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An Investigation Of The Cognitive And Perceptual Mechanisms Involved In Mania-Proneness

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AN INVESTIGATION OF THE COGNITIVE AND PERCEPTUAL MECHANISMS INVOLVED IN MANIA-PRONENESS

by

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Abstract

The present research investigates the cognitive and perceptual mechanisms involved in mania-proneness. Building on the work of Depue and colleagues (Depue & Iacono, 1989; Depue & Zald, 1993) and Gray (1994), which identifies links between the Behavioral Activation System (BAS) and the symptoms observed in mania, this research investigates the hypothesis that people who are prone to mania exhibit cognitive and perceptual biases in information processing when presented with achievement-oriented stimuli both at baseline, and after the receipt of a reward. These hypothesized biases were measured via an affective flanker task, a suboptimal priming task, and a judgment task about the probability of future events. In addition, affect was assessed at baseline and after the receipt of a reward. Results indicate that BAS was related to an enhanced orientation toward positivity and achievement cues. However, the hypothesis that BAS, positive affect, and enhanced achievement orientation are related to mania-proneness was generally not supported. Contrary to prediction, mania-prone participants exhibited higher levels of BIS, more negative affect, more predictions of negative events, and higher levels of threat perception, suggesting an overall propensity toward negative affect. These results are discussed in terms of previous research in this area, heterogeneity observed in Bipolar Disorder, implications for diagnostic classification, and the notion of Bipolar subtypes.

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An Investigation of the Cognitive and Perceptual Mechanisms Involved in Mania-Proneness

Researchers have hypothesized that mania-prone individuals exhibit biases in the processing of information that contains cues of potential rewards. These biases have been explained by conceptual links between the Behavioral Activation System (BAS) and the constellation of behaviors observed in mania. Further examples of these types of associations are found in the literature documenting cognitive and perceptual biases found in people with mental disorders.

In this paper, I first begin by describing mania: I summarize the literature regarding the etiology and course of mania, describe mania and hypomania according to DSM IV-TR diagnostic criteria, and summarize the negative consequences associated with mania. Next, I describe the theoretical and empirical links between the Behavioral Activation System and mania. Then, I describe the cognitive and perceptual biases that have been observed in the general domains of affect and psychopathology. Finally, I describe the present research, and how I elucidated the cognitive and perceptual mechanisms involved in mania-proneness by using a series of cognitive and perceptual combined with a measurement of affect, both in a baseline measurement and after the receipt of reward feedback.

What We Know About Bipolar Disorder and Mania

The consequences of mania and bipolar disorder to the individual and to society are substantial. A study by Angst and colleagues found that people with Bipolar Disorder were 12 times more likely to commit suicide than people in the general population

(Angst, Stassen, Clayton, & Angst, 2002). Furthermore, relapse rates are high. Even when receiving pharmacological treatment, one-third of Bipolar patients relapse within 3 years (Keller, Lavori, Kane, Gelenberg, Rosenbaum, Walzer, et al., 1992), and when medication compliance is less than perfect (as is often observed in Bipolar patients), the relapse rate increases to two-thirds within a 2-year time period (Silverstone, McPherson, Hunt, & Romans, 1998). Even when a therapeutic dose of medication is maintained, many patients with Bipolar Disorder experience severe symptoms nevertheless (Keller, et al., 1992).

Bipolar Disorder is also responsible for significant occupational impairment. According to Murray and Lopez (1996), Bipolar Disorder is the sixth leading cause of disability worldwide among both medical and psychiatric disorders, and episodes of mania are typically followed by high rates of continuing unemployment (Harrow, Goldberg, Grossman, & Meltzer, 1990). According to Wyatt and Henter (1995), the fiscal costs associated with adult Bipolar Disorder were estimated to be $45 billion in 1991. In addition, a study by Harrow and colleagues revealed that between 40-50% of people with Bipolar Disorder experience severe decrements in the domains of occupational and social functioning (Harrow, Goldberg, Grossman, Meltzer, 1990).

One of the challenges associated with understanding Bipolar Disorder and mania is that there is a considerable amount of variability associated with the types of symptoms each individual experiences (Johnson, Sandrow, Meyer, Winters, Miller, Solomon, & Keitner, 2000). For example, even though most people consider the hallmark of Bipolar Disorder symptomatology to be a vacillation between episodes of mania and depression,

approximately one fourth of patients with a diagnosis of Bipolar I Disorder never experience an episode of depression (Goodwin & Jamison, 1990).

As with most mental disorders, the role of genes in Bipolar mania has been well-substantiated (Vehmanen, Kaprio, & Loennqvist, 1995), and a twin study by Bertelsen and colleagues revealed a concordance rate of .84 for MZ twins and .35 for DZ twins (Bertelsen, Harvald, & Hague, 1977). However, the role of environment should not be overlooked here. Factors such as expressed emotion (Miklowitz, et al., 1988), life stressors (Ellicott, 1989; Johnson & Miller, 1997), and social support (Johnson, Winett, Meyer, Greenhouse, & Miller, 1999) all appear to play important roles in symptom severity and relapse in Bipolar Disorder. As such, current models of Bipolar Disorder stress the importance of both genes and environment (Johnson & Roberts, 1995).

Bipolar Disorder and Mania according to the DSM

According to the DSM IV-TR (American Psychiatric Association, 2000), mania is defined as a distinct time period of at least a week in which the person experiences a mood state that is elevated, expansive, or irritable. This mood state must be accompanied by additional symptoms, such as inflated self-esteem (i.e., grandiosity), a decreased need for sleep, pressured speech (i.e., speech that is accelerated, difficult to interrupt, and of an increased amount), flight of ideas, distractibility, increased participation in goal-directed activities, psychomotor agitation (e.g., excessive motor activity that is also associated with a feeling of inner tension that is usually unproductive and repetitious, such as pacing, fidgeting, etc.,) and an increased participation in pleasurable activities that also carry with them `a high potential for negative consequences. Hypomania is a less severe version of mania that carries the same symptoms as mania, but these are less severe and

disruptive. For a complete description of the diagnostic criteria required for mania and hypomania, please see Exhibit A. Since mania and hypomania are characterized by the same type of symptoms, in this document, I use the term "mania" to refer to the overall pattern of symptoms found in both diagnoses.

While many people who are experiencing an episode of mania describe the state as being euphoric or pleasantly high, others experience the elevation in mood in the form of irritability. While most euthymic people (i.e., experiencing neither depression nor mania) experience mild periods of good mood in their daily lives, an episode of mania or hypomania is recognized as being excessive by those who know the person well, thus differentiating it from the "normal" mood fluctuations experiencing by most people. In addition, affective lability is frequently observed, and the person may vacillate between periods of euphoria and periods of irritability.

Most people who experience mania also experience a decreased need for sleep. This can range from the person sleeping several hours less than usual and waking up feeling energetic, to the person going days without sleep and not feeling tired. Mania is also associated with changes in cognitive functioning. Thus, people experiencing a manic episode often report having racing thoughts, such that their minds are thinking of multiple thoughts simultaneously, and this often occurs at a rate that is faster than what can be expressed verbally, which can lead to accelerated speech and abrupt topic changes. In extreme cases, speech may become disorganized and incoherent. Distractibility is also reported, and is often the result of an ability to screen out non-essential information, which can lead to disruptions in one's ability to stay on topic and think clearly.

In addition to changes in mood and cognition, people experiencing an episode of mania also exhibit changes in judgment and behavior. This may include an increase in goal-directed activity, such as excessive planning and participation in multiple activities, including activities that are of a sexual or a social nature. In addition, when manic, people may engage in activities that are riskier than what they usually would engage in. Furthermore, people in the throes of mania often do not recognize that they are ill or are behaving in an unusual manner. In conclusion, given the level of debilitating impairment that mania-prone people often experience and the costs associated with mania to society in general, elucidating the mechanisms of mania can be meaningful for our understanding of mania, but also for improving current treatments for mania.

BAS and Mania

One model that attempts to explain the phenomenon of mania is the Behavioral Activation model. Depue and colleagues (Depue & Iacono, 1989; Depue & Zald, 1993) have proposed a model in which the symptoms observed in Bipolar Disorder are the result of increased activity in the Behavioral Facilitation System (BFS), which is akin to the Behavioral Activation System (BAS) proposed by Gray (1990, 1994). Gray's model of the BAS describes a system that regulates the engagement of positive affect and approach behaviors when the individual comes into contact cues of reward or other incentive-related stimuli. By increasing approach behaviors in the face of reward cues, the BAS helps the individual to increase the chances of obtaining these sought-after rewards.

Depue and colleagues (Depue & Iacono, 1989; Depue & Zald, 1993) have argued that the behaviors observed in mania (e.g., grandiosity, euphoric mood, pressured speech,

flight of ideas, increased goal-directed activities, increased involvement in pleasurable activities, decreased need for sleep, etc.) correspond to the behaviors that are thought to be associated with BAS. Gray (1994) described a pattern of low Behavioral Inhibition System (BIS; an anxiety system that is activated by cues of punishment) and high BAS as underlying mania. Indeed, a plethora of studies have investigated this theoretical relationship, and this model has received partial support. In a study by Meyer and colleagues that investigated self-reported BIS and BAS in participants who had been diagnosed with Bipolar I disorder, mania was found to be unrelated to BIS, but BIS was found to be related to current symptoms of depression (Meyer, Johnson, & Winters, 2001). Surprisingly, BAS was found to be unrelated to current mania symptoms, but BAS did predict an intensification of mania symptoms over time. The finding of a lack of association between BIS and mania was also found by an earlier study by Meyer and colleagues (Meyer, Johnson, & Carver, 1999). However, this study also found that BAS accounted for 27% of current mania symptoms in a college student sample (Meyer, Johnson, & Carver, 1999). Finally, in a diary study investigating mood fluctuations, overall self-reported BAS predicted levels of mania, positive affect, and fluctuations in mania (Meyer & Hoffman, 2005).

To test the theoretical link between BAS and mania, some researchers have investigated how mania-prone individuals respond to cues of reward in the environment (for a review, see Johnson, 2005). In a study by Stern and Berrenberg (1979), researchers found that after receiving success feedback, people with a history of hypomania symptoms made more internal attributions for their performance, and were more likely to

expect success on subsequent tasks. Conversely, these effects were not observed in participants who did not have a history of hypomanic symptoms.

Furthermore, Johnson, Ruggero, and Carver (2005) investigated participants' reaction times, affect, expectancy of success on future tasks, and goal setting following reward. They found that symptoms of mania (both current symptoms and a lifetime history of symptoms) were positively related to goal setting after receipt of a reward. In addition, current symptoms of hypomania were also related to positive affect after reward and success expectancy following reward. However, neither current symptoms nor lifetime symptoms of hypomania were related to changes in reaction time following the receipt of a reward. The authors interpret these findings as lending overall support for the model linking BAS to mania, and explain that a failure to find changes in reaction times following reward was likely due to participant limitations in psychomotor skills, rather than being due to a lack of motivation. Another limitation of this study is that history of symptoms and current symptoms of hypomania predicted different outcomes. Because positive affect after reward and success expectancy after reward were only related to current symptoms of hypomania (and not to lifetime symptoms), these findings should be interpreted with caution, as it is possible that they are the result of participants' positive, "activated" mood state rather than reflecting a relationship with a consistent tendency toward hypomania. Further evidence in this direction is the fact that participants' current mania symptoms correlated moderately with their initial positive affect before receiving the reward condition. However, the most noteworthy finding from this study is that a history of hypomania symptoms predicted goal setting after reward, and thus, goal setting appears to be an important component of the BAS-mania link.

Other studies have also validated this possible link. For example, as a study by Spielberger and colleagues found an elevation in ambitious goal setting in Bipolar patients whose symptoms had remitted (Spielberger, Parker, & Becker, 1963), and a study by Lozano and Johnson (2001) found that ambitious goal setting predicted increases in symptoms of mania over time. In addition, a study by Ruggero and Johnson (2006) revealed that Bipolar participants exhibited higher expectancies for success compared to control participants, even when in a euthymic state. Finally, above average achievement levels have been observed in the family members of people with Bipolar Disorder (Lenzi, Lazzerini, Marazziti, Rossi, & Cassano, 1993), and people with Bipolar Disorder tend to possess unusually high standards for themselves (Lam, Wright, & Smith, 2004).

A further study by Johnson and Carver (2006) investigated the relationship between mania-proneness and goal-setting. This study revealed that lifetime vulnerability to hypomania was related to all three dimensions of self-reported BAS (i.e., drive, reward responsiveness, and fun seeking) and was also related to setting high goals in the domains of popular fame, political influence, and financial success, even after controlling for the effects of current mania symptoms and current and lifetime symptoms of depression. The authors noted that in this study, the goals of the mania-prone participants in the study were high, even to the point of being grandiose, despite the fact that they were not currently experiencing an episode of mania or hypomania. Taken together, the findings from this group of studies suggests that hypomania is somehow linked to a tendency to set ambitious goals for themselves, and this information gives us clues about possible dysregulation of BAS as a mechanism for mania.

Researchers (Johnson et. al, 2000; Depue & Iacono, 1989) have hypothesized that people with Bipolar Disorder and people who have never experienced mania are similar regarding the nature of what constitutes a reward. However, where these two groups differ is in their ability to regulate affect following such reward triggers. While people low in mania-proneness will "coast" after goal attainment, mania-prone individuals appear to continue to escalate into increasingly positive affect and continued goal seeking (Johnson et. al, 2000). Therefore, they argue that future research should investigate this hypothesis by exploring how mania-prone individuals respond after receipt of a reward. The present research investigates the cognitive and perceptual biases of mania-prone individuals (versus a control sample) in a baseline measurement condition, and after receiving a reward. In addition, this research assesses affect in both clinical and non-clinical samples at baseline and after the receipt of reward to allow an empirical test of the aforementioned hypothesis that mania-prone individuals continue to experience a surge in positive affect after the receipt of a reward compared to people who are not prone to mania.

Psycholopathology, Affect, Cognition, and Perception

There is an extensive literature exploring the relationship between mental disorders, affect, cognition, and perception. For example, Johnson (1984) has proposed a relationship between the mechanisms involved in central information processing and affective dysfunction. Specifically, mania is purported to be related to stimulus over-processing, while depression is related to stimulus under-processing (Johnson, 1987). In addition, affective states have been found to be associated with vertical selective attention. Specifically, people experiencing positive affective have a tendency to focus

their attention upwards, while people experiencing negative affect have a tendency to focus their attention downwards (Meier & Robinson, 2004, 2006).

In addition to relationships between affect and verticality of attention, there is also extensive evidence suggesting a link between affect and the breadth of one's attention. In the domain of negative affect, this relationship was noted decades ago by Easterbrook (1959), who hypothesized that negative emotions such as anxiety and fear have a narrowing effect on one's scope of attention. Therefore, as the theory predicts, fearful and anxious people tend to focus on small details rather than seeing the bigger picture. A review paper by Derryberry and Tucker (1994) documents the extensive support for this notion. On the other hand, in the domain of positive affect, Derryberry and Tucker (1994) have hypothesized that positive emotions tend to expand one's attentional focus. In the realm of positive affect, Fredrickson (1998) discussed the parallels drawn by many researchers between the over-inclusiveness observed in mania and the creativity observed in artistic individuals. This overall pattern has been demonstrated in the research by Isen and colleagues, who found that individuals reporting positive affect made more unusual associations to neutrally-valenced words (Isen, Johnson, Mertz, & Robinson, 1985). In another paper, Isen (1987) has proposed that positive affect may have the effect of producing a more extensive cognitive elaboration, which then leads to improved memory. Finally, a review by Fredrickson (1998) summarizes the findings in this area, which are that people who are experiencing positive affect tend to make more unusual associations, tend to use more inclusive cognitive categories, and tend to perform better on tests measuring creative thinking. This evidence has given rise to her "Broaden and Build Theory," in which Fredrickson (1998) describes a phenomenon of an expanse of

behavior, attention, and cognition as a response to feelings of positive affect. Other research supports the notion of stimuli that are positively-valenced producing an enlargement of one's attentional sphere (Fenske & Eastwood, 2003).

Evidence of selective attention has also been found in the domain of positive affect. An eye-tracking study by Isaacowitz (2005) found that participants scoring high on optimism who were asked to view images depicting skin cancer lesions spent more time looking at the unaffected skin around the lesion rather than the lesion itself compared to participants who scored low on optimism. Furthermore, Wadlinger and Isaacowitz (2008) have proposed that selective attention to certain types of information may influence affect regulation. The researchers explored this effect further by training participants to attend toward either positive or neutral information, and then monitored their eye movements while viewing a variety of affectively-valenced images. The results indicated that the participants who had previously received attentional training for viewing positive images spent less time viewing the negative images during the experiment. However, this pattern was not demonstrated by the participants who had received the training for neutral images. Therefore, the authors concluded that the participants were using attention strategies to help regulate affect. Finally, selective attention is also proposed to be related to disorders involving addiction. In an eye tracking study by Bradeley and colleagues (Bradley, Garner, Hudson, & Mogg, 2007), researchers found that smokers showed an increased tendency to shift their gaze toward smoking-related cues initially, and they maintained their attention to the smoking-related stimuli throughout the experiment. The researchers concluded that these results offer

partial support for the hypothesis that negative mood increases selective attention to drug cues and urge to smoke for smokers compared to non-smokers.

Luh and Gooding (1999) found a relationship between spatial field biases and psychopathology. Specifically, participants prone to psychosis showed biases toward left spatial processing (i.e., they responded to the stimuli with greater right hemisphere engagement) compared to participants who scored high on measures of social anhedonia. In addition, participants who scored high on measures of psychosis-proneness showed greater bias when completing tasks using faces compared to control participants, while the social anhedonia participants exhibited less bias than controls. The authors attribute this pattern of results to be related to cerebral functioning, as impairments in functioning in the area of the brain that produce psychopathology also produce atypical patterns in cognitive functioning.

Finally, several studies have found processing biases for both angry faces and fearful faces in people evidencing high levels of BAS. In a study by Putman and colleagues (Putman, Hermans, & van Honk, 2004), researchers uncovered an association between BAS and mania via the processing of anger-related stimuli. Higher levels of BAS were associated with slower reaction times on a masked emotion Stroop task, thus indicating greater interference to the angry faces (Putman, Hermans, & van Honk, 2004). What this finding suggests is that for people high on BAS, the angry faces captured their attention, thus interfering with their ability to complete the task. The hypothesis linking BAS to the processing of angry faces in the aforementioned study was the result of several neuroimaging studies that demonstrated that BAS and trait anger are both associated with activation in the the left anterior region of the brain (Sutton & Davidson,

1997; Harmon-Jones & Allen, 1998). So, therefore, if BAS is related to a slow-down in processing of angry faces, and BAS is related to a tendency to experience mania, the question arises as to whether people who are mania-prone will also exhibit a processing biases related to angry faces. Furthermore, a more recent study by Putman and colleagues (Putman, Saevarsson, van Honk, 2007) found that trait-hypomanic individuals exhibited attentional hypovigilance (i.e., a lack of attention) when viewing fearful faces. Specifically, the hypomanic participants failed to show the expected response pattern that was shown by the control participants of an increase in attentional orienting after viewing the fearful faces (Putman, Saevarsson, van Honk, 2007). Instead, the hypomanic individuals displayed a reduction of reorienting attention after viewing the angry faces. However, despite the researchers' interpretation as these results being indicative of a lack of attention to fearful cues, it appears that the fearful faces captured the participants' attention so strongly that they were unable to re-orient their attention thereafter. This latter explanation is more consistent with other research is this domain that has found that high BAS rather than low BIS that is responsible for this observed pattern of results (Putman, Hermans, van Honk, 2004; Meyer, Johnson, & Carver, 1999).

Summary and Rational for the Present Study

To summarize, distinctive patterns in the domains of cognitive and perceptual processing have been found to be associated with mental disorders as well as affective patterns in non-clinical samples. In addition, there is an extensive literature investigating the relationship between mania and self-reported BAS. One of the most prominent areas where this association reveals itself is in the relationship between mania-proneness and achievement orientation. While there is a great deal of work investigating the overlap

between BAS and mania-proneness as assessed by self-report measures, and the relationship between mania-proneness and goal setting, there have been very few studies that have investigated the cognitive and perceptual mechanisms involved in mania-proneness as it relates to this domain. Furthermore, the majority of the aforementioned studies used correlations between self-report measures only, thus making them susceptible to mono-method bias.

In addition, previous studies have found a relationship between mania-proneness and an elevated expectancy of success (Johnson, Ruggero, & Carver, 2005; Ruggero & Johnson, 2006; Stern & Berrenberg, 1979) and elevated goal-setting (Johnson & Carver, 2006; Johnson, Ruggero & Carver, 2005; Lozano & Johnson, 2001; Spielberger, Parker, & Becker, 1963). Therefore, the data from the present research will serve as a partial replication of these previous findings, but will also extend them further by comparing participants' expectancies both at baseline and after receipt of a reward, which is a comparison that has been made only infrequently in previous research. Furthermore, previous research has focused on goal-setting, but the present study examines a slightly different variation: the estimation of future life events. This varies from goal-setting in that goal-setting refers to what one would prefer to have happen, while the estimation of life events assesses what one believes will happen, which may be more concrete and less hypothetical than the former. In addition, due to previous research suggesting a relationship between BAS and increased attention to threat cues (Harmon-Jones & Allen, 1998; Putman, Hermans, & van Honk, 2004; Sutton & Davidson, 1997), an exploratory hypothesis investigated in the present study is the possibility that people prone to mania have a cognitive bias toward threat-related information.

Furthermore, a Suboptimal Priming Task is utilized in order to assess whether mania-prone individuals are more sensitive to achievement cues in the environment compared to control participants. The Suboptimal Priming Task in the present experiment is based on an experiment described by Murphy and Zajonc (1993) that measured the effect of the presentation of a prime on judgments of a target stimulus, when the prime was presented for a very brief duration (i.e., 4 ms) versus a longer duration (i.e., 1,000 ms). The researchers refer to the short and long presentations of the prime as "suboptimal" and "optimal" presentations of the prime stimulus, respectively. An aim of this research is to test the Affective Primacy hypothesis (Zajonc, 1980), which hypothesizes that affective reactions can be elicited with minimal stimulus input. This hypothesis runs contrary to the Cognitive Appraisal viewpoint (Lazarus, 1982), which posits that prior cognitive mediation is required in order to elicit affective reactions.

Several studies provide support for the Affective Primacy hypothesis. A study by Kunst-Wilson and Zajonc (1980) found that participants who were exposed to Chinese ideographs at a suboptimal level developed preferences for the ideographs they had previously been exposed to, despite their lack of overt recognition of having seen the ideographs previously. In addition, the aforementioned study by Murphy and Zajonc (1993) found that the suboptimal (i.e., 4 ms) presentation of the primes influenced participants' judgments of the targets when these judgments were evaluative in nature (e.g., degree of liking, good/bad judgments), while the optimal presentation of the primes (i.e., 1,000 ms) did not. On the other hand, when participants were asked to make judgments that were both evaluative and descriptive in nature (i.e., judgments of size,

symmetry, gender), these judgments were influenced by the primes presented for 1,000 ms but not the primes presented for only 4 ms.

This pattern of results was replicated in a study by Stapel and Koomen (2005), who also tested the influence of primes presented at both a suboptimal duration of 40 ms and an optimal duration of 120 ms, on judgments of a target. The results indicated that the suboptimal condition produced greater priming effects than the optimal condition, leading the authors argue that when making only evaluative judgments, "less is more."

While "subliminal" or "suboptimal" priming tasks are thought to reside within the domain of social cognition, they can also be thought to be a measure of perceptual processes as well. Because the prime stimulus is presented at a brief duration, such that participants are not consciously aware of the content of the stimulus, any influence exerted by the prime on subsequent judgments of the target occur because the prime was processed on some level by the individual. That is, it entered the perceptual system and was processed by the individual during the course of making judgments of the target. Therefore, in the investigation of sensitivity to achievement-oriented stimuli, the question that is investigated is whether or not people who are mania-prone (versus control participants) will exhibit stronger preferences for ambiguous objects (i.e., Chinese ideographs) after being presented with achievement-oriented primes that will be over and above the positive priming effect expected in the positive stimulus condition.

Finally, Johnson and colleagues (Johnson et. al, 2000) have identified the investigation of information processing and affect in the context of goal attainments as being crucial to our understanding the mechanisms driving mania. The present research attempts to elucidate this previously overlooked area of research by investigating the

cognitive and perceptual bases of mania. This research goes beyond the previous findings in this area, which have largely been the result of self-report measures, by using laboratory experiments to investigate performance, behavior, and affect both at baseline and following the receipt of a reward. Moreover, the present study utilizes a clinical sample of participants who have received a clinical diagnosis that involves primary symptomatology of mania or hypomania. This research helps to satisfy the aforementioned goal of expanding our understanding of mania by elucidating the domains of information processing, perceptual processes, and affect associated with mania.

Method

Design and Purpose

The purpose of the present study is to explore the cognitive and perceptual mechanisms involved in mania-proneness. In addition, this study explores the affective reactions of mania-prone participants (versus non-clinical participants) at baseline and after the receipt of success feedback and a reward. The goal of this research is to answer the question of whether mania-prone individuals exhibit cognitive and perceptual biases in information processing, specifically when presented with achievement-relevant stimuli. Furthermore, this research addresses the question of whether or not these biases are present at baseline, or if they are present only after being elicited by the receipt of a reward.

In this research, *cognitive* bias was assessed by use of an Affective Flanker task and in a Probability Estimation Task, while *perceptual* bias was assessed by use of a Suboptimal Priming Task. All of the aforementioned tasks were administered both before

and after the receipt of a reward. In the Affective Flanker task, the goal was to investigate whether participants who are prone to mania (versus those who are not mania-prone) show more slowing in the presence of achievement-oriented stimuli compared to other types of stimuli. So the question is, are the achievement-oriented stimuli capturing participants' attention and interfering with their ability to complete the task? If this is the case, the data will show a pattern of mania-prone individuals showing slower reaction times in trials containing achievement-oriented words compared to the control participants. In the Probability Estimation Task, the goal was to investigate whether mania-prone individuals are more likely to predict a high probability of grandiose events occurring in their lives, both at baseline, and after receipt of a reward, compared to control participants. In the Suboptimal Priming Task, I investigated the hypothesis that people who are mania-prone may be more susceptible to becoming influenced by achievement-oriented information compared to people who are not mania-prone, even when that information is not perceived at a conscious level. Finally, an assessment of participants' mood both at baseline and after the receipt of a reward investigates the hypothesis that mania-prone participants may exhibit a propensity toward positive affect that is present at baseline and/or after the receipt of a reward.

All participants completed the three tasks and a measure of current affect twice during the series of experiments: once before, and once after the reward manipulation. The first series of tasks established a baseline level of performance for each of the tasks, while the second administration assessed potential change following a reward feedback manipulation. Participants' performance on the first series of tasks (i.e., baseline performance tasks) helps to elucidate the question of whether or not mania-prone

individuals exhibit cognitive and perceptual biases in the processing of achievement relevant information, even in the absence of reward cues in the environment. Then, after these baseline performance measures have been assessed, all participants were given a reward feedback manipulation whereby they were told that their performance on the aforementioned tasks was excellent, and that their favorable performance earns them a prize. After the reward feedback was given, the participants completed a second administration of the Affective Flanker task, the Suboptimal Priming Task, and the Probability Estimation Task. The data obtained from the second administration (i.e., performance post-reward tasks) was compared with the data from the first administration (i.e., baseline performance) in order to answer the question of whether people who are mania-prone exhibit cognitive and/or perceptual biases that are above and beyond any possible biases that were observed prior to receipt of the reward manipulation. In addition, the measurements of participants' affect both at baseline and following the receipt of the reward illustrates whether mania-prone participants show elevations in positive affect in general, and following the receipt of a reward.

Samples

For all experiments, I utilized two separate samples: a clinical sample and a non-clinical community sample. For the clinical sample, participants were recruited through a variety of sources, including the Volunteers for Health and the Center for Community-Based Research programs at Washington University, through a local Bipolar support group, through the Washington University Psychological Service Center, and by posting flyers in mental health offices in the area and around the University campus. The non-clinical community sample was recruited through the same venues. All participants were

paid $10/hour for their participation, in accordance with the payment regulations specified by the Washington University Institutional Review Board. To qualify for the study, clinical participants must have received a diagnosis that involved primary symptomatology involving mania or hypomania, such as Bipolar I Disorder, Bipolar II Disorder, or Schizoaffective Disorder, Bipolar Type. Because of possible confounds that may occur with participants who experience recurring episodes of psychosis (e.g., residual delusions and hallucinations that may interfere with cognitive and perceptual processes), recruiting priority was given to Bipolar I and Bipolar II patients. Finally, because of the complexities involved in diagnosing Bipolar Disorder, this diagnosis must have been given by a psychiatrist or psychologist rather than a primary care physician, counselor, or social worker. Patients were interviewed on the telephone by the author prior to scheduling in order to ensure that these inclusion criteria were met. In addition, during testing, patients reported their current medications, and any patients who were not currently taking medications that are typically prescribed for mood stabilization in Bipolar Disorder (i.e., antipsychotics, anticonvulsants, or mood stabilizers) were interviewed further by the author in order to ascertain that the patient had experienced a true episode of mania or hypomania, and met diagnostic criteria for Bipolar Disorder.

The goal of utilizing a non-clinical community sample in addition to the clinical sample was to provide a control group to which the clinical sample could be compared. To qualify for the study, these participants must not have received a diagnosis of a mental disorder from a psychologist or psychiatrist, must not have been on psychotropic medication during the past 5 years, and must not have been hospitalized for a mental disorder during their lifetime. All non-clinical participants were interviewed prior to

scheduling to ensure that they met the aforementioned inclusion criteria. Finally, demographic information such as age, sex, socio-economic status, education, etc. was obtained from both samples so that any significant difference in these variables between the clinical and control samples can be controlled for in the statistical analyses.

Creation of Affective Stimuli

A set of affectively-valenced words and pictures were selected for use in the Affective Flanker Task and the Suboptimal Priming Task. For the Affective Flanker Task, only words were used, while the Suboptimal Priming Task utilized both pictures and words. Both the pictures and words fell into the following valenced categories: achievement, positive, neutral, negative, and threat.

The pictures were selected from the International Affective Picture Set (IAPS; Lang, Bradley, & Cuthbert, 2008) which is a set of affective pictures that have been normed on the domains of valence, arousal, and dominance. A set of 5 pictures was selected for each of the valence categories of achievement, positive, neutral, negative, and threat, for a total of 25 pictures. While every attempt was made to balance the achievement/positive and threat/negative pictures on the aforementioned norms as much as possible, due to the nature of the differences between the valence categories, exact matches across the categories were impossible. The pictures and their norms are shown in Appendix C.

A total of 50 words were selected, with 10 words for each of the valence categories of achievement, positive, neutral, negative, and threat. These words were selected from the ANEW database (Bradley & Lang, 1999), and were balanced across the lexical characteristics of length, frequency, orthographic neighborhood, and arousal using

the ELP database (Balota, Cortese, Hutchison, Neely, Nelson, Simpson & Treiman, 2002), which contains the lexical characteristics of a large corpus of words. The aforementioned characteristics have been shown to affect the speed of word processing (Larsen, Mercer, & Balota, 2006; Larsen, Mercer, Balota, & Strube, 2008), so balancing the words on these characteristics across lexical categories ensures that any differences in reaction times can be attributed to the effect of the valence category and are not to lexical differences across word types. These words and their lexical characteristics are shown in Table 29.

It was impossible to balance the total number of pictures and words used in the present study, as there was a shortage of pictures that were clearly achievement-oriented, which resulted in the selection of 5 pictures per valence category, for a total of 25 pictures total. On the other hand, because the necessity of the word lists being balanced across four lexical characteristics across each valence category, it was necessary to select a minimum of ten words per valance category, for a total of 50 words. When attempts were made to trim the word lists down to 5 words per valence category, it became impossible to achieve lexical equivalence across the valence categories of achievement, positive, neutral, negative, and threat. Therefore, the compromise that was made was to use a corpus of 25 pictures and 50 words. As a result, the program used for presenting the stimuli on the Suboptimal Priming Task was adjusted accordingly so that participants saw an equal number of words vs. pictures.

Affective Flanker Task (AFT)

The goal of the AFT was to investigate perceptual biases toward valenced information. Each valence category (positive, achievement, neutral, negative, and threat)

consisted of ten words, for a total of 50 stimulus words total. The stimuli were presented in random order, approximately two times each, for a total of 100 trials. The stimuli were presented in the center of the screen, via E-Prime software.

Participants were presented with a word embedded in between two two-digit numbers (see Figure 1), such that the numbers appeared immediately before and after the stimulus word. Participants were told to ignore the word and to respond via a key press whether the two numbers are the same or are different. They were told to respond as quickly as possible, but without sacrificing accuracy. There was no response deadline, and each stimulus appeared on the screen until the response has been made. An inter-trial interval of 1,000 ms was utilized in the task. The instruction screens for the task are show in Figure 2.

At the end of the second administration of the task, participants were asked to record any words that they remembered during the task. This was a free recall task, and participants were not told ahead of time that they were asked to recall these words at the task at the end of the task.

Probability Estimation Task (PET)

The purpose of the Probability Estimation Task was to assess participants' judgments about positive/negative and likely/unlikely events occurring in his/her lives. Participants made their responses by moving a slider along a horizontal line to indicate how unlikely (i.e., by moving the slider to the far left) or likely (i.e., by moving the slider to the far right) they believed the event was to happen to them. The task consisted of 48 possible life events that were categorized as being either positive vs. negative, and were either likely vs. unlikely to occur (please see Appendix B for the aforementioned scale).

These events ranged from those that are highly probable, such as experiencing indigestion (negative likely) or having a good day (positive likely), versus highly improbable events, such as winning a Nobel prize (positive unlikely) or losing all of one's possessions in a catastrophic event (negative unlikely). All of the highly improbable positive events were grandiose in nature, and built on themes of success, power, wealth, fame, and prestige. The aforementioned scale was developed by the author, as no scale of this nature currently exists. The instructions screens and response format for the task can be seen in Figure 5. The psychometric properties of the task were shown to be sound, and are described in detail in the results section of this document.

Suboptimal Priming Task (SPT)

The goal of the SPT was to investigate possible biases in perception across the five valence categories. Each trial began with the presentation of a white fixation cross against a black background, which was displayed for 1,000 ms. This screen served as a cue to direct participants where to focus their gaze, and this directive was included in the task instructions. Next, the suboptimal prime, which consisted of either a word or a picture from the five valence categories, was displayed for 17 ms, which represents one clock cycle on the computers that were used in the experiment. The prime was followed by the presentation of the target, which also served as a backward mask. The target was a Chinese ideograph in black ink against a white background, and was displayed for 3,000 ms. The Chinese ideograph for each trial was randomly selected without replacement from a group of 200 possible ideographs (taken from Payne, Cheng, Govorun, & Stewart, 2005), thus each ideograph did not appear more than one time during each administration of the experiment. Following the presentation of the prime, participants

were presented with an instruction screen informing them to make their response via keyboard press regarding how the image made them feel on a 5-point Likert scale. The keypad was labeled as follows: 5 is very positive, 4 is somewhat positive, 3 is neutral, 2 is somewhat negative, and 1 is very negative (see Figure 3).

Each valence category (positive, achievement, neutral, negative, and threat) consisted of five pictures per category, for a total of 25 words total, and ten words per valence category, for a total of 50 stimulus words. These stimulus words were the same words that were used in the Affective Flanker Task. These stimuli were presented in random order, one time each, for a total of 100 trials, with 50% of the trials containing a picture prime and 50% containing a word prime. The stimuli were presented in the center of the computer monitor, via E-Prime software, and were followed by an inter-trial interval of 1,000 ms. Please see Figure 4 to view the instruction screens for the task.

After all of the tasks were completed, participants were asked to rate the positivity/negativity of each of the stimuli when presented at a supraliminal (i.e., conscious) level of perception. This step served as a manipulation check, to ensure that there is substantial agreement regarding which valence category each stimulus should belong to.

Reward Feedback Manipulation

The purpose of the reward feedback manipulation was to explore the effect of the receipt of a reward on participants' subsequent cognitions, perceptions, judgments, and affect. During the reward feedback manipulation, an instruction screen informed participants that they had completed the first series of tasks, and asked them to wait for a moment while the computer analyzed their task performance on the "same /different

task" (i.e., the Affective Flanker Task). For several seconds, a moving dot graphic appeared on the screen in order to give participants the impression that the computer was "thinking" while it calculated their scores. Then an instruction screen appeared that indicated that out of the possible ratings of fair, good, and excellent, that their performance was "excellent" and that they would be given a gift as a token of appreciation. They were further told to notify the experimenter that their performance had warranted the gift, and the experimenter brought the gift and praised the participant for his/her excellent performance. The aforementioned gift consisted of a goody bag that contained miniature candy bars and a Washington University pen with case. Please see Figure 6 for the Reward Manipulation instruction screens.

Order of Tasks

Participants completed the experiment in the following order: completion of the positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), followed by the completion of the Probability Estimation Task (PET). These components of the study were administered before any of the performance-based tasks in order to obtain an unadulterated baseline measurement of participants' current mood and judgments about the likelihood of certain events. These tasks were followed by the completion of the Affective Flanker Task (AFT) and the Suboptimal Priming Task (SPT), which were administered in random order. The aforementioned series constitutes the baseline administration of the tasks.

Then, the Reward Feedback manipulation was administered. Next, the following post-baseline measurements were completed in random order: Affective Flanker Task (with free recall), Suboptimal Priming Task, PANAS, and Probability Estimation Task.

Then, participants completed the following scales, also in random order: BIS/BAS, HPS, GBI, and ISS. Finally, at the end of the experiment, participants completed a word rating and categorization task, which served as an integrity check to ensure that the valence and category ratings of the words used in the aforementioned experiments were consistent with those made by the participants in the study. All of the aforementioned scales and tasks are described in detail below, and the order of tasks is illustrated in Figure 7.

Scales

The following scales were administered in random order to all participants: BIS/BAS Scale (Carver & White, 1994), The Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986), the General Behavior Inventory (GBI: Depue, Krauss, Spoont, & Arbisi, 1989), and the Internal State Scale (ISS; Bauer et. al, 1991). In addition, the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) was administered when participants first presented for the experiment, and a second time during the second administration of the aforementioned tasks (see Figure 3). At the end of the completion of all scales, demographic information such as age, sex, education, etc. were obtained so that any significant difference in these variables between the clinical and control samples can be controlled for in the statistical analyses. Finally, since the Suboptimal Priming Task uses Chinese ideographs, all participants were queried regarding their ability to read Chinese, and these participants were excluded from the analyses.

Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988).

The PANAS is a widely-used measure of one's current positive and negative affect. It consists of 20 adjectives that participants rate on a 5-point Likert scale from

"very slightly" to "extremely." Cronbach's alpha measurements are high, and range from .85 to .90 for positive affect and .84 to .87 for negative affect (Watson, Clark, & Tellegen, 1988).

BIS/BAS Scale (Carver & White, 1994).

The BIS/BAS scale is a 20-item scale that assesses participants' trait levels of the Behavioral Activation System and the Behavioral Inhibition System via the use of a 4-point Likert Scale. A sample question for BAS is "When I get something I want, I feel excited and energized," while a sample question for BIS is "Criticism or scolding hurts me quite a bit."

A number of studies have found this scale to be psychometrically sound, including a study by Caseras, Avila, and Torrubia (2003) which found that, when a variety of scales purported to measure BIS and BAS were factor analyzed, the three subscales found in the BIS/BAS scale of Drive (motivation and goal pursuit), Fun Seeking (tendency to pursue pleasurable activities), and Responsivity to Reward (the tendency to respond to rewarding situations with positive affect and an increase in energy) loaded on the BAS factor. Furthermore, in other studies, the BIS/BAS scale was found to be related to vulnerability toward mania (Meyer, Johnson, & Carver, 1999). On the other hand, the BIS component of the scale assesses one's tendency to respond to events that are perceived as threatening with negative affect, fear, or anxiety.

The Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986).

The HPS is a 48-item true-false response scale that measures individual differences in one's tendency toward behavioral characteristics associated with mania, such as optimism, energy level, confidence, etc. A sample item is, "I often have moods

where I feel so energetic and optimistic that I feel I could outperform almost anyone at anything."

This scale has been shown to have strong predictive validity, as a study by Kwapil and colleagues found that high scores predicted a high level of risk for the development of Bipolar Disorder 13 years later (Kwapil, Miller, Zinser, Chapman, Chapman, & Eckblad, 2000). Another study (Eckblad & Chapman, 1986) found that 75% of the participants who had high scores on the HPS (i.e., a score of greater than 36) met DSM criteria for Bipolar Disorder at the time they were tested. Furthermore, the HPS has been found to be better at predicting symptoms of mania than other personality scales, such as the NEO-PI (Meyer, 2002). Finally, several studies have found the HPS to have high test-retest reliability and internal consistency (Eckblad & Chapman, 1986; Johnson, Ruggero, & Carver, 2005; Klein, Lewinsohn, & Seeley, 1996).

General Behavior Inventory (GBI; Depue, Krauss, Spoont, & Arbisi, 1989).

The GBI is a 73-question measure of *lifetime* symptoms of affective disorders, such as depression, dysthymia, hypomania, and cyclothymia using a 4-point Likert scale. It is comprised of the following three subscales: depression, mania, and biphasic. While it does not measure current affective symptoms, it yields a global picture of participants' history of affective symptoms. In accordance with the recommendations of the scale's authors, ratings of a 3 or 4 was converted to a score of 1, while ratings of 1 or 2 were counted as a score of zero. The GBI has been found to have adequate reliability and validity, solid internal consistency, test-retest reliability, and convergent validity (Depue, Krauss, Spoont, & Arbisi, 1989).

The Internal State Scale (ISS; Bauer et. al, 1991).

The ISS is a 17-item scale that was used to assess participants' *current* symptoms of mania and depression. As described by Meyer and colleagues (Meyer, Johnson, & Carver, 1999), I used a 5-point Likert scale rather than the visual-analog line that was originally designed for use with participants with attentional problems. The scale's authors report sound internal consistencies, with coefficient alphas ranging from .81 to .92. (Bauer et. al, 1991).

Results

Individual Difference Variables

In all of the performance tasks described below, I investigated the relationship between a variety of individual difference variables and task performance. These individual difference variables include the General Behavior Inventory (GBI), the Internal State Scale (ISS), the Hypomanic Personality Scale (HPS), the BIS/BAS scale (BIS/BAS), and the Positive And Negative Affect Scale (PANAS). These scales are all self-report measures, and have been described in detail in the method section of this document.

Group differences.

A series of independent samples t tests were computed in order to investigate whether the clinical and non-clinical groups were significantly different from one another on each of the individual difference variables of interest. In this instance, and throughout this document, Levene's Test for Equality of variances was also computed, and in instances where the assumption of equal variances was violated, the statistics for non-equal variances are reported.

The two groups were significantly different on all of the individual difference scales, with the exception of the three BAS subscales, and the PANAS positive scale assessed prior to the reward manipulation. The lack of group differences on the BAS subscales was contrary to what was hypothesized, while the other observed differences were in accordance with what was predicted. These results are shown in Table 1.

Effect sizes were calculated and labeled according to the specifications outlined by Cohen (1988). Large effect sizes were observed in the GBI, ISS depression, and the Biphasic Factor, with medium effect sizes observed in BIS, the remaining subscales of the ISS, and the Negativity Factor. Even though significant group differences were observed for the HPS and both the negative and positive components of the PANAS, only small effect sizes were observed in these variables. These effect sizes are show in Table 1.

Correlations.

Since there were no significant group differences for BAS, a series of bivariate correlations was computed between BAS and the other individual difference variables in order to assess the relationship between BAS and the symptoms, traits, and affect typically associated with Bipolar Disorder. With the exception of the HPS, PANAS positive affect, and a few correlations between BAS fun seeking and the GBI hypomania and bipolar subscales, the overall results show a lack of correlation between BAS and the individual difference variables assessed in the study. However, significant relationships were found between BIS and nearly every individual difference measure assessed. The relationship with BIS was not expected, and the lack of relationship with BAS was contrary to what was hypothesized. These correlations are shown in Table 2.

Since large effect sizes were observed for the GBI, bivariate correlations were computed to investigate the relationship between the GBI and the other individual difference variables. These correlations are shown in Table 3, and show significant relationships between the GBI and all of the other individual difference variables, except for BAS. These results suggest a high degree of overlap between the symptoms, traits, and affect typically associated with Bipolar Disorder, even though they are being assessed by different self-report measurement tools.

Factor analysis.

The aforementioned individual difference scales were factor analyzed in order to create a composite representation of the individual difference scales (for the PANAS, the data were collapsed across time). The scales were factor analyzed using a principal components analysis with varimax rotation. For the first iteration, factors with eigenvalues >1 were extracted, which yielded an optimal solution containing 3 factors. Then, the data were reanalyzed using a principal components analysis with varimax rotation, with a pre-defined 3-factor solution. This solution explains 64.53% of the total variance observed in the individual difference variables, and is shown in Table 4.

The first factor that emerged loaded heavily on the GBI subscales of hypomania, depression, and biphasic; ISS activation, perceived conflict, and depression; PANAS negative affect, and the HPS. In order to avoid confusion between a DSM IV-TR diagnosis of Bipolar Disorder and this factor, I will refer to this factor as "Biphasic" rather than "Bipolar." The second factor loaded negatively on ISS well being and PANAS positive affect, and loaded positively on ISS perceived conflict and BIS. I will refer to this second factor as "Negativity." The third factor loaded strongly on BAS

reward responsiveness, drive, and fun seeking; PANAS positive affect, and the HPS. I will refer to this third factor as "Activation." These factor score coefficients were calculated using the regression method, and will also be correlated with the performance measures of each of the tasks below.

Group comparison of factor scores.

A series of independent sample t tests was computed in order to determine whether the two groups (clinical vs. non-clinical) were different on each of the three factor score coefficients. The results revealed significant differences on the Biphasic Factor t (102) = -5.62, p <.01 and the Negativity Factor t (86.07) = -2.69, p <.01, but not on the Activation Factor, p >.05. On the Biphasic Factor, participants in the clinical group scored higher (M = .49) on the biphasic indices than participants in the non-clinical group (M = -.47). This same pattern of results was also observed on the Negativity Factor, with clinical participants (M = .26) scoring higher on measures of negativity than the non-clinical participants (M = -.25). While the same pattern was observed on the Activation Factor (clinical: M = .05, nonclinical: M = -.05), this difference was not statistically significant.

Demographics.

A total of 114 people participated in the study, with 54 participants in the clinical group, and 60 participants in the non-clinical group. However, due to computer failures, approximately 10 participants were not able to complete all of the tasks and questionnaires in the experiment. For each task and set of analyses, all participants with missing data due to these technical failures were excluded. However, since many of the

tasks were presented in random order, the number of participants with a complete data set varies from task to task.

The average age of all participants was 44.39 years (*SD* = 15.81), with clinical participants (*M* = 46.93, *SD* = 17.39) being slightly older than non-clinical participants (*M* = 41.57, *SD* = 13.45). Participants rated their highest level of education completed, and these scores were converted to an interval scale from 0 to 7, with zero indicating no high school completed to 7 indicating completion of a doctoral degree, and a 4 indicating completion of an associates or technical degree. The mean education level of all participants was 4.05 (*SD* = 1.46), with clinical participants slightly lower (*M* = 3.85, *SD* = 1.45), and non-clinical participants (*M* = 4.23, *SD* = 1.47) slightly higher than the overall sample mean. Finally, both age and ethnicity were nearly identical between the two groups. The demographic characteristics of the two groups are show in Table 5.

Medication status.

The participants were asked to write down all of the medication that they were currently taking, and these medications were coded according to the drug class to which they belonged. Only psychotropic medications (e.g., antidepressant, antipsychotic, anxiolytic, etc.) were coded and recorded, while medications that were not prescribed for psychiatric purposes (e.g., high blood pressure, high cholesterol, etc.) were not recorded.

The majority of participants in the clinical group (85%) indicated that they were taking one or more psychotropic medications, while only 12% of the non-clinical participants were taking any psychotropic medications. Of those participants in the clinical group taking medications, the majority (30%) were taking two medications, followed by 20% who were taking three medications. The most number of psychotropic

medications taken by any participant in the clinical group was six psychotropic medications. Of the few participants who were taking medications in the non-clinical group, the majority (10%) were taking only one medication. These results are shown in Table 6.

The data were also analyzed according to medication type. Of the people in the clinical group who were taking medication, the majority were taking antidepressant medication (81%), followed by anti-convulsant medication (46%), anti-psychotic medication (35%), and anxiolytic medication (31%). The finding of so many Bipolar participants taking antidepressant medication may seem surprising, given the fact that this medication may induce mania. However, the pharmacological treatment of Bipolar Disorder often involves antidepressant medication combined with medications that have mood stabilization effects (Ketter & Wang, 2010). In the non-clinical group, of the few participants who were taking medication, three participants were taking antidepressant medication (two participants took this medication as a sleep aid, and one participant took this medication to prevent migraine headaches), one participant took an anti-convulsant medication, and one participant took a non-benzodiazepine hypnotic medication. These results are shown in Table 7.

In order to investigate the relationship between the symptoms, affect, individual differences, and medications prescribed, bivariate correlations were computed between the number of medications taken and the individual difference variables, including the three factor scores described previously. While these analyses are exploratory in nature, the total number of medications taken may be an indicator of severity, thus the correlations with the individual difference measures can serve as an indication of which

symptoms create the most impairment and need for medical intervention. The strongest correlations observed were with the GBI and all of its subscales (r = .42 to r = .53, p < .01). Significant correlations were also observed with BIS (r = .43, p < .01), ISS activation (r = .26, p < .01), and PANAS Negative Affect (r = .20, p <.05). For the factor scores, significant correlations emerged for Biphasic (r = .32, p <.01), and Negativity (r = .24, p <.05), but not for the Activation Factor (p > .05). These positive correlations indicate that high scores on the individual difference scale were associated with a higher number of medications taken. Since the GBI is a clinical scale, the positive correlations observed with number of medications is not surprising, however, it is surprising that no significant relationships were observed with the Hypomanic Personality Scale, any of the BAS scales, or the Activation Factor. Since correlations with PANAS Negative Affect and the Negativity Factor were present, this suggests that negative affect is related to severity, and the positive correlations with ISS activation and the Biphasic Factor suggest that there is also some relatedness between symptom severity and affective lability. The complete listing of correlations is shown in Table 8.

Chinese language.

Given the fact that the suboptimal priming task uses Chinese characters as ambiguous stimuli, all participants were asked if they were able to speak or write Chinese, as such knowledge could bias their responses in that task. Only one participant indicated some knowledge of the Chinese language, but when queried further, he disclosed that he was unable to read Chinese characters. Therefore, no participants were excluded from the analyses due to knowledge of the Chinese language.

Hypotheses.

I predicted that mania-prone individuals would show elevations on all of the clinical scales (e.g., GBI, HPS, ISS) compared to the participants in the non-clinical comparison group. This hypothesis was supported by the results. An additional hypothesis was that the mania-prone participants would have higher scores on measures of BAS than the participants who are not prone to mania. This hypothesis was not supported, as no significant differences between the two groups was observed on measures of BAS, nor were they observed for the activation factor that emerged from the factor analysis. Furthermore, there was no significant relationship found between BAS and the other individual measures used in the study, which were measures of Bipolar symptomatology, traits, and affect. However, these scales did appear to be capturing the same underlying concept, as significant relationships were observed between the GBI (which is one of the most psychometrically sound, and widely-used measures of Bipolar lifetime symptomatology), and the other scales. In addition, an unexpected finding was that clinical participants showed higher levels of BIS than non-clinical participants, and also were significantly different from their non-clinical counterparts on the Negativity factor that emerged from the factor analysis. Neither of these results were predicted.

Suboptimal Priming Task (SPT)

Task performance.

In order to investigate main effects and interactions, a 2 (time: pre vs. post reward manipulation) x 5 (valence category: achievement, negative, neutral, positive, threat) x 2 (stimulus type: image vs. word) x 2 (group: clinical vs. non-clinical), mixed model ANOVA was computed, with group as the only between subjects variable. Significant

main effects emerged for both valence (F (4, 420) = 92.54, p <.01)[1] and group (F (1, 105) = 8.75, p <.01), but the main effects for time (p = .12) and stimulus type (p = .71) were not significant. For valence, tests of simple effects were performed using a Bonferroni correction, in order to prevent Type I error inflation due to multiple tests performed. These analyses indicated that all valence categories were significantly different from one another (p < .01), with the exception of threat and negative stimuli (p = 1.00), and achievement and positive stimuli (p = 0.20), which were not significantly different from one another. These effects were in the predicted direction, with the achievement (M = 3.46) and positive (M = 3.40) stimuli being rated as most pleasant, and the negative (M = 2.62) and threat (M = 2.61) stimuli being rated as being least pleasant, with the neutral stimuli (M = 3.12) in the middle. These results suggest that even though the primes were presented at a level that is thought to be below conscious detection (17 ms), the valence of the primes did in fact influence participants' judgments of the ambiguous targets. For group, the clinical participants made ratings that were more negative across all valence categories (M = 2.98) compared to the non-clinical group (M = 3.11). This result was not expected.

In addition, several significant interactions emerged. Significant two-way interactions included: time x valence (F (4, 420) = 28.21, p < .01), valence x type (F (4, 420) = 17.91, p < .01), and time x group (F (1, 105) = 3.06, p = .08), which was only marginally significant. None of the two-way interactions were hypothesized. There was also a three-way interaction for time x valence x type (F (4, 420) = 11.22, p < .01), which

[1] While violations of sphericity often prompt researchers to report multivariate F or adjusted F values, the significance tests in all of the aforementioned analyses yielded the same results and lead to the same conclusions. Therefore, for the ease of simplicity, the original F values are reported in this document.

was also not predicted. Figures 8 and 9 depict these variables. The hypothesized 3-way interaction between group, time, and valence was not significant (p = .27).

Individual differences.

To investigate the relationship between the SPT task and the individual difference variables, bivariate correlations were computed between participants' SPT ratings (by image type: image vs. word; time: pre vs. post reward manipulation; and valence) and each of subscales of the BIS/BAS scale, GBI, ISS, and PANAS (taken pre and post reward manipulation). These results are shown in Tables 9-13. Positive correlations between individual difference variables and participants' ratings indicate that participants with a high score on the individual difference construct rated that stimulus type *more* favorably. Conversely, negative correlations indicate that participants with high scores on that individual differences scale rated the stimulus type *less* favorably.

In order to further assess the influence of the valenced primes on participants' pleasantness ratings of the ambiguous targets, a series of difference scores were also computed. To be consistent with the language used for the other tasks, I will refer to these as "interference scores" even though the SPT is not a task of interference per se. For the first set of interference scores, the ratings obtained in the neutral valence condition were considered as a baseline, and the interference scores were calculated by subtracting the neutral ratings from the ratings obtained in each of the valence conditions. This calculation corrects for the influence of extraneous factors on participants' ratings (e.g., participants' response sets), and the resulting score reflects the true influence that the valenced primes exerted on participants' pleasantness ratings of the ambiguous targets. The second set of interference scores assesses the impact of the special valence categories

of achievement (which is a particular type of positive stimuli) and threat (which is a particular type of negative stimuli) against their comparison categories, by subtracting the positive ratings from the achievement ratings, and the negative ratings from the threat ratings. Finally, all of the aforementioned interference scores were correlated with the individual difference variables.

For the interference scores calculated from the neutral baseline condition, for both the Positive and achievement conditions, positive correlations are an indication that high scores on the individual differences measure were associated with a high level of influence from the valence of the suboptimal stimuli. For both the negative and threat conditions, negative correlations indicate that high scores on the individual differences measure was associated with more influence by the valenced stimuli (thus resulting in lower pleasantness ratings of the ambiguous targets), while positive correlations indicate less influence by the valenced stimuli.

For the achievement-neutral interference analyses, significant positive correlations ranging from $r = .19$ to $r = .41$ were observed for the individual difference characteristics of BAS drive, BAS reward responsiveness, total BAS, ISS well-being, the Activation Factor, and PANAS positive affect. Most of these correlations were with the achievement *images*, while only the correlations with BAS drive and ISS well-being were observed for the achievement *words*. All of these correlations were positive, which indicates that high scores on the aforementioned individual differences characteristics were associated with a higher degree of influence by the achievement-oriented stimuli when rating ambiguous targets. These correlations can be seen in Table 14.

When the achievement stimuli were compared against the positive stimuli as the baseline for comparison, positive correlations were observed with BAS drive, BAS reward responsiveness, total BAS, GBI hypomania, GBI biphasic, GBI biphasic lability, and the Activation Factor. These results indicate that participants who obtained high scores on these scales were more influenced by the achievement stimuli compared to the positive stimuli, and therefore rated the ambiguous targets following the achievement stimuli as being more pleasant than the targets following the positive stimuli. On the other hand, negative correlations were observed with BIS, ISS activation, PANAS negative affect prior to reward, and the Negativity Factor, and indicate that high scores on these scales were associated with higher scores on the targets following the positive primes compared to the achievement primes. However, each of the negative correlations occurred in only one of the six total cells for each of the individual difference measures, which was less robust than the positive correlations, which occurred across many of the six cells. Therefore, the negative correlations should be interpreted with caution. A complete listing of these correlations can be seen in Table 18.

For the positive-neutral interference, positive correlations were observed with ISS well-being, ISS-activation, and PANAS positive affect, and indicate that high scores on these measures were associated with a high degree of influence by the positive suboptimal primes when rating the ambiguous targets. On the other hand, negative correlations were observed with GBI-biphasic, GBI-biphasic lability, and the Negativity Factor, and show that high scores on these measures were associated with less influence from the positive stimuli when compared with the neutral stimuli. These correlations are show in Table 16.

For the negative-neutral interference, negative correlations were observed with ISS perceived conflict, ISS activation, and the Biphasic Factor. These negative relationships indicate that high scores on the individual difference scales were associated with more influence by the negatively-valenced stimuli. Negative correlations were also observed with BAS reward responsiveness, total BAS, ISS activation, and the Activation Factor, but these correlations only occurred after the reward manipulation, and not before. The finding that participants would only be sensitive to the negatively-valenced cues after the reward manipulation is puzzling, and was not hypothesized. Conversely, a negative correlation was observed with the Biphasic Factor, only in the pre-reward, image condition, which is also puzzling. These correlations are show in Table 15.

For the threat stimuli compared with a neutral valence baseline, negative correlations were observed with BAS drive, BAS reward responsiveness, total BAS, ISS perceived conflict, ISS activation, and the Activation Factor. These correlations indicate that participants who scored high on the aforementioned individual difference measures were more likely to be influenced by the threat stimuli compared to the neutral stimuli, when making pleasantness ratings about the ambiguous targets. However, with the exception of ISS perceived conflict and ISS activation, these correlations were shown in the post-reward conditions and were not observed in the measurement that occurred before the reward manipulation. This pattern of results was also found with the negatively-valenced stimuli, and is puzzling. These correlations are shown in Table 17.

For the threat stimuli compared against a negative stimulus baseline, negative correlations were observed with BAS drive, BAS reward responsiveness, total BAS, GBI biphasic, GBI biphasic lability, GBI depression, GBI bipolar, and the Activation Factor.

These correlations reveal an association between high scores on these scales with more influence by the threat stimuli, compared to the negative Stimuli. Positive correlations were found with PANAS negative pre-reward manipulation, PANAS total negative, and PANAS positive post reward, and indicate that high scores in these areas were associated with a greater influence by the negative stimuli compared to the threat stimuli. However, these correlations were only significant in one of the six possible cells, and should be interpreted with caution. These correlations are show in Table 18.

Hypotheses.

For this task, I predicted that mania-prone individuals would be more strongly influenced by the suboptimal presentation of both the achievement and threat stimuli at baseline (i.e., before the reward manipulation) when making judgments about an ambiguous target. If participants are strongly influenced by the achievement stimuli, their ratings on these stimuli should be more positive than their ratings following the positive and neutral stimuli. Conversely, if participants are strongly influenced by the threat stimuli, their ratings should be more negative compared to their ratings of the target following the both the neutral and negative primes. I further hypothesized that the mania-prone individuals would show further elevations in their ratings of achievement stimuli following the reward manipulation, compared to the non-clinical participants.

There is mixed support for these predictions. On the one hand, the hypothesized interaction between group, valence, and time was not significant, which was contrary to prediction. However, the picture becomes more complicated when examining the correlations between task performance (including the interference scores), and the individual difference variables.

For the achievement stimuli, positive correlations were observed between ratings on the achievement stimuli and BAS drive, BAS reward responsiveness, total BAS, and the Activation Factor. These correlations indicate that high scores on the individual difference variables were associated with more pleasant ratings of the Chinese characters after priming with the achievement stimuli, and were in accordance with the predictions that BAS would be associated with an increased perceptual sensitivity toward achievement-oriented stimuli. However, there were no significant differences observed between the clinical and non-clinical groups on measures of BAS and the Activation Factor, so these results do not lend absolute support to the prediction of mania-prone participants rating the achievement stimuli more favorably. In addition, negative correlations were observed between GBI biphasic, GBI biphasic lability, and GBI bipolar, and ratings on the achievement images, and indicate that high scores on these clinical subscales of bipolar symptoms were associated with high unpleasant ratings on the achievement images. This pattern of results is contrary to what was predicted.

However, the calculation of interference scores helps to elucidate these patterns of results. The interference scores examine the true amount that a given valence category influences participants' responses by subtracting out their ratings in a baseline condition. This calculation helps to correct for the tendency for some participants to rate a certain stimulus high or low based on their own response set, and not based on the actual valence of the stimulus itself. The achievement-neutral interference correlations indicate a significant positive relationship with BAS drive, BAS reward responsiveness, total BAS, ISS well-being, the Activation Factor, and PANAS positive affect, which was in accordance with the achievement correlations previously discussed. These results provide

additional support for the notion that high levels of BAS are related to increased perceptual sensitivity to the achievement-oriented stimuli.

The achievement-positive interference correlations showed positive relationships with BAS drive, BAS reward responsiveness, total BAS, GBI hypomania, GBI biphasic, GBI biphasic lability, and the Activation Factor. These results offer support for the notion that perceptual sensitivity is not only related to BAS, but also to the symptoms associated with Bipolar disorder. These results help to elucidate the negative correlations previously discussed with GBI biphasic, GBI biphasic lability, and GBI bipolar and achievement ratings. Since these negative correlations occurred only in the raw scores and not in the interference scores, they suggest that the aforementioned results were the product of a negative response set rather than due to the valence of the affective primes.

For the threat words, there was mixed support for the prediction that mania-prone individuals would be more strongly influenced by the threat stimuli. Negative correlations were observed between the ratings on the threat stimuli and BAS drive, all GBI subscales, ISS activation, and the Biphasic Factor, which indicates that high scores on these scales were associated with more unpleasant ratings on the threat stimuli (i.e., the participants were more strongly influenced by the threatening content of the stimuli). These results were all in concert with the aforementioned hypothesis.

For the threat-neutral interference scores, negative correlations were observed with BAS drive, BAS reward responsiveness, total BAS, ISS perceived conflict, ISS activation, and the Activation Factor, and reveal that participants who scored high on the aforementioned individual difference measures showed a perceptual sensitivity to the negative stimuli compared with the neutral stimuli. Similarly, the threat-negative

interference scores showed negative correlations with BAS drive, BAS reward responsiveness, total BAS, GBI biphasic, GBI biphasic lability, GBI depression, GBI bipolar, and the Activation Factor. These correlations reveal an association between high scores on these scales with more influence by the threat stimuli, compared to the negative Stimuli. All of the aforementioned correlations are in concert with prediction, and offer support for the hypothesis that individuals high on BAS and mania-prone individuals would show a heightened perceptual sensitivity to the threat stimuli.

Affective Flanker Task (AFT)

Accuracy.

To assess participants' accuracy rates in performing the AFT, the data were trimmed to eliminate all trials with extreme reaction time scores. Since accuracy on any given trial is a dichotomous variable (i.e., correct vs. incorrect), I used reaction times as an indicator of whether the participants were fully attending to each given trial. Reaction times ranged from 306 ms to 15,362 ms, with a mean RT of 866.36 ms, and a *SD* of 374.62. All trials that exceeded an RT of 3 *SD*s (i.e., 1990.21 ms) were deleted. This step excluded 2% of the total observations. After eliminating these trials, accuracy rates were computed. The mean accuracy rate was 97.76%, with a range of 89% to 100%. Next, a 2 (time: pre vs. post reward manipulation) x 5 (valence) x 2 (group: clinical vs. non-clinical) mixed model ANOVA, was computed, with time and valence as the within subjects factor, and group as the between subjects factor. There was a significant main effect for time F (1, 103) = 12.99, p <.01, which indicated that participants were more accurate after the reward condition (M = .98) compared to before the reward condition (M = .97). This pattern of results likely indicates a practice effect. The interaction for time x

valence approached significance F (4, 100) = 2.13, p = .08, and is depicted in Figure 10. Neither the main effect nor the interactions for group were significant.

Reaction times.

To analyze the reaction time data, all incorrect trials were deleted. Then, descriptive statistics were computed, which yielded a M = 868.77 and a SD = 376.16. Next, all trials in which the reaction time exceeded 2 *SD*s (i.e., 1621.09 ms) were deleted, which eliminated 4% of the total number of trials. In order to assess possible main effects and interactions, a 2 (time: pre vs. post reward manipulation) x 5 (valence) x 2 (group: clinical vs. non-clinical) mixed model ANOVA, was computed, with time and valence as the within subjects factors, and group as the between subjects factor. Significant main effects emerged for both time F (1, 102) = 59.06, p <.01 and valence F (4, 99) = 3.32, p <.01. These data are shown in Figure 11. Examination of the means for time indicates that participants' reaction times were faster after the reward condition (M = 795.74 ms) compared to before the reward condition (M = 837.85 ms), which is likely indicative of a practice effect. For valence, tests of simple effects were calculated in two different ways. When using an LSD test, threat was different (i.e., slower) than all other categories (p < .05), and the difference between positive and achievement was marginally significant (p = .09). However, the LSD does not adjust for alpha inflation due to multiple tests performed, so a Bonferroni was also computed. Using a Bonferroni correction (which does guard against inflation of Type I error, but is quite conservative) to examine simple effects revealed that the only significant differences in the valence conditions were between threat (M = 824.87) and achievement (M = 811.40) p <.01, and threat (M = 824.87) and negative (M = 813.50), p < .05, which indicates that participants were slower

to perform the task when faced with the threatening stimuli compared to the achievement and negative stimuli. None of the main effects or interactions for group was significant.

Individual differences.

To investigate the relationship between participants' performance on the Affective Flanker Task and individual difference variables, bivariate correlations were computed. These results are shown in Table 19. Negative correlations were observed across all valence categories with all of the subscales of the GBI, the ISS perceived conflict subscale, and the Biphasic Factor, thus indicating that high scores on the individual difference variables were associated with faster performance on the task. This faster processing occurred across all valence categories, and was not expected. Next, the reaction times for the achievement and positive, and negative and threat words were aggregated, and correlated with all of the individual difference variables. These results can be seen in Table 20. The same pattern of results was observed, with additional negative relationships emerging with ISS activation and HPS as well, across both the positive/achievement and negative/threat aggregated stimuli. These results indicate that high scores on the individual difference variables were associated with faster task performance. Like the negative correlations discussed previously, this pattern of results was unusual, and was not expected.

In addition, a series of interferences scores were computed in order to assess the slowed/speeded processing that could be attributed to the valence of the word, and these scores were correlated with the individual difference variables. For the first set of interference scores, the RTs obtained in the neutral valence condition were considered as the baseline, thus the interference scores were calculated by subtracting the neutral RT

from the RTs in each of the valence categories. For the achievement word correlations, high scores on ISS activation was associated with faster RTs for the achievement words, while high scores on the PANAS negative affect post-reward were associated with slower RTS on the achievement words. For the negative words, the only significant correlation observed was a positive correlation with PANAS negative affect during the post-reward condition (thus indicating slower reaction times), but this correlation was only significant in one of the three possible cells, and therefore should be interpreted with caution. For the positive words, participants who scored high on the PANAS in the pre-reward, post-reward, and aggregated conditions showed slower RTs for the positive words. For the threat words, slower reaction times were observed for those who scored high on measures of BAS reward responsiveness, GBI biphasic, GBI biphasic lability, GBI depression, GBI bipolar, PANAS negative affect (in the pre, post, and aggregated cells), and the Negativity factor. However, of these correlations, the correlation with BAS reward responsiveness, and with the Negativity Factor occurred in only one of the three possible cells, and therefore should be interpreted with caution. These correlations can be seen in Table 21.

The second set of interference scores assessed the slowed/speeded processing that could be attributed to the special valence categories of achievement (which is a particular type of positive stimuli) and threat (which is a particular type of negative stimuli). Thus, these interference scores were computed by subtracting the positive stimulus RT from the achievement stimulus RT, and the negative stimulus RT from the threat stimulus RT, and were an indicator of the degree of speeded/slowed processing that could be attributed to the special category. The only significant correlation observed in these analyses was a

negative correlation between BAS reward responsiveness and achievement interference in the pre-reward condition, indicating an association between high scores of BASrr and faster RTs for the achievement-oriented words compared with the positive words. However, since this correlation occurred in only one of the three possible cells, it should be interpreted cautiously. These correlations are shown in Table 22.

Hypotheses.

For the affective flanker task, I hypothesized that mania-prone people would be more influenced by both the achievement and threat stimuli, and that this influence would capture their attention and would result in slower reaction times in these trials compared to both the neural and positive/negative stimuli. I also predicted that the influence of the achievement-oriented stimuli would be stronger for the mania-prone participants in the post-reward condition compared to the pre-reward condition.

The majority of the data do not support the aforementioned hypotheses, and in instead, lean primarily in the direction of running contrary to what was predicted. To begin, the hypothesized interaction between group, valence, and time was not significant, and none of the main effects or interactions for group were significant. While there were significant correlations observed between the GBI (all subscales) and the Biphasic Factor with reaction times, these were negative correlations (indicating *faster* reaction times for participants who scored high on those individual difference scales), and were present for every valence condition. Both of these findings run contrary to what was predicted. For the correlations with the interference scores, all of the correlations between the individual difference measures and the interference scores using positive/negative as the baseline were not significant. For the correlations between individual differences and the

interference scores using the neutral baseline, there was a negative correlation between ISS Activation and the achievement stimuli (indicating an association between high scores on ISS activation and faster RTs on achievement stimuli), and a positive correlation between the GBI (on all subscales except for hypomania) and the threat condition, which indicates that high scores on the GBI were associated with slower RTs on the threat stimuli. However, all of these relationships were only significant in one of the three possible cells, and should be therefore interpreted cautiously. The negative relationship between ISS Activation and the achievement stimuli RT runs contrary to prediction, while the latter relationship between the GBI subscales and the threat RT is in concert with prediction, but strangely, this pattern existed for all of the GBI subscales except hypomania. To summarize, the predictions that mania-prone participants would be more strongly influenced by the achievement-oriented words at baseline and *after* the reward manipulation were not supported, and the prediction that mania-proneness would be associated with increased attention to the threat stimuli received partial support.

Probability Estimation Task (PET)

Reliability and validity of PET scale.

Since the scale used in the PET was created by this author and was previously untested, I factor analyzed the scale to investigate whether the items loaded onto the appropriate four subscales that I created when designing the scale. A principal components analysis with varimax rotation revealed that a 4-factor model explained 60.86% of the total variance. In additional, each item loaded strongly on its intended factor. These factor loadings are show in Table 23. Finally, Cronbach's Alpha was

computed for each of the four subscales, and ranged from .90 to .94. These analyses are also shown in Table 23, and suggest that the scale is reliable and valid.

Task performance.

In order to test for main effects and interactions, a 2 (time: pre vs. post) x 2 (valence: positive vs. negative) x 2 (likelihood: likely vs. unlikely) x 2 (group: clinical vs. non-clinical), mixed model ANOVA was computed, with time, valence, and likelihood as the within subjects factors, and group as the only between subjects factor. Two main effects emerged: valence and likelihood. For the main effect for valence, (F (1, 105) = 7.57, $p < .01$), participants rated positive events (M = 322.53) as being more likely to occur than negative events (M = 292.86). For the likelihood main effect (F (1, 105) = 1,346.80, p <.01), participants rated high likelihood events (M = 513.62) as being more likely to occur compared to low likelihood events (M = 101.77). Both of these results lend support to the validity of the scale, and are shown in Figure 12. An investigation of interactions showed the presence of four 2-way interactions, all of which were significant, while one approached significance. These interactions are as follows: valence x group F (1, 105) = 6.55, p <.01; time x valence F (1, 105) = 3.21, p = .07 (marginally significant); time x likelihood F (1, 105) = 10.36, $p < .01$; and valence x likelihood F (1, 105) = 54.89, $p < .01$. The valence x group interaction showed that clinical participants estimated the likelihood of positive vs. negative events occurring as being roughly equal (M = 1245 vs. M = 1237, respectively), while participants in the non-clinical group estimated positive events (M = 1336) to be much more likely than negative events (M = 1106). A graph depicting this interaction is shown in Figure 13.

Exploratory analyses were computed to further assess the responses of each group when making judgments on the PET. A series of independent sample t-tests was employed to investigate differences between the two groups on each question on the task, and at each time interval (i.e., pre and post reward manipulation). The questions that yielded group differences are shown in Table 24. The majority of the questions that showed significant differences between the two groups were the negative category questions (i.e., nine questions showed significant differences), with seven of these in the likely category, and two in the unlikely category. Five questions in the positive category showed significant differences, with three in the unlikely category, two in the likely category. These results are in accordance with the group x valence interaction described previously, and show an overall tendency for participants in the non-clinical group to rate the *positive* events as being more probable compared to the clinical group, and for the clinical participants to rate the *negative* events as being more likely to occur compared to the non-clinical participants.

Individual differences.

In order to assess the relationship between participants' probability estimations and the individual difference variables, a series of bivariate correlations were computed. All of the individual difference variables showed a significant relationship with the probability estimation judgments. These relationships are show in Tables 25 and 26.

For the *positive* events, negative correlations with the following scales were observed: all subscales of the GBI (likely events), ISS Perceived Conflict (likely events), ISS Depression (likely events), PANAS negative affect pre-reward and total (likely events), and the Biphasic factor (likely events). These correlations indicate that high

scores on the aforementioned scales were associated with lower probability estimations for the positive events. Positive correlations were observed between the positive events and the following scales: BAS Reward Responsiveness (likely events), BAS Drive (unlikely events), BAS total (unlikely), HPS (unlikely events), ISS well-being (likely), PANAS negative affect pre-reward (unlikely), PANAS positive affect pre-reward and total (likely and unlikely), and the Activation Factor (both likely and unlikely events), and indicate that high scores on these scales were associated with high probability estimations about the occurrence of the positive events on the scale. These correlations are shown in Table 25.

For the negative events, negative correlations were observed for: BAS drive (for the likely events), BAS fun seeking (likely), BAS reward responsiveness (unlikely), total BAS (likely), ISS well-being (likely and unlikely), PANAS positive affect, during both pre- and post-reward (likely), and the Activation Factor (total: collapsed across likelihood). These correlations indicate that high scores on the individual differences scales listed were associated with lower probability estimations of negative events occurring in the likelihood categories specified. On the other hand, positive correlations were observed for: all five subscales on the GBI (likely and unlikely), ISS perceived conflict (likely and unlikely), BIS (likely), ISS depression (likely and unlikely), PANAS negative affect, both pre- and post-reward (likely and unlikely), the Biphasic Factor (unlikely and total), and the Negativity Factor (likely and total). These results show that participants who scored high on the aforementioned scales were more likely to rate negative events as being high in their likelihood to occur. These correlations are shown in Table 26.

Hypotheses.

For this task, I hypothesized that mania-prone individuals would make more positive unlikely judgments after the reward manipulation compared to participants who are not prone to mania. An additional area of interest was whether this pattern would also be observed *before* the reward manipulation as well.

The support for these hypotheses was mixed, but leans toward an overall lack of support. The hypothesized interaction between group x time x valence x type was not significant. Furthermore, the main effect for group was not significant, and the only interaction for group that was significant was a 2-way interaction between group and valence. This interaction showed that participants in the clinical group rated negative events as being more likely, and positive events as being less likely, than their non-clinical counterparts. The finding that clinical participants rated positive events as being less likely than participants in the non-clinical group ran counter to prediction.

Furthermore, among the clinical participants, there was no significant increase in judgments on the positive unlikely scale after the reward manipulation (M = 81 pre vs. M = 82 post), and in fact, the clinical participants had lower likelihood estimations on both the positive likely and positive unlikely events compared to their non-clinical counterparts, both pre- (M = 81 clinical, vs. M = 110 non-clinical) and post- (M = 82 clinical, vs. M = 99 non-clinical) reward manipulation. Therefore, the hypothesis that predicted an increase in the likelihood estimations of positive unlikely events among the mania-prone participants after the reward manipulation was not supported.

However, examination of the correlations between task performance and the individual difference variables shows a mixed pattern of results. For the likelihood

estimations of *positive* events, high scores on all of the GBI scales, in addition to the Biphasic Factor were associated with *lower* probability estimations of the positive events. These results ran contrary to prediction. However, BAS Reward Responsiveness (for the likely events), BAS Drive (for the unlikely events), BAS total (for the unlikely events), HPS (for the unlikely events), and the Activation Factor (for both likely and unlikely events) were all positively correlated with the probability estimations of the positive events, thus indicating that high scores on these scales were associated with high probability estimations for the positive events. Since the participants in the clinical group had significantly higher scores on the HPS, these latter results provide partial support for the hypothesis that mania-prone individuals will exhibit higher probability estimations of the positive unlikely events before the reward manipulation.

PANAS

While the PANAS was administered to assess affect both before and after the reward manipulation, it can also be considered an indicator of trait (or baseline) affect. As such, it is treated as both a task and as an individual difference variable in the present study. In this section, I will investigate the PANAS as a task variable, while the individual difference analyses were included in the previous *Individual Differences* section.

Task performance.

In order to assess possible main effects and interactions, a 2 (time: pre vs. post) x 2 (valence: negative vs. positive) x 2 (group: clinical vs. non-clinical) mixed model ANOVA was computed. Time and valence were treated as within subjects factors while group was treated as a between subjects factor. The main effects for both time F (1, 103)

= 6.11, $p < .05$ and valence F (1, 103) = 264.67, $p < .01$ were significant, while the main effect for group was not significant ($p > .05$). In addition, there was a significant two-way interaction between valence and group F (1, 103) = 8.49, $p < .01$, but the interaction between time and valence was not significant. The valence x group interaction (shown in Figure 15) indicates that the participants in the clinical group had higher scores on the PANAS negative scale but lower ratings on the PANAS positive scale compared to the participants in the non-clinical group. There was a marginally significant two-way interaction between time and group (F (1, 103) = 3.47, $p = .07$ and a marginally significant three-way interaction between time, group, and valence F (1, 103) = 3.23, $p = .08$. These results are illustrated in Figure 14, and suggest that clinical participants experienced a *decrease* in positive affect after the reward condition that their non-clinical counterparts did not experience.

Hypotheses.

I predicted that participants prone to mania would experience greater increases in positive affect after the reward manipulation than the non-clinical participants. This hypothesis was not supported, and the opposite pattern was observed, with levels of positive affect decreasing for participants in the clinical group after the reward manipulation. Another exploratory question was whether the participants in the clinical group would show higher levels of positive affect before the reward condition than the non-clinical participants. The results showed the opposite pattern, with clinical participants reporting lower levels of positive affect at baseline compared to their non-clinical counterparts.

Free Recall Task

All words recalled were coded to reflect the valence category to which they belonged, and then the number of stimulus words recalled for each of the five valence categories was summed for each participant. Any words that participants recalled that did not appear on the word stimulus list were excluded from the analyses. Credit was given for words that were not identical to the stimulus word, but had the same root word as the stimulus word (e.g., abducted was counted for the stimulus word abduction; amused was counted for the stimulus word amusing). However, words that were structurally similar to the stimulus word, but contained a different root word were not counted as being a stimulus word (e.g., actuate for the stimulus word activate), and were thus excluded from the analyses. In order to control for individual differences in participants' ability to recall the words in general, each cell consisted of the total number of words recalled per valence category, divided by the total number of words recalled across all of the valence categories for that participant.

Task performance.

In order to test for main effects and interactions, a 2 (group) x 5 (valence) mixed model ANOVA was computed, with group as the between subjects factor and valence as the within subjects factor. A significant main effect for valence was found F (4, 468) = 8.39, $p < .01$. However, the main effect for group and the group x valence interaction were not significant. Two different analyses were computed in order to test for simple effects. An LSD test (which does not adjust for Type I error inflation) revealed that threat (M = 21%) words were was recalled at a significantly higher rate than words from all of the other valence categories (achievement M = 9%; negative M = 12%; neutral M = 11%;

positive $M = 8\%$), and that positive and negative were also different from one another, with negative words being recalled more frequently than positive words. However, when using a Bonferroni correction, while the significant differences between threat and the other valence categories remained, the significant difference between the positive and negative valence categories fell away. These data are shown in Figure 16.

Individual differences.

A series of bivariate correlations were computed in order to investigate the relationship between the percentage of words recalled in each valence category, and all of the individual variables, including the three-factor model devised in the present research. Positive correlations indicate that high scores on a given individual difference variable are associated with high percentage of words recalled in that valence category, and vice versa. The correlations with the individual difference variables revealed that participants who scored high on all subscales of the GBI (with the exception of GBI biphasic), ISS activation, ISS depression, PANAS negative affect, and the Biphasic Factor, were less likely to recall the positively-valenced words. These correlations are shown in Table 27, and were not predicted.

As described previously, interference scores were computed in order to compare each valence category against both a neutral and valenced comparison baseline (see Table 28). For the achievement words, the comparison baseline was positive words, and for threat words, the comparison baseline was negative words. For the achievement words recalled, there were no significant correlations for the neutral baseline comparison, but the comparison with the positive words yielded significant negative correlations with BAS fun seeking, total BAS, and PANAS positive words post-reward condition. These

correlations reveal that high scores on these individual difference measures were associated with a tendency to recall more achievement words compared to positive words during the free recall task. For the positive-neutral interference, significant positive correlations were observed with BAS fun seeking, total BAS, and the Activation factor, indicating that high scores on the aforementioned scales were associated with a tendency to recall more positive words compared to neutral words during the free recall task. On the other hand, significant negative correlations were observed with ISS perceived conflict and ISS depression, which shows that high scores on these scales were associated with a tendency to recall more neutral words compared to positive words during the free recall task. Finally, no significant relationships with the individual difference scales were observed with achievement-neutral, negative-neutral, threat-neutral, and threat-negative interference.

Hypotheses.

For the free recall task, I hypothesized that mania-prone participants would recall more achievement words than the control participants. This hypothesis was not supported, as both the main effect and interaction for group were not significant. While the correlations observed between individual difference variables measuring Bipolar symptomatology and recall of the achievement words were not significant, significant correlations were present between BAS, positive affect, and recall of the achievement words, and these correlations were in the predicted direction.

Analyses of the Word List Used in the Experiments

The AFT, SPT, and Free Recall tasks all utilized the same word list, which contained five valence categories, with 10 words each, for a total of 50 words. As

described in the method section of this document, these words were selected from the ANEW database (Bradley & Lang, 1999), and were balanced across the lexical characteristics of length, frequency, and orthographic neighborhood using the ELP database (Balota, Cortese, Hutchison, Neely, Nelson, Simpson & Treiman, 2002). In addition, given that previous research has suggested that the arousability of the word also influences the speed of word processing (Larsen, Mercer, Balota, & Strube, 2008), an attempt was also made to balance the words on arousal across the valence categories (see Table 29). These steps were taken in order to ensure that any changes in reaction times would be due to the valence of the words and would not be due to the lexical factors related to word processing.

Since the assignment of the words to each valence category was made by this experimenter and was not normed prior to this study, the word list was analyzed in order to examine the concurrence between these categorizations and the participants' categorizations. In addition, the participants' valence ratings from the present study were compared to the valence ratings made by participants from the ANEW database.

Word categorizations.

The percentage of agreement between the participants' categorizations of the words to the 5 valence categories, and the word categorizations used in these experiments was computed. These percentages varied by valance category, and ranged from a low of 46.57% for threat, to a high of 72.95% for positive, with 57.33% for achievement, 64.29% for negative, and 61.05% for neutral (see Table 30).

These agreement rates were lower than expected, and an examination of participants' word categorizations revealed some unusual, yet consistent rating patterns.

For example, for the achievement word category, 29 participants rated the word "famous" as being neutral, 18 participants rated the word "prestige" as neutral, and 11 participants rated the word "triumph" as neutral. For the negative word category, the following words were rated as being neutral: mistake (22 participants), damage (18 participants), putrid (17 participants), and helpless (11 participants). In the neutral word category, the word "skyscraper" was rated as being achievement-oriented by 12 participants. In the positive word category, the word "reunion" was rated as threatening by 5 participants and neutral by 31 participants, and all of the following words were rated as being neutral: waterfall (27 participants), liberty (13 participants), vacation (13 participants), and kindness (11 participants). In the threat word category, the word "spider" was rated by 9 participants as positive and by 43 participants as being neutral, and the following threat words were all rated as being neutral: knife (59 participants), avalanche (22 participants), invader (8 participants), infection (7 participants), and murderer (7 participants). This pattern reveals an overall ambiguity between the neutral and affectively-valenced categories, despite the fact that the ANEW norms for these words place them squarely within the non-neutral valence categories. A possible source of this ambiguity could be the result of the selection of words that were low in arousal, so as to keep the words in each category balanced on the arousal characteristic cross the valence categories. A complete listing of these words and their characteristics can be seen in Table 29, and Table 30 contains a complete list of the word categorizations and valence ratings.

Word valence ratings.

An analysis of participants' word valence ratings was computed in order to investigate the correspondence between the valence ratings between the ANEW norms,

and participants' valence ratings of the words on a 9 point Likert scale, with a rating of 1 being extremely unpleasant and a 9 being extremely pleasant, and 5 being neutral. These analyses were computed in order to ascertain whether the participants in the present experiments evaluated the words in a manner than was comparable to the participants in the ANEW norms, as large differences between the word ratings between the samples could be a possible source of error. Participants' ratings for the achievement and positive words were $M = 7.19$ and $M = 7.42$, respectively, and were rated as being slightly less positive than the ANEW norms of $M = 7.66$ (achievement) and $M = 7.74$ (positive). For threat and negative words, participants' ratings were $M = 2.41$ and $M = 2.71$, respectively, compared to the ANEW ratings of $M = 2.55$ and $M = 2.39$. To summarize, participants in the present study rated the positive and achievement words as being less positive than the ANEW sample, and they rated the negative words as being less negative than the ANEW norms, while the threat words were rated more negatively than the ANEW norms. The participants rated the neutral words as being only slightly less negative ($M = 5.62$) than the ANEW norms ($M = 5.65$). These results are shown in Table 30.

Discussion

Individual Differences/PANAS

The results from the analyses of individual difference variables largely support the prediction that participants in the clinical group would be different on the measures of affect, personality, and psychopathology/symptomatology used in the present study, compared to participants in the non-clinical group. Significant differences were found between the clinical and non-clinical groups on all measures (i.e., BIS, GBI, HPS, ISS,

PANAS positive affect--total and post reward, PANAS negative affect, Biphasic Factor, and the Negativity Factor), except the PANAS positive affect scale administered before the reward manipulation, and all of the BAS subscales, including total BAS, and the Activation Factor. Large effect sizes were observed in the GBI, ISS depression, and the Biphasic Factor, which indicates that the clinical group was quite different than the non-clinical group on the domains of lifetime Bipolar symptoms, current symptoms of depression, and the Biphasic Factor, which captures affective lability. These results were consistent with the findings that of the three factors that emerged from factor analyzing all of the individual difference measures, clinical participants showed significantly higher rates than non-clinical participants on both the Biphasic Factor and the Negativity Factor, but not on the Activation Factor (i.e., no significant differences were observed). Furthermore, bivariate correlations computed between BAS and the other individual difference variables showed an overall lack of correspondence between BAS and the symptoms, traits, and affect typically associated with Bipolar Disorder. However, significant positive correlations were found between BIS and nearly every individual difference measure assessed. The finding of no significant differences between the clinical and non-clinical groups on BAS was surprising, and ran contrary to the hypothesized association between BAS and mania-proneness. Furthermore, the positive relationship between BIS and the affect, personality, and symptomatology associated with Bipolar Disorder were not expected.

One of the questions of interest in this study was whether mania-prone participants would show elevations in positive affect both at baseline and after the receipt of a reward, compared to participants in the non-clinical group. Not only did the results

fail to find evidence of high levels of positive affect at baseline (i.e., before the reward manipulation) and also after the reward manipulation, clinical participants showed a *decrease* in positive affect after the reward manipulation, which was the exact opposite of what was predicted. In addition, clinical participants had lower levels of positive affect and higher levels of negative affect overall compared to the participants in the non-clinical group, which also ran contrary to what was hypothesized. Furthermore, this pattern of results was contrary to the non-clinical participants, who showed no changes in affect from the pre-reward administration compared to the post-reward administration.

Suboptimal Priming Task

The SPT measured how strongly both words and images presented at a suboptimal perceptual threshold influenced participants' pleasantness ratings on ambiguous primes. This task can be thought of as a measure of perceptual sensitivity toward the primes in the five valence categories of achievement, negative, neutral, positive, and threat. In this task, I hypothesized that participants prone to mania would show a perceptual sensitivity to both the achievement and threat stimuli, and that this sensitivity would increase further for the achievement stimuli after the receipt of a reward for the mania-prone participants. While the hypothesized three-way interaction between group, time, and valence was not significant, many of the correlations observed between perceptual sensitivity to the achievement stimuli and the the individual difference variables were significant. Specifically, participants who scored high on BAS drive, BAS reward responsiveness, total BAS, the Activation Factor, ISS well-being, and PANAS positive affect showed greater perceptual sensitivity toward the achievement stimuli versus the neutral stimuli. When compared against the positive stimuli, greater perceptual

sensitivity toward the achievement stimuli was observed in those who scored high on BAS drive, BAS reward responsiveness, total BAS, the Activation Factor, GBI hypomania, GBI biphasic, and GBI biphasic lability. These latter results are particularly noteworthy, as they demonstrate that lifetime Bipolar symptoms were related to a sensitivity toward achievement-oriented stimuli that was over and above the sensitivity that was observed for the positive stimuli.

Taken together, these results suggest that while group membership (i.e., clinical vs. non-clinical) alone was not sufficient enough to determine sensitivity to achievement stimuli, many other characteristics that are strongly related to mania-proneness were in fact associated with achievement sensitivity. High scores on BAS and the Activation factor were associated with enhanced perceptual sensitivity toward achievement stimuli, and Bipolar Symptomatology was related to perceptual sensitivity toward achievement cues that was above what was observed for the positive stimuli. Therefore, the hypothesis that mania-prone individuals will exhibit sensitivity toward achievement-oriented stimuli was partially supported. The next hypothesis that was investigated was that mania-prone participants would show an increase in sensitivity toward achievement stimuli after the receipt of a reward. This latter hypothesis was not supported, as the hypothesized interaction between group, valence, and time was not significant, and analyses of the individual differences data showed no significant relationships with the achievement stimuli.

For the threat stimuli on the SPT, the hypothesis that mania-prone participants would show a heightened sensitivity to the threat stimuli was also partially supported. While the two-way interaction between group and valence was not significant, a

substantial number of correlations between the traits, symptoms, and affect associated with mania-proneness and threat sensitivity were significant, and in the predicted direction. The correlations showing heightened threat sensitivity when compared with the neutral stimuli were with BAS drive, BAS reward responsiveness, total BAS, ISS perceived conflict, ISS activation, the Activation Factor. These results indicate that high scores of these measures were associated with a greater perceptual sensitivity to the threat stimuli. In addition, the pattern of results observed with the threat stimuli were similar to those observed with the achievement stimuli, in that, when these stimuli were compared against their similar affect baseline conditions (i.e., achievement stimuli compared with positive stimuli; threat stimuli compared with negative stimuli), correlations were observed with lifetime Bipolar symptomatology. Specifically, high scores on BAS drive, BAS reward responsiveness, total BAS, GBI biphasic, GBI biphasic lability, GBI depression, GBI bipolar, and the Activation Factor were related to greater perceptual sensitivity to the threat stimuli that was over and above the influence conferred by the negative stimuli. Finally, in examining just the threat responses, a number of correlations were observed, indicating associations between both BAS and Bipolar symptomatology, and lower ratings on the threat stimuli, even without a comparison to the neutral and negative stimulus baselines. Taken together, these results provide support for the notion that both BAS and mania-proneness are associated with greater sensitivity toward threat-related stimuli, which is in accordance with hypotheses.

Affective Flanker Task

The AFT measured differential attention to stimuli in the five valence categories of achievement, negative, neutral, positive, and threat. Even though participants were

explicitly told not to attend to the word nested in between the two number pairs, because the numerical comparison involves moving the eyes from left to right, reading of the word occurs nevertheless, and the affective content of the word typically influences participants' reaction times. To control for the possibility that participants' reaction times could be influenced by the lexical characteristics of the words rather than the affective content, the word list used was balanced on the characteristics known to affect speeded processing, such as word length, frequency, orthographic neighborhood, in addition to affective arousal. This ensured that any differences observed between the valence categories can correctly be attributed to the valence of the word.

For the AFT, I hypothesized that mania-prone participants would be most influenced by both the achievement and threat stimuli, and that this influence would capture their attention, thus resulting in slower reaction times in these trials compared to both the neural and positive/negative stimuli. I further predicted that the influence of the achievement words for mania-prone participants would be stronger *after* the reward manipulation, thus, the prediction was that the RTs for the achievement would be greater in the post-reward condition compared to the pre-reward condition.

To begin, the hypothesized interaction between group, valence, and time was not significant, and there were no significant main effects or interactions observed for group. Furthermore, most of the correlations observed between processing speed on the threat and achievement stimuli and the individual difference variables associated with mania-proneness were in the *opposite* direction from what was predicted. Specifically, participants who scored high on all of the subscales of the GBI (hypomania, biphasic, biphasic lability, depression, bipolar), ISS perceived conflict, and the Biphasic factor had

faster reaction times, and this pattern of results was observed across *all* valence categories. Since these participants in the clinical group had significantly higher scores than the non-clinical group on all of these measures, and because these scales measure constructs that are associated with mania-proneness, we can infer that the mania-prone participants were more likely to have faster RTs across all valence categories compared with their non-clinical counterparts. To summarize, the prediction that mania-prone participants would exhibit greater attention (and slower reactions times) toward the achievement and threat stimuli was not supported, nor was the prediction that this attention toward achievement stimuli would increase after the receipt of a reward.

While these results may call into question the integrity of the task, the significant main effect that was found for valence, and the results indicating that participants were slowest on the trials with the threat words compared to the words in all of the other valence categories, are in concert with the results that are typically found on this type of task. Therefore, it appears that the task itself is not the cause of this unusual pattern of results.

In the present study, mania-prone participants were faster at completing the Affective Flanker Task, but without compromising accuracy, thus resulting in better overall task performance than the non-clinical participants. Given the extensive literature demonstrating cognitive impairment in patients with both active and remitted Bipolar Disorder (Kessing, 1998; Martinez-Aran, et al. 2002; Rubinsztein, Michael, Paykel, Sahakian, 2000; VanGorp, Altshuler, Theberge, Wilkins, & Dixon, 1998; Tham, Engelbrektson, Mathe, Johnson, Olsson, & Aberg-Wistedt, 1997), the aforementioned results are puzzling. Furthermore, the mania-prone participants did not show task

interference due to the valence of the word, as predicted. It is possible that the task was not robust enough to produce the predicted effects, which is an explanation that is supported by the lack of significant differences between the neutral stimuli and the emotionally-valenced stimuli across both groups. Indeed, the only effects found for valence were between the achievement and threat words, and between the threat and negative words. The former results were in an expected direction, and the latter results show a clear difference between negative words compared to threat words, with threat words producing more slowing than the negative words. Taken together, these results showed a pattern of all participants exhibiting a general slowing in the presence of extremely negative (i.e., threat) stimuli, and of the mania-prone participants showing better task performance (i.e., faster reaction times, without compromising accuracy) across all valence categories.

Probability Estimation Task

The PET was created for this study in order to explore participants' judgments about the probability of negative vs. positive and likely vs. unlikely events occurring for them in the future. Of particular interest was whether these judgments would differ between the two groups both at baseline, and after the receipt of a reward. The hypotheses for this task were that the mania-prone participants would be more likely to make positive unlikely judgments compared to the non-clinical participants, and that their probability estimations of these events would increase further after the receipt of a reward.

The results failed to provide support for the hypothesis that clinical participants would rate the positive events as being more likely both at baseline, and after the receipt

of a reward. Furthermore, the clinical participants did not rate the positive unlikely events as being more likely compared to their non-clinical counterparts. Instead, a two-way interaction between group and valence revealed that clinical participants rated *negative* events as being *more* likely and *positive* events as being *less* likely, compared to the non-clinical participants. These results were the opposite from what was predicted. In addition, exploratory analyses investigating the individual items on the scale showed an overall tendency for participants in the non-clinical group to rate the *positive* events as being more likely compared to the clinical group, and for the clinical participants to rate the *negative* events as being more likely compared to the non-clinical participants.

There was a general lack of support for the hypotheses in the PET, and many of the results were in the opposite direction of what was predicted, and show a propensity toward making high estimations of negative events among the mania-prone participants. In addition to the aforementioned two-way interaction showing a tendency for the clinical-participants to rate negative events as being more likely and positive events as being more unlikely, high scores on all of the GBI scales, in addition to the Biphasic Factor were found to be associated with *lower* probability estimations of the positive events.

The single items on the PET that yielded significant differences between the groups were examined in hopes of obtaining insight into this pattern of the results. Of the positive events that showed significant differences between the groups, all of these were related in some way to having adequate (or even copious) financial resources. Given the high degree of employment difficulties that often accompany a diagnosis of Bipolar Disorder (Murray & Lopez 1996; Harrow, Goldberg, Grossman, & Meltzer, 1990), it

may be the case that the assessments of the clinical participants of having the positive events be less likely to occur compared to the non-clinical group reflects the reality of having Bipolar Disorder. In addition, the negative events in which there were significant group differences were also somewhat related to Bipolar symptomatology. Nevertheless, the purpose of the task was not to assess the reality of what would be likely occur, but instead participants' *beliefs* about what would happen during the next seven years, as there was a hypothesized difference between them. Previous research has found that people with Bipolar Disorder tend to make optimistic judgments about such events (Ruggero & Johnson, 2006), while other studies have found a pattern of ambitious goal setting in people with Bipolar Disorder (Johnson, Ruggero, & Carver, 2005; Lozano & Johnson, 2001; Spielberger, Parker, & Becker, 1963), which lead to the hypothesis that Bipolar participants would rate the positive events as being more likely. However, the results of the present study may be better explained by the finding of unstable self-esteem in Bipolar patients, even when their symptoms are in remission (Knowles, Tai, Jones, Highfield, Morriss, & Bentall, 2007).

However, the analyses of the individual differences data yielded a more complex picture. While the correlations with lifetime history of mania and the Biphasic factor were opposite of predicted, high scores on total BAS, BAS Drive, HPS (i.e., trait-like mania-proneness), and the Activation Factor were associated with high scores on the *Positive Unlikely* events, which was as predicted. Taken together, these results suggest that it is BAS and trait-like activation rather than the symptoms of Bipolar Disorder that is associated with cognitive distortions towards an expectation of unlikely positive events.

Free Recall Task

The purpose of the free recall task was to assess which types of valenced information people pay attention to, and later remember. In the present study, the list of stimulus words were presented to the participants during the two iterations of the SPT and during the two iterations of the AFT. During the SPT, the words were presented to participants suboptimally (i.e., at 17 ms each), and during the AFT, the words were nested between the two numbers that participants were instructed to compare. In both tasks, the words were not the focus of the task, and in the AFT, the participants received explicit instructions to ignore the words. Therefore, the Free Recall task was designed to assess incidental learning. For this task, I hypothesized that mania-prone participants would recall more achievement words compared to the non-clinical participants. This hypothesis was not supported, as both the main effect and interaction for group were not significant, and when measured strictly in terms of words recalled, the correlations observed between individual difference variables and recall of the achievement words were also not significant. However, when measured against a baseline of positive words recalled, the analyses revealed that high scores on BAS and Positive Affect were associated with a tendency to recall more achievement words than positive words during the task. In addition, the correlations between the valence of the words recalled and the individual difference variables revealed that high scores on all subscales of the GBI (with the exception of GBI biphasic), ISS activation, ISS depression, PANAS negative affect, and the Biphasic Factor were associated with a diminished tendency to recall the positively-valenced words. These results suggest that the tendency to recall less positive

words may be related to mania-proneness. This finding was the opposite of what was predicted.

Summary of All Results

The present study found that, contrary to prediction, participants in the clinical group did not exhibit higher levels of BAS, and instead had higher levels of BIS. Furthermore, while there were correlations between lifetime symptoms associated with Bipolar Disorder and enhanced perception of both achievement and threat stimuli in the SPT, the majority of hypotheses that predicted that mania-prone participants would show increased judgments in the probability of positive unlikely events, increased attention to achievement oriented stimuli, and enhanced Positive Affect overall were not supported. In addition, the hypothesis of an intensification of positive affect and an increase in attention, perception, and judgments favoring an achievement orientation after the receipt of a reward for mania-prone participants was also not supported. However, the relationships that were hypothesized for the mania-prone participants were observed for the participants scoring high on BAS/activation, as positive relationships were observed between BAS/Activation Factor and Positive Affect, increased attention toward achievement oriented stimuli, increased tendency to predict positive unlikely events, and enhanced perception of achievement stimuli. Furthermore, while on the one hand, BAS/activation and the Biphasic symptoms that occur in mania formed separate factors in the factor analyses of all individual difference variables, other analyses that compared the factor variables with task performance showed parallel results on these two factors. So, while the overall results show a lack of correspondence between BAS and mania-proneness, the data also suggest that BAS is in fact related to enhanced perception of

achievement stimuli, increased judgments in the probability of positive unlikely events, increased attention to achievement oriented stimuli, and enhanced positive affect overall. A surprising yet consistent finding in the present study was the positive association between Bipolar symptomatology and higher levels of BIS, more negative affect, more predictions of negative events, and higher levels of threat perception. These results suggest an overall propensity toward negative affect in the mania-prone participants.

Critical Evaluation of the Present Study

The finding in the present study showing a propensity of the Bipolar participants towards negative affect might lead the reader the wonder whether a diagnosis of Bipolar Disorder was an accurate classification. Participants' Bipolar symptomatology was assessed using a variety of scales, each of which was shown to have sound psychometric properties, and each measuring a different component of Bipolar symptomatology. These results indicated that the clinical participants were significantly different than their non-clinical counterparts on scales measuring lifetime Bipolar symptoms, current Bipolar symptoms, and trait-like hypomania. In addition, any participants in the clinical group who were not currently taking medication typically prescribed for Bipolar Disorder in the categories of mood stabilizers, anti-psychotics, or anti-convulsants were interviewed by this author to ensure that they had experienced an episode of true mania or hypomania. In every case, the participants who were interviewed described an episode that met DSM-IV-TR diagnostic criteria for mania or hypomania. As a result, it appears that the participants in the clinical group were in fact accurately diagnosed as having Bipolar Disorder.

However, a shortcoming of the present study is that the assessment of Bipolar symptomatology suffer mono-method bias, as all of the individual difference measures used in the study were captured via self-report scales. Indeed, several studies have shown that significant shortcomings exist in the assessment of personality and psychopathology when self-report is used as the sole source of data (Achenbach, Krukowski, Dumenci, & Ivanova, 2005; Oltmanns & Turkheimer, 2009; Wilson, & Dunn, 2004). Future studies in this area should utilize other methods such as informant data and physiological data to supplement self-report data.

A further shortcoming of the present study is that the reward manipulation had no effect on all participants across all tasks. One explanation is that the reward manipulation was not believable to participants. This explanation may be the case, as during the part of the experiment in which participants were told to ask for their prize, several participants continued on with the experiment, and later reported that they didn't think these instructions were the truth. As a result, this author had to change the computer program after the reward manipulation to not advance until the experimenter had entered a code following the distribution of the prize, in order to ensure that all participants would receive all components of the reward manipulation.

There are several possible explanations as to why the reward manipulation may not have been convincing to participants. First, all participants received the reward manipulation, which included positive feedback about task performance regardless to actual task performance. So, for participants who were not giving the tasks their full attention or who felt that they had not performed well on the tasks, this lack on congruence between their beliefs about their task performance and the false positive

feedback about their task performance may have resulted in incredulity about the reward manipulation. Second, since many of the participants in the study came from a participant database, it is possible that their prior experience with experimental protocols in psychology experiments made them suspicious about the reward manipulation. Third, it is possible that the positive feedback about task performance and the small bag containing candy and a university pen were not strong enough rewards to change mood and/or task performance. Fourth, since the reward manipulation was administered after the first iteration of the tasks, it was therefore confounded with time, and it is possible that any positive changes in mood or motivation that occurred as a result of the reward manipulation were negated by fatigue, boredom, or frustration with the tasks. A final explanation is that the reward manipulation was in fact believable, but that the processes that govern task performance are not influenced by such factors. The present study did not query participants about the effect of the reward manipulation after the completion of the study, so it is impossible to state which if these possible explanations was responsible for the lack of results in this area. Future research could manipulate the type and strength of rewards on cognitive and perceptual task performance in order to further assess the impact of rewards on these processes.

Propensity Toward Negativity in Bipolar Disorder

The results in the present study of clinical participants evidencing higher levels of BIS, more negative affect, more predictions of negative events, and higher levels of threat perception suggest an overall propensity toward negative affect. Even though an exploratory hypothesis in the present study was an association between increased attention toward threat cues and high levels of BAS, this hypothesis did not predict the

associations observed in the present study between BIS, negative affect, and enhanced attention and perception of treat cues in the mania-prone participants, especially in the absence of high levels of BAS. While these results were unexpected, a review of the literature has revealed other researchers who have found similar patterns of results. A study by Quilty and colleagues (Quilty, Sellbom, Tackett, & Bagby, 2009) investigated the personality predictors of Bipolar Disorder and discovered that Bipolar Disorder was best predicted by low Agreeableness and high Neuroticism on the NEO, and not Extraversion/BAS, as would be expected by the research discussed in the present study (Meyer & Hoffman, 2005; Meyer, Johnson, & Carver, 1999). Furthermore, when the data were modeled using a solution that conceptualized mania separately from the domain of depression, mania itself was associated with high Neuroticism, high Extraversion, and low Agreeableness scores on the NEO. The finding that Bipolar Disorder was related to high levels of Neuroticism is consistent with the results in the present study that found higher levels of BIS in the clinical participants and positive correlations between BIS and measures of Bipolar symptomatology. Furthermore, the results in the present study of more negativity in the clinical vs. non-clinical samples makes sense if we consider the notion that Bipolar participants have a propensity toward negative affective styles rather than a positive/grandiose one.

Indeed, this pattern of results has been found in other studies as well. Several studies have found that Bipolar (and in some cases, Bipolar spectrum) individuals had cognitive styles (i.e., automatic thoughts, dysfunctional attitudes, attribution styles, self esteem) that were as negative as their Unipolar counterparts (Alloy, Reilly-Harrington, Fresco, Whitehouse, & Zechmeister, 1999; Hollon, Kendall, & Lumry, 1986; Jones,

Scott, Haque, Gordon-Smith, Heron, & Caesar, 2005). Furthermore, in a study by Lam and colleagues (Lam, Wright, & Smith, 2004), no significant differences in dysfunctional attitudes were observed between Unipolar and Bipolar participants on goal attainment, dependency, and achievement factors. However, when current mood was controlled for, Bipolar participants evidenced even higher levels of dysfunctional attitudes in the domain of goal attainment than their Unipolar counterparts. Furthermore, in a study by Lyon and colleagues (Lyon, Startup, & Bentall, 1999), both Unpiolar and Bipolar participants made more self-attributions when presented with negative vs. positive events on an implicit test of attributional style. In addition, both groups were slower to name depression-related but not euphoria-related words, which is suggestive of increased attention to the negatively-valenced words. However, on explicit measures of attributional style, the Bipolar participants' performance was in concert with the non-clinical participants. Taken together, the authors describe these results as being consistent with Neale's (1988) model of the manic defense, which proposes that when latent negative self-representations are primed, Bipolar individuals experience conscious feelings of low self-worth, which then triggers either a depressive response, or a response in which they become manic and grandiose. However, Lyon and colleagues (1999) argue that a key limitation of this model is that it does not offer an adequate explanation of why the manic outcome is sometimes triggered, while on other occasions the depressive outcome is triggered. It is clear that more research in this area is needed in order to better describe the processes that underlie the affective lability and dysregulation that are the key features of Bipolar Disorder.

Subtypes in Bipolar Disorder

Given the extensive literature revealing propensities toward both negative affect and positive/reward cues in people prone to mania, the question arises as to how can we reconcile these seemingly disparate findings. One answer may be in the fact that Bipolar Disorder is widely accepted to be a disorder with a high degree of heterogeneity, which can pose significant challenges when conducting Bipolar research (Johnson, Sandrow, Meyer, et al., 2000). Attempts to better capture this heterogeneity have resulted in the suggestion that there are subtypes within the disorder, in addition to substantial differences between the diagnostic categories of Bipolar I and Bipolar II Disorder.

Several studies investigating Bipolar Disorder in children have yielded evidence for subtypes within the disorder. A study by Rydén and colleagues found that Bipolar patients who had ADHD in childhood had a different clinical outcome than Bipolar patients without ADHD, even when the childhood ADHD symptoms remitted in adulthood (Rydén, Thase, Stråht, Åberg-Wistedt, Bejerot, & Landén, 2009). In this study, those with childhood ADHD exhibited an earlier onset of their first affective episode, more frequent affective episodes, and more interpersonal violence compared with the patients who did not have a history of childhood ADHD. These results led the authors to the conclusion that comorbid childhood ADHD and Bipolar Disorder represents a distinctive, early-onset phenotype of Bipolar Disorder. Furthermore, in a study of pediatric Bipolar Disorder, Papolos and colleagues (Papolos, Mattis, Golshan, & Molay, 2009) found a clinically homogeneous behavioral phenotype of Bipolar Disorder characterized by high levels of Fear of Harm that was distinctively different from what was observed in other participants with pediatric Bipolar Disorder. The authors found that participants with the Fear of Harm phenotype had more severe mania and depression,

an earlier age of onset, higher degrees of social impairment, and higher levels of disturbance in the domains of sleep/arousal, harm to self and others, territorial aggression, anxiety, self-esteem, and psychosis/parasomnias/sweet cravings/obsessions. The finding of a subtype of Bipolar Disorder having unusually high levels of Fear of Harm may explain the results in the present experiment, which found a propensity toward negative affect and increased perception toward threat cues.

The effect of early age of onset was investigated in a study by Biffin and colleagues (Biffin, Tahtalian, Filia, Fitzgerald, de Castella, Filia, et al., 2009). The authors explored the hypothesis that there are three distinct subgroups of Bipolar I Disorder, and that these subgroups are defined by the age of onset. This longitudinal study found that the early onset group (mean age of onset = 15.50 years) experienced higher rates of depression, suicidal ideation, binge drinking, and poorer quality of life across several domains. This group was also more likely to have a depressive episode as the initial episode, while the intermediate age of onset group (mean age of onset = 26.10 years) was more likely to have a manic episode as their initial episode.

Differences between Bipolar I and Bipolar II Disorder have also emerged in the literature. A study by Nagamine and colleagues (Nagamine, Yoshino, Miyazaki, Takahashi, & Nomura, 2009) investigated conscious visual awareness via a phenomenon called binocular rivalry, which occurs when figures that are dissimilar are presented to each eye individually, causing perception to alternate spontaneously between each monocular view. The researchers found that binocular rivalry was significantly longer for the Bipolar I patients compared to both the Bipolar II patients and controls, while no significant differences were observed in the binocular rivalry duration between the

Bipolar-II patients and controls. The authors interpreted these results as being evidence of neurobiological differences between these two subtypes of Bipolar Disorder. In addition, a study by Hsiao and colleagues also found evidence supporting the notion of neurological differences between the two Bipolar subtypes (Hsiao, Wu, Wu, Hsu, Chen, Lee, et al., 2009). This study assessed cognitive functioning in Bipolar Disorder, and found that participants with Bipolar I Disorder performed more poorly on tests of verbal memory, psychomotor speed, and executive function compared to both the Bipolar II and control group. On the other hand, participants with Bipolar II only showed impairment in the domains of working memory and psychomotor speed. Taken together, these studies suggest that there are clear differences in neurobiological functioning between people with Bipolar I and Bipolar II Disorder, which is one possible explanation for the high degree of heterogeneity observed within the disorder, and in the results of the present study.

Given the heterogeneity observed in Bipolar Disorder, and the aforementioned evidence regarding the existence of Bipolar Subtypes, future research should include investigations of age of onset, symptom profiles, comorbid ADHD, and childhood symptoms in their investigations of Bipolar Disorder. In addition, future studies elucidating the boundary conditions under which negativity vs. positivity/achievement orientation prevails for people with Bipolar Disorder will be especially useful in advancing our understanding of this extremely heterogeneous disorder.

Final Summary and Conclusions

The present study investigated the hypotheses that mania-prone participants would show a propensity toward positive affect and toward achievement-oriented stimuli

in tasks measuring attention, perception, and judgments about future events. The mechanism thought to be underlying these tendencies was a high level of BAS, which has been proposed as the driving force behind mania. These relationships were predicted both at baseline, and after the receipt of a reward, in which case mania-prone participants were expected to show further increases across all of the aforementioned areas. The present study failed to find high levels of BAS in mania-prone participants, and failed to find high levels of positive affect and propensity toward achievement oriented stimuli, except in a task measuring perceptual sensitivity, in which case, there was evidence to support the notion of mania-prone participants being perceptually sensitive to achievement cues. There was also a lack of support for the hypothesis that a reward manipulation would further increase positive affect and achievement-oriented cognition, perception, and judgments about future events for the mania-prone participants. However, BAS was positively related to positive affect, enhanced attention and perception of achievement stimuli, and judgments about positive unlikely events. Therefore the hypothesis that BAS is related to an enhanced orientation toward positivity and achievement cues was supported; the hypothesis that BAS, positive affect, and enhanced achievement orientation was related to mania-proneness was generally not supported.

An unexpected finding was that the mania-prone participants in the present study had a propensity toward negative affect, and toward the negative and threat stimuli in the experiments. While running contrary to the hypotheses in the present study, there is an extensive literature documenting these relationships. Several researchers have proposed that the tremendous heterogeneity observed in Bipolar Disorder can be best explained by the notion of Bipolar subtypes, and research in this area has shown important differences

in people with Bipolar Disorder, based on age of onset, initial presenting symptoms, overall symptomatology, comorbidity with ADHD, symptomatology in childhood, attention to cues of harm, and between the Bipolar I and Bipolar II subtypes. However, the majority of these factors have not been integrated into the current DSM diagnostic nomenclature, and are usually not measured by Bipolar researchers. In addition, no formal phenotype of Bipolar Disorder describing a propensity toward negativity has been delineated in the DSM. Therefore, future research should include an assessment of the aforementioned factors (e.g., age of onset, initial presenting symptoms, overall symptomatology, comorbidity with ADHD, symptomatology in childhood, attention to cues of harm), and should use multi-source methods, including informant and psychophysiological data in order to better elucidate the complex mechanisms underlying mania.

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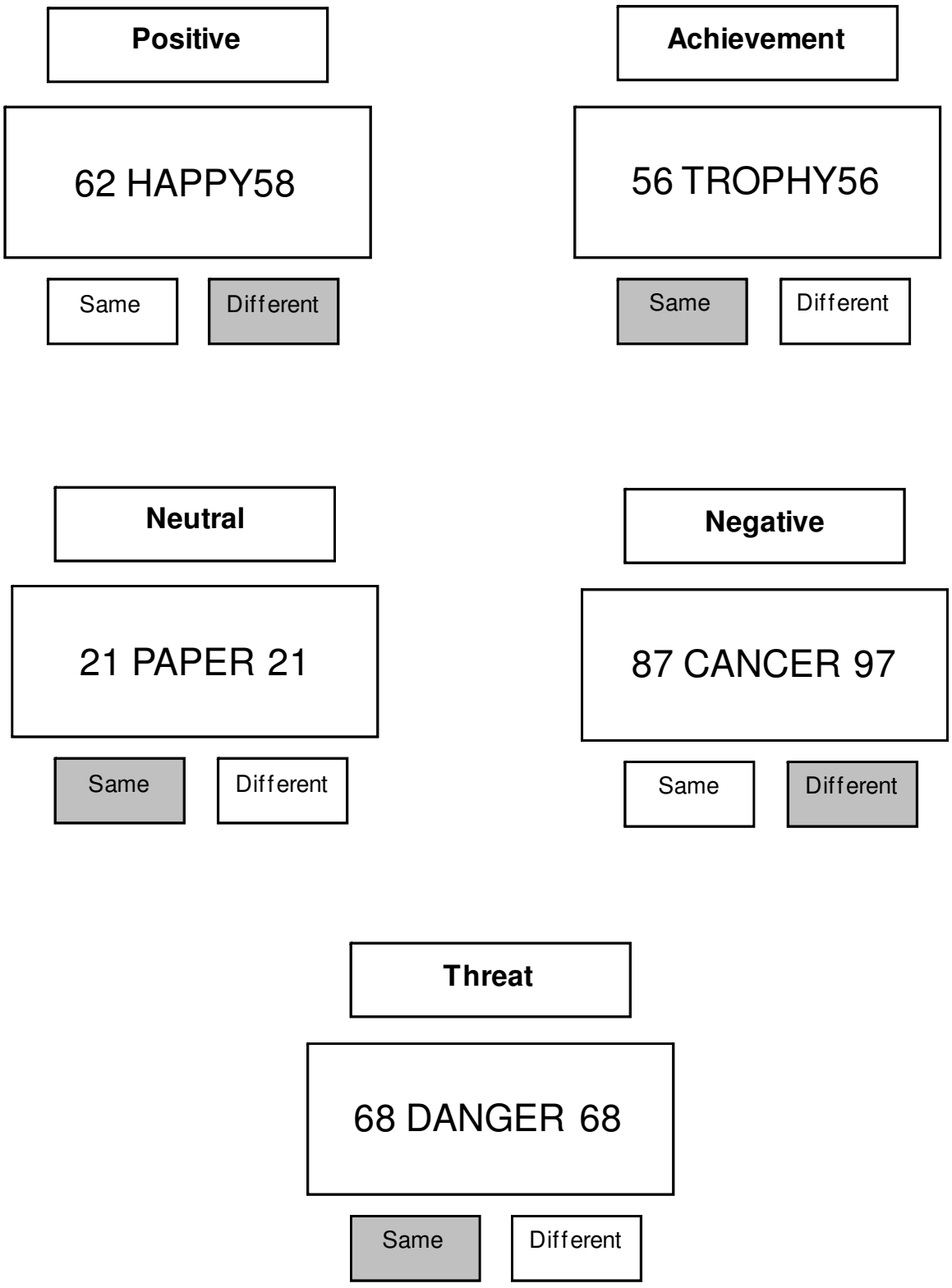
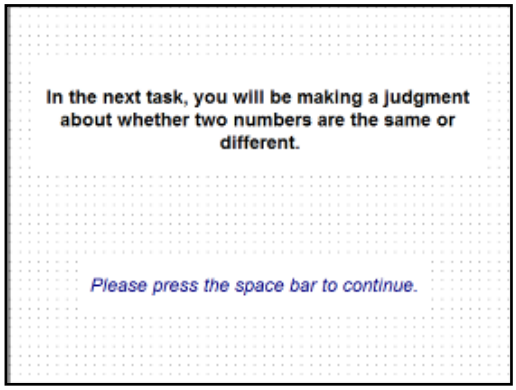
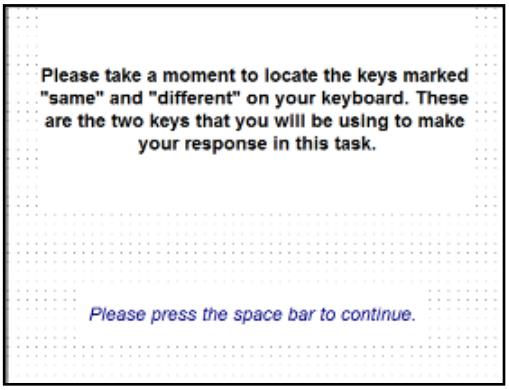
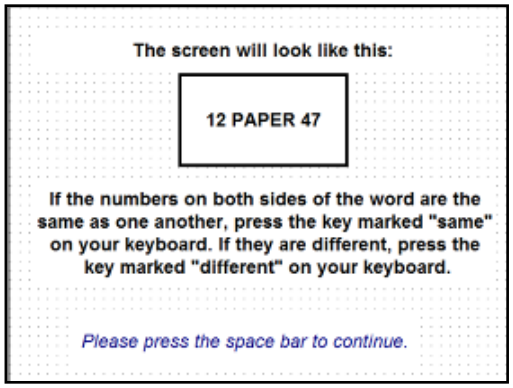
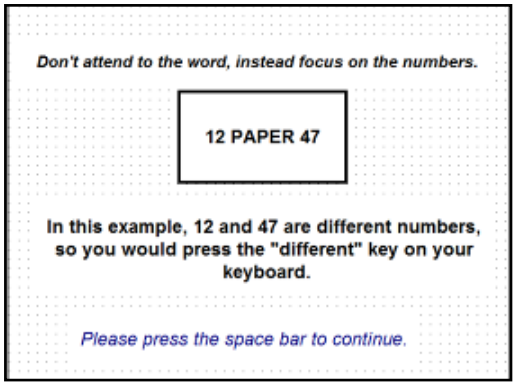


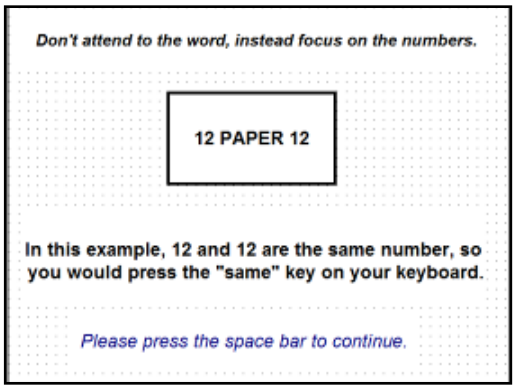
Figure 1: Affective Flanker Task: Examples of word categories and correct responses

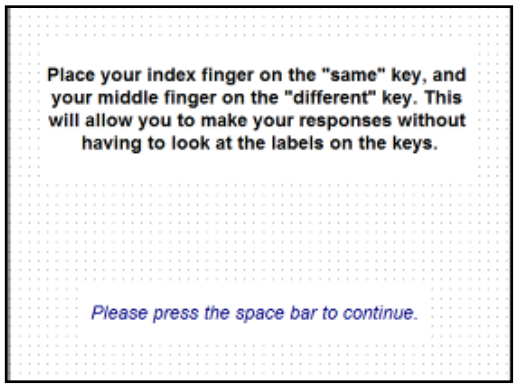


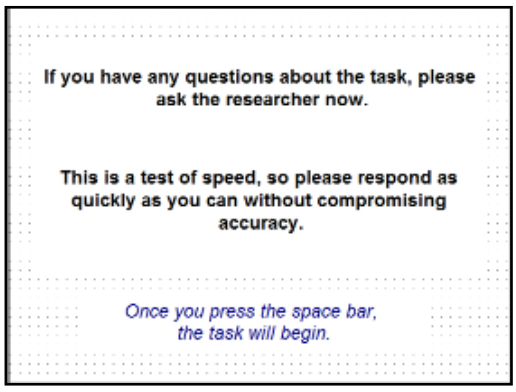












-AFT: 100 trials = 2x50 words (5 valence categories, 10 words/category)
-Words presented in random order
-Equal probability of same vs. different trials
-ITI = 1,000 ms (1 second)

Figure 2: Instruction Screens for the Affective Flanker Task

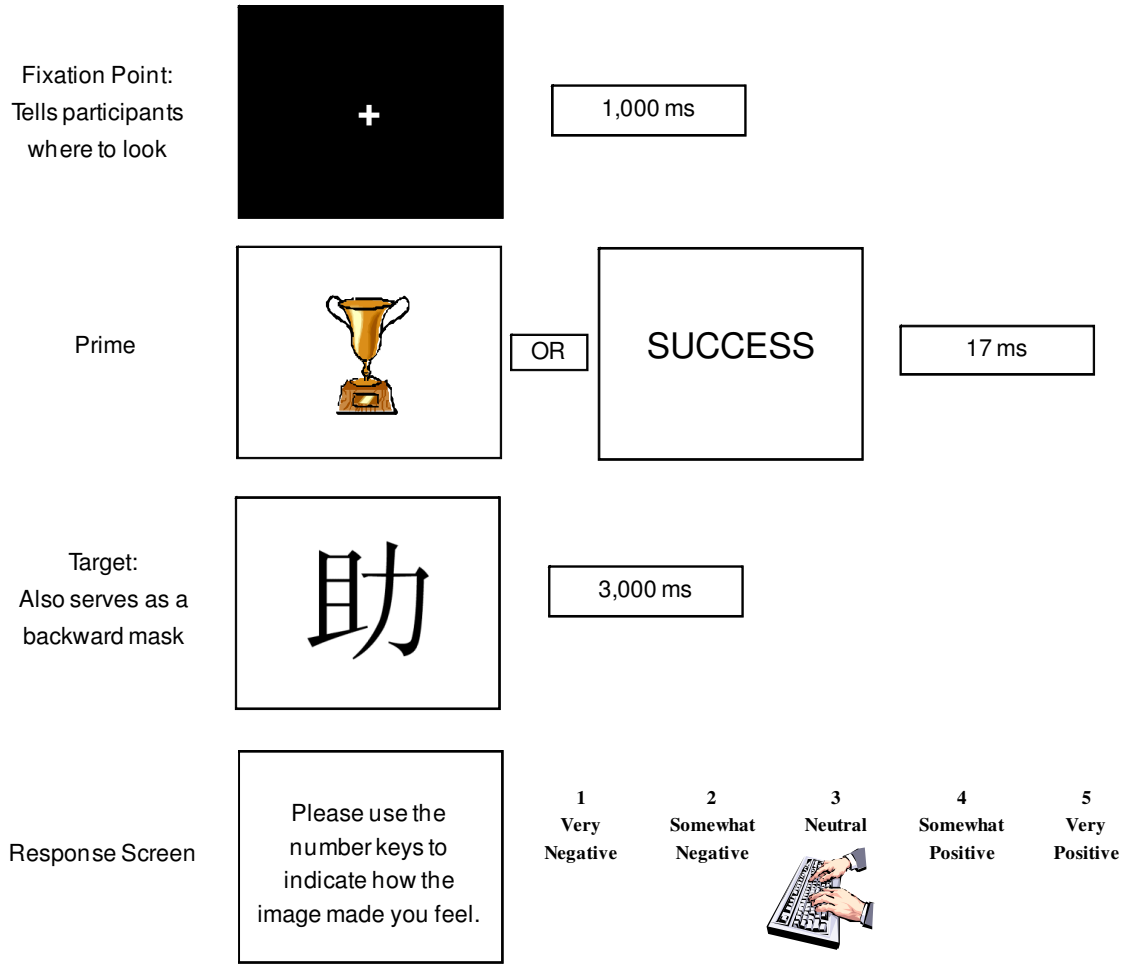


Figure 3: Suboptimal Priming Task

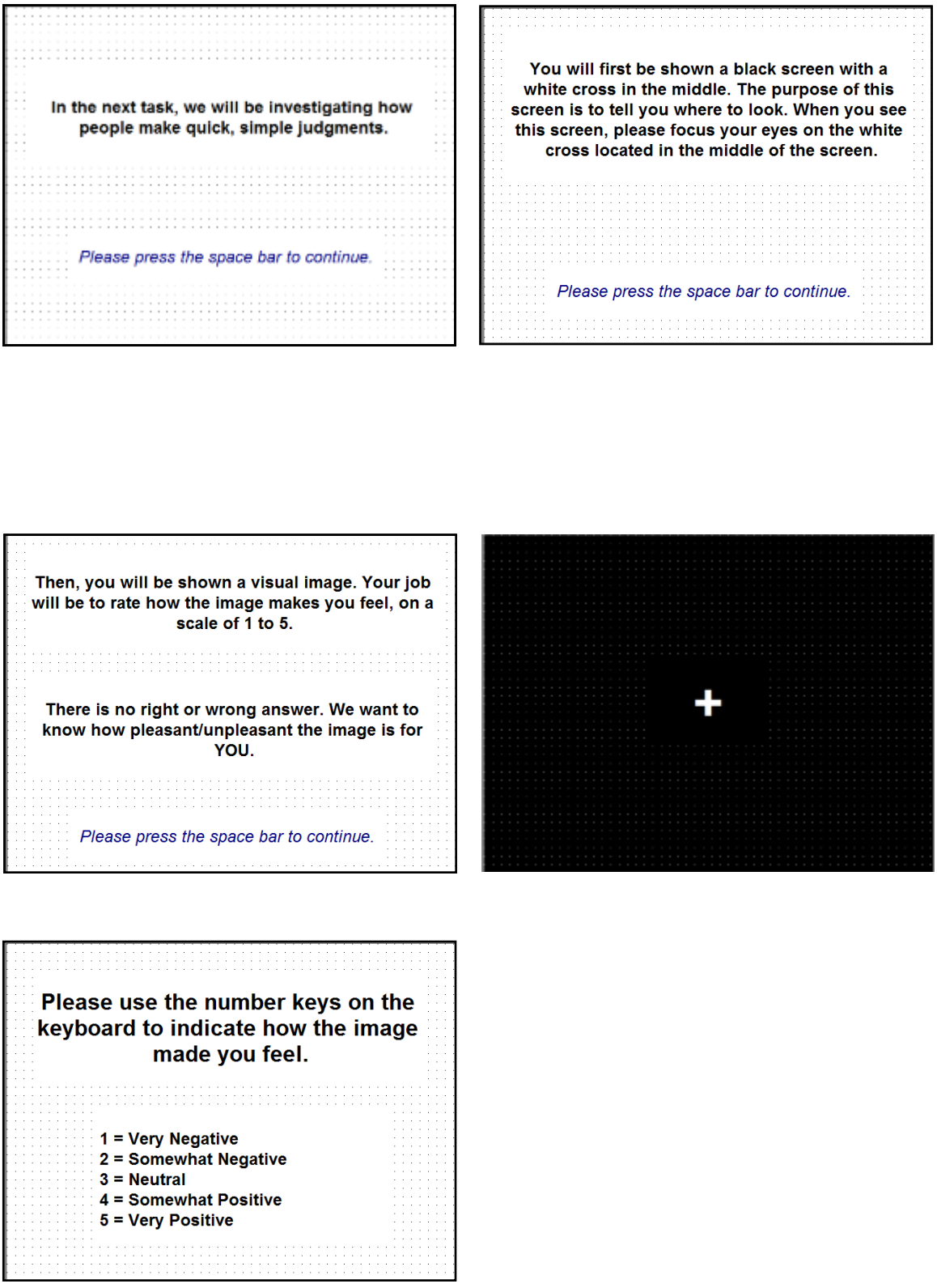
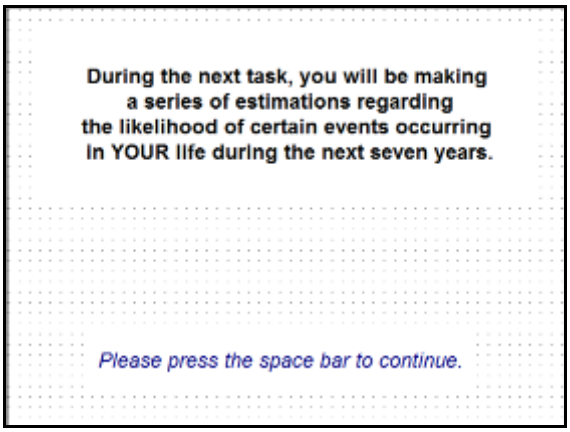
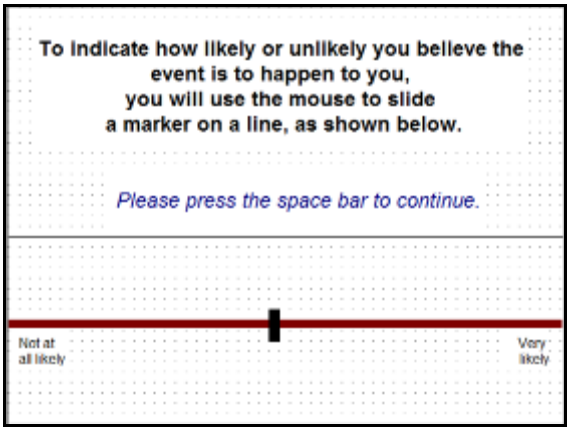
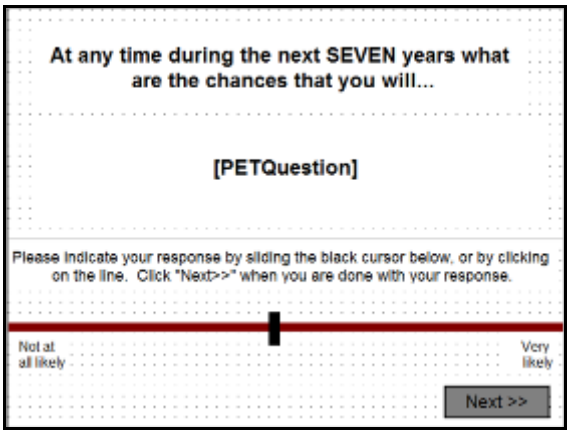


Figure 4: Instruction Screens for the Suboptimal Priming Task







-PET = 48 questions, from 4 categories (positive likely, positive unlikely, negative likely, negative unlikely), 12 questions per category
-Questions presented in random order

Figure 5: Instruction Screens for the Probability Estimation Task

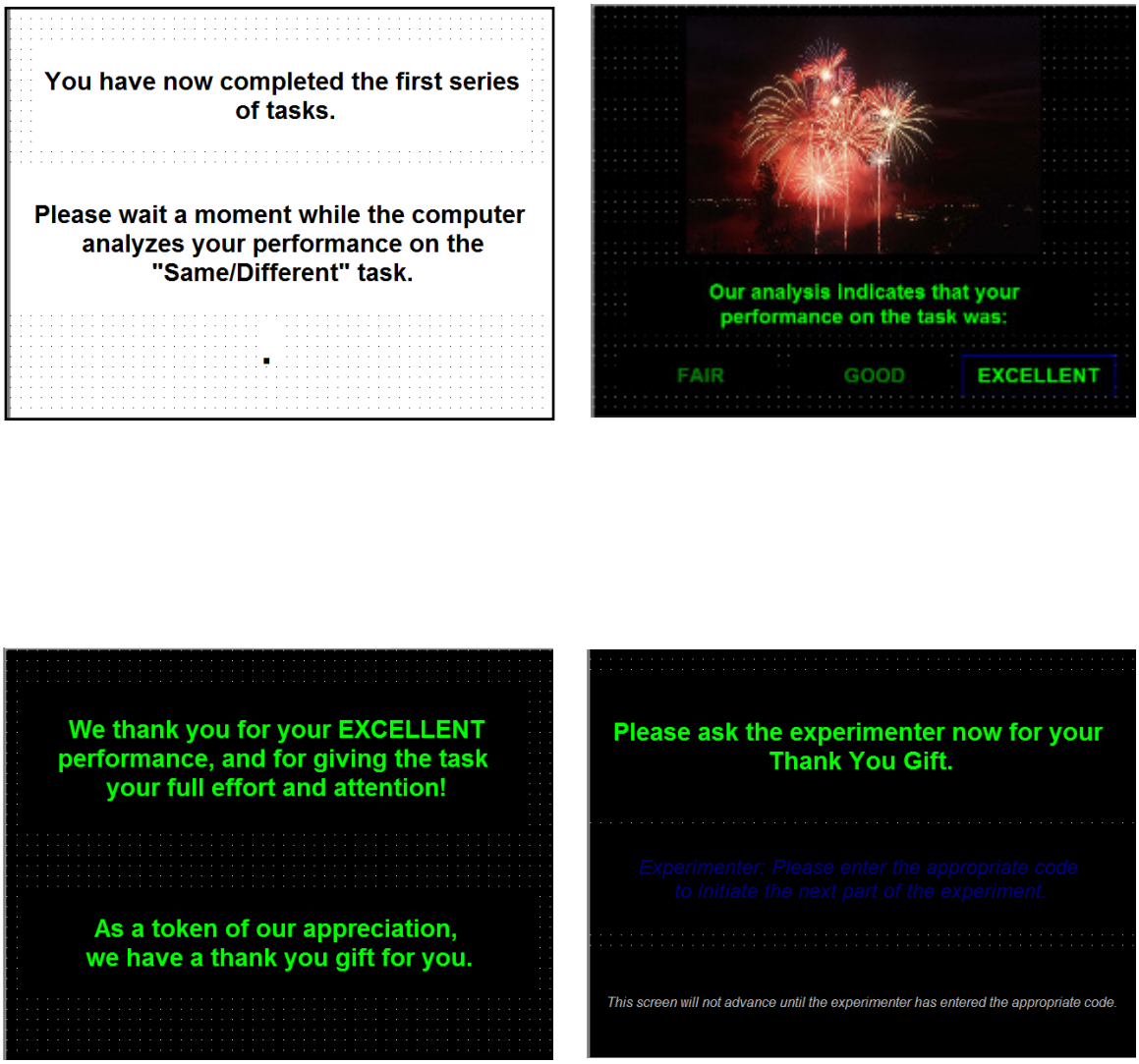
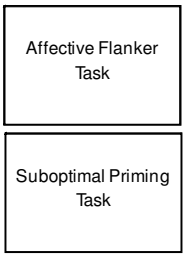


Figure 6: Instruction Screens for the Reward Manipulation

• Administer PANAS – measures current mood

• Probability Estimation Task

• Baseline Tasks: administered in random order



• Reward Feedback Manipulation: positive performance feedback and goody bag

• Post-Reward Tasks: administered in random order

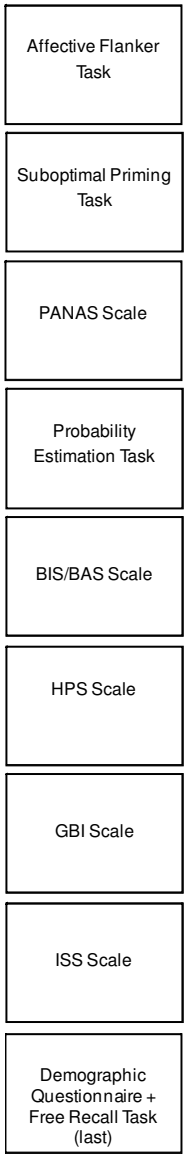
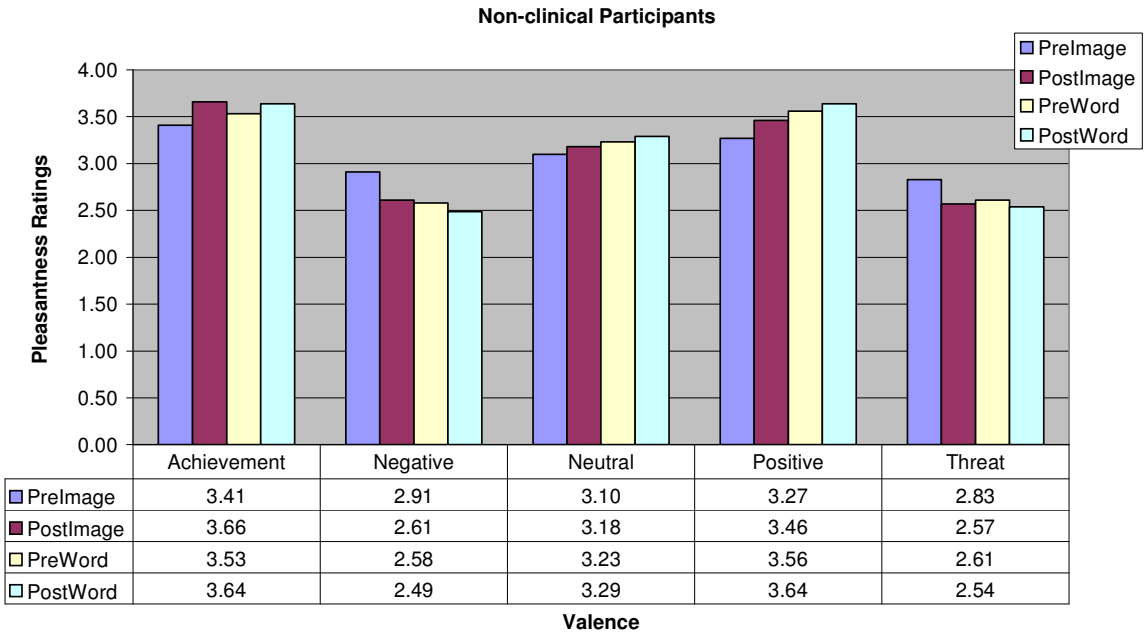
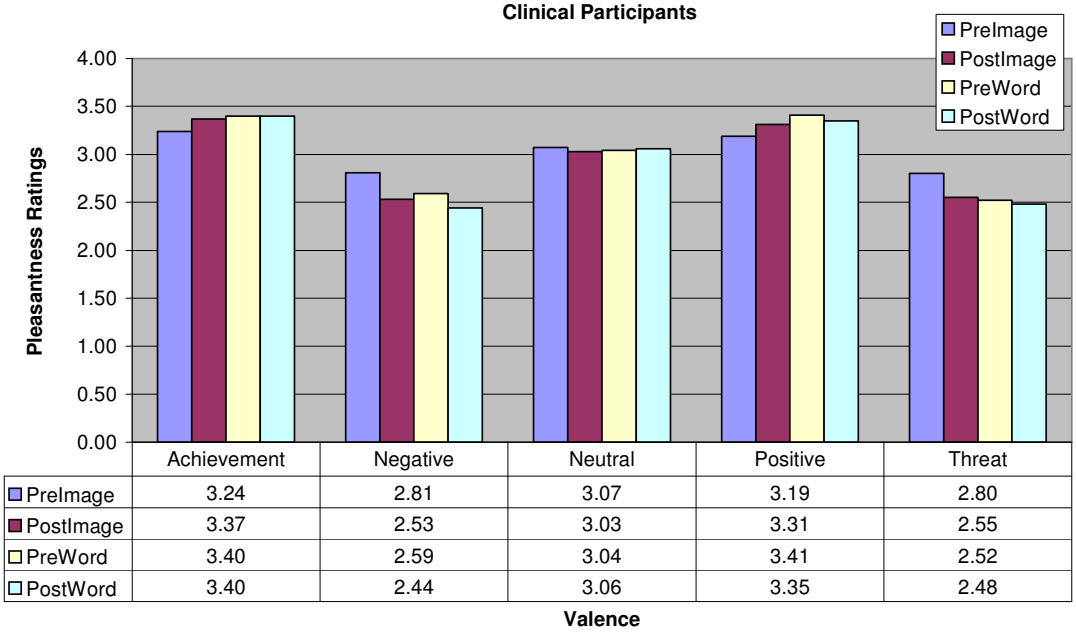


Figure 7: Order of Tasks

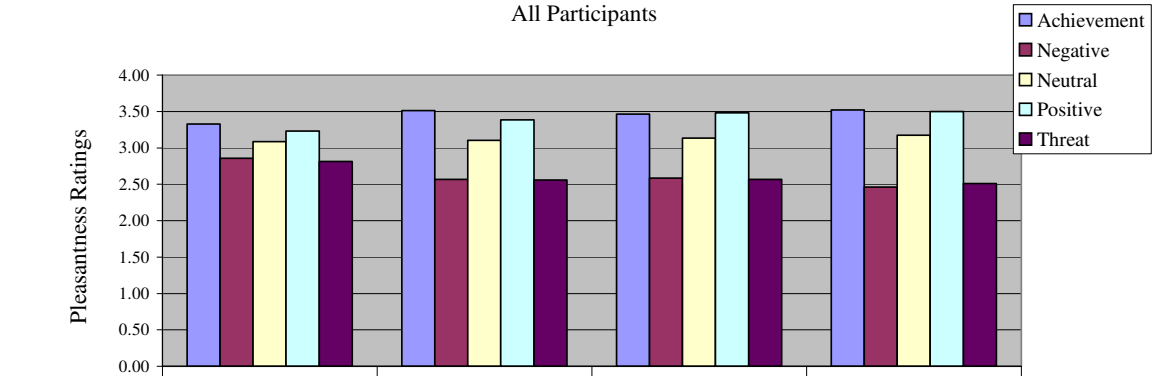


	Achievement	Negative	Neutral	Positive	Threat
PreImage	3.41	2.91	3.10	3.27	2.83
PostImage	3.66	2.61	3.18	3.46	2.57
PreWord	3.53	2.58	3.23	3.56	2.61
PostWord	3.64	2.49	3.29	3.64	2.54



	Achievement	Negative	Neutral	Positive	Threat
PreImage	3.24	2.81	3.07	3.19	2.80
PostImage	3.37	2.53	3.03	3.31	2.55
PreWord	3.40	2.59	3.04	3.41	2.52
PostWord	3.40	2.44	3.06	3.35	2.48

Figure 8: Suboptimal Priming Task: Mean pleasantness ratings by time, stimulus type, and valence category for both non-clinical and clinical participants.



	PreImage	PostImage	PreWord	PostWord
Achievement	3.33	3.51	3.46	3.52
Negative	2.86	2.57	2.59	2.46
Neutral	3.09	3.11	3.13	3.17
Positive	3.23	3.39	3.48	3.50
Threat	2.81	2.56	2.57	2.51

Time x Stimulus Type

Figure 9: Suboptimal Priming Task: Mean pleasantness ratings by time, stimulus type, and valence category for all participants.

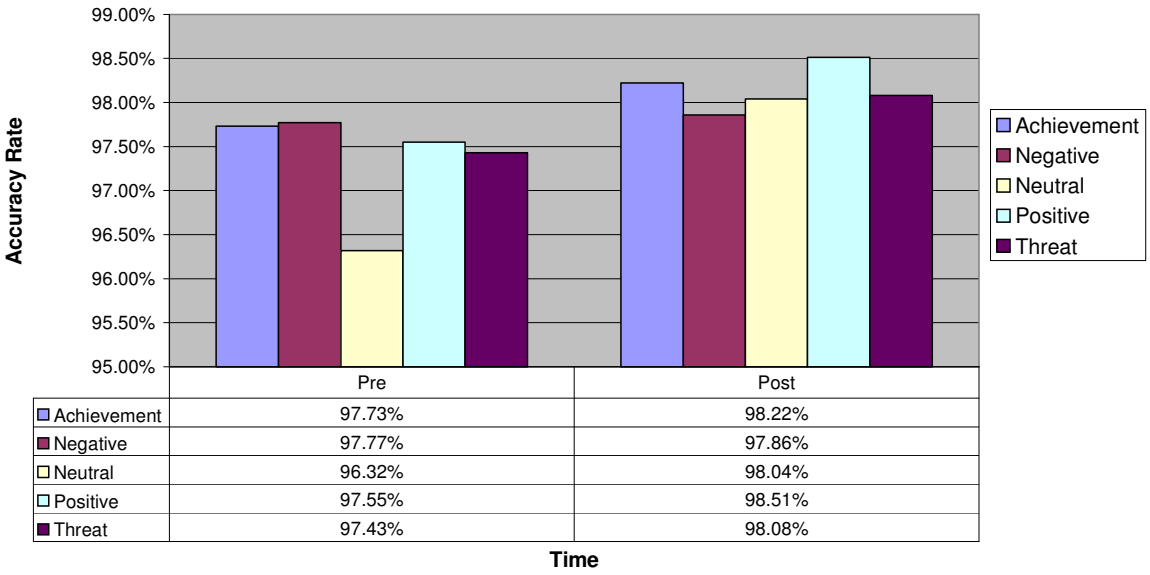


Figure 10: Affective Flanker Task: Mean accuracy rates by time and valence category.

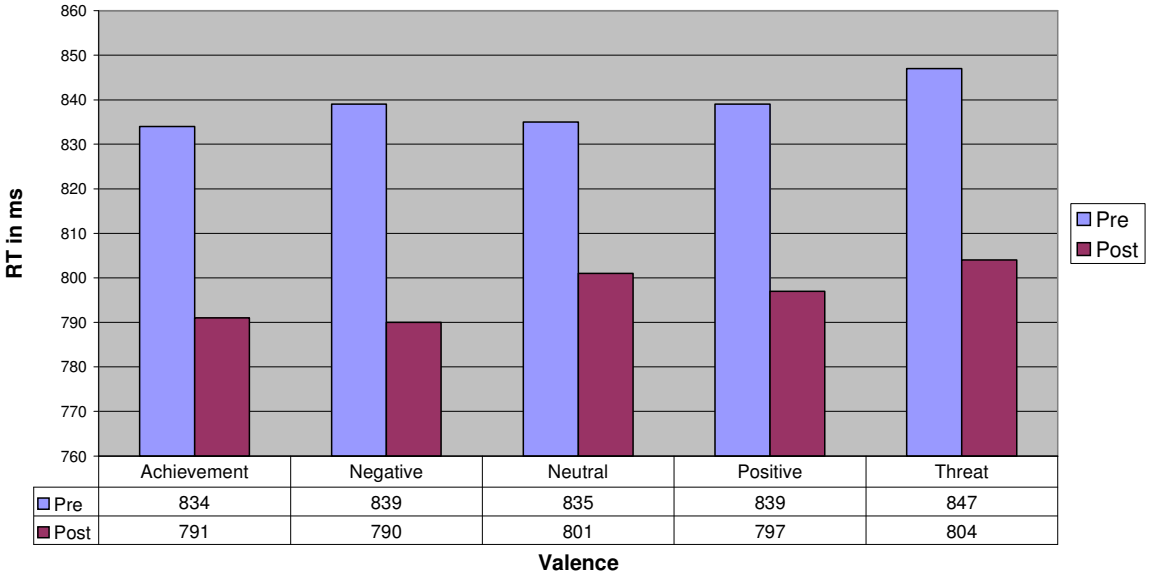
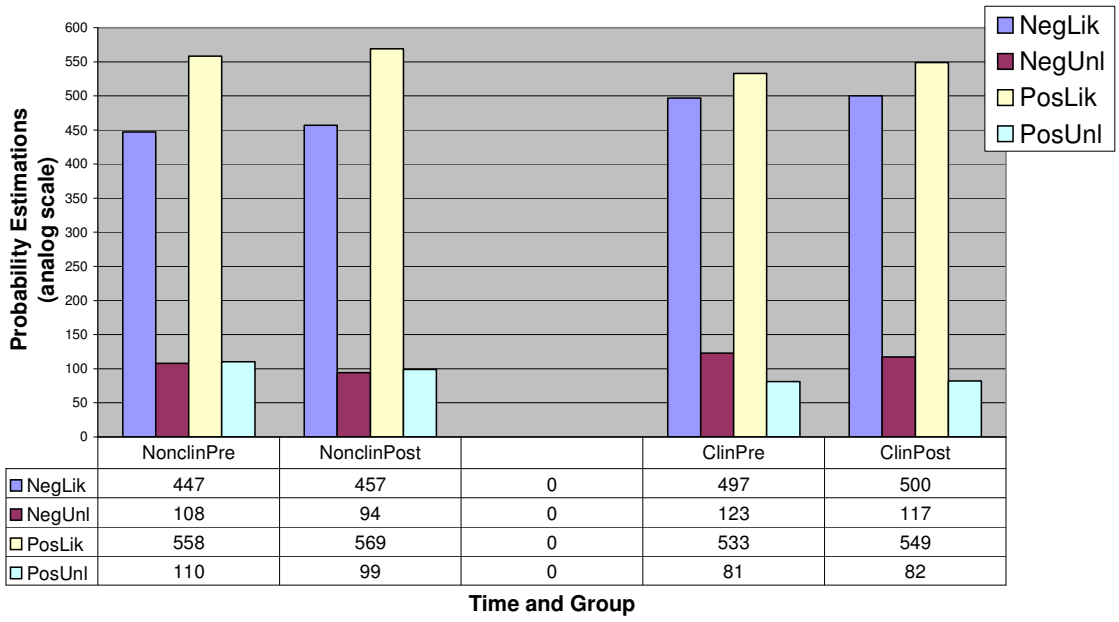


Figure 11: Affective Flanker Task: Mean reaction times by time and valence category.



	NonclinPre	NonclinPost		ClinPre	ClinPost
NegLik	447	457	0	497	500
NegUnl	108	94	0	123	117
PosLik	558	569	0	533	549
PosUnl	110	99	0	81	82

Figure 12: Probability Estimation Task: Mean probability estimations by event type (positive vs. negative; likely vs. unlikely), time (pre vs. post reward) and group (clinical vs. non-clinical).

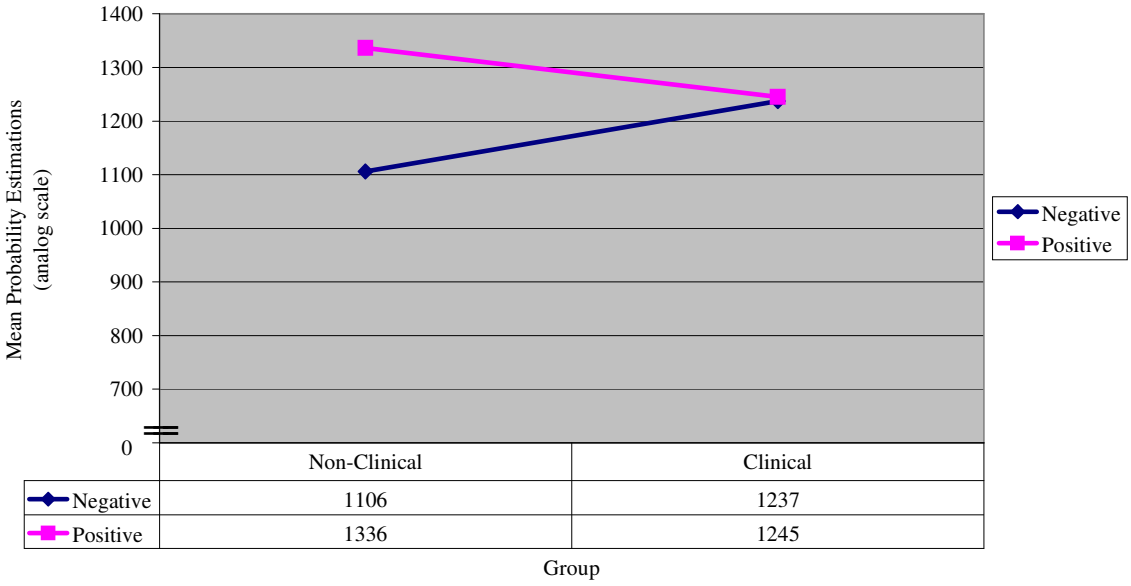
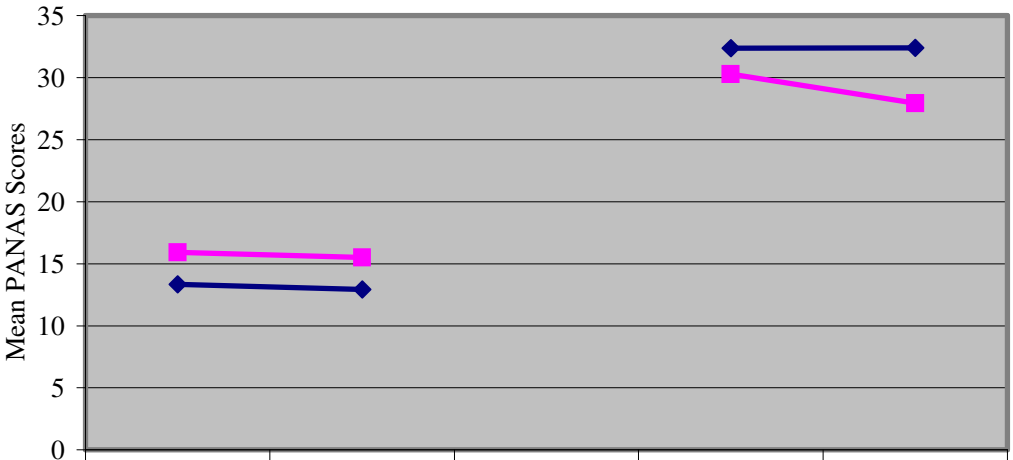


Figure 13: Probability Estimation Task: Two-way interaction between valence and group.



	PreNeg	PostNeg		PrePos	PostPos
Non-clinical	13.33	12.93		32.37	32.39
Clinical	15.92	15.51		30.29	27.94

Time x Valence

Figure 14: PANAS: Marginally significant three-way interaction between group, time, and valence.

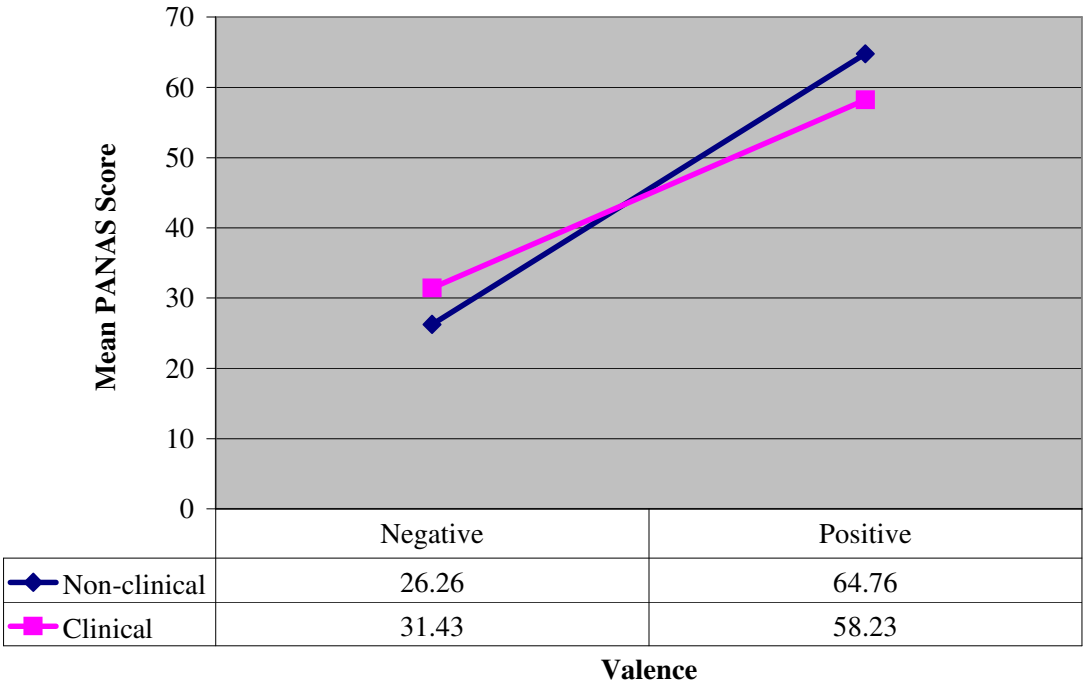
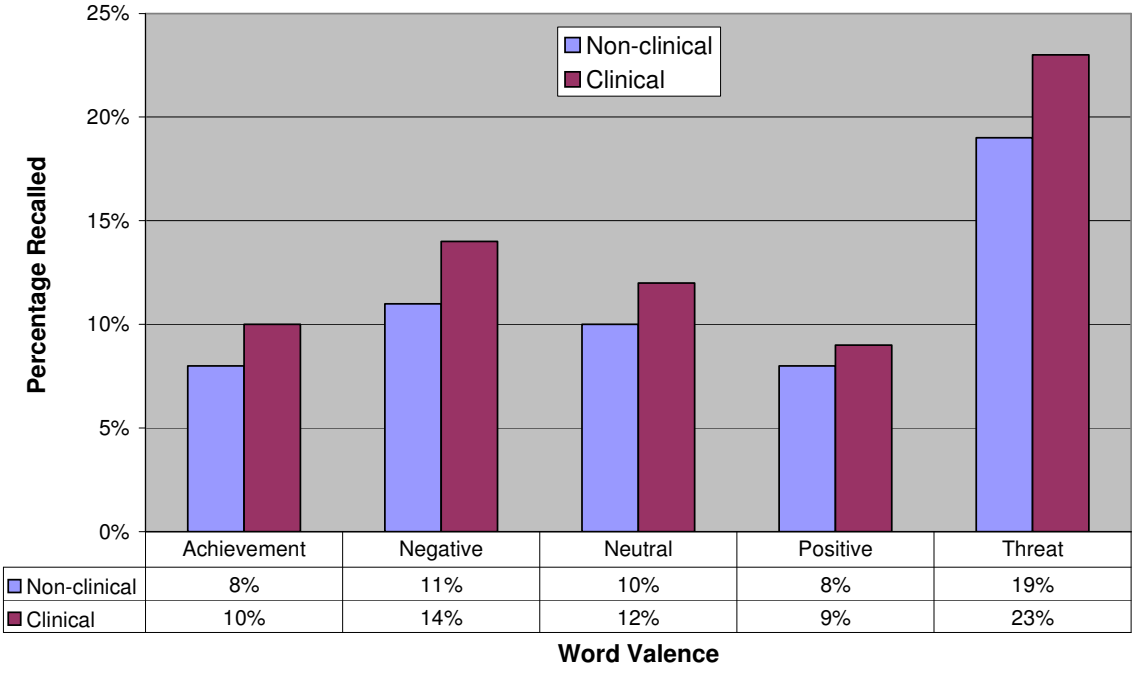


Figure 15: PANAS: Two-way interaction between group and valence.



	Achievement	Negative	Neutral	Positive	Threat
Non-clinical	8%	11%	10%	8%	19%
Clinical	10%	14%	12%	9%	23%

Figure 16: Free Recall Task: Mean percentage of words recalled as a function of word valence.

	t	df	p	Cohen's d	Effect Size	NonClinical M	Clinical M	NonClinical SD	Clinical SD
BAS-drive	-.62	103	.53	0.12	Small	10.70	11.00	2.50	2.36
BAS-fun seeking	-1.02	103	.31	0.20	Small	11.41	11.84	2.14	2.24
BAS-reward respns.	.46	103	.65	0.09	Small	17.19	17.00	2.04	2.07
BAS-all	-.51	103	.61	0.10	Small	39.90	39.84	5.58	5.44
BIS	-3.50**	103	.00	0.68	Medium	20.26	22.73	3.47	3.74
GBI-hypomania	-6.36**	81.61	.00	1.26	Large	6.94	18.29	6.63	10.97
GBI-biphasic	-7.31**	80	.00	1.45	Large	3.40	10.43	3.49	5.96
GBI-biphasic lability	-7.43**	78.9	.00	1.47	Large	1.62	5.53	1.87	3.28
GBI-depression	-7.93**	79.83	.00	1.57	Large	19.72	59.63	18.19	31.20
GBI-bipolar	-6.96**	80.99	.00	1.38	Large	10.34	28.73	9.71	16.28
HPS	-2.13*	102	.04	0.42	Small	22.58	24.29	3.89	4.30
ISS-perceived conflict	-3.27**	102	.00	0.64	Medium	10.83	15.84	7.15	8.45
ISS-well being	2.68**	89.48	.00	0.53	Medium	19.17	16.20	4.59	6.51
ISS-activation	-2.92**	102	.00	0.57	Medium	13.81	18.57	7.42	9.12
ISS-depression	-4.25**	95.75	.00	0.84	Large	3.89	7.00	3.30	4.11
PANAS-Pre-Neg	-2.36*	102	.02	0.46	Small	13.40	15.92	5.38	5.53
PANAS-Post-Neg	-2.22*	102	.03	0.43	Small	12.98	15.51	5.92	5.71
PANAS-Ttl-Neg	-2.39*	102	.02	0.47	Small	13.19	15.72	5.54	5.23
PANAS-Pre-Pos	1.29	102	.20	0.25	Small	32.26	30.29	7.39	8.15
PANAS-Post-Pos	2.42*	93.91	.02	0.48	Small	32.38	27.94	8.03	10.43
PANAS-Ttl-Pos	2.03*	102	.05	0.40	Small	32.32	29.12	7.32	8.76
Biphasic Factor	-5.62**	102	.00	1.10	Large	-.47	.49	.76	.99
Negativity Factor	-2.69**	86.07	.00	0.53	Medium	-.25	.26	.76	1.15
Activation Factor	-.48	102	.63	0.09	Small	-.05	.05	.99	1.02

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

--Calculation of Cohen's d and effect size labels are in accordance with the specifications described in Cohen (1988).

Table 1: Individual Differences: T tests assessing differences between the clinical vs. non-clinical group on all individual difference variables.

	BAS-dr	BAS-fs	BAS-rr	BAS-all	BIS
GBI-hypomania	.15	.23*	-.04	.15	.22*
GBI-biphasic	.10	.16	-.04	.09	.40**
GBI-biphasic lability	.10	.15	-.03	.09	.39**
GBI-depression	-.01	.06	-.10	-.02	.40**
GBI-bipolar	.14	.21*	-.04	.13	.29**
HPS	.39**	.38**	.14	.37**	-.01
ISS-perceived conflict	.12	.10	-.03	.08	.23*
ISS-well being	.17	.07	.14	.16	-.19*
ISS-activation	.08	.21*	.03	.13	.20*
ISS-depression	.06	.03	-.08	.01	.21*
PANAS-Pre-Neg	.06	.06	-.08	.02	.13
PANAS-Post-Neg	.07	.08	.02	.07	.25**
PANAS-Ttl-Neg	.06	.07	-.03	.05	.20*
PANAS-Pre-Pos	.28**	.26**	.29**	.34**	-.31**
PANAS-Post-Pos	.32**	.19	.30**	.33**	-.30**
PANAS-Ttl-Pos	.32**	.23*	.31**	.35**	-.32**

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

BAS: dr = drive; fs = fun seeking; rr = reward responsiveness

Table 2: Individual Differences: Correlations between BAS/BIS and the other individual difference variables.

	GBIhyp	GBIbiphas	GBIbilab	GBIdep	GBIbipolar
HPS	.48**	.43**	.42**	.34**	.47**
ISS-perceived conflict	.51**	.55**	.59**	.61**	.54**
ISS-well being	-.30**	-.37**	-.38**	-.42**	-.34**
ISS-activation	.41**	.41**	.46**	.42**	.42**
ISS-depression	.46**	.53**	.56**	.62**	.50**
PANAS-Pre-Neg	.46**	.42**	.43**	.54**	.45**
PANAS-Post-Neg	.40**	.42**	.44**	.53**	.42**
PANAS-Ttl-Neg	.45**	.43**	.45**	.56**	.45**
PANAS-Pre-Pos	-.21*	-.31**	-.31**	-.38**	-.25**
PANAS-Post-Pos	-.26**	-.34**	-.34**	-.36**	-.30**
PANAS-Ttl-Pos	-.25**	-.35**	-.35**	-.39**	-.29**
BAS-drive	.15	.10	.10	-.01	.14
BAS-fun seeking	.23*	.16	.15	.06	.21*
BAS-reward respns.	-.04	-.04	-.03	-.10	-.04
BAS-all	.15	.09	.09	-.02	.13
BIS	.22*	.40**	.39**	.40**	.29**

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

GBI: hyp = hypomania; biphas = biphasic; bilab = biphasic lability; dep = depression

Table 3: Individual Differences: Correlations between the GBI and the other individual difference variables.

	Biphasic	Negativity	Activation
GBI-hypomania	**0.85**	0.17	0.08
GBI-depression	**0.82**	**0.40**	-0.06
GBI-biphasic	**0.82**	0.34	0.05
ISS-pcconflict	**0.68**	**0.41**	0.03
ISS-activation	**0.66**	-0.16	0.08
PANAS-negative	**0.64**	0.26	0.00
ISS-depression	0.60	**0.54**	-0.03
HPS	0.59	-0.14	**0.37**
ISS-wellbeing	-0.22	**-0.77**	0.18
PANAS-positive	-0.13	**-0.74**	**0.38**
BIS	0.10	**0.63**	0.23
BAS-rwrdrespons	-0.16	0.12	**0.88**
BAS-drive	0.13	-0.09	**0.81**
BAS-funseeking	0.23	-0.14	**0.72**

Extraction Method: Principal Component Analysis
Rotation Method: Varimax, with Kaiser Normalization

The strongest loadings for each factor are highlighted.

Table 4: Individual Differences: Factor loadings of individual difference measures, which created a 3-factor solution.

Ethnicity	Clinical		Non-clinical	
	Number	Percentage	Number	Percentage
Caucasian	40	78%	42	78%
African American	9	18%	10	19%
Hispanic	0	0%	1	2%
Asian	1	2%	0	0%
Native American	1	2%	0	0%
Other	0	0%	1	2%
Total	51	100%	54	100%

Sex	Clinical		Non-clinical	
Female	35	69%	35	65%
Male	16	31%	19	35%
Transgender	0	0%	0	0%
Total	51	100%	54	100%

Highest Level of Education	Clinical		Non-clinical	
No high school	1	2%	0	0%
Some high school	2	4%	1	2%
High school graduate	3	6%	7	12%
Some college	21	39%	14	23%
Associate's/Technical Degree	6	11%	8	13%
Bachelor's Degree	13	24%	17	28%
MA/MS Degree	8	15%	11	18%
Ph.D./M.D./Doctorate	0	0%	2	3%
Total	54	100%	60	100%

Table 5: Individual Differences: Demographic characteristics of the clinical vs. non-clinical groups.

Number of Meds Taken	Clinical		Non-clinical		Total	
	Number	% of Clin Ttl	Number	% of N-Clin Ttl	Number	% of Ttl
0	8	14.81%	53	88.33%	61	53.51%
1	7	12.96%	6	10.00%	13	11.40%
2	16	29.63%	1	1.67%	17	14.91%
3	11	20.37%	0	0.00%	11	9.65%
4	8	14.81%	0	0.00%	8	7.02%
5	3	5.56%	0	0.00%	3	2.63%
6	1	1.85%	0	0.00%	1	0.88%
Total:	54	100.00%	60	100.00%	114	100.00%

Table 6: Individual Differences: Total number of psychotropic medications taken per participant.

	Clinical		Non-clinical		Total	
	Number	% of Clin Ttl	Number	% of N-Clin Ttl	Number	% of Ttl
Antidepressants						
SSRI	17	31.48%	0	0.00%	17	14.91%
SNRI	8	14.81%	0	0.00%	8	7.02%
SARI	6	11.11%	1	1.67%	7	6.14%
DNRI	10	18.52%	0	0.00%	10	8.77%
NRI	1	1.85%	0	0.00%	1	0.88%
Tetracyclic	2	3.70%	0	0.00%	2	1.75%
Tricyclic	0	0.00%	2	3.33%	2	1.75%
MAOI	0	0.00%	0	0.00%	0	0.00%
Total:	44	81.48%	3	5.00%	47	41.23%
Antipsychotics						
Conventional	2	3.70%	0	0.00%	2	1.75%
Atypical	17	31.48%	0	0.00%	17	14.91%
Total:	19	35.19%	0	0.00%	19	16.67%
Anti-mania	9	16.67%	0	0.00%	9	7.89%
Anti-convulsant	25	46.30%	1	1.67%	26	22.81%
Anxiolytics						
Benzo	12	22.22%	0	0.00%	12	10.53%
Non-benzo Hypnotic	3	5.56%	1	1.67%	4	3.51%
Hypnotic	1	1.85%	0	0.00%	1	0.88%
Other anti-anxiety	1	1.85%	0	0.00%	1	0.88%
Total:	17	31.48%	1	1.85%	18	15.79%
Miscellaneous						
Stimulant	2	3.70%	0	0.00%	2	1.75%
Alcohol Antagonist	1	1.85%	0	0.00%	1	0.88%
Misc	2	3.70%	1	1.67%	3	2.63%
Narcotic pain killers	2	3.70%	1	1.67%	3	2.63%
Total:	7	12.96%	2	3.33%	9	7.89%

SSRI = Selective Serontonin Reuptake Inhibitor; SNRI = Selective Norepinepherine Reuptake Inhibitor
SARI = Serotonin-2 Antagonist Reuptake Inhibitor; DNRI = Dopamine-Norepinephrine Reuptake Inhibitor
NRI = Norepinepherine Reuptake Inhibitor; MAOI = Monoamine Oxidase Reuptake Inhibitor
Benzo = Benzodiazepine

Table 7: Individual Differences: Number/percentage of participants taking one or more medications in each drug class.

ID Variables	Correlation with # of Meds Taken
BAS-drive	.05
BAS-fun seeking	.03
BAS-reward respons.	.03
BAS-total	.04
BIS	.43**
GBI-hypomania	.42**
GBI-biphasic	.47**
GBI-biphasic lability	.45**
GBI-depression	.53**
GBI-bipolar	.45**
HPS	.03
ISS-perceived conflict	.13
ISS-well being	-.14
ISS-activation	.26**
ISS-depression	.18
PANAS-Pre-Neg	.19
PANAS-Post-Neg	.19*
PANAS-Ttl-Neg	.20*
PANAS-Pre-Pos	-.10
PANAS-Post-Pos	-.18
PANAS-Ttl-Pos	-.15
Biphasic Factor	.32**
Negativity Factor	.24*
Activation Factor	.06

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Table 8: Individual Differences: Correlation between individual difference variables and total number of psychotropic medications taken.

SPT: Ratings of Achievement Stimuli							
	PreImage	PostImage	TtlImage	PreWord	PostWord	TtlWord	TtlImageWord
BAS-drive	.28**	.22*	.26**	.27**	.21*	.26**	.28**
BAS-fun seeking	.16	.13	.15	.11	.16	.14	.16
BAS-reward respns.	.38**	.22*	.30**	.29**	.23*	.27**	.31**
BAS-total	.35**	.25**	.31**	.27**	.25**	.28**	.31**
BIS	-.13	-.17	-.16	-.03	-.13	-.09	-.13
GBI-hypomania	-.17	-.18	-.19	-.01	-.10	-.06	-.13
GBI-biphasic	-.22*	-.21*	-.23*	-.03	-.09	-.07	-.16
GBI-biphasic lability	-.21*	-.22*	-.23*	-.04	-.09	-.07	-.16
GBI-depression	-.23*	-.20*	-.23*	-.05	-.11	-.09	-.16
GBI-bipolar	-.19	-.20*	-.21*	-.02	-.10	-.07	-.14
HPS	-.03	.02	0	.12	.07	.10	.06
ISS-perceived conflict	.01	-.02	0	.14	.09	.12	.07
ISS-well being	.23*	.34**	.31**	.15	.18	.17	.26**
ISS-activation	-.01	.09	.05	.04	.18	.12	.10
ISS-depression	-.15	-.21*	-.20*	0	-.03	-.02	-.12
PANAS-Pre-Neg	-.16	-.13	-.15	-.12	-.12	-.13	-.15
PANAS-Post-Neg	-.08	-.06	-.07	-.03	.05	.01	-.03
PANAS-Ttl-Neg	-.12	-.10	-.11	-.08	-.04	-.06	-.09
PANAS-Pre-Pos	.25*	.26**	.27**	.07	.22*	.16	.23*
PANAS-Post-Pos	.23*	.29**	.28**	.14	.24*	.21*	.26**
PANAS-Ttl-Pos	.25**	.29**	.29**	.12	.25*	.20*	.26**
Biphasic Factor	-.16	-.08	-.12	.00	.02	.01	-.06
Negativity Factor	-.14	-.30**	-.25**	-.05	-.20*	-.14	-.20*
Activation Factor	.33**	.22*	.28**	.28**	.23*	.27**	.29**

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Pre = before reward manipulation; Post = after reward manipulation; Ttl = total (collapsed across time)

Table 9: SPT: Correlations between individual difference variables and SPT ratings of achievement stimuli.

SPT: Ratings of Negative Stimuli							
	PreImage	PostImage	TtlImage	PreWord	PostWord	TtlWord	TtlImageWord
BAS-drive	-.15	-.08	-.12	-.14	-.12	-.14	-.14
BAS-fun seeking	-.02	0	-.01	-.09	-.13	-.12	-.08
BAS-reward respns.	.02	.01	.01	-.06	-.14	-.11	-.06
BAS-total	-.07	-.04	-.06	-.13	-.16	-.15	-.12
BIS	-.06	-.04	-.05	0	-.07	-.04	-.05
GBI-hypomania	-.28**	-.13	-.20*	-.09	-.09	-.10	-.16
GBI-biphasic	-.29**	-.16	-.23*	-.07	-.10	-.09	-.17
GBI-biphasic lability	-.27**	-.16	-.22*	-.05	-.11	-.09	-.16
GBI-depression	-.24*	-.12	-.18	-.05	-.09	-.08	-.13
GBI-bipolar	-.29**	-.15	-.22*	-.09	-.10	-.10	-.17
HPS	-.12	-.05	-.08	-.22*	-.10	-.16	-.14
ISS-perceived conflict	-.32**	-.26**	-.30**	-.26**	-.27**	-.28**	-.32**
ISS-well being	.08	.05	.07	-.11	-.07	-.09	-.02
ISS-activation	-.28**	-.23*	-.26**	-.26**	-.29**	-.29**	-31**
ISS-depression	-.12	-.05	-.08	-.08	-.04	-.06	-.08
PANAS-Pre-Neg	-.12	.06	-.01	.08	.07	.07	.04
PANAS-Post-Neg	-.13	0	-.05	-.10	-.11	-.11	-.09
PANAS-Ttl-Neg	-.13	.03	-.34	-.02	-.03	-.02	-.03
PANAS-Pre-Pos	.16	.13	.15	-.06	-.01	-.04	.05
PANAS-Post-Pos	.06	.12	.10	-.18	-.02	-.10	-.01
PANAS-Ttl-Pos	.11	.13	.13	-.13	-.02	-.08	.02
Biphasic Factor	-.30**	-.16	-.23*	-.21*	-.17	-.20*	-.23*
Negativity Factor	-.04	-.04	-.05	.14	.03	.09	.03
Activation Factor	-.03	-.01	-.02	-.12	-.15	-.14	-.09

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Pre = before reward manipulation; Post = after reward manipulation; Ttl = total (collapsed across time)

Table 10: SPT: Correlations between individual difference variables and SPT ratings of negative stimuli.

SPT: Ratings of Neutral Stimuli							
	PreImage	PostImage	TtlImage	PreWord	PostWord	TtlWord	TtlImageWord
BAS-drive	-.07	.12	.05	.06	.13	.10	.09
BAS-fun seeking	.02	.17	.13	.13	.07	.11	.13
BAS-reward respns.	-.01	.24*	.17	.17	.24*	.22*	.22*
BAS-total	-.02	.23*	.16	.15	.18	.18	.19*
BIS	-.04	-.15	-.13	.01	.04	.03	-.04
GBI-hypomania	-.14	-.19	-.20*	-.18	-.18	-.20*	-.22*
GBI-biphasic	-.13	-.24*	-.24*	-.22*	-.14	-.20*	-.24**
GBI-biphasic lability	-.16	-.24*	-.25**	-.21*	-.15	-.20*	-.24**
GBI-depression	-.13	-.21*	-.21*	-.23*	-.16	-.22*	-.24**
GBI-bipolar	-.14	-.21*	-.22*	-.20*	-.17	-.20*	-.24*
HPS	-.07	-.09	-.10	-.01	.05	.02	-.03
ISS-perceived conflict	-.04	-.04	-.05	-.01	.02	0	-.02
ISS-well being	.03	.29**	.23*	.04	.22*	.14	.20*
ISS-activation	-.17	.14	.02	-.13	.05	-.05	-.02
ISS-depression	-.11	-.18	-.18	-.10	-.03	-.07	-.13
PANAS-Pre-Neg	-.07	-.06	-.08	-.16	-.01	-.09	-.10
PANAS-Post-Neg	-.13	-.01	-.07	-.11	.10	0	-.03
PANAS-Ttl-Neg	-.11	-.03	-.08	-.14	.05	-.05	-.07
PANAS-Pre-Pos	.06	.34**	.27**	.01	.13	.08	.18
PANAS-Post-Pos	-.01	.32**	-.22*	.05	.18	.13	.19
PANAS-Ttl-Pos	-.02	.35**	.26**	.04	.17	.11	.19*
Biphasic Factor	-.15	-.09	-.14	-.21*	-.08	-.16	-.17
Negativity Factor	-.01	-.28**	-.20*	.03	-.08	-.03	-.11
Activation Factor	-.01	.20*	.14	.17	.21*	.21*	.20*

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Pre = before reward manipulation; Post = after reward manipulation; Ttl = total (collapsed across time)

Table 11: SPT: Correlations between individual difference variables and SPT ratings of neutral stimuli.

SPT: Ratings of Positive Stimuli							
	PreImage	PostImage	TtlImage	PreWord	PostWord	TtlWord	TtlImageWord
BAS-drive	.13	.15	.15	.16	.10	.14	.15
BAS-fun seeking	.10	.08	.09	.12	.03	.08	.09
BAS-reward respns.	.15	.17	.17	.21*	.23*	.23*	.22*
BAS-total	.15	.17	.17	.19	.14	.17	.18
BIS	-.13	-.05	-.09	-.05	-.06	-.06	-.08
GBI-hypomania	-.13	-.18	-.17	-.06	-.23*	-.15	-.17
GBI-biphasic	-.19	-.22*	-.23*	-.10	-.23*	-.17	-.21*
GBI-biphasic lability	-.16	-.21*	-.20*	-.10	-.24*	-.18	-.21*
GBI-depression	-.15	-.18	-.18	-.12	-.20*	-.17	-.19
GBI-bipolar	-.16	-.20*	-.20*	-.07	-.23*	-.17	-.19*
HPS	.06	-.06	-.01	.10	.02	.06	.03
ISS-perceived conflict	.17	-.02	.06	.15	.07	.11	-.10
ISS-well being	.19*	.31**	.28**	.20*	.22*	.22*	-.26**
ISS-activation	.10	.07	.09	.16	.08	.12	.12
ISS-depression	-.05	-.17	-.12	-.08	-.10	-.10	-.12
PANAS-Pre-Neg	-.01	-.11	-.07	-.11	-.13	-.13	-.11
PANAS-Post-Neg	.02	-.04	-.02	-.01	.02	.01	0
PANAS-Ttl-Neg	0	-.08	-.05	-.06	-.05	-.06	-.06
PANAS-Pre-Pos	.19	.21*	.22*	.10	.14	.13	.18
PANAS-Post-Pos	.23*	.23*	.25**	.14	.25**	.21*	.24**
PANAS-Ttl-Pos	.23*	.24*	.25**	.13	.22*	.18	.23*
Biphasic Factor	-.01	-.11	-.07	.01	-.11	-.05	-.07
Negativity Factor	-.19	-.20*	-.21*	-.14	-.15	-.15	-.19*
Activation Factor	.15	.17	.17	.20*	.17	.19*	.20*

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Pre = before reward manipulation; Post = after reward manipulation; Ttl = total (collapsed across time)

Table 12: SPT: Correlations between individual difference variables and SPT ratings of positive stimuli.

SPT: Ratings of Threat Stimuli							
	PreImage	PostImage	TtlImage	PreWord	PostWord	TtlWord	TtlImageWord
BAS-drive	-.17	-.23*	-.22*	-.05	-.10	-.08	-.16
BAS-fun seeking	-.12	-.04	-.08	-.11	-.11	-.12	-.11
BAS-reward respns.	-.11	-.15	-.15	-.02	-.08	-.05	-.10
BAS-total	-.18	-.20*	-.21*	-.08	-.12	-.11	-.17
BIS	-.08	-.13	-.12	-.11	-.13	-.13	-.13
GBI-hypomania	-.13	-.11	-.13	-.21*	-.15	-.18	-.17
GBI-biphasic	-.20*	-.16	-.19	-.26**	-.19	-.24*	-.23*
GBI-biphasic lability	-.20*	-.16	-.19*	-.25*	-.21*	-.24**	-.24*
GBI-depression	-.12	-.09	-.11	-.22*	-.19	-.22*	-.18
GBI-bipolar	-.16	-.13	-.15	-.23*	-.17	-.21*	-.20*
HPS	-.17	-.15	-.17	-.16	-.12	-.14	-.17
ISS-perceived conflict	-.20*	-.25**	-.25**	-.27**	-.25*	-.27**	-.29**
ISS-well being	.05	-.03	.01	-.06	-.04	-.05	-.03
ISS-activation	-.21*	-.24*	-.25**	-.34**	-.34**	-.36**	-.33**
ISS-depression	.02	-.01	.01	-.04	-.02	-.03	-.02
PANAS-Pre-Neg	.07	.09	.09	-.04	.06	.01	.05
PANAS-Post-Neg	.01	.01	.01	-.17	-.11	-.15	-.08
PANAS-Ttl-Neg	.04	.05	.05	-.11	-.03	-.07	-.02
PANAS-Pre-Pos	.11	.07	.10	.06	-.02	.02	.06
PANAS-Post-Pos	.01	.02	.01	.01	-.03	-.01	0
PANAS-Ttl-Pos	.06	.04	.05	.03	-.02	0	.03
Biphasic Factor	-.16	-.14	-.16	-.29**	-.23*	-.27**	-.24**
Negativity Factor	-.03	-.03	-.03	.05	.03	.04	.01
Activation Factor	-.16	-.18	-.18	-.06	-.11	-.09	-.14

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Pre = before reward manipulation; Post = after reward manipulation; Ttl = total (collapsed across time)

Table 13: SPT: Correlations between individual difference variables and SPT ratings of threat stimuli.

	SPT: Achievement - Neutral Interference					
	PreImage	PreWord	PostImage	PostWord	TtlImage	TtlWord
BAS-drive	.34**	.25**	.20*	.15	.30**	.23*
BAS-fun seeking	.16	.03	.04	.13	.11	.09
BAS-reward respons.	.41**	.19*	.12	.09	.28**	.16
BAS-total	.36**	.19*	.15	.16	.28**	.20*
BIS	-.11	-.04	-.11	-.19	-.13	-.13
GBI-hypomania	-.10	.12	-.10	.02	-.12	.08
GBI-biphasic	-.16	.13	-.11	-.01	-.15	.07
GBI-biphasic lability	-.14	.11	-.12	.01	-.15	.07
GBI-depression	-.18	.12	-.11	-.01	-.16	.06
GBI-bipolar	-.13	.13	-.11	.01	-.13	.08
HPS	.00	.14	.09	.04	.06	.11
ISS-perceived conflict	.04	.16	.01	.10	.02	.15
ISS-well being	.22*	.13	.24*	.04	.26**	.10
ISS-activation	.08	.14	.02	.19	.06	.19
ISS-depression	-.11	.07	-.15	-.02	-.14	.03
PANAS-Pre-Neg	-.13	-.01	-.12	-.14	-.14	-.09
PANAS-Post-Neg	-.01	.05	-.07	-.02	-.05	.01
PANAS-Ttl-Neg	-.07	.02	-.10	-.08	-.10	-.04
PANAS-Pre-Pos	.23*	.07	.10	.17	.18	.13
PANAS-Post-Pos	.26**	.12	.15	.15	.23*	.15
PANAS-Ttl-Pos	.26**	.10	.14	.17	.22*	.15
Biphasic Factor	-.09	.16	-.04	.09	-.07	.14
Negativity Factor	-.15	-.08	-.19	-.17	-.19*	-.14
Activation Factor	.36**	.18	.14	.11	.27**	.17

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Pre = before reward manipulation; Post = after reward manipulation; Ttl = total (collapsed across time)

Table 14: SPT: Correlations between individual difference variables and SPT achievement interference, derived from a comparison with a neutral valence baseline.

	SPT: Negative - Neutral Interference					
	PreImage	PreWord	PostImage	PostWord	TtlImage	TtlWord
BAS-drive	-.11	-.15	-.14	-.16	-.14	-.16
BAS-fun seeking	-.03	-.14	-.09	-.14	-.08	-.15
BAS-reward respons.	.02	-.14	-.12	-.22*	-.07	-.19*
BAS-total	-.06	-.17	-.14	-.20*	-.12	-.20*
BIS	-.03	-.01	.05	-.07	.02	-.05
GBI-hypomania	-.19	.03	-.01	.02	-.08	.03
GBI-biphasic	-.21*	.07	-.02	-.01	-.09	.03
GBI-biphasic lability	-.17	.08	-.01	-.01	-.08	.03
GBI-depression	-.16	.09	.01	.01	-.06	.05
GBI-bipolar	-.20*	.04	-.01	.01	-.09	.03
HPS	-.08	-.16	.01	-.10	-.03	-.14
ISS-perceived conflict	-.29**	-.19*	-.21*	-.21*	-.26**	-.21*
ISS-well being	.06	-.11	-.11	-.16	-.05	-.14
ISS-activation	-.17	-.13	-.27**	-.24**	-.26**	-.20*
ISS-depression	-.05	-.01	.05	-.01	.02	-.01
PANAS-Pre-Neg	-.07	.15	.09	.05	.03	.10
PANAS-Post-Neg	-.05	-.02	.00	-.14	-.02	-.08
PANAS-Ttl-Neg	-.06	.06	.05	-.05	.01	.01
PANAS-Pre-Pos	.12	-.06	-.07	-.08	.00	-.07
PANAS-Post-Pos	.07	-.17	-.06	-.11	-.01	-.14
PANAS-Ttl-Pos	.10	-.12	-.07	-.10	-.01	-.12
Biphasic Factor	-.20*	-.04	-.09	-.09	-.14	-.07
Negativity Factor	-.04	.09	.11	.07	.06	.08
Activation Factor	-.02	-.18	-.11	-.22*	-.09	-.21*

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Pre = before reward manipulation; Post = after reward manipulation; Ttl = total (collapsed across time)

Table 15: SPT: Correlations between individual difference variables and SPT negative interference, derived from a comparison with a neutral valence baseline.

	SPT: Positive - Neutral Interference					
	PreImage	PreWord	PostImage	PostWord	TtlImage	TtlWord
BAS-drive	.17	.14	.10	.03	.16	.10
BAS-fun seeking	.10	.04	-.05	-.02	.03	.01
BAS-reward respons.	.16	.11	.03	.11	.11	.12
BAS-total	.17	.12	.04	.04	.12	.09
BIS	-.11	-.06	.07	-.11	-.02	-.10
GBI-hypomania	-.05	.08	-.08	-.16	-.08	-.04
GBI-biphasic	-.12	.07	-.10	-.19*	-.13	-.07
GBI-biphasic lability	-.07	.05	-.07	-.20*	-.09	-.08
GBI-depression	-.07	.04	-.06	-.14	-.08	-.05
GBI-bipolar	-.08	.08	-.09	-.17	-.10	-.05
HPS	.10	.13	.00	-.02	.06	.06
ISS-perceived conflict	.20*	.18	.00	.08	.12	.15
ISS-well being	.18	.20*	.17	.12	.21*	.18
ISS-activation	.21*	.30**	-.03	.07	.10	.21*
ISS-depression	.02	-.02	-.07	-.11	-.03	-.07
PANAS-Pre-Neg	.03	.00	-.10	-.17	-.04	-.09
PANAS-Post-Neg	.10	.08	-.05	-.05	.03	.01
PANAS-Ttl-Neg	.07	.04	-.08	-.12	-.01	-.04
PANAS-Pre-Pos	.16	.11	.00	.08	.09	.10
PANAS-Post-Pos	.25**	.12	.04	.19*	.17	.17
PANAS-Ttl-Pos	.22*	.12	.02	.15	.14	.15
Biphasic Factor	.09	.18	-.07	-.08	.01	.06
Negativity Factor	-.19*	-.19*	-.03	-.13	-.13	-.18
Activation Factor	.16	.10	.06	.05	.13	.09

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Pre = before reward manipulation; Post = after reward manipulation; Ttl = total (collapsed across time)

Table 16: SPT: Correlations between individual difference variables and SPT positive interference, derived from a comparison with a neutral valence baseline.

	SPT: Threat - Neutral Interference					
	PreImage	PreWord	PostImage	PostWord	TtlImage	TtlWord
BAS-drive	-.13	-.08	-.26**	-.15	-.23*	-.13
BAS-fun seeking	-.14	-.17	-.12	-.14	-.14	-.16
BAS-reward respons.	-.11	-.12	-.25**	-.20*	-.22*	-.17
BAS-total	-.15	-.15	-.25**	-.19*	-.24**	-.18
BIS	-.06	-.10	-.03	-.13	-.04	-.12
GBI-hypomania	-.05	-.07	.01	-.02	-.02	-.04
GBI-biphasic	-.12	-.09	-.01	-.08	-.05	-.09
GBI-biphasic lability	-.11	-.09	-.01	-.08	-.05	-.09
GBI-depression	-.04	-.05	.03	-.07	.01	-.06
GBI-bipolar	-.08	-.08	.00	-.04	-.03	-.06
HPS	-.13	-.12	-.08	-.13	-.11	-.13
ISS-perceived conflict	-.17	-.22*	-.20*	-.22*	-.21*	-.23*
ISS-well being	.03	-.07	-.17	-.16	-.11	-.12
ISS-activation	-.11	-.21*	-.28**	-.31**	-.24*	-.28**
ISS-depression	.09	.02	.09	.00	.10	.01
PANAS-Pre-Neg	.12	.06	.11	.05	.12	.06
PANAS-Post-Neg	.09	-.08	.01	-.15	.04	-.12
PANAS-Ttl-Neg	.11	-.01	.06	-.06	.08	-.04
PANAS-Pre-Pos	.07	.04	-.11	-.09	-.05	-.03
PANAS-Post-Pos	.01	-.03	-.15	-.13	-.10	-.08
PANAS-Ttl-Pos	.04	.01	-.14	-.12	-.08	-.06
Biphasic Factor	-.06	-.12	-.07	-.15	-.07	-.14
Negativity Factor	-.02	.02	.12	.08	.07	.05
Activation Factor	-.15	-.15	-.25**	-.21*	-.24*	-.19*

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Pre = before reward manipulation; Post = after reward manipulation; Ttl = total (collapsed across time)

Table 17: SPT: Correlations between individual difference variables and SPT threat interference, derived from a comparison with a neutral valence baseline.

	Ach - Pos Interference Images			Ach - Pos Interference Words			Threat - Neg Interference Images			Threat - Neg Interference Words		
	Pre	Post	Ttl	Pre	Post	Ttl	Pre	Post	Ttl	Pre	Post	Ttl
BAS-drive	.22*	.17	.25**	.20*	.15	.22*	-.03	-.20*	-.17	.12	.05	.11
BAS-fun seeking	.09	.12	.13	-.02	.19*	.13	-.14	-.05	-.11	-.03	.04	.00
BAS-reward respons.	.32**	.14	.29**	.14	-.01	.07	-.17	-.22*	-.25**	.05	.11	.10
BAS-total	.25**	.18	.27**	.13	.15	.18	-.13	-.19	-.21*	.06	.08	.09
BIS	-.02	-.24**	-.16	.03	-.11	-.06	-.03	-.13	-.11	-.16	-.10	-.17
GBI-hypomania	-.07	-.05	-.08	.08	.21*	.19*	.18	.03	.12	-.17	-.09	-.17
GBI-biphasic	-.06	-.05	-.07	.11	.21*	.21*	.12	.01	.07	-.27**	-.15	-.27**
GBI-biphasic lability	-.09	-.10	-.12	.11	.24*	.23*	.08	-.01	.04	-.30**	-.16	-.29**
GBI-depression	-.14	-.09	-.15	.12	.15	.17	.16	.04	.11	-.24**	-.17	-.26**
GBI-bipolar	-.07	-.05	-.08	.09	.21*	.20*	.16	.02	.10	-.21*	-.12	-.21*
HPS	-.11	.13	.02	.04	.08	.07	-.07	-.14	-.14	.09	-.03	.04
ISS-perceived conflict	-.18	.01	-.11	-.01	.03	.02	.15	.02	.09	-.04	.05	.01
ISS-well being	.07	.16	.15	-.09	-.08	-.11	-.03	-.11	-.10	.07	.05	.08
ISS-activation	-.12	.07	-.04	-.22*	.15	-.01	.08	-.01	.03	-.13	-.07	-.13
ISS-depression	-.15	-.14	-.18	.14	.10	.15	.18	.06	.14	.05	.02	.05
PANAS-Pre-Neg	-.20*	-.07	-.17	-.02	.02	.00	.25**	.04	.16	-.16	-.02	-.12
PANAS-Post-Neg	-.12	-.04	-.10	-.04	.03	.00	.18	.00	.10	-.10	.01	-.06
PANAS-Ttl-Neg	-.16	-.06	-.14	-.03	.03	.00	.22*	.02	.13	-.14	-.01	-.10
PANAS-Pre-Pos	.11	.15	.16	-.05	.11	.05	-.06	-.08	-.09	.18	-.02	.11
PANAS-Post-Pos	.04	.18	.14	.01	-.03	-.02	-.07	-.15	-.15	.26**	-.01	.17
PANAS-Ttl-Pos	.07	.18	.16	-.02	.04	.02	-.07	-.12	-.13	.24*	-.02	.15
Biphasic Factor	-.20*	.03	-.11	-.02	.20*	.13	.18	.03	.12	-.13	-.10	-.15
Negativity Factor	.03	-.24*	-.13	.16	-.07	.04	.02	.02	.02	-.13	.00	-.08
Activation Factor	.26**	.14	.26**	.14	.08	.13	-.17	-.24*	-.26**	.08	.07	.10

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Pre = before reward manipulation; Post = after reward manipulation; Ttl = total (collapsed across time)

--Ach - Pos: Interference score computed by subtracting baseline ratings (positive) from comparison condition ratings (achievement).
--Threat - Neg: Interference score computed by subtracting baseline ratings (negative) from comparison condition ratings (threat).

Table 18: SPT: Correlations between individual difference variables and SPT achievement and threat interference, derived from a comparison with positive and negative valence baselines.

AFT: RTs by Stimulus Valence (collapsed across time)					
	Achievement	Negative	Neutral	Positive	Threat
BAS-drive	-.03	.01	-.02	.01	.00
BAS-fun seeking	-.08	-.04	-.05	-.08	-.05
BAS-reward respons.	.02	.04	.03	.06	.07
BAS-total	-.05	0	-.02	-.01	0
BIS	.03	-.02	.02	.05	.03
GBI-hypomania	-.26**	-.24**	-.25**	-.25**	-.23*
GBI-biphasic	-.22*	-.23*	-.23*	-.22*	-.20*
GBI-biphasic lability	-.23*	-.24*	-.24**	-.22*	-.21*
GBI-depression	-.21*	-.22*	-.22*	-.21*	-.18
GBI-bipolar	-.25**	-.25**	-.25**	-.24**	-.22*
HPS	-.18	-.17	-.18	-.19*	-.19
ISS-perceived conflict	-.23*	-.21*	-.25**	-.22*	-.22*
ISS-well being	-.08	-.05	-.04	-.07	-.05
ISS-activation	-.20*	-.17	-.15	-.18	-.17
ISS-depression	-.10	-.10	-.12	-.10	-.09
PANAS-Pre-Neg	-.07	-.07	-.10	-.08	-.04
PANAS-Post-Neg	-.06	-.06	-.11	-.07	-.03
PANAS-Ttl-Neg	-.07	-.06	-.11	-.08	-.04
PANAS-Pre-Pos	.00	.04	.03	.01	.03
PANAS-Post-Pos	.01	.04	.04	.01	.03
PANAS-Ttl-Pos	.00	.04	.03	.01	.03
Biphasic Factor	-.29**	-.27**	-.28**	-.29**	-.26**
Negativity Factor	.10	.05	.05	.10	.08
Activation Factor	-.01	.02	.01	.02	.03

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Table 19: AFT: Correlations between individual difference variables and AFT reaction times by valence category.

	AFT: Aggregated RTs					
	Mean Negative + Threat RTs			Mean Positive + Achievement RTs		
	Pre	Post	Total	Pre	Post	Total
BAS-drive	-.03	.04	.01	-.01	-.01	-.01
BAS-fun seeking	-.05	-.03	-.04	-.07	-.08	-.08
BAS-reward respons.	.01	.10	.06	.04	.04	.04
BAS-total	-.04	.04	0	-.03	-.03	-.03
BIS	.02	-.01	.01	.03	.04	.04
GBI-hypomania	-.20*	-.25**	-.24*	-.27**	-.22*	-.25**
GBI-biphasic	-.19	-.23*	-.22*	-.23*	-.21*	-.22*
GBI-biphasic lability	-.20*	-.23*	-.22*	-.24*	-.20*	-.23*
GBI-depression	-.16	-.23*	-.20*	-.22*	-.19*	-.21*
GBI-bipolar	-.20*	-.25**	-.24*	-.26**	-.22*	-.25**
HPS	-.20*	-.15	-.18	-.21*	-.15	-.19
ISS-perceived conflict	-.23*	-.20*	-.22*	-.23*	-.21*	-.23*
ISS-well being	-.02	-.09	-.05	-.03	-.12	-.07
ISS-activation	-.12	-.22*	-.18	-.16	-.21*	-.19*
ISS-depression	-.10	-.09	-.10	-.11	-.08	-.10
PANAS-Pre-Neg	.00	-.11	-.06	-.06	-.09	-.07
PANAS-Post-Neg	-.01	-.08	-.04	-.04	-.08	-.06
PANAS-Ttl-Neg	.00	-.10	-.05	-.05	-.09	-.07
PANAS-Pre-Pos	.06	.00	.03	.04	-.04	.00
PANAS-Post-Pos	.07	.00	.03	.05	-.04	.01
PANAS-Ttl-Pos	.07	.00	.04	.05	-.05	.00
Biphasic Factor	-.22*	-.30**	-.27**	-.29**	-.29**	-.29**
Negativity Factor	.03	.11	.07	.06	.14	.10
Activation Factor	-.01	.07	.03	.01	.01	.01

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Pre = before reward manipulation; Post = after reward manipulation; Total = collapsed across time

Table 20: AFT: Correlations between individual difference variables and AFT reaction times by aggregated valence categories.

	AFT: Valence Category - Neutral Interference RTs											
	Achievement			Negative			Positive			Threat		
	Pre	Post	Total	Pre	Post	Total	Pre	Post	Total	Pre	Post	Total
BAS-drive	.09	-.15	-.03	.04	.12	.12	.14	-.01	.10	.09	.01	.07
BAS-fun seeking	-.08	-.12	-.13	-.06	.09	.03	-.14	-.03	-.13	-.09	.08	-.01
BAS-reward respons.	-.03	-.03	-.06	-.04	.09	.04	.15	-.01	.11	.01	.21*	.15
BAS-total	0	-.12	-.09	-.02	.13	.08	.07	0	.05	.01	.12	.09
BIS	.00	.04	.03	-.09	-.13	-.15	.09	.04	.11	.08	-.03	.06
GBI-hypomania	-.02	-.07	-.05	.14	-.13	.00	-.05	.03	-.02	.18	-.09	.07
GBI-biphasic	-.01	-.01	-.01	.04	-.10	-.05	-.02	.02	.01	.22*	-.06	.12
GBI-biphasic lability	.01	.03	.03	.06	-.06	-.01	-.01	.06	.04	.20*	-.05	.11
GBI-depression	-.06	.08	.01	.04	-.05	-.01	-.07	.12	.03	.21*	.01	.16
GBI-bipolar	-.02	-.05	-.04	.11	-.13	-.02	-.04	.03	-.01	.20*	-.09	.09
HPS	.01	-.04	-.01	.01	.03	.02	-.07	-.02	-.07	.03	-.07	-.03
ISS-perceived conflict	.03	.01	.03	.07	.06	.10	.06	.06	.10	.12	.00	.08
ISS-well being	-.10	-.11	-.15	-.11	.02	-.05	-.02	-.13	-.10	.04	-.10	-.04
ISS-activation	-.13	-.19*	-.22*	.04	-.17	-.10	-.04	-.16	-.14	.09	-.24**	-.11
ISS-depression	.03	.11	.09	.05	.05	.07	.02	.08	.07	.12	.05	.12
PANAS-Pre-Neg	.05	.14	.12	.17	.01	.12	.00	.11	.08	.23*	.11	.24**
PANAS-Post-Neg	.10	.22*	.21*	.16	.13	.21*	.08	.14	.16	.26**	.19*	.33**
PANAS-Ttl-Neg	.08	.19	.17	.17	.08	.17	.04	.13	.13	.26**	.16	.30**
PANAS-Pre-Pos	-.02	-.15	-.11	.07	-.02	.04	.08	-.22*	-.08	.12	-.09	.02
PANAS-Post-Pos	-.05	-.13	-.12	-.03	.05	.00	.05	-.23*	-.11	.10	-.14	-.02
PANAS-Ttl-Pos	-.04	-.14	-.12	.02	.02	.02	.07	-.24*	-.10	.12	-.12	.00
Biphasic Factor	-.04	-.05	-.05	.10	-.06	.02	-.08	-.01	-.07	.21*	-.13	.06
Negativity Factor	.08	.18	.18	-.01	.02	.01	.09	.20*	.21*	-.02	.20*	.13
Activation Factor	.00	-.11	-.07	-.04	.10	.05	.10	-.03	.05	.01	.11	.09

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Pre = before reward manipulation; Post = after reward manipulation; Total = collapsed across time
Interference scores were computed by subtracting the baseline RT (neutral) from the RT for each comparison condition.

Table 21: AFT: Correlations between individual difference variables and AFT interference reaction times compared with a neutral valence baseline.

	Ach - Pos Interference RTs			Threat - Neg Interference RTs		
	Pre	Post	Ttl	Pre	Post	Ttl
BAS-drive	-.07	-.14	-.14	.04	-.12	-.06
BAS-fun seeking	.08	-.08	.00	-.03	-.02	-.04
BAS-reward respons.	-.20*	-.02	-.17	.04	.09	.10
BAS-total	-.08	-.11	-.14	.03	-.04	0
BIS	-.10	.00	-.08	.14	.11	.18
GBI-hypomania	.04	-.10	-.04	.04	.06	.06
GBI-biphasic	.02	-.03	-.01	.16	.05	.15
GBI-biphasic lability	.01	-.04	-.02	.12	.02	.10
GBI-depression	.02	-.05	-.02	.14	.06	.14
GBI-bipolar	.03	-.08	-.03	.08	.06	.10
HPS	.09	-.02	.06	.02	-.09	-.04
ISS-perceived conflict	-.04	-.05	-.06	.04	-.06	-.03
ISS-well being	-.08	.03	-.05	.12	-.11	.02
ISS-activation	-.09	-.02	-.08	.05	-.03	.00
ISS-depression	.01	.03	.02	.06	-.01	.03
PANAS-Pre-Neg	.05	.02	.04	.05	.08	.10
PANAS-Post-Neg	.01	.06	.05	.10	.02	.09
PANAS-Ttl-Neg	.03	.04	.05	.08	.06	.10
PANAS-Pre-Pos	-.11	.09	-.03	.05	-.06	-.01
PANAS-Post-Pos	-.11	.12	-.01	.11	-.17	-.01
PANAS-Ttl-Pos	-.12	.11	-.02	.09	-.13	-.01
Biphasic Factor	.05	-.03	.01	.09	-.04	.03
Negativity Factor	-.02	-.04	-.04	-.01	.16	.10
Activation Factor	-.11	-.07	-.13	.05	-.01	.03

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Pre = before reward manipulation; Post = after reward manipulation;
Ttl = total (collapsed across time)

--Ach - Pos: Interference score computed by subtracting baseline RT (positive) from comparison condition RT(achievement).
--Threat - Neg: Interference score computed by subtracting baseline RT (negative) from comparison condition RT (threat).

Table 22: AFT: Correlations between individual difference variables and AFT interference reaction times compared with a positive and negative valence baseline.

Factor #1: Positive Unlikely

Loading	Question#	Question	Type
0.89	8	Have multiple servants (e.g., housekeeper, nanny, cook, driver)?	PU
0.87	11	Live in a mansion?	PU
0.84	1	Become a multi-millionaire?	PU
0.72	10	Become the most successful person in your peer group?	PU
0.68	7	Own priceless artwork?	PU
0.64	2	Win the Nobel Prize?	PU
0.64	12	Become a house-hold name?	PU
0.63	4	Become the envy of most people?	PU
0.58	9	Earn multiple doctorate degrees?	PU
0.56	5	Be followed by the paparazzi?	PU
0.52	3	Own an island?	PU
0.45	6	Win the lottery?	PU
		Cronbach's α =	0.90

Factor #2: Positive Likely

0.94	24	Experience joy?	PL
0.92	18	Have an enjoyable weekend?	PL
0.92	21	Have a good day?	PL
0.90	22	Have a good time with a friend or family member?	PL
0.83	19	Feel good about an accomplishment?	PL
0.83	17	Receive a compliment?	PL
0.77	16	Have an enjoyable vacation?	PL
0.77	23	Feel content?	PL
0.77	15	Have dinner at your favorite restaurant?	PL
0.68	20	Receive a gift that you like?	PL
0.63	14	Buy something you've always wanted?	PL
0.32	13	Win an award?	PL
		Cronbach's α =	0.94

Factor #3: Negative Unlikely

0.88	35	Be murdered?	NU
0.87	32	Be run over by a truck?	NU
0.86	31	Be in an airplane crash?	NU
0.82	25	Be struck by lightning?	NU
0.81	34	Have an airplane fall on your house?	NU
0.79	33	Be eaten by a bear?	NU
0.78	36	Be attacked by a pack of dogs?	NU
0.67	26	Lose all of your possessions in a catastrophic event?	NU
0.60	27	Spend time in jail/prison?	NU
0.57	29	Develop an incurable illness?	NU
0.50	28	Become homeless?	NU
0.47	30	Be fired from your job without reason?	NU
		Cronbach's α =	0.93

Factor #4: Negative Likely

0.92	45	Have a terrible day?	NL
0.87	41	Experience frustration?	NL
0.87	39	Experience indigestion?	NL
0.84	38	Have a headache?	NL
0.82	40	Have the hiccups?	NL
0.82	42	Feel embarrassed?	NL
0.79	43	Feel regret?	NL
0.76	48	Misplace something important?	NL
0.62	47	Gain 5% or more of your current body weight?	NL
0.61	46	Have a fight with a good friend?	NL
0.60	37	Disagree with your boss?	NL
0.56	44	Develop a bad habit?	NL
		Cronbach's α =	0.93

Table 23: PET Reliability and Validity Analyses: Factor loadings and Cronbach's Alpha for each factor

#	Question	Type	Time	t	df	p	Nonclin M	Nonclin SD	Clin M	Clin SD
1	Become a multi-millionaire	PU	pre	2.25	96.69	0.03	148.33	169.57	84.75	118.09
			post			ns				
			total	1.82	96.51	0.07	141.90	171.17	90.02	118.71
7	Own priceless artwork	PU	pre	1.84	99.50	0.07	159.33	194.22	98.53	144.71
			post			ns				
			total	1.78	94.65	0.08	152.65	192.08	96.55	127.96
9	Earn multiple doctorate degrees	PU	pre	2.43	81.72	0.02	91.56	146.29	37.20	74.79
			post			ns				
			total	1.92	91.16	0.05	82.97	131.84	42.38	81.78
16	Have an enjoyable vacation	PL	pre	1.70	104.00	0.09	564.93	133.11	515.76	164.08
			post			ns				
			total	1.71	104.00	0.09	571.93	121.67	525.41	157.32
18	Have an enjoyable weekend	PL	pre	1.92	64.59	0.06	602.95	57.17	561.78	143.06
			post			ns				
			total			ns				
28	Become homeless	NU	pre			ns				
			post	-1.77	87.33	0.08	90.33	107.44	136.96	157.68
			total			ns				
29	Develop an incurable illness	NU	pre	-1.88	95.23	0.06	184.38	152.43	248.00	192.54
			post	-1.69	92.46	0.09	164.18	149.77	222.53	199.72
			total	-1.86	92.95	0.07	174.28	143.49	235.26	189.58
38	Have a headache	NL	pre	-2.08	85.92	0.04	520.80	177.72	578.27	99.21
			post	-1.70	89.00	0.09	531.75	168.85	577.27	100.31
			total	-1.94	87.69	0.05	526.27	168.53	577.77	97.52
41	Experience frustration	NL	pre	-1.92	96.11	0.06	532.04	152.56	580.57	104.89
			post	-2.34	92.82	0.02	516.60	159.89	577.29	102.57
			total	-2.25	97.09	0.03	524.32	145.16	578.93	101.99
42	Feel embarrassed	NL	pre	-2.47	102.78	0.02	477.02	170.61	552.10	141.60
			post			ns				
			total	-1.81	104.00	0.07	483.56	165.35	537.75	141.71
44	Develop a bad habit	NL	pre			ns				
			post	-1.78	104.00	0.08	320.91	211.02	396.59	214.97
			total	-1.78	104.00	0.08	313.67	188.65	382.31	208.44
45	Have a terrible day	NL	pre	-2.22	95.67	0.03	498.09	184.32	565.71	125.51
			post			ns				
			total	-1.91	100.34	0.05	502.77	173.97	559.94	132.65
46	Have a fight with a good friend	NL	pre	-1.89	104.00	0.06	335.91	207.09	415.27	224.55
			post	-2.27	104.00	0.03	355.76	208.98	448.08	210.46
			total	-2.16	104.00	0.03	345.84	201.23	431.68	207.67
47	Gain 5% or more of your current body weight	NL	pre	-2.17	104.00	0.03	292.11	177.99	372.06	201.21
			post			ns				
			total	-1.83	104.00	0.07	292.23	184.50	360.19	198.12

P values were calculated using a 2-tailed test.
When Levene's Test for Equality of variances indicated that the assumption of equal variances was violated, the statistics for non-equal variances were reported.

Question type: (P)Positive vs. (N)negative; (U)Unlikely vs. (L)Likely
Sample: Clinical vs. Non-clinical

Table 24: PET: Significant ($p < .05$) and marginally significant ($p < .09$) group comparisons by question and time (pre vs. post reward) on the PET.

	PET Positive Stimuli						
	PreLikely	PostLikely	TtlLikely	PreUnlikely	PostUnlikely	TtlUnlikely	TtlPositive
BAS-drive	.03	.05	.04	.30**	.30**	.31**	.23*
BAS-fun seeking	.06	.05	.06	.15	.17	.16	.14
BAS-reward respons.	.32**	.31**	.32**	.10	.08	.09	.28**
BAS-total	.15	.16	.16	.23*	.23*	.24*	.26**
BIS	.09	.13	.11	-.13	-.10	-.12	.00
GBI-hypomania	-.23*	-.19*	-.21*	.07	.20*	.14	-.05
GBI-biphasic	-.29**	-.27**	-.28**	.00	.09	.05	-.16
GBI-biphasic lability	-.28**	-.27**	-.28**	-.02	.08	.03	-.17
GBI-depression	-.35**	-.33**	-.35**	-.06	.02	-.02	-.25**
GBI-bipolar	-.26**	-.22*	-.25**	.05	.17	.11	-.09
HPS	-.14	-.18	-.16	.29**	.31**	.31**	.10
ISS-perceived conflict	-.28**	-.28**	-.28**	.02	.09	.06	-.15
ISS-well being	.31**	.31**	.32**	.12	.03	.07	.26**
ISS-activation	-.01	.02	.00	-.02	-.01	-.01	-.01
ISS-depression	-.40**	-.38**	-.40**	-.01	.03	.01	-.26**
PANAS-Pre-Neg	-.26**	-.23*	-.25**	.19*	.23*	.22*	-.02
PANAS-Post-Neg	-.15	-.11	-.13	.15	.19*	.17	.03
PANAS-Ttl-Neg	-.21*	-.18	-.19*	.18	.22*	.20*	.00
PANAS-Pre-Pos	.25**	.28**	.27**	.28**	.22*	.26**	.36**
PANAS-Post-Pos	.17	.20*	.18	.18	.09	.14	.22*
PANAS-Ttl-Pos	.22*	.25**	.24*	.24**	.16	.20*	.30**
Biphasic Factor	-.31**	-.29**	-.31**	.10	.19	.15	-.11
Negativity Factor	-.15	-.15	-.15	-.19	-.13	-.16	-.21*
Activation Factor	.22*	.22*	.22*	.22*	.21*	.22*	.30**

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Time: Pre = before reward manipulation; Post = after reward manipulation; Ttl = total (collapsed across time)
Question type: Likely vs. unlikely = likelihood of event occurring

Table 25: PET: Correlations between individual difference variables and likelihood ratings of positive events on the probability estimation task.

	PET Negative Stimuli						
	PreLikely	PostLikely	TtlLikely	PreUnlikely	PostUnlikely	TtlUnlikely	TtlNegative
BAS-drive	-.21*	-.21*	-.21*	.00	-.02	-.01	-.16
BAS-fun seeking	-.18	-.23*	-.21*	-.09	-.05	-.07	-.19
BAS-reward respons.	-.09	-.12	-.11	-.19	-.20*	-.20*	-.18
BAS-total	-.19*	-.22*	-.21*	-.09	-.08	-.08	-.20*
BIS	.27**	.30**	.29**	-.12	-.11	-.12	.14
GBI-hypomania	.24**	.17	.21*	.24**	.30**	.28**	.30**
GBI-biphasic	.27**	.21*	.25**	.24**	.27**	.26**	.32**
GBI-biphasic lability	.26**	.21*	.24*	.22*	.25**	.24**	.30**
GBI-depression	.32**	.25**	.29**	.25**	.28**	.27**	.36**
GBI-bipolar	.26**	.19	.23*	.25**	.30**	.28**	.32**
HPS	-.04	-.06	-.05	.11	.12	.11	.02
ISS-perceived conflict	.35**	.34**	.35**	.29**	.29**	.30**	.41**
ISS-well being	-.33**	-.30**	-.32**	-.21*	-.24*	-.23*	-.36**
ISS-activation	.07	.08	.07	.15	.13	.14	.13
ISS-depression	.24**	.23*	.24*	.26**	.28**	.28**	.32**
PANAS-Pre-Neg	.16	.11	.13	.18	.19	.19	.20*
PANAS-Post-Neg	.24**	.20*	.22*	.19*	.18	.19*	.26**
PANAS-Ttl-Neg	.21*	.16	.19	.19*	.19*	.20*	.24**
PANAS-Pre-Pos	-.31**	-.30**	-.31**	-.02	.00	-.01	-.22*
PANAS-Post-Pos	-.22*	-.21*	-.22*	.00	.00	.00	-.15
PANAS-Ttl-Pos	-.28**	-.26**	-.27**	-.01	.00	.00	-.19*
Biphasic Factor	.19	.14	.16	.29**	.32**	.31**	.29**
Negativity Factor	.36**	.35**	.36**	.01	.02	.02	.26**
Activation Factor	-.17	-.19	-.18	-.15	-.15	-.15	-.21*

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Time: Pre = before reward manipulation; Post = after reward manipulation; Ttl = total (collapsed across time)
Question type: Likely vs. unlikely = likelihood of event occurring

Table 26: PET: Correlations between individual difference variables and likelihood ratings of negative events on the probability estimation task.

	Achievement	Negative	Neutral	Positive	Threat		Total
BAS-drive	-.08	-.17	-.13	.05	-.06		-.10
BAS-fun seeking	-.21*	-.17	-.21*	.16	-.06		-.12
BAS-reward respns.	-.04	-.13	-.07	.14	-.05		-.03
BAS-total	-.14	-.12	-.18	.13	-.08		-.11
BIS	.08	.15	.08	.03	.06		.06
GBI-hypomania	-.11	.02	-.08	-.19*	-.11		-.07
GBI-biphasic	-.11	.11	-.07	-.17	-.08		-.06
GBI-biphasic lability	-.08	.09	-.06	-.19*	-.07		-.07
GBI-depression	-.06	.00	.00	-.21*	-.07		-.05
GBI-bipolar	-.11	.05	-.08	-.19*	-.10		-.07
HPS	-.11	.02	-.11	.02	-.07		-.08
ISS-perceived conflict	-.06	.00	.15	-.17	.14		.11
ISS-well being	.15	-.06	-.10	.12	-.12		.05
ISS-activation	-.09	-.01	-.04	-.22*	.06		-.06
ISS-depression	-.15	.01	.09	-.20*	.10		-.06
PANAS-Pre-Neg	-.15	-.10	.04	-.21*	-.11		-.14
PANAS-Post-Neg	-.01	-.02	.05	-.19	-.06		-.06
PANAS-Ttl-Neg	-.08	-.06	.05	-.20*	-.09		-.11
PANAS-Pre-Pos	-.02	-.06	-.19	.01	-.01		-.10
PANAS-Post-Pos	-.16	-.18	-.10	.13	-.04		-.09
PANAS-Ttl-Pos	-.10	-.13	-.15	.08	-.03		-.10
Biphasic Factor	-.14	.00	-.06	-.24*	-.06		-.08
Negativity Factor	.02	.09	.17	-.03	.10		.06
Activation Factor	-.10	-.15	-.14	.17	-.06		-.08

*Correlation is significant at the 0.05 level (2-tailed).

Table 27: Free Recall: Correlations between the percentage of words recalled in each valence category and the individual difference variables.

	Valence - Neutral Interference				Comparison Interference	
	Ach-Neu	Neg-Neu	Pos-Neu	Thr-Neu	Ach-Pos	Thr-Neg
BAS-drive	.03	-.03	.13	.02	-.09	.05
BAS-fun seeking	.00	.02	.26**	.08	-.26**	.06
BAS-reward respons.	.02	-.04	.15	.00	-.12	.03
BAS-total	.02	-.02	.22*	.04	-.19*	.06
BIS	.00	.05	-.04	.00	.04	-.04
GBI-hypomania	-.02	.07	-.07	-.04	.05	-.10
GBI-biphasic	-.02	.13	-.06	-.03	.04	-.13
GBI-biphasic lability	-.01	.10	-.09	-.02	.07	-.11
GBI-depression	-.04	.00	-.14	-.06	.09	-.05
GBI-bipolar	-.02	.09	-.07	-.04	.04	-.11
HPS	.00	.09	.10	.00	-.09	-.07
ISS-perceived conflict	-.14	-.10	-.22*	.03	.07	.11
ISS-well being	.17	.03	.16	-.04	.03	-.06
ISS-activation	-.04	.02	-.12	.07	.08	.05
ISS-depression	-.16	-.06	-.20*	.03	.03	.07
PANAS-Pre-Neg	-.13	-.10	-.17	-.12	.03	-.03
PANAS-Post-Neg	-.04	-.05	-.17	-.09	.12	-.04
PANAS-Ttl-Neg	-.09	-.08	-.18	-.11	.08	-.04
PANAS-Pre-Pos	.11	.08	.14	.10	-.02	.02
PANAS-Post-Pos	-.04	-.06	.17	.03	-.20*	.07
PANAS-Ttl-Pos	.03	.01	.16	.06	-.13	.05
Biphasic Factor	-.06	.04	-.12	-.01	.06	-.04
Negativity Factor	-.10	-.05	-.14	-.02	.03	.02
Activation Factor	.03	-.01	.22*	.04	-.18	.04

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

--Valence - Neu: Interference scores computed by subtracting baseline recall (neutral) from recall in each of the 4 valence conditions (achievement, negative, positive, threat)
Comparison interference:
--Ach - Pos: Interference score computed by subtracting baseline recall (positive) from the comparison condition recall (achievement).
--Threat - Neg: Interference score computed by subtracting baseline recall (negative) from the comparison condition recall (threat).

Table 28: Free Recall: Correlations between the individual difference variables and the interference recall percentages compared with neutral and positive/negative valence baselines.

Word	Category	ValMn	AroMn	Length	LogFreqHal	OrthoN
mushroom	neutral	5.78	4.72	8.00	7.54	0.00
whistle	neutral	5.81	4.69	7.00	7.89	2.00
trumpet	neutral	5.75	4.97	7.00	8.88	2.00
salute	neutral	5.92	5.31	6.00	7.19	0.00
skyscraper	neutral	5.88	5.71	10.00	5.24	0.00
highway	neutral	5.92	5.16	7.00	9.33	0.00
lightning	neutral	4.57	6.61	9.00	9.48	0.00
activate	neutral	5.46	4.86	8.00	8.16	0.00
doctor	neutral	5.20	5.86	6.00	10.37	0.00
event	neutral	6.21	5.10	5.00	10.67	1.00
	Mean:	**5.65**	**5.30**	**7.30**	**8.47**	**0.50**
Word	**Category**	**ValMn**	**AroMn**	**Length**	**LogFreqHal**	**OrthoN**
success	achievement	8.29	6.11	7.00	10.52	0.00
triumph	achievement	7.80	5.78	7.00	8.15	0.00
trophy	achievement	7.78	5.39	6.00	7.69	0.00
admired	achievement	7.74	6.11	7.00	7.22	3.00
wealthy	achievement	7.70	5.80	7.00	8.49	1.00
reward	achievement	7.53	4.95	6.00	8.58	4.00
prestige	achievement	7.26	5.86	8.00	7.44	0.00
ambition	achievement	7.04	5.61	8.00	7.14	0.00
famous	achievement	6.98	5.73	6.00	9.77	0.00
champion	achievement	8.44	5.85	8.00	9.02	0.00
	Mean:	**7.66**	**5.72**	**7.00**	**8.40**	**0.80**
Word	**Category**	**ValMn**	**AroMn**	**Length**	**LogFreqHal**	**OrthoN**
delight	positive	8.26	5.44	7.00	8.07	0.00
reunion	positive	6.48	6.34	7.00	7.98	0.00
kindness	positive	7.82	4.30	8.00	7.74	0.00
liberty	positive	7.98	5.60	7.00	9.75	0.00
exercise	positive	7.13	6.84	8.00	9.88	1.00
satisfied	positive	7.94	4.94	9.00	9.27	1.00
snuggle	positive	7.92	4.16	7.00	5.63	1.00
sunrise	positive	7.86	5.06	7.00	7.63	0.00
vacation	positive	8.16	5.64	8.00	9.16	1.00
waterfall	positive	7.88	5.37	9.00	6.71	0.00
	Mean:	**7.74**	**5.37**	**7.70**	**8.18**	**0.40**
Word	**Category**	**ValMn**	**AroMn**	**Length**	**LogFreqHal**	**OrthoN**
abduction	threat	2.76	5.53	9.00	7.60	0.00
avalanche	threat	3.29	5.54	9.00	7.41	0.00
infection	threat	1.66	5.03	9.00	9.11	1.00
invader	threat	3.05	5.50	7.00	5.92	2.00
knife	threat	3.62	5.80	5.00	8.87	1.00
spider	threat	3.33	5.71	6.00	8.85	0.00
execution	threat	2.37	5.71	9.00	9.06	0.00
massacre	threat	2.28	5.33	8.00	8.16	0.00
torture	threat	1.56	6.10	7.00	8.92	0.00
murderer	threat	1.53	7.47	8.00	7.60	1.00
	Mean:	**2.55**	**5.77**	**7.70**	**8.15**	**0.50**
Word	**Category**	**ValMn**	**AroMn**	**Length**	**LogFreqHal**	**OrthoN**
unhappy	negative	1.57	4.18	7.00	8.24	0.00
failure	negative	1.70	4.95	7.00	10.09	0.00
damage	negative	3.05	5.57	6.00	10.66	1.00
helpless	negative	2.20	5.34	8.00	7.89	0.00
nervous	negative	3.29	6.59	7.00	8.81	0.00
putrid	negative	2.38	5.74	6.00	7.62	0.00
terrible	negative	1.93	6.27	8.00	9.42	1.00
troubled	negative	2.17	5.94	8.00	7.49	1.00
hostile	negative	2.73	6.44	7.00	8.44	0.00
mistake	negative	2.86	5.18	7.00	10.14	0.00
	Mean:	**2.39**	**5.62**	**7.10**	**8.88**	**0.30**

Table 29: Characteristics of the words used in the present experiments.

Participant Categorizations of Words Used in Experiments

	Word Categorizations Used in Experiments									
	Achievement		Negative		Neutral		Positive		Threat	
Participant Categorizations	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Achievement	602	**57.33%**	42	4.00%	89	8.48%	106	10.10%	9	0.86%
Threat	9	0.86%	176	16.76%	53	5.05%	9	0.86%	489	**46.57%**
Positive	301	28.67%	19	1.81%	221	21.05%	766	**72.95%**	20	1.90%
Negative	10	0.95%	675	**64.29%**	46	4.38%	11	1.05%	356	33.90%
Neutral	128	12.19%	138	13.14%	641	**61.05%**	158	15.05%	176	16.76%
Total	1050	100.00%	1050	100.00%	1050	100.00%	1050	100.00%	1050	100.00%

Participant Valence Ratings of Words Used in Experiments

	Valence Categories									
	Achievement		Negative		Neutral		Positive		Threat	
	Participants	ANEW	Participants	ANEW	Participants	ANEW	Participants	ANEW	Participants	ANEW
Valence Mean	7.19	7.66	2.71	2.39	5.62	5.65	7.42	7.74	2.41	2.55
Valence SD	1.57		1.61		1.56		1.63		1.87	

Table 30: Participant categorizations and valence ratings of the words used in the present experiments.

Appendix A: DSM IV-TR Criteria for a Manic Episode

A. A distinct period of abnormally and persistently elevated, expansive, or irritable mood, lasting at least 1 week (or any duration if hospitalization is necessary).

B. During the period of mood disturbance, three (or more) of the following symptoms have persisted (four if the mood is only irritable) and have been present to a significant degree:

    1. Inflated self-esteem or grandiosity
    2. Decreased need for sleep (e.g., feels rested after only 3 hours of sleep)
    3. More talkative than usual or pressure to keep talking
    4. Flight of ideas or subjective experience that thoughts are racing
    5. Distractibility (i.e., attention too easily drawn to unimportant or irrelevant external stimuli)
    6. Increase in goal-directed activity (either socially, at work or at school, or sexually) or psychomotor agitation
    7. Excessive involvement in pleasurable activities that have a high potential for painful consequences (e.g., engaging in unrestrained buying sprees, sexual indiscretions, or foolish business investments)

C. The symptoms do not meet criteria for a mixed episode

D. The mood disturbance is sufficiently severe to cause a marked impairment in occupational functioning or in usual social activities or relationships with others, or to necessitate hospitalization to prevent harm to self or others, or there are psychotic features

E. The symptoms are not due to the direct physiological effects of a substance (e.g., a drug of abuse, a medication, or other treatment) or a general medical condition (e.g., hyperthyroidism)

Note: Manic-like episodes that are clearly caused by somatic antidepressant treatment (e.g., medication, electroconvulsive therapy, light therapy) should not count toward a diagnosis of Bipolar I Disorder.

Excerpted from the DSM IV-TR, page 362

Criteria for a Hypomanic Episode *compared with Manic Episode*:

A. Lasts 4 days *(1 week for mania)*

B. Same as Criterion B above.

C. The episode is associated with an unequivocal change in functioning that is uncharacteristic of the person when not symptomatic.

D. The disturbance in mood and the change in functioning are observable by others.

E. The episode is not severe enough to cause marked impairment in social or occupational functioning, or to necessitate hospitalization, and there are no psychotic features. *(For Mania, criterion D states that the mood disturbance must cause a marked impairment in functioning. Also, the presence of psychotic symptoms makes the episode manic rather than hypomanic.)*

F. *Same as criterion E above.*

Appendix B: Probability Estimation Task

At any time during the next seven years, what are the chances that you will…

Positive Unlikely:

1. Become a multi-millionaire?
2. Win the Nobel Prize?
3. Own an island?
4. Become the envy of most people?
5. Be followed by the paparazzi?
6. Win the lottery?
7. Own priceless artwork?
8. Have multiple servants (e.g., housekeeper, nanny, cook, driver)?
9. Earn multiple doctorate degrees?
10. Become the most successful person in your peer group?
11. Live in a mansion?
12. Become a house-hold name?

Positive Likely:

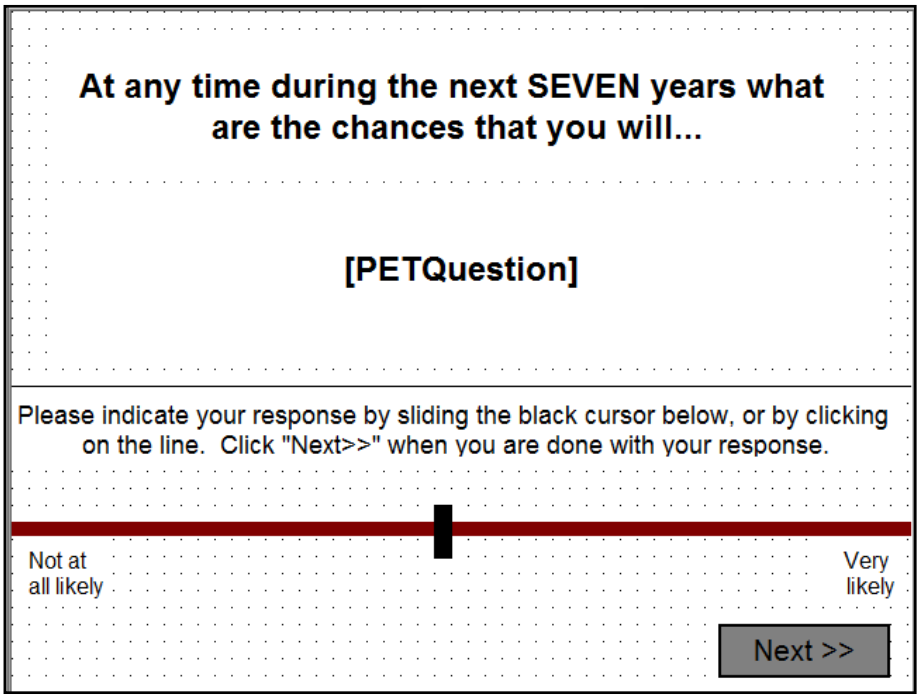
1. Win an award?
2. Buy something you've always wanted?
3. Have dinner at your favorite restaurant?
4. Have an enjoyable vacation?
5. Receive a compliment?
6. Have an enjoyable weekend?
7. Feel good about an accomplishment?
8. Receive a gift that you like?
9. Have a good day?
10. Have a good time with a friend or family member?
11. Feel content?
12. Experience joy?

Negative Unlikely:

1. Be struck by lightning?
2. Lose all of your possessions in a catastrophic event?
3. Spend time in jail/prison?
4. Become homeless?
5. Develop an incurable illness?
6. Be fired from your job without reason?
7. Be in an airplane crash?
8. Be run over by a truck?
9. Be eaten by a bear?
10. Have an airplane fall on your house?
11. Be murdered?
12. Be attacked by a pack of dogs?

Negative Likely:

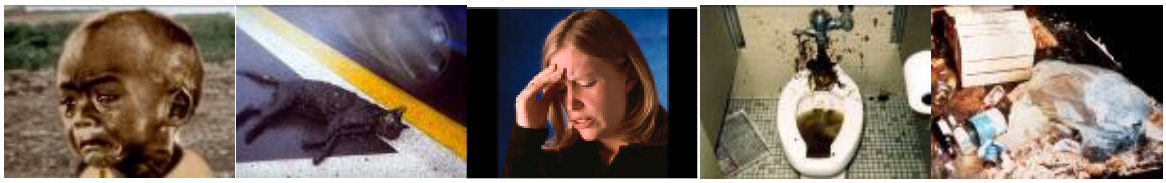
1. Disagree with your boss?
2. Have a headache?
3. Experience indigestion?
4. Have the hiccups?
5. Experience frustration?
6. Feel embarrassed?
7. Feel regret?
8. Develop a bad habit?
9. Have a terrible day?
10. Have a fight with a good friend?
11. Gain 5% or more of your current body weight?
12. Misplace something important?



Appendix C: Picture Stimuli and Characteristics of Picture Stimuli

Threat:

Negative:



Neutral:

Achievement:

Positive:

Characteristics of Picture Stimuli: (source: IAPS, Lang, Bradley, & Cuthbert, 2008)

Stimulus	IAPS#	Val MN	Val SD	Arou MN	Arou SD	Dom MN	Dom SD
Threat:							
Snake	1120	3.79	1.93	6.93	1.68	3.87	2.31
PitBull	1300	3.55	1.78	6.79	1.84	3.49	2.10
AimedGun	6250	2.83	1.79	6.54	2.61	2.40	1.88
Attack	6550	2.73	2.38	7.09	1.98	3.01	2.41
Masked face	6370	2.70	1.52	6.44	2.19	3.00	1.87
	Mean	**3.12**	**1.88**	**6.76**	**2.06**	**3.15**	**2.11**
Negative:							
Injury	3550	2.54	1.6	5.92	2.13	3.64	1.87
Cat	9571	1.96	1.50	5.64	2.50	4.17	2.46
DeerHead	2981	2.76	1.94	5.97	2.12	4.16	2.4
Toilet	9301	2.26	1.56	5.28	2.46	4.11	2.32
StickThruLip	9042	3.15	1.89	5.78	2.48	4.37	2.16
	Mean	**2.53**	**1.70**	**5.72**	**2.34**	**4.09**	**2.24**
Neutral:							
ClothesRack	7217	4.82	0.99	2.43	1.64	6.25	1.86
Cow	1670	5.82	1.63	3.33	1.98	5.63	1.80
Buffalo	1675	5.24	1.48	4.37	2.15	4.63	2.1
NeutFace	2200	4.79	1.38	3.18	2.17	5.44	2.17
AbstractArt	7186	4.63	1.60	3.60	2.36	5.88	2.50
	Mean	**5.06**	**1.42**	**3.38**	**2.06**	**5.57**	**2.09**
Achievement							
Money	8502	7.51	1.72	5.78	2.49	6.40	2.54
Gymnast	8470	7.74	1.53	6.14	2.19	6.17	2.09
Athletes	8380	7.56	1.55	5.74	2.32	5.80	2.02
TennisPlayer	8350	7.18	1.56	5.18	2.28	5.78	1.76
Winner	8330	6.65	1.39	4.06	2.28	5.56	1.59
	Mean	**7.33**	**1.55**	**5.38**	**2.31**	**5.94**	**2.00**
Positive							
Women	1340	7.13	1.57	4.75	2.31	6.13	1.78
Monkeys	1811	7.62	1.59	5.12	2.25	6.07	1.96
Father	2057	7.81	1.28	4.54	2.41	6.76	1.94
Skier	8034	7.06	1.53	6.3	2.16	6.26	2.02
Astronaut	5470	7.35	1.62	6.02	2.26	4.96	2.47
	Mean	**7.39**	**1.52**	**5.35**	**2.28**	**6.04**	**2.03**

Val = valence; Arou = arousal; Dom=dominance; MN = mean; SD = standard deviation