devaluation; (3) identity

disturbance involving markedly and persistently unstable self-image or sense of self; (4) impulsivity in at least two areas that are potentially self-damaging; (5) recurrent suicidal behavior, gestures, or threats, or self-mutilating behavior; (6) affective instability due to a marked reactivity of mood; (7) chronic feelings of emptiness; (8) inappropriate, intense anger or difficulty controlling anger; and (9) transient, stress-related paranoid ideation or severe dissociative symptoms.

BPD is estimated to affect approximately 2% of the general population, with females comprising 75% of those diagnosed. BPD commonly co-occurs with a number of other disorders, including mood disorders, substance-related disorders, eating disorders, posttraumatic stress disorder, and attention-deficit/hyperactivity disorder. In a sample of 202 BPD patients, Barnow (2010) found that 27% had comorbid substance use disorders, 88% had comorbid affective disorders, and 59% had comorbid PTSD (Barnow, 2010). Both environmental and genetic factors are thought to contribute to the development of BPD. It is about five times more common among first-degree biological relatives of those with the disorder than in the general population. Additionally, physical and sexual abuse, neglect, hostile conflict, and early parental loss or separation is common during childhood of individuals with BPD.

Cognitive impairments. Patients with BPD have been found to display a wide range of cognitive impairments, though findings are mixed. Some neuropsychological task domains in which deficits have been found include global functioning, attention-vigilance, verbal intelligence and language, spatial organization, visual memory, verbal memory, visuomotor processing, and immediate auditory memory, (e.g.,

Monarch, Saykin, & Flashman, 2004). Ruocco (2005) conducted a meta-analysis of ten neuropsychological studies with patients with BPD. He found the largest effect size for planning, with BPD patients demonstrating deficits on tasks such as the Tower of Hanoi. Medium effect sizes were also found in the domains of speeded processing, attention, and visuospatial abilities. Speeded processing includes tasks such as the Stroop task, attention includes the Go/Nogo task, and visuospatial abilities include pattern recognition tasks.

In contrast, Kunert, Druecke, Sass, and Herpertz (2003) found no differences between BPD patients and healthy controls on measures including intelligence, attention, visual scanning, cognitive flexibility, working memory, planning and problem solving, and learning and memory. The patients with BPD had higher self-reported scores of aggressiveness and impulsivity but did not show worse performance on most tasks. Discrepancies in findings across studies are potentially at least partially due to variations in symptom severity and comorbidity in BPD participants.

One cognitive impairment that has received greater empirical support and that might bear on decision making behavior is that of impulsivity and its relation to response inhibition. Response inhibition, a component of executive functioning, is the ability to suppress actions that are inappropriate in a given context and that interfere with goal-driven behavior. A study by Rentrop and colleagues (Rentrop et al., 2008) investigated the performance of patients with BPD and healthy controls on an auditory Go/Nogo paradigm. In a "Go" condition, participants were instructed to manually respond to the target stimulus, an infrequent high-pitched target stimulus,

while in the "Nogo" condition participants were to *withhold* a response to the same stimulus. BPD patients performed worse than healthy controls in the Nogo task but not in the Go task. They also had a higher relative frequency of errors of commission in the Nogo task. Interestingly, BPD patients sometimes articulated aloud "their finger moved before they made a decision." The findings of this study support the hypothesis that BPD patients have trouble inhibiting inappropriate responses, and are consistent with the possibility that difficulty with response inhibition gives rise to the pattern of impulsive behaviors that marks BPD.

It is also possible that BPD impulsivity might be better characterized as a preference for immediate gratification driven by nonplanning impulsiveness rather than a tendency for quick action based on a lack of response inhibition. A study by Lawrence, Allen, and Chanen (2010) examined the relationship between impulsivity, reward-based decision making, and emotional distress in BPD. Participants were presented with a series of 138 choices between 2 amounts of money. $1,000 was offered after one of 6 delay periods: no delay, 1 day, 1 week, 2 months, 6 months, and 1 year. The alternative option varied between $0 and $1,050 in $50 increments and was available immediately. Additionally, feelings of rejection were induced using the exclusion condition of Cyberball, a virtual ball-toss computer game between four animated ball-tossers in which participants only received the ball twice during the beginning of the game. The authors found that both groups exhibited discounting of the delayed reward but that the BPD group discounted the delayed reward more steeply than controls. While controls discounted the value of $1,000 over long delays, the lowest amounts they were prepared to accept were much larger than the BPD

group, suggesting a greater degree of self-control and ability to delay gratification. Furthermore, the control group demonstrated less discounting of delayed rewards following mood induction, but the BPD group did not differ significantly before and after mood induction.

Decision making research. Only two known studies of decision making have been conducted with individuals with BPD, however both have revealed decision making difficulties. In a study by Bazanis et al. (2002), ten colored boxes in varying ratios of red: blue (e.g., 8 red and 2 blue boxes) were displayed on a computer screen, and a token was said to be hidden in one of the boxes. Participants were instructed to guess the likely color of the box containing the token and then to choose a percentage of their total earned points to bet on the choice being correct. The overall goal of the task was to accumulate as many points as possible. The bet amounts from which the participant was to select a choice were presented sequentially in either ascending order (5%, followed by 25%, 50%, 75%, and 95% of the total score) or descending order (95%, followed by 75%, 50%, 25%, and 5%) until the participant made a choice. Over multiple trials, Bazanis et al. found that the BPD patients took significantly longer than control subjects to decide whether the token was more likely to be in a red or a blue box and BPD patients were less likely to choose the color that described the majority of boxes. Furthermore, BPD patients chose earlier bets than control subjects in both the ascending and descending bet conditions, potentially reflecting an increase in disinhibition and impulsivity. These results again support the hypothesis that BPD is associated with difficulty in executive functioning.

In another decision making study, Haaland and Landrø (2007) used the Iowa Gambling Task (IGT) to measure decision-making ability in BPD. The IGT is a standard neuropsychological assessment of decision making. In the version of the task used in this study, participants began with a $2,000 loan of imaginary money. They were instructed to win as much money as possible by choosing one card at a time from any of four available decks (Decks A, B, C, D) until instructed to stop. On each card, an amount of monetary gain (e.g., Gain $5) and loss (e.g., Lose $0) was written, resulting in a net gain or loss to the participant's wealth depending on which cards were chosen. Decks A and B were disadvantageous overall in that they provided large immediate rewards but also large and unpredictable losses. Decks C and D were advantageous overall in that they provided more modest immediate rewards but much lower losses. Haaland et al. found that BPD patients made fewer advantageous choices than healthy control subjects on the IGT, especially when the participants had co-morbid substance abuse. Participants with BPD showed improvement over the task, but the level of improvement was far less than that of the controls. The authors proposed that BPD patients might need more experience to learn from their behavior and gain behavioral control, and suggested that with continued trials the performance of participants with BPD could approach that of controls. Another possibility is that patients with BPD are more impulsive and therefore give less thought to which deck to choose from.

Depression

Description of disorder. Major depressive disorder (MDD; also depression) is a clinical disorder characterized by either depressed mood or loss of interest or

pleasure. The diagnostic criteria for MDD include five or more of the following symptoms present during the same 2-week period: (1) significant weight loss when not dieting or weight gain, or decrease or increase in appetite; (2) insomnia or hypersomnia; (3) psychomotor agitation or retardation; (4) fatigue or loss of energy; (5) feelings of worthlessness or excessive or inappropriate guilt; (6) diminished ability to think or concentrate, or indecisiveness; and (7) recurrent thoughts of death, recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide. Additionally, the symptoms must also cause clinically significant distress or impairment in social, occupational, or other important areas of functioning, must not be due to the direct physiological effects of a substance or a general medical condition, and most not be better accounted for by bereavement.

MDD is estimated to affect anywhere from 10-25% of women and 5-12% of men over their lifetime. A number of other clinical disorders frequently co-occur with MDD, including substance abuse disorders, anxiety disorders, BPD, PTSD, and obsessive-compulsive disorder. For example, among 677 randomly sampled depressed military veteran primary care patients, 36% screened positive for PTSD (Campbell et al., 2007). Fava et al. (2002) assessed 378 depressed outpatients before and after antidepressant treatment and found that prior to treatment, the most common co-morbid disorders were obsessive-compulsive disorder (30%), avoidant personality disorder (29%), and paranoid personality disorder (24%). Following treatment with fluoxetine, the overall occurrence of co-morbid personality disorders decreased, although obsessive-compulsive disorder, avoidant personality disorder, and paranoid personality disorder still affected at least 18% of the patients. A study by Rossi et al.

(2001) sampled 117 patients with depression and found that the most common comorbid disorders were avoidant personality disorder (31.6%), BPD (30.8%) and obsessive-compulsive disorder (30.8%).

Basic cognitive impairments. A number of cognitive and neuropsychological impairments are associated with depression. For instance, Must et al. (2006) found that people with depression completed fewer categories and had more perseverative errors on the WCST than controls, suggesting a decreased capacity for executive functioning, more specifically in the ability to shift mental frameworks.

Taconnat et al. (2010) sought to characterize memory deficits in adults with depression based on the level of cognitive support provided at encoding. Depressed and healthy adults were presented with a list of 20 words to remember on two separate occasions. One list presented the words in blocks corresponding to categories, while the other list presented them such that two words from the same category were never shown sequentially. Taconnat et al. found that healthy adults recalled more words overall than depressed participants. Additionally, cognitive support helped only the depressed group to recall more words, with no effect on the recall of the healthy group, and the observed memory and organizational deficits were associated with poor executive function performance on the WCST. These results suggest that healthy participants are able to implement self-initiated processes that allow them to categorize a seemingly random list of words, leading them to perform as well with the random list of words as with the blocked list. On the other hand, depressed adults seem unable to use a clustering strategy with the random list and their recall therefore improves when the words are already clustered for them.

There is one known study that examines the interaction between depression and BPD or PTSD. Maurex et al. (2010) tested participants with BPD with and without comorbid depression or PTSD on the Autobiographical Memory Test (AMT) and Means-End Problem Solving (MEPS) procedure. For the AMT, participants were given a total of 36 positive, negative, or neutral words and asked to retrieve a memory cued by each word. The MEPS procedure involves reading each of 5 stories aloud to participants who then must say how or what they would do if they were put in that situation and needed to arrive at a defined goal. Participants with BPD had significantly fewer specific answers on the AMT, but depressed BPD participants didn't differ from those with BPD but without depression. BPD participants also had a significantly lower total number of relevant means on the MEPS compared to controls, and a significant difference was found between depressed BPD participants and controls, but not between non-depressed BPD participants and controls or between depressed BPD participants and non-depressed BPD participants. Based on these results, it appears as though less specific autobiographical memory and social problem solving deficits are a product of BPD itself and aren't secondary to a diagnosis of depression.

Decision making research. Decision-making in depression has been more widely studied than in BPD or PTSD. A study by Lewicka (1997) examined the information used by depressed and non-depressed participants to choose from 5 possible partners to perform a joint job. Participants had to ask questions about the candidates in order to receive information about them, and could either ask about a specific candidate or which candidate possessed a certain trait. Participants rated each of the candidates on

a 5-point scale of attractiveness each time they received 10 pieces of information and after making a final decision. Lewicka found that depressed participants spread their attention more evenly across the possible candidates, asked more questions overall, and asked more criterion questions (e.g., "Which candidate is funny?") than non-depressed controls. Thus, depressed participants required more information before making a decision and utilized a different strategy than control participants to arrive at a decision. Control participants tended to develop an initial preference for a certain candidate and then collect as much evidence as possible regarding that candidate, while depressed participants continued to remain impartial and pay less attention to the eventually chosen candidate. Lewicka concluded that depressed participants' behavior could be interpreted as either rational (refraining from choice until enough information is available) or reflecting inability to commit to a choice.

A study by Monroe, Skowronski, Macdonald, and Wood (2005) suggests that people with depression might be more uncommitted than rational in their decision making. Depressed and non-depressed college students were asked to decide whether or not to hire a potential candidate for a university position. After the decision, a second candidate of either higher or lower quality was presented. Both before and after presentation of the second candidate, participants were asked questions designed to assess the extent to which they regretted their initial decision. Depressed participants reported more post-decisional regret than non-depressed participants, and the enhanced regret was not found to depend on the personal relevance of the decision, initial candidate quality, second candidate quality, or their initial hiring decision. Depressed participants reported greater levels of post-decisional regret at

both times, relative to controls. Regret was especially high after a second candidate high in quality emerged after the first candidate had already been selected. This increased post-decisional regret could contribute to indecisiveness and uncertainty in people with depression in that they might avoid or postpone making decisions in order to also avoid the higher associated regret.

There is also evidence that people with depression perceive risks and benefits differently than people without depression. Pietromonaco and Rook (1987) asked participants to make decisions about common life situations involving sociability, assertion, morality, or finances. Before making each decision, the participants were given several potential risks and benefits that might follow from the decision and evaluated how important, how likely, and how good or bad they believed each one to be. Following the series of decisions, participants were asked how likely they would be to perform specified actions. The depressed participants assigned more weight to potential risks across all problem types than healthy controls. Depressed participants also rated potential benefits as less influential on issues of sociability and were less likely to perform actions related to sociability. Furthermore, when the study was repeated with half the situations reworded to be either self-referent or other-referent, perceptions of risk only contributed to depressed participants decision style for self-referential problems involving sociability and assertive behavior. When making decisions regarding others, depressed participants behaved similarly to non-depressed participants. The increased weight that people with depression give to risks, particularly in social situations, could have negative consequences in their daily life by limiting beneficial social contact.

Interestingly, participants with depression were impaired on the typical ABCD version of the IGT, whereas they showed a normal learning rate on an EFGH version of the IGT (Must et al., 2006). In the ABCD task, participants always won money with each card draw and sometimes also lost money. In the EFGH task, participants always lost money with each card, and sometimes also won money. The authors suggest that the ABCD version investigates the possibility that decision making problems in depression are based on hypersensitivity to reward, with large immediate gains outweighing even larger future losses, while the EGFH version examines the possibility that problems are due to the failure of a high reward to outweigh immediate punishment. The results suggest that participants with depression have an increased sensitivity to reward, which leads them to select from disadvantageous decks with high immediate rewards but even higher future losses.

Anxiety

Description of disorder. The main clinical characteristic of Generalized Anxiety Disorder (GAD) is excessive anxiety and worry for at least 6 months about a number of events or activities. The diagnostic criteria also specify that: (1) the person finds it difficult to control the worry; (2) the anxiety, worry, or physical symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning; (3) the disturbance is not due to the direct physiological effects of a substance or a general medical condition and does not occur exclusively during a mood disorder, a psychotic disorder, or a pervasive developmental disorder; (4) the focus of the anxiety and worry is not confined to features of an Axis 1 disorder such as being embarrassed in public (as in social phobia) or being contaminated (as in

obsessive-compulsive disorder); (5) and the anxiety and worry are associated with three or more of the following symptoms: restlessness or feeling on edge, being easily fatigued, difficulty concentrating or mind going blank, irritability, muscle tension, or sleep disturbance. GAD frequently co-occurs with mood disorders such as MDD, other anxiety disorders such as obsessive-compulsive disorder, and with substance abuse. In a community sample, the 1-year prevalence rate for GAD was 3% and the lifetime prevalence rate was 5%, with females making up about 55-60% of those presenting with the disorder.

Basic cognitive impairments. Neuropsychological findings on the cognitive impairments in people with anxiety disorders have been mixed, partly due to the wide variety of disorders classified more generally as anxiety disorders. A study by Airaksinen, Larsson, and Forsell (2005) examined episodic memory, verbal fluency, perceptual-motor speed, and executive functioning in a sample of participants with anxiety disorders including panic disorder, social phobia, generalized anxiety disorder, obsessive-compulsive disorder, and specific phobia. The authors found that overall participants with an anxiety disorder demonstrated an impairment in episodic memory and remembered fewer words in both free and cued recall compared with healthy controls. Participants with an anxiety disorder also required more time than controls on Part B of the Trail Making Task, a measure of executive function. However, participants specifically with GAD or specific phobia did not have impaired performance in either episodic memory or executive functioning, although there were only 7 participants with GAD. Additionally, verbal fluency and

perceptual-motor speed were unaffected in participants with anxiety compared to controls.

Decision making research. A number of studies have examined the relationship between anxiety and decision making, although many of these involve participants with other co-morbid disorders such as depression or substance abuse. One study focused specifically on decision making in people with generalized anxiety disorder utilized both a standard and modified version of the IGT (Mueller, Nguyen, Ray, & Borkovec, 2010). In the modified version of the IGT, the long-term advantageous decks had high consistent losses with proportionally higher inconsistent rewards, while the long-term disadvantageous decks had low consistent losses and proportionally smaller inconsistent rewards. Mueller et al. (2010) found that compared to healthy controls, participants with GAD learned significantly faster to avoid decks associated with long-term loss. This effect was observed in both the standard version of the IGT, in which long-term loss was due to decisions associated with a larger probability of high punishments, and in the modified version, in which long-term loss was due to decisions associated with a smaller probability of high rewards. These findings support the hypothesis that GAD is associated with an enhanced sensitivity for unpredictable long-term loss and suggests that decision making in GAD is long-term oriented.

A series of studies by Maner et al. (2007) also investigated the possible link between anxiety and risk-avoidant decision making. Participants in the first two studies completed the Balloon Analog Risk Task (BART), in which 15 different virtual balloons are blown up. Each pump of the balloon earns points towards

rewards, however each balloon also has an explosion threshold. If the explosion threshold is reached, all of the points earned for that particular balloon are lost. Maner et al. (2007) found significant relationships between BART performance and social anxiety, trait anxiety, and worry, such that more anxious participants exhibited more risk-avoidant behavior. The third study involved participants with anxiety disorders, mood disorders, and learning disorders, and utilized a 14-item version of the risk-taking behaviors scale to assess participants' willingness to engage in risk decision making. In addition to reporting significantly greater risk-aversion than non-clinical controls, participants with anxiety disorders were also more inclined to avoid risks than participants with mood disorders or learning disorders.

Summary of introduction

Few studies have looked specifically at decision making among individuals with clinical disorders of affect regulation. Further systematic study involving the presentation of similar decision tasks across clinical diagnostic categories, and use of a wider variety of decision tasks, is needed in order to better understand decision making in individuals with disorders of affect regulation. Thus far, neuropsychological findings on disorders of affect regulation have been mixed, with some studies pointing to numerous cognitive impairments while other studies find no impairments relative to healthy controls. Most of the reported difficulties among individuals with disorders of affect regulation seem to relate to impulsivity and sensitivity to negative affective stimuli, especially among those with BPD and PTSD, respectively. Most studies use the IGT to investigate decision making and show similarly impaired behavior in individuals with BPD (Haaland et al., 2007) and

depression (Must et al., 2006). Conversely, one known study found that people with GAD performed better on the IGT than healthy controls (Mueller et al., 2010), further complicating the relationship between affect regulation and decision making. Another difference between the groups might be that depressed individuals show more cognitive differences in interpreting stimuli and, in some ways, demonstrate less impulsive and more indecisive behavior (e.g. Lewicka, 1997; Monroe et al., 2005). The findings suggest that difficulties in decision making might be limited to decision tasks like the IGT among individuals with disorders of affect regulation and not to other kinds of decision-related skills, possibly with the exception of depression. However, is it difficult to determine if this is the case because so few studies have considered the separate contributions of traumatic stress, borderline, depression, and anxiety symptoms to decision making behavior.

Overview of Study

The goal of the present study was to assess decision competencies among individuals with affect dysregulation across tasks requiring a broader set of decision skills than in previous studies. The focal task was the Adult Decision Making Competence Scale (ADMC; Bruine de Bruin, Parker, & Fischhoff, 2007), a recently developed test of decision competence with six subscale areas of decision making: resistance to framing, recognizing social norms, under/overconfidence, applying decision rules, consistency in risk perception, and resistance to sunk costs. These areas of decision competence are based on common errors of decision making that have been documented in decision research with the general population. This scale has been used with both adults and adolescents (Parker & Fischhoff, 2005) to assess

individual differences in decision competence in the general population (for adults, the scale was validated with a sample of 360 adults 18 – 88 years old), and thus adult norms are available. Competence test scores have been found to be negatively associated with scores on a Decision Outcomes Inventory (DOI; Bruine de Bruin, Parker, and Fischhoff, 2007), a checklist of bad decision outcomes that one might have encountered in his or her life and that range from minor (e.g., accidentally locking oneself out of one's house) to more serious (e.g., being convicted of a crime), suggesting face validity. The dimensions of the competence scale are not clearly dependent on affective processing in the way that, for example, the Iowa Gambling Task has been suggested to be. As such, use of the scale has the potential to indicate both whether other types of impairments exist across disorders, and also whether the competency scale can capture decision difficulties that might have origins in affect dysregulation. In addition, participants were administered the Decision Outcome Inventory, the Indecisiveness Scale (IS; Frost & Shows, 1993)—a self-report measure of indecisiveness—and a computerized version of the Iowa Gambling Task (Bechara, Damasio, Damasio, & Anderson, 1994). The Indecisiveness Scale was included because it has previously been shown to be related to depression and anxiety and because related measures predict sensitivity to sunk costs in the ADMC.

The participants in this study were adult women from the central Connecticut community who responded to an advertisement for volunteers who had been exposed to trauma and were experiencing symptoms of affect dysregulation (e.g., mood swings). The Personality Assessment Inventory (PAI; Morey, 2007), a standard self-report measure containing subscales for traumatic stress as an anxiety related

disorder, borderline personality, depression, and anxiety, as well as drug and alcohol use, was administered to all individuals at the start of the study to assess degree of symptoms. In the future, age-matched control participants will be recruited for comparison with the trauma-exposed group but, in the present report, published adult norms on decision tasks were used for comparison. Of central interest here was the comparison of decision task performance of trauma-exposed individuals to the published adult norms. Additionally, regression analyses were conducted to assess the relationship between performance of the trauma-exposed adults and comorbid symptoms of depression, anxiety, and borderline personality, as well as history of alcohol and drug.

Methods

Participants

Adult participants were recruited from the greater Middletown, CT community through advertisements placed in local newspapers. The advertisements sought women 18 and over who had experienced a traumatic event, had mood swings or angry outbursts, or behaved impulsively. Sixteen women responded to and participated in the study (*M* age = 35.38, *SD* = 9.13, range = 23-50) and were paid $8 per hour for participation. They came to the lab 2-3 times for 1.5-2.5 hours per session to complete the tasks for the present study, which were interleaved with tasks of unrelated studies. These participants took the PAI, which contains clinical scales that correspond to psychiatric diagnostic symptoms, including subscales associated with traumatic stress, BPD, depression, and anxiety, and all participants had clinically relevant elevated symptoms on at least one of these subscales. A group of 16 age-

matched controls from the community will be recruited for participation in the full study, but published adult norms for the ADMC and IGT are used for comparison here.

Materials

Personality Assessment Inventory. The PAI is a self-administered personality test presented on a computer and designed to provide information on clinically relevant variables (Morey, 2007). It consists of 344 items answered on a four-point scale of Totally False, Slightly True, Mainly True, and Very True. For each scale and subscale, raw scores are transformed to *T* scores to provide a relative comparison to a standardization sample of 1,000 adults. *T* scores have a mean of 50 and a standard deviation of 10, with *T* scores greater than 50 representing more severe symptoms and a *T* score of 70 or higher signifying a clinically significant deviation from the mean. Only the 11 scales associated with borderline personality (four subscales: affective instability (BORA), identity problems (BORI), negative relationships (BORN), and self-harm (BORS)), depression (three subscales: cognitive depression (DEPC), affective depression (DEPA), and physiological depression (DEPP)), anxiety (three subscales: affective anxiety (ANXA), cognitive anxiety (ANXC), and physiological anxiety (ANXP)), traumatic stress (one scale: traumatic stress (ARDT)), drug use (one scale: drug problems (DRG)), and alcohol use (one scale: alcohol problems (ALC)) were used in the present study. The questionnaire took approximately 45 min to complete.

Adult Decision Making Competence Inventory. The 134-item inventory (Bruine de Bruin et al., 2007) includes six subsections designed to measure resistance to

framing, recognizing social norms, under/overconfidence, applying decision rules, consistency in risk perception, and resistance to sunk costs. The inventory was presented to participants as a paper booklet, with items grouped by subscale, in a single order. Participants were allowed to complete the ADMC at their own pace. The inventory took approximately 45 min to complete. Subscales of the inventory are as follows:

Resistance to framing (RF) measures whether value assessment is affected by irrelevant variations in problem descriptions. This task includes seven risky-choice problems that present a sure-thing option and a risky-choice option which result in a formally equivalent gain or loss. For example, participants must choose between: (a) saving 600 endangered animals for sure (which implies losing 200 animals) and (b) a 75% chance that 800 animals will be saved, and a 25% chance that no animals will be saved. There are also seven attribute framing items in which one must rate positively and negatively described versions of normatively equivalent events. For example, judging the quality of ground beef labeled 80% lean or 20% fat. The positive and negative frames of both the risky-choice problems and attribute framing items are presented in different sets and separated by other ADMC tasks. Performance was scored here as the mean absolute difference between ratings for the loss and gain versions of each item. Scores were then reverse coded so that a score of 0 represents the worst performance, while a score of 5 represents the best performance.

Recognizing social norms (SN) measures how well one can assess peer social norms. Individuals first judge whether "it is sometimes OK" to engage in each of 16 undesirable behaviors, such as to steal under certain circumstances, and then later

estimate how many "out of 100 people your age" would endorse each behavior. Pretest responses from 72 Wesleyan University students (ages 18 – 24) to the first portion of this task were used to compute the percentage of participants who endorse each behavior. Adult performance was then measured as the rank-order correlation between the actual percentage and estimated percentage of endorsements across the 16 behaviors. Possible scores ranged from -1 – 1, with a score of 1 representing the best performance.

Under/overconfidence (CAL) measures how well individuals recognize the extent of their own knowledge. Individuals indicate whether each of 34 statements is true or false, for example, "alcohol causes dehydration," and then rate their confidence in that answer on a scale from 50% to 100%. The statements were randomly chosen from 17 different *Complete Idiot's* guides on varied topics and were selected by two independent judges as decision relevant and falsifiable. Performance was measured as one minus the absolute difference between mean confidence and percentage correct across items so that higher scores reflect better performance, with a highest possible score of 1.

Applying decision rules (DR) has individuals indicate which of five DVD players they would buy for hypothetical individual consumers using different specific decision rules. For example, individuals are presented with a grid consisting of ratings of the DVD players on four attributes and told, "LaToya only wants a DVD player that got a 'Very High' rating on Reliability of Brand. Which one of the presented DVD players would LaToya prefer?" Performance was measured as the percentage of items for which the correct DVD players are chosen, using the decision rule to be

applied. Higher scores represent better performance, with a score of 1 equal to perfect performance.

Consistency in risk perception (RP) measures ability to follow probability rules. Individuals judge the chance of 10 events happening to them on a linear scale ranging from 0% to 100%. Events include, "What is the probability that you will get into a car accident while driving." The probability of each event is judged twice: for the next year and for the next 5 years. Each time frame pair is scored as correct if the probability for the even happening the next year is less than or equal to it happening in the next 5 years. Additionally, for each time frame, three item pairs are presented as nested subset and superset events. To be scored as correct, the probability of a subset event should not exceed that of its superset event. Finally, in each time frame, two item pairs present complementary events and responses to each pair are scored as correct if their combined probability is 100%. Scores are then calculated as the percentage of correct responses, with 1 being a perfect score.

Resistance to sunk costs (SC) measures the ability to ignore prior investments when making decisions. Individuals are given 10 scenarios and use a rating scale ranging from 1 (most likely to choose [the sunk-cost option]) to 6 (most likely to choose [the normatively correct option]). Performance was calculated as the average rating across the 10 scenarios, with 6 representing the best possible score and 1 representing the worst possible score.

Decision Outcomes Inventory. The DOI (Bruine de Bruin et al., 2007) is a self-report measure of avoiding negative decision outcomes. It consists of 41 negative decision outcomes, such as "received a DUI for drunk driving," and 35 of the

outcomes are preceded by a question asking whether participants had made decisions that would make that outcome possible, such as "had an alcoholic drink." The overall DOI score was calculated by weighting each negative outcome that a respondent could have experienced by the proportion of participants who haven't experienced it, since more severe outcomes are generally less frequent than less severe ones. The average score across items is then subtracted from zero so that higher scores reflect better outcomes.

Indecisiveness Scale. The 15-item Frost and Shows' (1993) Indecisiveness Scale was presented as a self-report decision making questionnaire. Participants determined how much they agreed with each statement, such as "I try to put off making decisions," and responded on a Likert scale ranging from 1 (Highly agree) to 5 (Highly disagree). Scores were calculated as the average rating across items, with higher scores corresponding to greater indecisiveness.

Iowa Gambling Task. In the IGT task (Bechara et al., 1994), individuals are presented with four decks of cards on a computer screen and asked to select a card from any of the decks, one at a time. In response to each card, the individual is presented on the screen with a numerical monetary gain and loss value based on the deck and the card's position in the deck according to a schedule unknown to the individual. After some cards, individuals are both given money and lose money. Individuals are allowed to choose from any deck at any time, with the ultimate goal of maximizing their profit. Two of the four decks are "advantageous," resulting in a net gain over time, while the other two decks are "disadvantageous" and result in a net loss over time. Individuals continue choosing cards for 100 trials and performance is

evaluated based on the number of selections from "good" decks (Decks A and B) minus the number of selections from "bad" decks (Decks C and D) (see Appendix for complete gain and loss list for each deck and trial). Deck A always had a gain of $100 and had small but frequent losses of $150-$350. Deck B also always had a gain of $100, but had a less frequent loss of $1250. A participant would have a net loss of -$2,500 if she only selected cards from Deck A or only selected cards from Deck B for the 100 trials. Deck C always had a gain of $50 and had small but frequent losses of $25-$75. Deck D also always had a gain of $50, but had a less frequent loss of $250. A participant would have a net gain of $2,500 if she only selected cards from Deck C or only selected cards from Deck D for the 100 trials. The task took approximately 15 minutes to complete.

Procedure

The Wesleyan University Institutional Review Board approved this study. On each visit to the lab, participants gave their written informed consent and then took a urine drug-screening test for use of THC, cocaine, methamphetamine, opiates, and amphetamines. The PAI and IGT were administered on a computer, while the ADMC, DOI, and IS were paper questionnaires. A short debriefing questionnaire was also administered following the IGT to assess participants' understanding of the task. Participants came to the lab for up to 3 hours at a time to participate in these and other tasks in the lab. All participants first received the PAI. All other materials were administered with the goal of alternating paper questionnaires and computerized tasks to keep participants engaged and to fit tasks into the time available to the participant

on each occasion. The only constraint in administering tasks was that two decision-related tasks were never presented next to one another.

Results

Of the 16 participants, four did not complete the ADMC and DOI, three did not complete IS, and one did not complete the IGT because they did not return to do the tasks by the project deadline. Participants were included in all analyses for which they completed tasks. Additionally, two participants tested positive for cocaine, two tested positive for marijuana, one tested positive for methamphetamine and opiates, and one tested positive for cocaine and opiates in the drug screening at the time of the study. Results were analyzed with and without the current drug users, but no statistically reliable differences were found between the groups. All reported analyses include drug users and all patterns should be assumed to be the same without the drug users, except where noted.

Personality assessment inventory subscales

Descriptive statistics for the 11 PAI subscales are shown in Table 1, as well as the number of participants who had extreme scores. As would be expected, most participants had a score of 70 or higher on the ARDT subscale, which assesses trauma traumatic stress. The majority of participants also had a score of 70 or higher on at least one subscale measuring symptoms of anxiety, depression, and borderline personality disorder. Interestingly, only one participant had a score over 70 related to alcohol use, and the mean for the participants was close to the published community mean of 50.

Table 1
Descriptive statistics for PAI subscales

	M	SD	X > 70
ANXA	71.1	16.3	50%
ANXC	71.4	13.2	69%
ANXP	72.8	16.0	63%
ARDT	79.4	17.3	81%
DEPC	65.4	16.4	31%
DEPA	74.1	17.7	56%
DEPP	69.5	9.1	38%
BORA	67.8	14.9	56%
BORI	70.9	15.3	63%
BORN	73.4	13.4	69%
BORS	59.1	18.9	31%
ALC	51.8	8.7	6%
DRG	72.0	20.0	50%

Notes. N =16. X > 70 refers to percentage of Ps with clinically significant score.

Significant correlations were found between almost every subscale, with the exception of the alcohol and drug use scales, as shown in Table 2. The alcohol use scale was not correlated with any of the other PAI subscales, and the drug use scale was only correlated with the self-harm subscale of BPD. The high correlations among affect-related scales illustrate the strong positive relationship among different symptoms of affect regulation and are consistent with reported co-morbidity among disorders.

Table 2
Correlations between PAI subscales

	ANXA	ANXC	ANXP	ARDT	DEPC	DEPA	DEPP	BORA	BORI	BORN	BORS	ALC
ANXC	.926											
	.000*											
ANXP	.785	.808										
	.000*	.0008										
ARDT	.717	.609	.451									
	.002*	.012*	.080									
DEPC	.645	.558	.512	.660								
	.007*	.025*	.043*	.005*								
DEPA	.659	.622	.336	.480	.772							
	.005*	.010*	.203	.060	.000*							
DEPP	.734	.555	.356	.786	.680	.718						
	.001*	.026*	.176	.000*	.004*	.002*						
BORA	.666	.747	.383	.524	.617	.855	.604					
	.005*	.001*	.143	.037*	.011*	.000*	.013*					
BORI	.730	.771	.624	.747	.804	.708	.611	.803				
	.001*	.000*	.010	.001*	.000*	.002*	.012*	.000*				
BORN	.588	.618	.348	.634	.824	.735	.592	.773	.853			
	.017*	.011*	.187	.008*	.000*	.001*	.016	.000*	.000*			
BORS	.621	.606	.639	.313	.540	.512	.533	.527	.531	.397		
	.010*	.013*	.008*	.238	.031*	.042*	.034	.036*	.034*	.128		
ALC	-.252	-.071	-.136	-.020	.187	.068	-.237	.199	.142	.234	-.039	
	.346	.794	.615	.943	.488	.801	.376	.460	.600	.382	.886	
DRG	.223	.286	.172	.150	.434	.378	.333	.417	.335	.394	.764	.304
	.406	.283	.524	.579	.093	.149	.207	.108	.205	.131	.001*	.253

Notes. N =16*;* Bottom value is significance level; *$p < .05$.

Decision making competence scales

There were no significant differences in the means of any of the ADMC components between the studied clinical population and published control data by Bruine de Bruin et al. (2007). The values in Table 3 show that the clinical participants performed remarkably similar to controls on every measure. Participants did,

however, have significantly lower scores for the DOI than controls, signifying that the participants experienced more negative decision outcomes than controls.

Table 3
Descriptive Statistics of ADMC Components, DOI, and IS

ADMC component	Potential Range	Observed Range	M	SD	Norm M	Norm SD	*t*	*p*
Resistance to Framing	0.00-5.00	2.21-4.64	3.58	0.73	3.72	0.61	0.68	.513
Recognizing Social Norms	-1.00-1.00	0.09-0.62	0.33	0.15	0.33	0.26	0.01	.993
Over/Under Confidence	0.00-1.00	0.69-0.97	0.89	0.08	0.91	0.08	-0.98	.347
Decision Rule Use	0.00-1.00	0.10-0.80	0.45	0.23	0.44	0.24	0.15	.882
Perception of Risk	0.00-1.00	0.45-0.85	0.67	0.12	0.70	.016	-0.82	.430
Resistance to Sunk Cost	1.00-6.00	3.90-5.10	4.39	0.36	4.40	0.77	-0.07	.956

DOI	-1.00-0.00	-0.57--0.18	-0.36	0.14	-0.15	0.11	5.37	.000*
IS	1.00-5.00	2.33-4.60	3.06	0.79	2.56	0.88	2.28	.042*

Notes. $N = 12$; For all ADMC components, higher numbers reflect better performance. For the DOI, higher numbers reflect fewer poor decisions. For IS, higher numbers reflect greater indecisiveness; $*p < .05$.

As shown in Table 4, no correlations among subscales of the ADMC were found, except for a negative correlation between over/underconfidence and resistance to

sunk costs. The correlations between total IGT score and resistance to framing, and IGT score and DOI were also marginally significant. Unlike past work, there was no reliable correlation between ADMC scale scores and DOI, although the correlation between the resistance to framing measure and the DOI was marginally significant.

Table 4
Correlations between decision making measures

	RF	SN	CAL	DR	RP	SC	DOI	IS
SN	-.484							
	.111							
CAL	-.322	.272						
	.308	.392						
DR	-.213	.454	.022					
	.507	.139	.946					
RP	.319	-.229	.426	.348				
	.313	.474	.167	.267				
SC	.050	-.477	-.686	.016	-.107			
	.878	.117	.014*	.961	.740			
DOI	.551	-.415	-.275	-.417	.135	.052		
	.063	.180	.388	.177	.675	.871		
IS	.203	-.160	-.018	-.165	-.155	-.500	.151	
	.528	.620	.956	.608	.631	.098	.622	
IGT	.526	-.369	-.330	-.114	.249	.087	.538	.102
	.097	.265	.322	.739	.461	.800	.071	.752

Notes. N =12; Bottom value is significance level; *$p < .05$.

Correlations between decision making measures and clinical measures are shown in Table 5. Significant negative correlations were found between both the cognitive and affective anxiety subscales and recognizing social norms, while significant positive correlations were found between the DOI and cognitive depression, affective depression, affective instability, self-harm, and drug use subscales. A significant positive correlation was also found between physiological anxiety and resistance to framing. A stepwise linear regression model using DOI score as the response variable

and all of the PAI subscale scores as predictor variables, found that DOI score is predicted only by the drug use subscale score (DOI = -.087 + .006*DRG; $t(11) = 6.47$; $p < .001$) when $p < .05$ is used as a cutoff for inclusion in the model.

Table 5
Relationship between clinical scales and task performance

	RF	SN	CAL	DR	RP	SC	DOI	IGT	IS
ANXA	.250	-.602	-.156	.075	.287	.192	.369	.269	.200
	.434	.038*	.628	.818	.365	.550	.215	.332	.513
ANXC	.431	-.620	-.223	.095	.356	.195	.428	.203	.292
	.162	.032*	.486	.769	.256	.544	.145	.467	.333
ANXP	.580	-.471	-.169	.043	.246	-.057	.301	.294	.395
	.048*	.123	.600	.896	.441	.861	.318	.288	.182
ARDT	.141	-.228	.139	-.009	.302	-.298	.321	.476	.321
	.663	.476	.667	.977	.340	.347	.285	.073	.284
DEPC	.302	-.449	-.270	-.135	.017	-.046	.579	.627	.565
	.340	.143	.397	.675	.957	.887	.038*	.012*	.044*
DEPA	.223	-.557	-.263	-.044	.080	.140	.560	.125	.468
	.487	.060	.408	.892	.805	.664	.047*	.658	.107
DEPP	.053	-.218	.065	.139	.197	-.126	.389	.290	.137
	.870	.495	.840	.666	.540	.696	.189	.294	.656
BORA	.235	-.432	-.093	.053	.237	-.035	.579	.086	.520
	.463	.162	.775	.870	.457	.914	.038*	.761	.069
BORI	.435	-.545	-.032	-.074	.332	-.207	.472	.478	.685
	.157	.067	.922	.818	.292	.519	.104	.071	.010*
BORN	.243	-.379	-.325	.134	.195	.068	.478	.549	.514
	.447	.224	.302	.678	.544	.834	.099	.034*	.072
BORS	.530	-.422	-.029	-.278	.198	-.086	.672	.197	.144
	.076	.172	.928	.381	.538	.791	.012*	.481	.638
ALC	.516	.031	-.266	-.279	-.038	-.144	.497	.299	.259
	.086	.923	.403	.379	.906	.654	.084	.279	.392
DRG	.377	-.246	-.247	-.495	-.120	.051	.890	.269	.058
	.228	.440	.439	.102	.710	.874	.000*	.333	.850

Notes. $N = 12$; Bottom value is significance level; $p < .05$.

Iowa gambling task performance

Although clinical participants performed similarly to controls on the ADMC, they demonstrated deficits on the IGT relative to control data published by Tranel, Bechara, and Denburg (2002). Performance by block is shown in Table 6. Although

the participants performed better than the controls during the first block of 20 trials, they performed significantly worse than controls during the fourth and fifth blocks as well as overall. A repeated-measures ANOVA was conducted comparing scores by block for participants in the present study and showed no significant difference between them ($F(4,56) = 1.33$, $MSE = 27.58$, $p = .270$), indicating that participants' performance did not significantly change over the course of the 100 trials. While the ANOVA was not statistically significant, the block means suggest that participants generally moved towards the "good" decks during exploration, before then moving back to the "poor" decks for the final blocks. None of the participants demonstrated a steady learning pattern similar to controls. One participant showed improvement across the first four blocks, followed by a steep decline in the fifth block, possibly due to loss of interest in the task. A second participant showed evidence of learning across the last three blocks, with scores going from -6 to +4. Additionally, a third participant had a positive score for four of the five blocks of trials, suggesting that she understood which decks were advantageous and which were not.

Participants also completed a short questionnaire after the IGT that asked the following questions: (1) How did you decide which decks to choose? Did you have a strategy of any kind? Did your behavior change over time? (2) Which decks were better and worse? Explain your response if you can. (3) When playing the game, what information did you most pay attention to? (4) If there is anything else you would like to tell us, please do so here. Most participants stated that they didn't have a specific strategy but that they just chose from the decks randomly or based on a "feeling." Such responses included, "[My] strategy was not working so I went for safe bets, then

I got greedy and then I lost it all then I just picked any card because I realized it was just luck," and "I started feeling angry and so [I] sped up my choices making less rational choices because I felt frantic to get my money back." Some participants also felt that certain decks were better than others, with five participants accurately believing that decks A and/or B were disadvantageous and with five separate participants believing that decks C and/or D were advantageous. Despite appearing to recognize which decks would provide the most money, only one of the aforementioned participants showed evidence of learning during the task.

Table 6
Score by 20-Trial Block on the Iowa Gambling Task

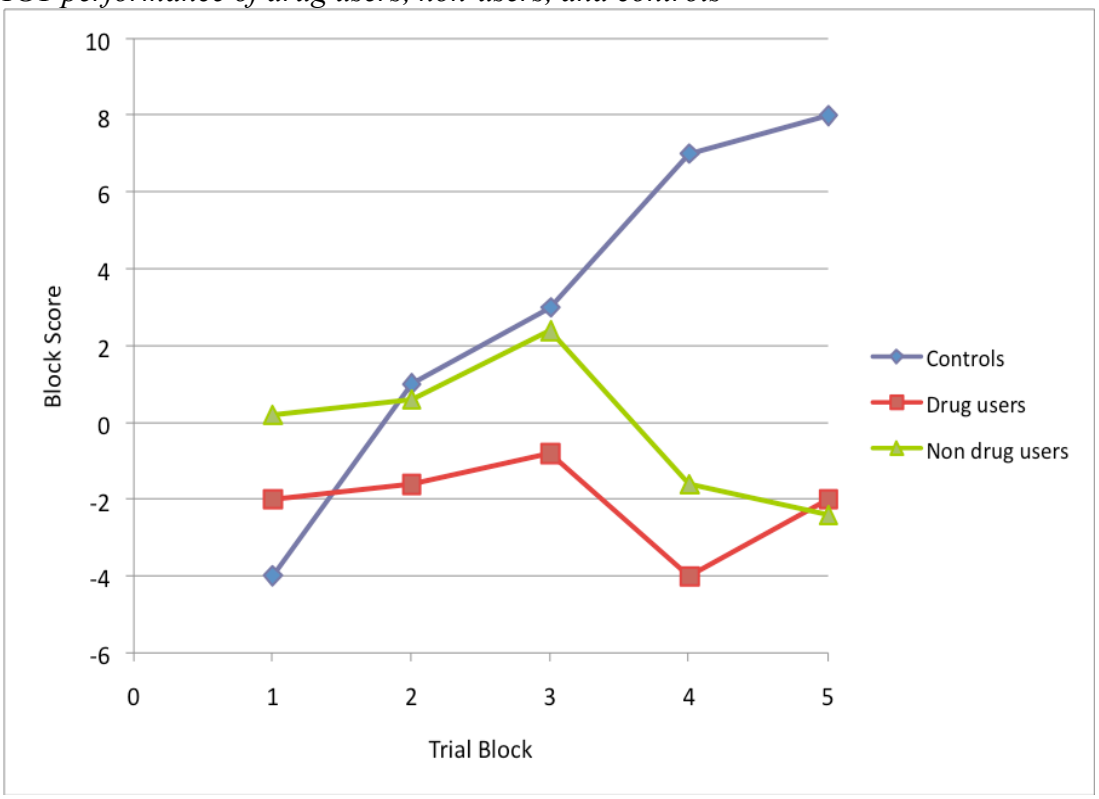
	Block 1	Block 2	Block 3	Block 4	Block 5	Total Score
Observed Range	-10.00-8.00	-12.00-12.00	-14.00-12.00	-16.00-12.00	-14.00-14.00	-50.00-44.00
M	-0.53	-0.13	1.33	-2.40	-2.27	-4.00
SD	5.04	5.32	7.47	6.33	7.05	21.09
Norm M	-4	1	3	7	8	15
t	2.66	-0.83	-0.86	-5.75	-5.64	-3.49
p	.019*	.423	.402	.000*	.000*	.004*

Notes. $N = 15$; $*p < .05$.

Correlations between clinical measures and the IGT are listed in Table 5 and indicate a positive correlation between IGT score and cognitive depression and between IGT score and negative relationships. Additionally, a stepwise regression showed that total IGT score is predicted by cognitive and affective depression, giving

an equation of IGT score = -35.01 + 1.62*DEPC – 1.01*DEPA (for DEPC: $t(14) = 5.22$, $p < .001$; for DEPA: $t(14) = -3.50$, $p = .004$; for full model $F(2,12) = 13.94$, $MS = 156.06$, $p = .001$). There was no relationship between performance on IGT and performance on ADMC tasks but the IGT was a marginally significant predictor of DOI score, as shown in Table 4.

Figure 1
IGT performance of drug users, non-users, and controls



Note. N's = 5 drug users and 10 non drug users.

Participants were separated into two groups based on whether they tested positive for drug use at the time of the study. There were no significant differences between drug users and non-users, and Figure 1 illustrates that both groups demonstrated a similar pattern across trial blocks. Drug users performed significantly worse than controls in block 4 ($t(4) = -6.574$; $p = .003$), block 5($t(4) = -7.906$; $p = .001$), and overall ($t(4) = -3.912$; $p = .017$). Non drug users were significantly better than

controls in block 1 ($t(9) = 2.366$; $p = .042$), were significantly worse than controls in block 4 ($t(9) = -3.699$; $p = .005$), and block 5 ($t(9) = -3.833$; $p = .004$), and were marginally worse than controls overall ($t(9) = -2.104$; $p = .065$). Additionally, drug users and non-drug users did not have significantly different DOI scores ($t(11) = -.468$; $p = .649$).

Additional analyses

The mean indecisiveness score of the current participants was significantly higher than a control group of Wesleyan University students, meaning the participants were more indecisive than the Wesleyan students (see Table 3). Additionally, in the present work correlations were found between indecisiveness scale scores and cognitive depression and identity problem subscales, but indecisiveness was not related to ADMC or IGT or DOI scores (see Table 4). There was a marginally significant negative correlation between indecisiveness and the ADMC component of sensitivity to sunk costs, indicating that more indecisive participants tended to be more sensitive to sunk costs, consistent with past work. A stepwise regression analysis showed that only the identity problem subscale was a significant predictor of indecisiveness: IS score = .70 + .03*BORI; $t(12) = 3.12$; $p = .010$.

Discussion

This study investigated scenario-based and activity-based decision behaviors in a population of women with a history of trauma exposure and current symptoms of affect dysregulation, including borderline personality symptoms, traumatic stress, depression, and anxiety. Surprisingly, decision making deficits were found in this clinical population compared to controls in action-oriented but not scenario-based

cognitive tasks. For every component of the ADMC, participants performed extremely similar to published control data. This was not the case for the IGT, in which participants demonstrated significant impairments relative to controls. While the controls demonstrated a tendency to pick more from the advantageous decks as the task went on, the participants did not show this same pattern. This difference in performance was not simply due to the presence of drug users in the clinical group, since the participant's still performed worse than the controls when the drug users were excluded from the analysis. The striking differences between participants and controls on the IGT suggest that trauma exposure and resulting affect-dysregulation is manifested most strongly in action-based decision tasks. IGT performance was positively related to DOI performance, even though overall group differences were only marginally significant. Trauma-exposed individuals also had significantly lower DOI scores than the population at large, which was also not merely due to drug use given that the drug users and non-users did not have significantly different means. The DOI scores of participants were, however, predicted by the drug use subscale score, which measures lifetime drug usage. None of the ADMC scores were related to DOI performance for participants, unlike controls, for whom the DOI was significantly correlated with all of the ADMC components except resistance to framing.

Overall, the findings are consistent with past work in that they suggest that individuals with disorders of affect regulation do not have significant global impairments in neuropsychological functioning (e.g. Kunert et al., 2003; Twamley et al., 2004) but are impaired on the IGT compared to controls (e.g. Haaland et al.,

2007; Keri et al., 2006). However, the dramatic dissociation in performance on the ADMC and IGT is nonetheless surprising. Haaland et al. (2007) found that while participants with BPD were impaired on the IGT compared to controls, they did show improvement over the task, albeit their level of improvement was far less than that of controls. This is somewhat in contrast to the current findings, in which participants showed a small amount of improvement over the first three blocks, but then preferred the disadvantageous blocks for the last two decks. Must et al. (2006) found that participants with depression were impaired compared to controls on the standard version of the IGT, but showed a normal learning rate on a modified version in which participants lost money with each card and sometimes also won money. In line with these results, participants with depression in the current study were impaired on the IGT compared to controls, although the cognitive depression subscale of the PAI was positively correlated with IGT score, indicating that participants with more severe depression symptoms performed better on the IGT. In contrast to the current results, Mueller et al. (2010) found that participants with GAD learned significantly faster than controls to avoid decks associated with long-term loss on both the standard and modified IGT, leading to better performance. There was no evidence in the current study that participants with any form of anxiety performed better than other participants or better than controls.

The current participants' performance on the ADMC is dramatic in that no differences were found on any of the tasks including resistance to framing, recognizing social norms, under/overconfidence, applying decision rules, consistency in risk perception, and resistance to sunk costs. These tasks were often difficult and

utilized a large number of cognitive abilities and processes; especially working memory, long term memory retrieval, and logical reasoning. However, age and education matched controls from the community are needed to further clarify the results.

One important question that this pattern of results raises is why the participants performed so close to controls on the ADMC yet were greatly impaired on the IGT. Is it simply that the IGT requires engaging in a physical action and actually making decisions, whereas the ADMC involves thinking about how one would decide? Or perhaps the IGT illuminates a more central problem faced by these individuals while making decisions, such as a lack of response inhibition. This hypothesis is supported by work by Rentrop et al. (2008), who showed that people with BPD have difficulties inhibiting inappropriate responses on the Go/Nogo task, and studies by Lawrence et al. (2010), which suggested that people with BPD have a preference for immediate gratification driven by nonplanning impulsiveness. It is possible that a lack of response inhibition or drive for immediate gratification drove the decisions that the participants made throughout the IGT. A drive for immediate gratification could help explain why participants continued to select from disadvantageous decks despite seeming to understand that they would lead to long-term loss. Maybe the participants' desire for immediate gratification outweighed the long-term consequences. Similarly, if the participants lacked adequate response inhibition it could lead to more impulsive choices during the IGT that didn't take in to account their long-term goal of making as much money as possible.

More generally, the participants may process or weight gains and losses differently. Past research by Pietromonaco and Rook (1987) found that depressed participants assigned more weight to potential risks when evaluating common life situations involving sociability, assertion, morality, or finances, than healthy controls did. These results possibly suggest that more depressed people are more sensitive to risks or big losses. In the IGT, the two disadvantageous decks provide larger rewards than the two advantageous decks, but the disadvantageous decks also have larger losses than the advantageous decks. Therefore, being more sensitive to losses would lead to more choices from advantageous decks. The current study seems to support Pietromonaco and Rook's (1987) findings and the hypothesis that, at least compared to other clinical participants, people with depression are more sensitive to future losses rather than immediate gains in the IGT. IGT performance was predicted by an equation of IGT score = -35.01 + 1.62*DEPC – 1.01*DEPA. However, this is somewhat misleading in that both the cognitive and affective depression subscales were positively correlated with IGT performance and performance is essentially related to an average of the cognitive and affective depression scores. Overall, it does suggest that there is something common to trauma exposure and affect dysregulation that impairs performance, but that this is lessened in depressed individuals.

An alternative clinical explanation for the increase in IGT performance with an increase in depression symptoms is that depression is essentially a shutting down in response to the experience of other affective symptoms, and so the effects of them are lessened. Rather than quickly committing to an action, individuals do not build an affective response that leads them to choose one deck over another but, rather, remain

uncommitted. This alternative is supported by previous studies by both Monroe et al. (2005) and Lewicka (1997), which suggested that individuals with depression have an inability to commit to a choice compared to controls.

In contrast, Must et al. (2006) conducted an alternate version of the IGT with depressed participants in which money was always lost with each card and sometimes also won, as described in the introduction. In this instance, the ultimately advantageous decks have higher immediate losses, but larger future gains, while the disadvantageous decks have lower immediate losses but lower future gains. Although in this study depressed participants were impaired on the typical version of the IGT, they showed a normal learning rate on the alternate version, possibly suggesting that people with depression are hypersensitive to reward and that gains are viewed as more salient or important than losses.

The possibility that participants weigh gains and losses differently then raises the question of why they did not appear to do so on the ADMC. One explanation could be that the ADMC is more a measure of what participants believe they should do when making decisions, while the IGT measures what they actually do, and that these two things are not the same. This is supported by the fact that a number of participants expressed knowledge of which decks were "good" and which were "bad" in the IGT, yet still performed poorly. There appears to be a disconnect between what the participants think and their actions related to decision making.

Interestingly in the self-report questionnaire following the IGT, although most participants did not indicate whether they paid more attention to gains or losses, two of them did. The first said that she "paid the most attention to gains, I didn't notice

losses unless they were very large," while the second said "I paid the most attention to the negative amounts." While the first participant had a total IGT score of -4 and a PAI cognitive depression score of 61, the second had a total IGT score of 14 and a PAI cognitive depression score of 69, which is almost one standard deviation higher than the first participant. Although these are only two participants, they support the idea that people with more cognitive depression symptoms are more sensitive to losses and perform better on the IGT.

Also of note is the presence of one extreme outlier on the IGT who obtained a total score of 44, which is much higher than even the average control score. It is surprising that this participant reported that she "just randomly [chose] the deck," although she did remark that "the last one was giving me [a little] money but steady. The first was taking a lot of money in one shot." This participant also had a total PAI depression scale score of 87 and a cognitive depression subscale score of 84, both significantly above the normalized community average of 50 and the third highest scores among all of the clinical participants. Even with this participant removed from the analysis, the correlation between IGT score and cognitive depression is still significant ($r = .579$, $p = .030$).

This study also considered how performance on the tasks was modulated by the degree of different kinds of affect regulation symptoms. All of the participants had symptoms of anxiety, traumatic stress, depression, and/or borderline personality disorder, but they varied in the degree of severity for each disorder. Overall, 13 of the 16 participants had clinically significant scores for traumatic stress. Additionally, all but 1 of the participants had clinically significant scores for one or more subscales

related to anxiety, depression, and borderline personality disorder. Somewhat surprisingly, the participants' mean alcohol use score was little more than the standardized community mean, and only 1 participant had a clinically significant score.

For the ADMC, despite no overall differences between group and published controls, there was a negative correlation between the ADMC measure of recognizing social norms and the PAI subscales of affective anxiety and cognitive anxiety. One potential reason for this is that anxious people are more likely to believe that none of the listed behaviors are acceptable. However, this is unlikely as a follow-up tabulation of the correlation between the number of behaviors marked as acceptable and cognitive anxiety scores was not significant. Another possible explanation is that more anxious people reported that they thought fewer people their age would find each behavior acceptable. This is also unlikely to be the case, since there was no correlation between cognitive anxiety scores and the average number of people a participant said would find each behavior acceptable. The most probable explanation is simply that more anxious people think that different things are acceptable than non-anxious people.

There were no significant correlations between any of the decision making measures, except a negative correlation between the ADMC measures of resistance to sunk costs and over/underconfidence. This is in stark contrast to the results originally published by Bruine de Bruin et al. (2007), in which positive significant correlations were found between all of the ADMC measures except between resistance to sunk costs and resistance to framing and between resistance to sunk costs and

over/underconfidence. However, it is possible that with more participants, these correlations would emerge, even in a clinical population. A larger sample and control group could also assess whether the controls are doing the task differently than the clinical population. There is no evidence in the current study that the participants are always choosing the middle value or that their responses are skewed in any other way, but it's important to compare the patterns of responses across groups.

A stepwise linear regression procedure using DOI score as the response variable and all of the PAI subscale scores as predictor variables, found that DOI score is only predicted by the drug use subscale score. It is possible that the occurrence of clinical disorders such as borderline personality disorder, depression, and anxiety leads to drug use, which in turn leads to poor decisions. The participants also had a significantly lower mean DOI score than controls, meaning that the participants experienced worse outcomes related to decisions they made. Importantly, there were no differences between participants that did and did not use drugs on any of the ADMC measures or the IGT.

Further studies are needed to better understand the pattern of results found here. One study that may be useful would be to use the modified version of the IGT used by Must et al. (2006) with a diverse clinical group. Must et al. (2006) found that participants with depression showed a normal learning rate on the modified IGT, but it is unclear whether participants with anxiety, traumatic stress, or borderline personality disorder would display the same pattern. The modified IGT, in conjunction with the standard IGT, could help clarify the sensitivity of clinical participants to gains and losses. It could also be helpful to use the Go/Nogo paradigm

to examine response inhibition across clinical groups. If it is found that the clinical participants have inadequate response inhibition that could explain why they succeeded at the ADMC but not the IGT. The current study will also be expanded to include the Balloon Analog Risk Task (BART), which could provide a measure of how participants respond to risk and reward. The BART was developed and evaluated by Lejuez et al. (2002) as a behavioral measure of risk taking. Participants are shown a small balloon, balloon pump, button labeled "Collect $$$," a display labeled "Total Earned," and a display listing the money earned on the last balloon labeled "Last balloon" on a computer screen. For each trial, participants click on the balloon pump to inflate the balloon and earn 5 cents for each click. Participants must choose whether to continue inflating the balloon and risk popping it or collecting the money already earned on that trial. If a balloon is inflated past its explosion point, it pops and all the money from that trial is lost. This could help elucidate the reasons for the behavior shown by the participants and whether it relates to an altered perception of risks.

Furthermore, the current results could suggest that the ADMC might focus on only a subset of what makes up good decision making, possibly focusing on cognitive consistency, logical reasoning, and long term memory, but not addressing at all many other important contributors to decision competence. The results suggest that while the task might be a valuable predictor of decision competency, its use maybe should be limited to a subgroup of those without disorders of affect regulation. Further study of these and other clinical groups are needed, as well as comparison of strategies used

during the task, not just overall score, to assess the usefulness of this scale for these groups.

Generally, this work is important because the ability to make sound decisions is vital to almost every aspect of life. It is also important to understand the decision making behavior of clinical groups in order to know how to help improve their decisions. Many people with clinical disorders seek some form of therapy. If a therapist is aware of an individual's specific decision making deficits, maybe he or she could design a treatment plan to address those deficits. Although perhaps not as relevant to the participants currently studied, people with other clinical disorders must often make decisions regarding their treatment or whether to participate in a clinical trial. If they are known to make impulsive decisions that don't adequately consider the future consequences, then it may be best to implement a policy where the future consequences are clearly laid out and the patients have to wait a certain amount of time before making a final decision.

References

Airaksinen, E., Larsson, M., & Forsell, Y. (2005). Neuropsychological functions in anxiety disorders in population-based samples: evidence of episodic memory dysfunction. *Journal of Psychiatric Research, 39*, 207-214.

American Psychiatric Association., & American Psychiatric Association. Task Force on DSM-IV. (2000). *Diagnostic and statistical manual of mental disorders : DSM-IV-TR* (4th ed.). Washington, DC: American Psychiatric Association.

Barnow, S., Arens, E. A., Sieswerda, S., Dinu-Biringer, R., Spitzer, C., & Lang, S. (2010). Borderline personality disorder and psychosis: a review. *Current Psychiatry Reports, 12*, 186-195.

Bazanis, E., Rogers, R. D., Dowson, J. H., Taylor, P., Meux, C., Staley, C., et al. (2002). Neurocognitive deficits in decision-making and planning of patients with DSM-III-R borderline personality disorder. *Psychological Medicine, 32*, 1395-1405.

Campbell, D. G., Felker, B. L., Liu, C. F., Yano, E. M., Kirchner, J. E., Chan, D., et al. (2007). Prevalence of depression-PTSD comorbidity: Implications for clinical practice guidelines and primary care-based interventions. *Journal of General Internal Medicine, 22*, 711-718.

de Bruin, W. B., Parker, A. M., & Fischhoff, B. (2007). Individual differences in adult decision-making competence. *Journal of Personality and Social Psychology, 92*, 938-956.

Eysenck, M. W., & Calvo, M. G. (1992). Anxiety and Performance - the Processing Efficiency Theory. *Cognition & Emotion, 6*, 409-434.

Fava, M., Farabaugh, A. H., Sickinger, A. H., Wright, E., Alpert, J. E., Sonawalla, S., et al.

(2002). Personality disorders and depression. *Psychological Medicine, 32*(6), 1049-1057.

Frost, R. O., & Shows, D. L. (1993). The Nature and Measurement of Compulsive Indecisiveness. *Behaviour Research and Therapy, 31*, 683-692.

Haaland, V. O., & Landro, N. I. (2007). Decision making as measured with the Iowa Gambling Task in patients with borderline personality disorder. *Journal of the International Neuropsychological Society, 13*, 699-703.

Hopper, J. W., Pitman, R. K., Su, Z., Heyman, G. M., Lasko, N. B., Macklin, M. L., et al. (2008). Probing reward function in posttraumatic stress disorder: expectancy and satisfaction with monetary gains and losses. *Journal of Psychiatric Research, 42*, 802-807.

Koso, M., & Hansen, S. (2006). Executive function and memory in posttraumatic stress disorder: a study of Bosnian war veterans. *European Psychiatry, 21*, 167-173.

Kunert, H. J., Druecke, H. W., Sass, H., & Herpertz, S. C. (2003). Frontal lobe dysfunctions in borderline personality disorder? Neuropsychological findings. *Journal of Personality Disorders, 17*, 497-509.

LaGarde, G., Doyon, J., & Brunet, A. (2010). Memory and executive dysfunctions associated with acute posttraumatic stress disorder. *Psychiatry Research, 177*, 144-149.

Lawrence, K. A., Allen, J. S., & Chanen, A. M. (2010). Impulsivity in borderline personality disorder: Reward-based decision-making and its relationship to emotional distress. *Journal of Personality Disorders, 24*, 785-799.

Lejuez, C. W., Read, J. P., Kahler, C. W., Richards, J. B., Ramsey, S. E., Stuart, G. L., et al. (2002). Evaluation of a behavioral measure of risk taking: The Balloon Analogue Risk Task (BART). *Journal of Experimental Psychology-Applied, 8*, 75-84.

Lenzenweger, M. F., Clarkin, J. F., Fertuck, E. A., & Kernberg, O. F. (2004). Executive neurocognitive functioning and neurobehavioral systems indicators in borderline personality disorder: A preliminary study. *Journal of Personality Disorders, 18*, 421-438.

Lewicka, M. (1997). Rational or uncommitted? Depression and indecisiveness in interpersonal decision making. *Scandinavian Journal of Psychology, 38*, 227-236.

Maner, J. K., Richey, J. A., Cromer, K., Mallott, M., Lejuez, C. W., Joiner, T. E., et al. (2007). Dispositional anxiety and risk-avoidant decision-making. *Personality and Individual Differences, 42*, 665-675.

Maurex, L., Lekander, M., Nilsonne, A., Andersson, E. E., Asberg, M., & Ohman, A. (2010). Social problem solving, autobiographical memory, trauma, and depression in women with borderline personality disorder and a history of suicide attempts. *British Journal of Clinical Psychology, 49*, 327-342.

Monarch, E. S., Saykin, A. J., & Flashman, L. A. (2004). Neuropsychological impairment in borderline personality disorder. *Psychiatric Clinics of North America, 27*, 67.

Monroe, M. R., Skowronski, J. J., MacDonald, W., & Wood, S. E. (2005). The mildly depressed experience more post-decisional regret than the non-depressed. *Journal of Social and Clinical Psychology, 24*, 665-690.

Morey, L.C. (2007). The Personality Assessment Inventory professional manual. Lutz, FL: Psychological Assessment Resources.

Mueller, E. M., Nguyen, J., Ray, W. J., & Borkovec, T. D. (2010). Future-oriented decision-making in Generalized Anxiety Disorder is evident across different versions of the Iowa Gambling Task. *Journal of Behavior Therapy and Experimental Psychiatry, 41*, 165-171.

Mueller-Pfeiffer, C., Martin-Soelch, C., Blair, J. R., Carnier, A., Kaiser, N., Rufer, M., et al.

(2010). Impact of emotion on cognition in trauma survivors: What is the role of posttraumatic stress disorder? *Journal of Affective Disorders, 126*, 287-292.

Must, A., Szabo, Z., Bodi, N., Szasz, A., Janka, Z., & Keri, S. (2006). Sensitivity to reward and punishment and the prefrontal cortex in major depression. *Journal of Affective Disorders, 90*, 209-215.

Must, A., Szabo, Z., Bodi, N., Szasz, A., Janka, Z., & Keri, S. (2006). Sensitivity to reward and punishment and the prefrontal cortex in major depression. *Journal of Affective Disorders, 90*, 209-215.

Parker, A. M., & Fischhoff, B. (2005). Decision-making competence: External validation through an individual-differences approach. *Journal of Behavioral Decision Making, 18*, 1-27.

Pietromonaco, P. R., & Rook, K. S. (1987). Decision Style in Depression - the Contribution of Perceived Risks Versus Benefits. *Journal of Personality and Social Psychology, 52*, 399-408.

Raghunathan, R., & Pham, M. T. (1999). All negative moods are not equal: Motivational influences of anxiety and sadness on decision making. *Organizational Behavior and Human Decision Processes, 79*, 56-77.

Rentrop, M., Backenstrass, M., Jaentsch, B., Kaiser, S., Roth, A., Unger, J., et al. (2008). Response inhibition in borderline personality disorder: Performance in a Go/Nogo task. *Psychopathology, 41*, 50-57.

Rogers, R. D. (2003). Neuropsychological investigations of the impulsive personality disorders. *Psychological Medicine, 33*, 1335-1340.

Rossi, A., Marinangeli, M. G., Butti, G., Scinto, A., Di Cicco, L., Kalyvoka, A., et al. (2001).

Personality disorders in bipolar and depressive disorders. *Journal of Affective Disorders, 65*, 3-8.

Ruocco, A. C. (2005). The neuropsychology of borderline personality disorder: A meta-analysis and review. *Psychiatry Research, 137*, 191-202.

Taconnat, L., Baudouin, A., Fay, S., Raz, N., Bouazzaoui, B., El-Hage, W., et al. (2010). Episodic memory and organizational strategy in free recall in unipolar depression: The role of cognitive support and executive functions. *Journal of Clinical and Experimental Neuropsychology, 32*, 719-727.

Twamley, E. W., Hami, S., & Stein, M. B. (2004). Neuropsychological function in college students with and without posttraumatic stress disorder. *Psychiatry Research, 126*, 265-274.

Vasterling, J. J., Duke, L. M., Brailey, K., Constans, J. I., Allain, A. N., & Stuker, P. B. (2002). Attention, learning, and memory performances and intellectual resources in Vietnam veterans: PTSD and no disorder comparisons. *Neuropsychology, 16*, 5-14.

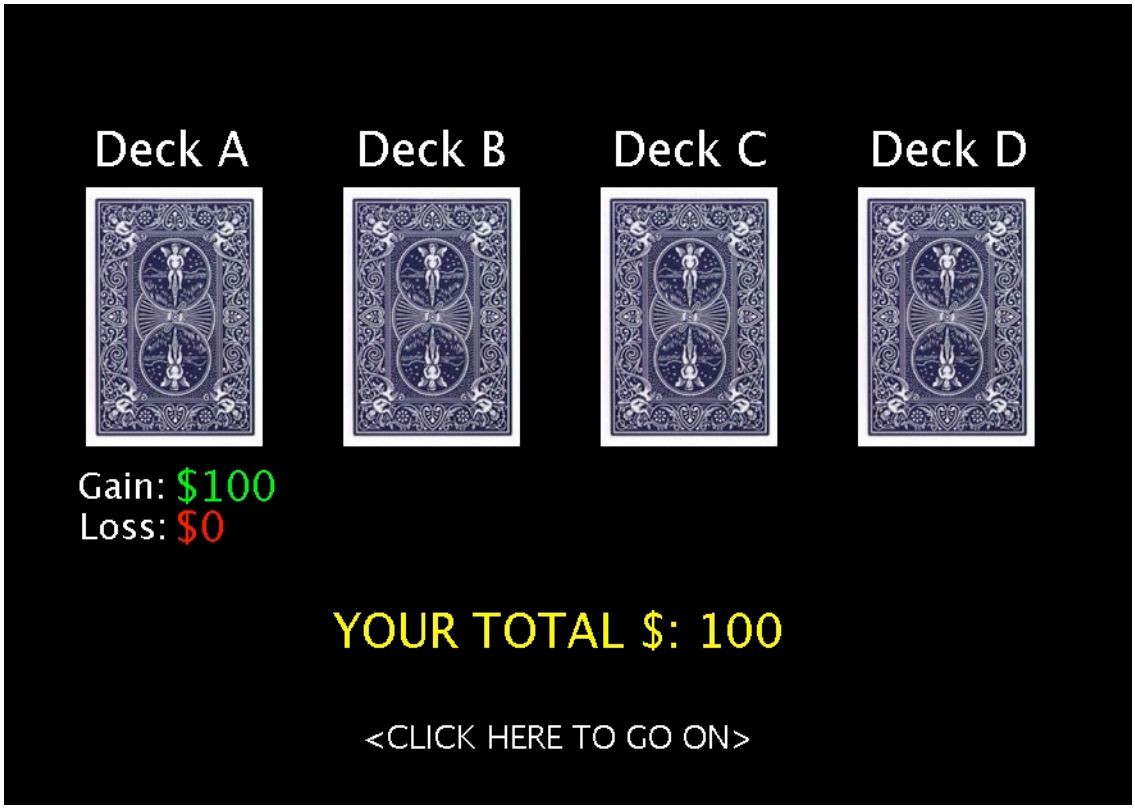
Vythilingam, M., Blair, K. S., McCaffrey, D., Scaramozza, M., Jones, M., Nakic, M., et al. (2007). Biased emotional attention in post-traumatic stress disorder: a help as well as a hindrance? *Psychological Medicine, 37*, 1445-1455.

Werner, N. S., Duschek, S., & Schandry, R. (2009). Relationships between affective states and decision-making. *International Journal of Psychophysiology, 74*, 259-265.

Yuen, K. S. L., & Lee, T. M. C. (2003). Could mood state affect risk-taking decisions? *Journal of Affective Disorders, 75*, 11-18.

Appendix

Screen Shot of Iowa Gambling Task



Iowa Gambling Task Participant Instructions

Welcome to this card game. In this game, you are starting out with no money and your goal is to try to earn as much money as possible. If you do well, you will receive a small bonus at the end of today's session. How will you make money? You will pick cards, one at a time, from the four decks that appear on the screen. When you pick a card from a deck, you will see how much you've gained, how much you've lost, and how much you have in your winnings. For example, the first card you pick might give you $50 but take away from you $20, resulting in your having $30 in your winnings. Pick cards in any way you like from whichever decks you like until the computer tells you that it is time to stop. If you have questions, ask the experimenter

now. When you are ready to go on to the game, click anywhere on this screen with the mouse button to begin.

Iowa Gambling Task Gains and Losses by Deck

On every trial, Deck A provided a gain of $100. Trials 3, 18, 28, 37, 43, 53, 68, 78, 87, and 93, also had a loss of $150. Trials 7, 15, 26, 32, 47, 57, 65, 76, 82, and 97 also had a loss of $200. Trials 9, 14, 27, 33, 49, 59, 64, 77, 83, and 99 also had a loss of $250. Trials 5, 17, 22, 38, 45, 55, 67, 72, 88, and 95 also had a loss of $300. Trials 10, 12, 24, 31, 50, 60, 62, 74, 81, and 100 also had a loss of $350. All other trials did not have a loss.

Deck B also provided a gain of $100 on every trial. Trials 9, 14, 21, 32, 49, 59, 64, 71, 82, and 99 also had a loss of $1250. All other trials did not have a loss.

Deck C provided a gain of $50 on every trial. Trials 12, 17, 25, 34, 35, 62, 67, 75, 84, and 85 also had a loss of $25. Trials 3, 5, 7, 9, 10, 20, 24, 26, 30, 39, 43, 45, 47, 49, 50, 53, 55, 57, 59, 60, 70, 74, 76, 80, 89, 93, 95, 97, 99, and 100 also had a loss of $50. Trials 13, 18, 29, 37, 40, 63, 68, 79, 87, and 90 also had a loss of $75. All other trials did not have a loss.

Deck D provided a gain of $50 on every trial. Trials 10, 20, 29, 35, 50, 60, 70, 79, 85, and 100 also had a loss of $250. All other trials did not have a loss.

[Note that the full Adult Decision Making Competence Inventory, Decision Outcomes Inventory, and Indecisiveness Scale are omitted from the online version of this thesis.]