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Avoidance, Escape, and Approach Behavior in Individuals with High Behavioral Inhibition

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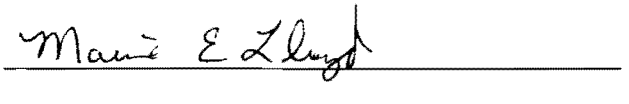

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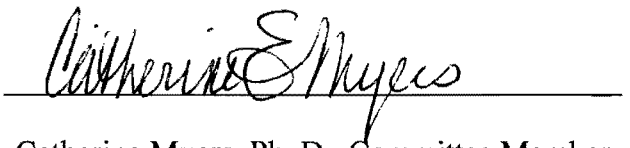

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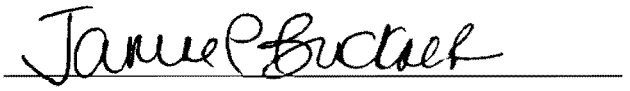

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Abstract

Post-traumatic stress disorder (PTSD) is a chronic and severe anxiety disorder that may arise in the wake of exposure to an extremely stressful or traumatic event. Abnormal avoidance is a core feature and symptom of this disorder. Typically, avoidance behavior has been explored through animal models and recently, the use of computer-based tasks where the to-be-avoided stimulus is cognitive feedback (e.g. point or money loss) is a popular means to assess this kind of behavior in humans. It is unknown whether the acquisition or expression of avoidance on such a task correlates with PTSD or factors known to confer risk with PTSD, such as heightened behavioral inhibition (BI; the tendency to avoid or withdraw from novel social or non-social stimuli). BI was measured both retrospectively (measured by RMBI) and currently (measured by AMBI). The present study utilized a computer-based learning and memory task, where participants were exposed to approach, avoidance, and escape trials, to determine whether self-reported BI correlates with avoidance learning. The hypothesis was that high BI would be correlated with performance on avoidance learning and possibly with escape learning, as avoidance has been implicated in PTSD. It was also hypothesized that high BI would not be correlated with approach learning. Demographic information and other personality measures, including novelty-seeking, reward dependency, and harm avoidance as well as a measure of depression was collected to determine the relation among these variables with BI and avoidance learning; they were predicted to not account for significant variance in avoidance learning scores beyond that predicted by BI. Contrary to the hypotheses, RMBI and AMBI were revealed as significant predictors for only approach learning, which suggests a relation among BI and approach behavior. No model was yielded for avoidance and escape learning.

Introduction

Post-traumatic stress disorder (PTSD), a chronic and severe anxiety disorder, may arise in the wake of exposure to an extremely stressful or traumatic event. The development of PTSD can occur at any age and is characterized by three specific core symptom clusters; re-experiencing phenomena of the traumatic event or intrusive thoughts, abnormal avoidance, and hyperarousal (Davis et al., 2001). The presence of the following DSM-IV criterion is required for a diagnosis of this disorder: the traumatic event must be directly experienced, witnessed, or learned about and elicit feelings of intense helplessness, horror, and fear within the individual (Gilbertson et al., 2008). In PTSD, the normal mechanisms that allow people to engage in a "fight-or-flight" response for the preparation, and subsequent protection, of danger or harm are changed and possibly damaged (National Institute of Mental Health [NIMH], n.d.). This alteration renders people to experience exacerbated stress and fear when there is no longer an actual threat (NIMH, n.d.).

As just mentioned, abnormal avoidance is a core feature and symptom of PTSD. Patients with PTSD have the tendency to avoid any stimuli that are associated with the traumatic event as feelings of intense fear and hopelessness can be brought about with exposure to reminders of their trauma. This avoidant behavior, or learning, has historically been explored through the use of animal models. A typical avoidance procedure involves emitting a warning stimulus, which serves as the conditioned stimulus (CS), before the presentation of an aversive unconditioned stimulus (US; e.g. electrical shock). However, if a desired response (e.g. bar pressing) is made, the electrical shock is not given and has therefore been successfully avoided. Essentially, a negative contingency between response and an aversive stimulus is what constitutes this procedure and avoidance responses are reasoned to be due to stimulus absence (Domjan, 2010).

In humans, avoidance behavior is especially difficult to study because of ethical considerations, including the presentation of a highly-aversive stimulus (e.g. intense shock) that is capable of motivating such behavior. Although avoidance learning is still studied with the use of relatively painless, uncomfortable shock in humans (e.g. Lovibond et al., 2008), an effective alternative is to execute computer-based tasks where the to-be-avoided stimulus is cognitive feedback (e.g. point or money loss). For example, Molet, Leconte, and Rosas (2006) utilized a computer videogame to study human conditioned avoidance in an attempt to develop an avoidance procedure specifically for humans. Molet et al. (2006) conducted two experiments that involved participants destroying alien enemy spaceships with the intention of gaining as many points as possible to increase their scores. The game had different colored signals that sometimes preceded the launching of a bomb, which would then destroy the participants' spaceship and result in a deduction of points. This reduction was made avoidable by maneuvering the spaceship to safety areas and in doing so, was considered an avoidance response. In the first experiment, Molet et al. (2006) used the videogame to study the acquisition of conditioned avoidance and temporal discrimination by calculating and comparing suppression ratios among three different groups (Instrumental, Yoked Control, and Pavlovian). Those in the instrumental group could always avoid point loss by placing the spaceship in the safety areas during the warning signals. Participants in the yoked group received the same treatment given to the instrument group despite their behavior during the task. Finally, the Pavlovian group always had a loss of points following the warning signal regardless of their behavior. Molet et al. (2006) concluded that their task successfully allowed for the study of conditioned avoidance as the instrumental group had decreased suppression ratios over trials compared to the control groups.

Kim, Shimojo, and O'Doherty (2006) used a computerized task, but in combination with functional MRI (fMRI) data to explore the proposition that in avoidance learning, the act of correctly avoiding an aversive stimulus operates as a reward. Kim et al. (2006) used a choice task that allowed participants to win or lose money through trials of reward and avoidance. During reward trials, an action could be chosen that led to a high or low probability of receiving monetary reward (Kim et al., 2006). Conversely, on avoidance trials, a choice selection could result in high or low probability of avoiding the negative outcome of money loss (Kim et al., 2006). Ultimately, a preference was shown for responses that led to a lower probability of receiving an aversive outcome. Compared to neutral trials, avoidant responses had a longer reaction time (RT) than approach trials and were found to be associated with increased activity in medial orbital frontal cortex (OFC), which occurred with reward receipt as well (Kim et al., 2006).

Schlund and Cataldo (2010) also used a computer task with monetary gain and loss, but did so to determine amygdala involvement in human approach, avoidance, and escape behavior. fMRI was used for the examination of amygdala reactivity to aversive and threatening cues when such cues are successfully avoided. In addition, this technique assessed the contributions of the amygdala during escape from similarly noxious stimuli (Schlund & Cataldo, 2010). Varying stimulus cues corresponded with approach, avoidance, or escape contingencies, each of which required a specific response and number of responses in order to obtain their respective optimal outcomes (e.g. monetary gain, avoidance of future monetary loss, and escape from repeated monetary loss). Participants' performance on the task was not Schlund and Cataldo's primary interest. However, no difference between avoidance and escape responding was reported. Furthermore, Schlund and Cataldo described that there were no differences in brain activity

during avoidance and escape responding as well. An increase in the number of responses per trial during avoidance compared to approach and during escape relative to approach was found and thought to suggest a larger motivation to avoid and escape aversive stimuli (Schlund & Cataldo, 2010). Alternatively, the authors' procedure could have given a set of expectancies that, in turn, provided information about how to behave/avoid during the task (Seligman's cognitive theory of avoidance), as opposed to eliciting an emotion, like fear, that would motivate such avoidance learning (Mowrer's two-factor theory of avoidance). Although Schlund and Cataldo found no significant differences in amygdala responses to escape, avoidance, or approach cues, there were significant between-subject responses, which the authors suggested could be relevant for understanding different individuals' vulnerability to anxiety disorders.

It is unknown whether acquisition or expression of avoidance on such computer tasks does, in fact, correlate with PTSD or with factors known to confer risk to PTSD. One such risk factor for PTSD (and anxiety disorders in general) is behavioral inhibition (BI), the temperamental tendency to avoid or withdraw from novel social or non-social stimuli (Fox et al., 2005). The relation among BI and avoidance learning was explored through the use of an animal model of BI (Wistar-Kyoto rat strain; WKY) by Beck et al. (2011). One aspect of their exploration involved how sex, which is another vulnerability factor for anxiety disorders, and a behaviorally inhibited temperament influence the acquisition of avoidance behavior in a discrete lever-press escape-avoidance procedure. This procedure allowed for avoidance of shock when a lever press was produced before the warning signal (tone). When the lever was pressed during the administration of the tone, the shock would cease and therefore rats had successfully escaped this adverse stimulus. Beck et al. (2011) also examined the effects of an inter-trial-interval (ITI) signal (a flash of light) on the WKY strain and female sex on avoidance behavior acquisition.

Compared to normal outbred rats (Sprague Dawley; SD), the WKY strain acquired avoidance behavior faster as their latency to respond with the lever press decreased more rapidly. The WKY strain also extinguished this behavior slower than the SD rats (Beck et al., 2011) over trials. Furthermore, Beck et al. (2011) reported that without the ITI-signal, the acquisition of avoidance behavior was slowed only in the male WKY rats. The training with this signal did not have any influence on the extinction of avoidance behavior for either male strain. With regard to female WKY and SD rats, the presence of the ITI-signal did not affect either strain's avoidance acquisition; however, the absence of the ITI-signal did facilitate extinction for both female strains. Ultimately, Beck et al. (2011) demonstrated that a behaviorally inhibited temperament can affect avoidance learning as it leads to a faster acquisition of avoidance. Regarding sex, it remains unclear of why such an ITI-signal would affect the sexes so differently. In humans, it also remains unclear how sex relates to PTSD risk, BI, and avoidant behavior.

Within humans, BI can reliably be self-assessed through questionnaires (e.g. Adult and Retrospective Measures of Behavioural Inhibition; AMBI/RMBI). Individuals with high BI are at heightened risk to develop PTSD if exposed to highly traumatic events (Fincham et al., 2008; Kashdan et al., 2009). According to diathesis-stress models, a premorbid risk, like BI, interacts with environmental/situational stressors (e.g. a severely traumatic event) and genetic predispositions (e.g. personality traits; BI) to bring about the development of PTSD (McKeever & Huff, 2003). The probability of PTSD development after trauma exposure is roughly 9.2% (Gilbertson et al., 2008), which prompts curiosity concerning individual differences in PTSD vulnerability and development. A relation between self-reported current PTSD symptoms (PTSS) and self-reported BI has been found (Myers et al., 2012). This finding is consistent with the idea that individuals with the personality trait of BI are at a heightened risk to develop PTSD

if exposed to highly stressful events. It is suggested that a vulnerability to PTSD has grounds in personality traits that pre-date its attainment (Myers et al., 2012). Therefore, it is possible that individual differences in vulnerability to PTSD may partially reflect individual differences in the ability to acquire avoidant behavior. The results of Myers et al. (2012) are purely correlational and so it is also possible that PTSS causes high self-reported BI. BI levels prior to PTSS were not obtained in the Myers et al. study.

BI is just one vulnerability factor for PTSD, but there are others which may be involved in its development as well. Such a factor is the personality trait of harm avoidance, which is an intense response to and learning to avoid punishment (Cloninger et al., 1991). One common way to measure harm avoidance is through the Tridimensional Personality Questionnaire (Cloninger et al., 1991). Using this questionnaire, Casada et al. (2005) and Yoon et al. (2009) both have found higher TPQ harm avoidance scores in patients with PTSD. Whether BI and harm avoidance are two measures of the same construct or separate, distinct vulnerability factors has yet to be determined and remains an open question for investigation.

PTSD is highly co-morbid with major depressive disorder (MDD) (Gilbertson et al., 2008) and at least one study suggests a relation between BI and depression. Fincham et al. (2008) has found self-reported childhood (retrospective) BI to be positively correlated with depression in patients with HIV. However, Gladstone, Parker, Mitchell et al. (2005) reported no difference in depression severity in patients with major (clinical) depression on the AMBI/RMBI. Currently, it is unknown whether BI correlates with depressive symptoms in individuals without a clinical diagnosis of depression.

In the current study, I explored whether self-assessed BI correlates with avoidance learning. The goal of the present study was to determine whether self-reported BI actually

manifests in behavior, particularly in avoidance behavior. I was interested in understanding the relation between self-reported/self-knowledge of BI and the assessments used to measure it; are they really accurately measuring BI? The hypothesis was that high BI, a risk factor for PTSD, is correlated with performance on avoidance learning and possibly with escape learning; it was expected that those who score high on BI would be more likely to perform better on such types of learning. If so, it would suggest that facilitated avoidance learning in individuals with PTSD reflects pre-existing personality traits, rather than being a symptom acquired in the course of PTSD or following exposure to traumatic events. This in turn would provide support for a theory of individual differences in learning providing risk factors for PTSD (Myers et al., 2012). Furthermore, I predicted that high behavioral inhibition will not correlate with performance on other kinds of learning, such as approach learning, that are not implicated in PTSD. I also collected several other demographic and personality measures, including subject age, sex, novelty-seeking, reward dependency, and harm-avoidance, as well as a measure of depression, but I predicted these would not account for significant variance in avoidance learning scores beyond that predicted by BI. If and how BI is related to escape also remains unanswered and was explored in the current study. Based on the outcomes of this study, I plan to follow up with future studies examining the computer-based avoidance learning task in populations with PTSD symptoms.

Methods

Participants

A total of ninety-three undergraduate students (24 male, 69 female) from Seton Hall University participated in this study and were recruited through the psychology research pool. To be able to participate, participants must have had the ability to see a computer screen at a normal viewing distance, vision correctable by glasses or contacts was permissible, and students were also required to have the ability to press buttons on a keyboard in order for their responses to be registered.

Data analysis excluded the first six participants of the study as the computer task was modified after their participation (n = 87; 24 male, 63 female) (See *Procedure* for details). With this exclusion, participants were between the ages of 18 and 24 years old.

Apparatus

To complete the computer-based learning and memory task (adapted from a task designed by Schlund & Cataldo, 2010), a Macintosh i-book was provided to the participants in an isolated research area. All keys, except three (control, option, and command) were masked throughout the task. The experimental software was programmed and executed in the SuperCard development language (Allegiant Technologies, San Diego, CA). All stimuli created for this task were original; they can be seen in Figure 1.

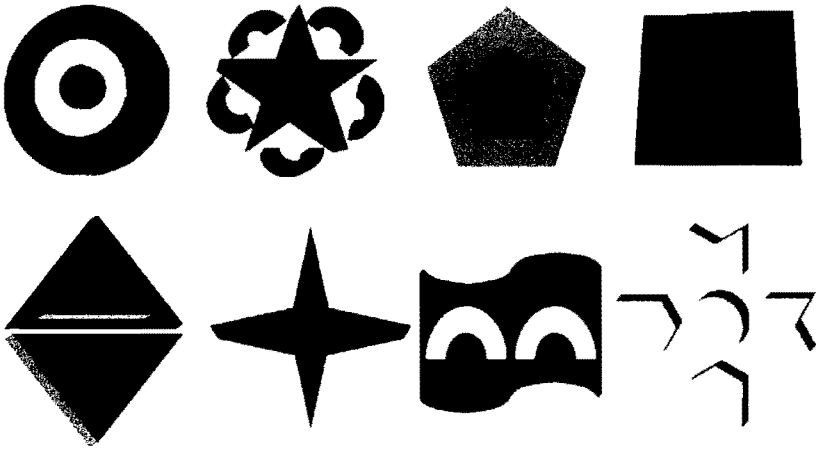


Figure 1. Stimuli for the computer-based learning and memory task.

Measurements

The demographic questionnaire was the first self-report measurement provided to the participants and it contained questions pertaining to their age, sex, race, and other demographic information as well as exclusionary criteria (such as vision or motor impairments that would affect their ability to complete the computer-based task). All the following measurements were self-report, paper-and-pencil assessments that were completed following the termination of the computer-based task. These assessments included; the Adult and Retrospective Measures of Behavioural Inhibition (AMBI/RMBI; Gladstone & Parker, 2005), the Tridimensional Personality Questionnaire (TPQ; Cloninger et al., 1991), and a modified version of the Beck Depression Inventory-II (BDI-II-Modified; Beck, 1987).

AMBI is composed of 16 items and known to self-assess current trait inhibition, or the tendency to respond to novel stimuli with inhibition and/or avoidance; this measurement is capable of predicting anxiety proneness as well (Gladstone & Parker, 2005). With regard to its scoring, a total AMBI score between 2 and 15 classifies an individual as "uninhibited," while scoring from 16-32 classifies one as "inhibited." Based on factor analysis, the four subscales of AMBI are as follows: "fearful inhibition," "non-approach," "low sociability," and "risk

avoidance" (Gladstone & Parker, 2005). The fearful inhibition subscale assesses the tendency to respond with a sense of hesitation as one displays hypervigilance, and reacts with anxiety toward novel social situations. The non-approach subscale includes items that examine an interpersonal reticence and lack of spontaneity towards social approach and involvement. The low sociability subscale contains items that assess a sense of independence and preference for one's own company and solo activities. Items in the risk avoidance subscale address the tendency to avoid physical risk and adventurous activities while attaching to a secure social basis.

RMBI is an 18-item assessment of childhood memories of displaying inhibition to the unfamiliar that was administered after AMBI (Gladstone & Parker, 2005). A classification of "uninhibited" requires a score between 0 and 11; a score from 12-25 will label one as "inhibited" (Gladstone & Parker, 2005). RMBI shares three subscales, and their respective assessments, with AMBI ("fearful inhibition," "non-approach," and "low sociability"), but specifically target memories of childhood memories. The fourth subscale of RMBI is "shyness and sensitivity," which evaluates an individual's shyness and reluctance to go to school.

TPQ consists of 100 items (true/false statements) and is used to generate three scores that respectively represent self-assessed harm avoidance (intense response to and learning to avoid punishment), as well as novelty-seeking (exploration of and excitement in response to novel stimuli) and reward dependence (intense response to and learning to obtain reward).

A modified version of the BDI-II is used as a self-report tool to assess the intensity of depressive symptoms in normal patients; it does not clinically diagnose depression. The standard version contains a question related to subjects' thoughts of suicide, which could reasonably be expected to provoke suicide-related thoughts. To avoid this issue and reduce the likelihood of subjects becoming uncomfortable, the current study used a modified version (the BDI-II

Modified) which eliminated this question as well as a question about sexual interest. In total, the BDI-II Modified contains 20 groups of statements for which participants are asked to determine which best describes how they have been feeling in the past two weeks. As a result of eliminating questions, raw scores on the BDI-II Modified will be two scores lower, and as such cannot be directly compared against data obtained from other populations who were administered the full BDI-II. However, for current purposes, there was more interest in comparing number of symptoms endorsed among individuals within the Seton Hall University sample, and so this was not a serious limitation.

Procedure

Participants were first provided with the demographic questionnaire and following its completion, the computer-based learning and memory task was administered and consisted of exactly 270 trials. It took participants roughly 20 minutes to complete the task. The design of the computer task used in the present study was adapted from the task designed by Schlund & Cataldo (2010).

Originally, the design required 6 or more button presses in order to achieve the optimal outcome for each trial contingency. It had also included a punishment cue that was going to be provided randomly. Any response made to this cue would have resulted in a monetary loss of $0.05. Appropriately responding to this cue (by not pressing any button during its presentation) would have resulted in the presentation of a blank, white screen; indicating that nothing was neither lost nor gained. These features were modified after the testing of the first six participants because the task proved too difficult to solve with only one person successfully completing the game. The modifications were made in order to increase the number of solvers, but they did not allow for the task to be learned by every participant.

Before participants began testing, they were read the following task instructions out loud:

> "From time to time, you will see objects on the screen. From time to time, you'll win money or lose money. You are allowed to press any of the three keys whenever you like, as often as you like. In the beginning, you'll have to figure out what to do. Try to win as much money as you can."

After the instructions were read, participants were asked if they understood what they were expected to do. Once an indication of understanding was given, the task began without any further instruction. In this task, participants responded to various approach, avoid, and escape stimuli with, again, the goal of earning as much money as possible.

For each trial a single visual cue was provided at a fixed interval presentation (a maximum of 8 seconds), during which subjects were be able to press or not press the available three response buttons (control, option, and command). Immediately following this initial stimulus presentation and subsequent behavioral response, an outcome was provided (displayed for a total of 2 seconds). For approach and avoidance trials, if the correct response (e.g. the correct target button was selected with appropriate number of button presses) was successfully emitted during the stimulus cue presentation, the reward or no loss of money immediately followed the termination of the participant's response. If the incorrect response was provided by the participant (e.g. the target button was not the initial button press), the stimulus was immediately taken away upon this response and replaced with the appropriate monetary outcome (e.g. no money gain or money loss). If a response was never made (no button was ever pressed), then the outcome would appear on the screen after the cessation of stimulus presentation (after the full 8 seconds). Regardless of trial, a fixed interval outcome display (of 2 seconds) indicated the amount of money earned or lost depending on the paired contingency (e.g. approach,

avoidance, escape). The presentation of each trial contingency was randomized across participants as well. Participants were not told the stimulus-contingency pairing. The assignment of visual cues and key mappings were counterbalanced across participants. The outcome display served as the inter-trial-interval and visually separated each trial for the participants. An example of the mapping of cues and response keys to each trial type can be seen in Figure 2. This pairing (of cues and response keys) was randomized throughout the entire study and Figure 2 displays a single example mapping for one hypothetical subject.

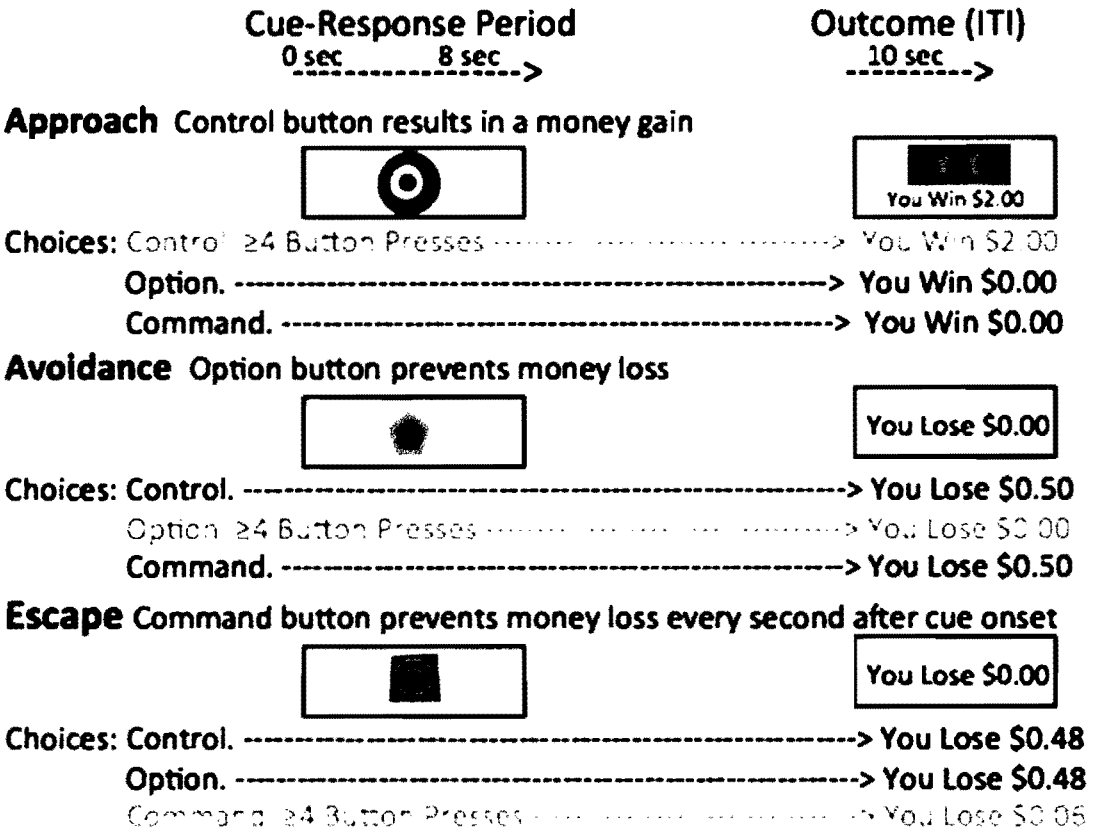


Figure 2. Approach, avoidance, and escape contingencies.

The approach cue was paired with a positive reinforcement contingency such that responding with a fixed number of target button presses (e.g. control button; ≥4 presses) resulted in a monetary gain of $2.00, which was depicted with a picture of a one-dollar bill with the phrase "You win $2.00" beneath it. Responding with a different button press or with less than

the fixed number of presses required, or not pressing a button at all did not produce any monetary gain and the text "You win $0.00" appeared on the computer screen.

The avoidance cue was associated with a negative reinforcement contingency by which pressing a target button (e.g. option button) for a fixed number of times (≥4 presses) prevented the loss of money and the text "You lose $0.00" was presented. Pressing a different button or responding with less than the required number of presses automatically resulted in monetary loss and a picture of a quarter with a red "X" on it appeared with the text "You lose $0.50" beneath it. Schlund and Cataldo (2010) had a third trial type, which they called "escape." The current study also implemented this type of trial. A negative reinforcement contingency was associated with the escape cue as well in that pressing the target button (e.g. command button) for a fixed number of presses (≥4 presses) ceased the continued monetary loss (i.e. $0.06) that occurred every 1 second from stimulus cue onset. Pressing a non-target button or non-responding in this contingency resulted in a total loss of $0.48, which was depicted with a picture of quarter with a red "X" and the text "You lose $0.48" beneath it. Failing to emit the required amount of button presses resulted in a monetary loss proportional to the time elapsed between stimulus onset and completion of the required response, and was depicted with the same quarter picture used before, but with the appropriate monetary loss text below it.

Once the learning and memory task was completed, the total earnings collected by the participant was displayed on the computer screen. Once the display appeared, the computer was then removed and the participants were provided with the three self-assessment questionnaires (in this order: AMBI/RMBI; Gladstone & Parker, 2005, TPQ; Cloninger et al., 1991; BDI-II-Modified; Beck, 1987).

Statistical Analysis

For the current study, the dependent variables were performance (response accuracy or percent correct) on the avoidance, approach, and escape cues. Each contingency cue contained 90 trials (for a total of 270 randomly presented trials for the entire computer task). The 90 trials were broken down into three, 30-trial blocks once the trials were organized by type. If participants obtained a response accuracy of 50% or greater on any block, in any given trial contingency, he or she was considered as a "solver" of the task and grouped accordingly. Considering the difficulty of the task, a response accuracy of 50% is not considered chance performance. A "non-solver" was defined as a participant who obtained a response accuracy lower than 50% on all blocks, in all three trial contingency types. For approach, avoidance, and escape additional performance measures were tabulated. These included; the number of trials until the first correct response, the number of correct trials in a row once the initial correct response was made, the longest number of trials correctly responded in a row, and the shortest number of trials correctly responded in a row.

In each contingency, a stepwise multiple linear regression was run on performance, with predictor variables including demographic information (e.g., age, sex), personality traits (e.g. adult BI, childhood BI, novelty-seeking, harm avoidance), and depression score. Where multiple comparisons were conducted, a Bonferroni corrected alpha was used to protect against type 1 error and, where appropriate, such corrected alphas were noted in the text. Again, BI was expected to be the best predictor of avoidance performance and possibly escape learning above the other variables. BI was not predicted to be a good indicator of approach learning as such learning has not been implicated in PTSD.

Results

One participant unintentionally omitted one question from the AMBI and another participant similarly omitted one question from the TPQ. Both participants were solvers of the task and their missing responses were interpolated to give approximate scores. A different student, a non-solver, purposely omitted five answers from the TPQ and responses for these questions were again interpolated. In all cases, omitted data was less than a quarter of the questions making up the scale and it was assumed that participants would generally answer in a similar way.

Questionnaires

Examining behavioral inhibition scores first, the mean total score on the AMBI was 14.48 (*SD* 5.1) and on the RMBI, the mean total score was 12.74 (*SD* 6.7); these scores are similar to what has been previously reported with AMBI/RMBI (Gladstone & Parker, 2005). The range of scores for AMBI was 24, with a minimum score of 2 and a maximum of 26. For RMBI, the range of scores was 31, with a minimum score of 1 and a maximum of 32. Within participants, AMBI and RMBI scores were moderately correlated (corrected alpha= 0.003, r=0.385, p<0.001). There was no effect of sex on AMBI or RMBI total scores (independent-samples-t-tests, corrected alpha=0.004, p>0.05). Based on AMBI, 44 of the 87 participants were categorized as "behaviorally inhibited," and, according to RMBI standards, 49 of the 87 participants were categorized as "behaviorally inhibited." 26 of the participants scored consistently low BI on both AMBI and RMBI, 32 scored consistently high BI on both measures, while 29 had mixed scores (e.g. high on AMBI and low on RMBI, vice versa).

Turning next to TPQ, the mean total score for novelty-seeking was 15.68 (*SD* 5.0), for harm avoidance it was 12.97 (*SD* 7.0), and finally for reward dependency the mean total score was

20.22 (*SD* 4.4). There was an effect of sex on harm avoidance (independent-samples-*t*-test, corrected alpha=0.004, t=-3.04, p=0.003) such that the mean total score for harm avoidance was greater for females (*M* 14.32, *SD* 7.1) compared to males (*M* 9.42, *SD* 5.6). No effect of sex on novelty-seeking or reward dependency was found (independent-samples-*t*-tests, alpha=0.004, p>0.004). Novelty-seeking and harm avoidance approached a significant correlation (corrected-alpha=0.003, p=0.004) with one another; both significantly correlated with AMBI and RMBI (Table 1; corrected-alpha=0.003, p<0.003). The correlation among AMBI and reward dependency approached significance (Table 1; corrected-alpha=0.003, p=0.031).

Table 1.

Correlations among questionnaires.

	AMBI	RMBI	BDI-II	NS	HA	RD
AMBI	-	0.385*	0.155	-0.447*	0.553*	-0.231
RMBI		-	0.227	-0.343*	0.454*	-0.150
BDI-II			-	0.112	0.502*	-0.237
NS				-	-0.309	0.114
HA					-	-0.224
RD						-

Note. * = Correlation is significant at the corrected alpha (p<0.003). AMBI- Adult Measure of Behavioural Inhibition; RMBI- Retrospective Measure of Behavioral Inhibition, BDI-II- Beck Depression Inventory II Modified; NS- Novelty Seeking; HA- Harm Avoidance; RD- Reward Dependency.

Considering depression scores, the mean total score for BDI-II modified in this sample was 7.41 (*SD* 6.6). Female participants scored higher on the BDI-II (*M* 8.37, *SD* 7.2) than males (*M* 4.92, *SD* 3.7). However this difference approached, but failed, to reach significance (independent-samples-*t*-test, corrected alpha=0.004, t=-2.24, p=0.028). BDI was significantly correlated with harm avoidance (Table 1; corrected alpha=0.003, $p<0.001$) and neared a significant correlation with RMBI (Table 1; corrected alpha=0.003, p=0.034).

Computer-Based Task Performance

Data analysis for task performance was limited to only solvers. Based on the criterion for the computer task, 56 of the 87 participants were solvers (21 male, 35 female), while the remaining 31 participants were non-solvers (3 male, 28 female). There were no differences found between solvers and non-solvers on any of the questionnaires, including BI (independent-samples-*t*-tests, corrected alpha=0.008, all $p>0.05$). However, there was a sex difference among solvers and non-solvers such that there were proportionally more males solving the task than not (Yates-corrected χ^2=6.402, df=1, p=0.001). Not every solver learned every contingency type as some participants solved all three contingencies (n=46), while others learned only approach (n=4), only avoidance (n=1), only avoidance and escape (n=4), or just approach and avoidance (n=1). BI varied among these groups and no group (with the exception of those with an n of 1) had the same BI categorization. The following analysis concerned all 56 solvers collectively due to the small n within each breakdown.

Mean response accuracy (or percent of correct responses) for approach trials was 64.21% (*SD* 28.5), for avoidance trials it was 63.80% (*SD* 21.1), and for escape trials mean response accuracy was 59.90% (*SD* = 22.0); no differences in response accuracy were found between the contingency types (repeated-measures ANOVA, $F(2,110)$=1.450, p=0.239). Approach,

avoidance, and escape response accuracies increased across blocks, which indicated learning of the contingencies and this can be seen in Figure 3 (repeated-measures ANOVA, all $p<0.001$). Furthermore, the number of solvers for approach, avoidance, and escape increased across blocks (Table 2; repeated-measures ANOVA, all $p<0.001$).

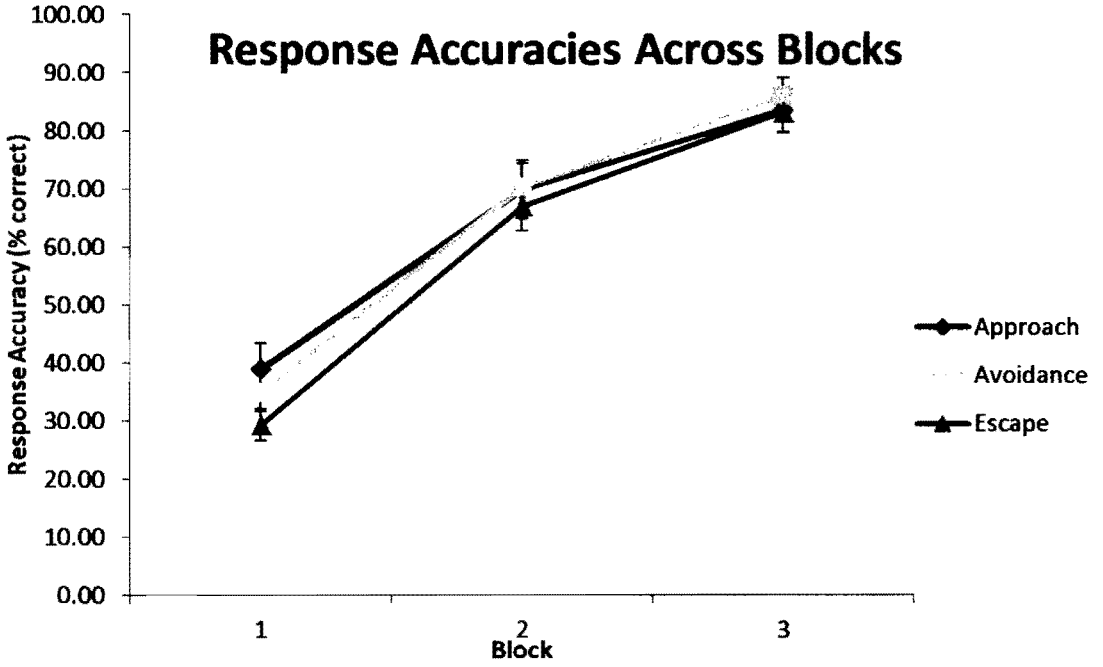


Figure 3. Approach, avoidance, and escape responses accuracies across blocks.

Table 2.

Number of solvers per block for approach, avoidance, and escape trials.

	Block 1	Block 2	Block 3
Approach	22	42	49
Avoidance	22	43	51
Escape	8	43	49

The correlations among response accuracy for each of the trial contingencies is displayed in Figure 4; overall response accuracy for approach is highly correlated with avoidance response accuracy (corrected alpha= 0.017, r= 0.505, p<0.001) as well as with response accuracy for escape (corrected alpha= 0.017, r= 0.586, p<.001). Additionally, response accuracy for avoidance is highly correlated with escape response accuracy (corrected alpha= 0.017, r= 0.898, p<0.001).

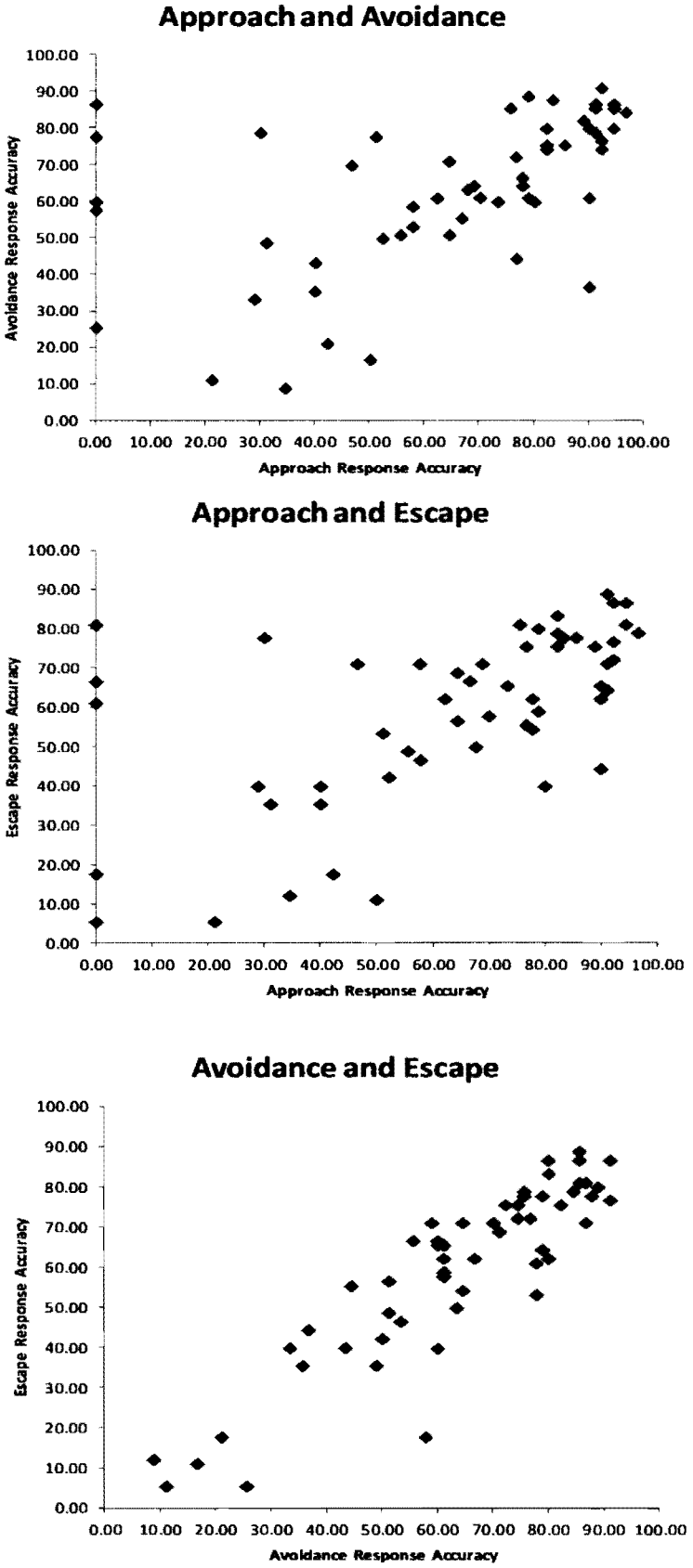


Figure 4. Correlations among trial contingencies and response accuracy.

Approach trials had a mean reaction time (RT) of 7010.87 ms (*SD* 535.3), avoidance trials had a mean RT of 6883.33 ms (*SD* 455.4), and mean RT for escape was 7015.75 ms (*SD* 393.0). There was a difference found in RT among the three contingencies (repeated-measures ANOVA, $F(2, 110)= 3.751$, $p=0.027$). A follow-up post-hoc *t*-test was conducted to determine where the RT difference between the contingencies was. It was found that the RT for avoidance responding was faster than escape ($p<0.001$), but neither avoidance nor escape was different from approach (all $p>0.05$). Another indicator of task learning was seen as approach, avoidance, and escape reaction times improved across blocks (repeated-measures ANOVA, all $p<0.001$); this is shown in Figure 5.

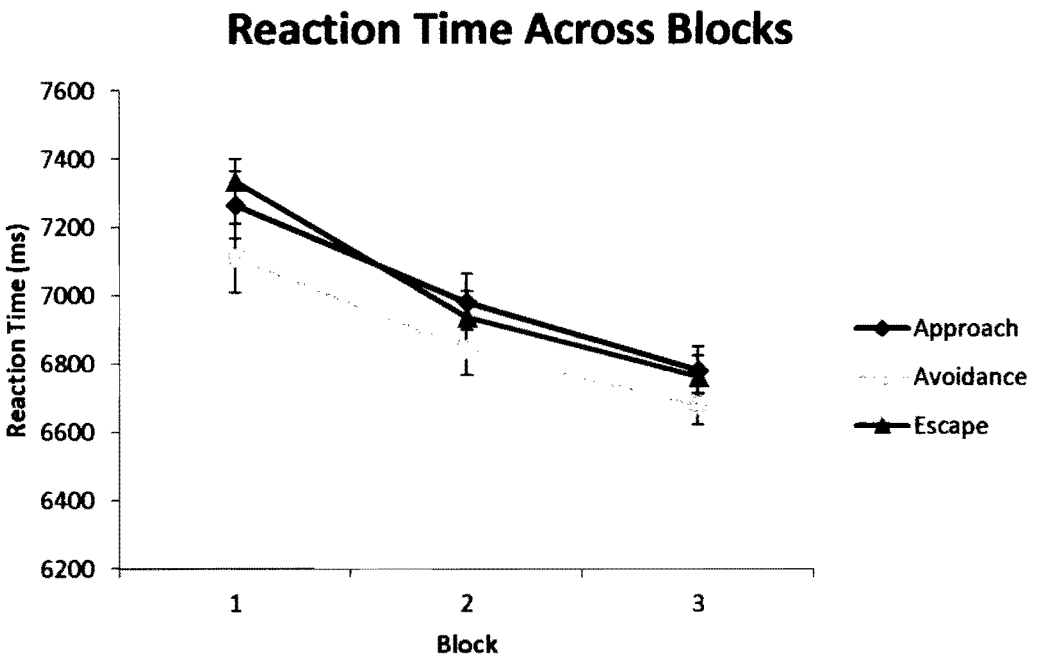


Figure 5. Approach, avoidance, and escape reaction time across blocks.

The means and standard deviations for the other measures of task performance (i.e. the number of trials until the first correct response, etc.) can be found in Table 3.

Table 3.

Means and standards deviations of other task performance measures.

	Approach	Avoidance	Escape
# of trials until the first correct response	18.84 (19.4)	13.21 (15.5)	13.04 (12.06)
# of correct trials in a row once the initial correct response was made	17.16 (24.3)**	3.43 (5.3)	3.02 (8.2)
Longest # of trials correctly responded in a row	38.11 (23.2)	28.13 (17.1)	27.91 (17.0)
Shortest # of trials correctly responded in a row	11.75 (23.9)	2.02 (4.4)	2.30 (7.6)

Note. ** = approach > avoidance and approach > escape, two-sample *t*-test, all $t>4.00$, all $p=0.000$.

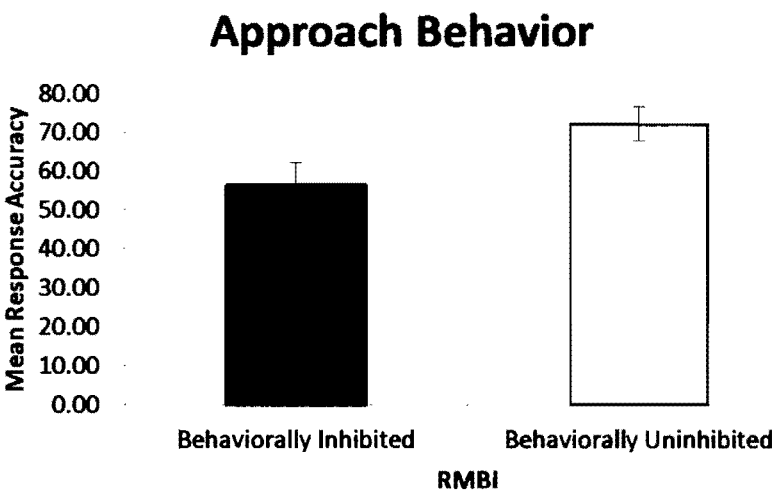
When comparing these measures among approach, avoidance, and escape, there was a significant difference in the number of correct trials in a row once the initial correct response was made for approach and avoidance (two-sample *t*-test, corrected alpha=0.003, $t=4.13$, $p<0.001$); such that approach (*M* 17.16 *SD* 24.3) had a greater string of correct responses compared to avoidance (*M* 3.43 *SD* 5.3). Approach also significantly differed from escape (*M* 3.02 *SD* 8.2) in the same measure, in the same direction (two-sample *t*-test, corrected alpha=0.003, $t=4.13$, $p<0.001$). The only other measure where trial contingencies even approached a difference was with the shortest number of trials correctly responded in a row; avoidance (*M* 2.02 *SD* 4.4) had fewer trials correct in a row compared to approach (*M* 11.75 *SD* 23.9), but this was not significant (two-sample *t*-test, corrected alpha=0.003, $t=3.00$, $p=0.003$) and escape (*M* 2.30 *SD* 7.6) trended this same result (two-sample *t*-test, corrected alpha=0.003, $t=2.82$, $p=0.005$). No other measures differed

among the contingency types (two-sample t-test, corrected alpha=0.003, all p>0.003) or between AMBI or RMBI categorizations (independent-samples-t-tests, corrected alpha=0.004, p>0.05).

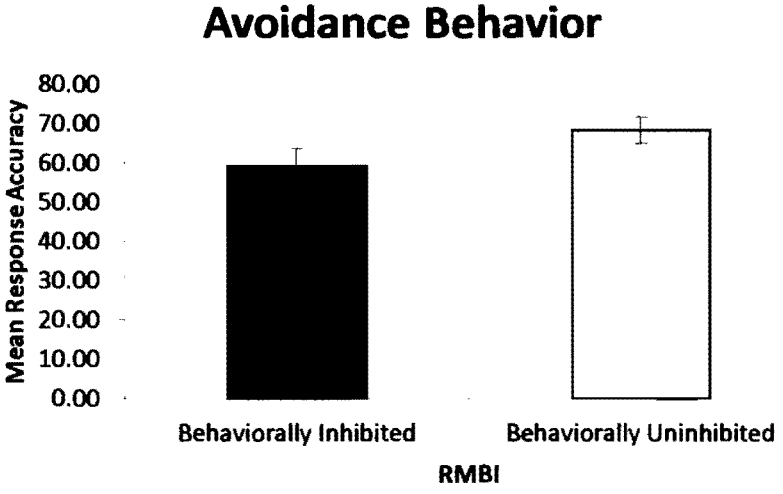
Questionnaires predicting Computer Task Performance

Three stepwise linear regressions were conducted in order to determine which independent variables; behavioral inhibition (AMBI and RMBI), novelty-seeking (NS), harm avoidance (HA), reward dependency (RD), sex, and depression (BDI-II modified) were the predictors of performance (response accuracy) on approach, avoidance, and escape trials for solvers of the computer task. Despite the high correlation among the three contingencies, with respect to response accuracy, the results of the regression indicated that an overall model of two predictors (RMBI and AMBI) could significantly predict only approach performance, R^2= 0.442, R^2_{adj}= 0.165, $F(2, 53)$= 6.42, p= 0.003. RMBI accounted for 13.2% of the variance in approach performance and AMBI provided an additional 6.3%. Since RMBI best predicted performance on approach trials, Figure 6a showed that participants with lower RMBI scores (indicative of uninhibited behavior) performed better on approach trials compared to higher RMBI scores (indicative of inhibited behavior; independent-samples t-test, t=2.16, p=0.035), Additionally, the correlation among RMBI score and approach response accuracy approached significance (corrected alpha =0.005, r=-0.363, p=0.006). Moreover, it appeared that having a high RMBI score was selectively detrimental to only approach behavior as this pattern trended with avoidance and escape behavior (Figure 6b and 6c). For avoidance and escape performance, no significant predictors were identified. Similarly, no significant predictors were identified for approach, avoidance, or escape response latencies.

A



B



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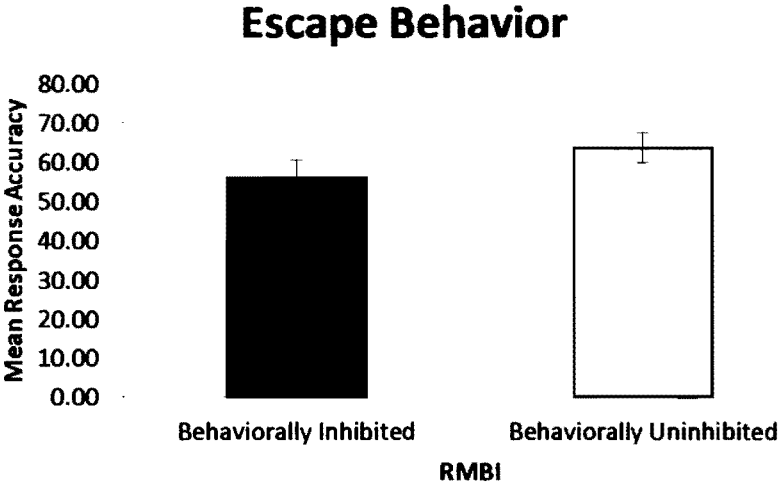

Figure 6. Response accuracy differences among high (n =28) and low (n=28) RMBI in approach behavior (a), avoidance behavior (b), and escape behavior (c).

In this sample, AMBI and RMBI total scores were found to be correlated with one another, which a common finding (Myers et al., 2012). Despite this correlation, according to regression analysis, RMBI was found to account for more variance in approach learning beyond that accounted for by AMBI as well as the other personality and demographic measures. Specifically, it would appear that having a higher RMBI score, indicative of a behaviorally inhibited personality, is detrimental to approach learning. A slight, non-significant decrement was observed in avoidance and escape performance for those with higher RMBI scores as well. These findings were not expected as it was initially thought a BI difference would arise with avoidance and escape learning, and not necessarily with approach. Again, facilitated avoidance and escape performance with high BI was expected to occur due to the tendency for patients with PTSD, and with possibly higher BI, to rigorously engage in avoidant behavior. To date and to the best of my knowledge, this is the first study to find a relation among BI, specifically retrospective BI, and approach behavior. This ultimately suggests that there is indeed a relation between BI and approach learning, which is in need of further exploration and clarification. This result occurred even though approach, avoidance, and escape response accuracies were highly correlated with one another, which demonstrates the selectivity of this effect on learning. Finding no such differences in avoidance and escape performance could have been due to the fact that no feelings of novelty were elicited during those parts of the task and therefore BI was not discernible. Perhaps avoidance and escape trials were either not sensitive enough to differentiate high and low BI, maybe different performance measures would better tease BI apart, or no such difference actually exists with this task. Schlund and Cataldo (2010) maintained a response accuracy that exceeded 95% for all their subjects, mostly for fMRI purposes, and instead assessed task performance based on the number of responses per trial; a

measurement not collected in this study, but could be added in future endeavors to explore whether BI manifests in this kind of responding. This finding could have also occurred because approach was the more salient contingency type; approach did have a greater string of correct responses compared to avoidance and escape once the initial correct response was made. It was easier for participants to lose money than it was for them to gain money as an incorrect response to avoidance and escape trial automatically resulted in money loss. To achieve any sort of money gain a correct response was required, which took more effort to learn. In order to adjust for this salience, there is a need of balancing among trial types. This could be accomplished by adding a reward cue that is similar to escape, whereby the faster one correctly responds, the more money one wins. Another reason for this finding could be that participants were instructed to try to win as much money as they possibly could, which could have directed their focus more towards gaining money. It may be useful to modify the task instructions to express a more neutral goal.

Interestingly, the only difference in RT was between avoidance and escape; participants were faster at responding to avoidance cues compared to escape. This is contrary to the RT difference that was reported by Kim et al. (2006), which showed a longer RT for avoidance performance compared to approach and neutral trials. It is unnecessary to respond faster to avoidance trials as there is a stagnant money loss, as opposed to escape trials where money is lost every second the correct response is not made. Participants should be motivated to respond faster during escape trials since doing so would result in less money loss, but this was not the case. This could be due maybe to the length of the task, the time pressure associated with escape in that it stressed participants to respond not as fast, or perhaps the escape trials were more difficult. I do not believe it was a matter of participants not realizing that there was a constant deduction of money during those trials as they acknowledged this reduction during test

debriefing. However, I do not know when this monetary decrement was acknowledged. This RT difference can also be explained from the perspective of the behavior systems theory in that the avoidance performance can be perceived as a post-encounter behavior, while escape performance can be consider cira-strike behavior. Post-encounter behavior reflects the first detection of potential danger where behavior is not yet disturbed; avoidance and freezing typically occurs (Mobbs, Marchant, Hassabis, Seymour, Tan, Gray, Petrovic, Dolan, & Frith, 2009). Conversely, cira-strike behavior is exhibited when trying to deal directly with the aversive threat/stimulus and causes disruption of organized behavior (Mobbs et al., 2009). Participants may have been engaging in cira-strike behavior when responding to the escape trials as their RT was slower in these trials compared to avoidance. Accordingly, during trials of avoidance, participants could be engaging in post-encounter behavior since their behavior was not disrupted and remained effective. With all of this taken in to consideration, it does, overall, appear that the assessments used to measure BI are in fact accurately measuring inhibition since this behavior did manifest during the task.

With regard to relations among measures, novelty-seeking and harm avoidance approached a negative correlation, which is along the lines of what Cloninger et al. (1991) reported (they reported a significant relation) and it makes inherent sense for those who seek novelty to have a lower regard for avoiding harm. Both novelty-seeking and harm avoidance were correlated with AMBI and RMBI; novelty-seeking negatively and harm avoidance positively. This finding is consistent with how BI is defined, which is again the tendency to avoid or withdraw from novel social or non-social stimuli. Accordingly, persons with higher scores on AMBI and RMBI would be less likely to engage in novelty and more prone to avoidance (Gladstone and Parker, 2005), and this was found in the current sample. Like

Cloninger et al. (1991), females tended to have a higher harm avoidance scores than males. Nothing consistent was found with respect to reward dependency and this could be due to the questionnaire in and of itself as this subscale is composed of the fewest number of items (Cloninger et al. 1991). Overall, these measures (novelty-seeking, harm avoidance, and reward dependency) were not related to task performance and despite that the TPQ is widely used and popular questionnaire, it was not useful in predicting approach, avoidance, and escape behavior. One of the reasons harm avoidance was measured was to determine whether it and BI are measures of the same construct or distinguishable vulnerability factors. Based on what was found in the current study, this issue still remains unclear. Since harm avoidance was not implicated in learning behavior, as BI was, it is not appropriate to say that these measures are of the same construct. On the other hand, harm avoidance was highly correlated with BI on both AMBI and RMBI, suggesting that these vulnerability factors are not completely discernible either.

As previously mentioned, it is currently unknown whether, or how, BI relates to depressive symptoms in people without a clinical diagnosis of depression. In this sample, depressive symptoms correlated only with harm avoidance, not BI. Depressive symptoms did near a correlation with RMBI, similar to what Fincham et al. (2008) has previously reported in patients with HIV, but ultimately no definitive relation was found among these variable nor did they contribute to the computer task performance, suggesting that depressive symptoms was not particularly useful in this task.

There has been some debate on how to treat AMBI and RMBI scores; should these measures be combined or treated separately. Results of the current study imply that these two factors are related to one another, but are ultimately measuring different aspects of behavioral

inhibition and should therefore be treated as individual factors. Future studies could use a veteran population with PTSD symptoms to further explore the relation among AMBI and RMBI as well as with the approach, avoidance, and escape task. It would be of interest to examine if and how veterans' performance varies among the three contingencies types and how this is related to BI to provide a better understanding of vulnerability to PTSD.

References

Beck, A. (1987). *Beck Depression Inventory*. San Antonio, TX: The Psychological Corporation.

Beck, K. D., Jiao, X., Ricart, T. M., Myers, C. E., Minor, T. R., Pang, K. C. H., et al. (2011). Vulnerability factors in anxiety: Strain and sex differences in the use of signals associated with non-threat during the acquisition and extinction of active-avoidance behavior. *Progress in Neuro-Psychopharmacology and Biological Psychiatry, 35*(7), 1659-1670. doi: 10.1016/j.pnpbp.2011.05.002

Casada, J. H., & Roache, J. D. (2005). Behavioral inhibition and activation in posttraumatic stress disorder. *Journal of Nervous and Mental Disease, 193*(2), 102-109. doi: 10.1097/01.nmd.0000152809.20938.37

Cloninger, C., Przybeck, T., & Svrakic, D. (1991). The Tridimensional Personality Questionnaire: U.S. normative data. *Psychological Reports, 69*, 1047-1057. doi: 10.2466/pr0.1991.69.3.1047

Davis, L.L., English, B.A., Ambrose, S.M., & Petty, F. (2001). Pharmacotherapy for post-traumatic stress disorder: a comprehensive review. *Expert Opin. Pharmacother., 2(10),* 1583-1595. doi:10.1517/14656566.2.10.1583

Domjan, M. (2010). *The Principles of Learning and Behavior* (6th ed.). Belmont, CA: Wadsworth.

Fincham, D., Smit, J., Carey, P., Stein, D. J., & Seedat, S. (2008). The relationship between behavioural inhibition, anxiety disorders, depression and CD4 counts in HIV-positive adults: A cross-sectional controlled study. *AIDS Care, 20*(10), 1279-1283. doi: 10.1080/09540120801927025

Fox, N.A., Henderson, H.A., Marshall, P.J., Nichols, K.E., & Ghera, M.M. (2005). Behavioural Inhibition: Linking Biology and Behavior within a Developmental Framework. *Annu.Rev.Psychol, 56*, 235-62. doi: 10.1146/annurev.psych.55.090902.141532

Gilbertson, M. W., Orr, S. P., Rauch, S. L., & Pitman, R. K. (2008). Trauma and posttraumatic stress disorder. In T. A. Stern, J. F. Rosenbaum, M. Fava, J. Biederman & S. L. Rauch (Eds.), *Massachusetts General Hospital Comprehensive Clinical Psychiatry* (1 ed., pp. 465-480). Philadelphia, PA: Mosby Elsevier.

Gladstone, G. L., Parker, G. B., Mitchell, P. B., Wilhelm, K. A., & Malhi, G. S. (2005). Relationship between self-reported childhood behavioral inhibition and lifetime anxiety disorders in a clinical sample. *Depression and Anxiety, 22*(3), 103-113. doi: 10.1002/da.20082

Kashdan, T.B., Morina, N., Priebe, S. (2009). Post-traumatic stress disorder, social anxiety disorder, and depression in survivors of the Kosovo War: Experimental avoidance as a contributor to distress and quality of life. *J Anxiety Disord, 23(2)*, 185-196. doi: 10.1016/j.janxdis.2008.06.006

Kim, H., Shimojo, S., & O'Doherty (2006). Is Avoiding an Aversive Outcome Rewarding? Neural Substrates of Avoidance Learning in the human brain. *Plos Biology, 4(8),* 1453-61. doi:10.1371/journal.pbio.0040233

Lovibond, P.F, Saunders, J.C., Weidemann, G., & Mitchell, C.J. (2008). Evidence for expectancy as a mediator of avoidance and anxiety in a laboratory model of human avoidance learning. *Quarterly Journal of Experimental Psychology, 61(8),* 1199-216. doi: 10.1080/17470210701503229

Manual for the Beck Depression Inventory–II. Gladstone, G. & Parker, G. (2005). Measuring a behaviorally inhibited temperament style: Development and initial validation of new self-report measures. *Psychiatry Research, 135,* 133-143. doi: 10.1016/j.psychres.2005.03.005

McKeever, V.M & Huff, M.E. (2003). A Diathesis-Stress Model of Posttraumatic Stress Disorder: Ecological, Biological, and Residual Stress Pathways. *Review of General Psychology, 7(3),* 237-250. doi: 10.1037/1089-2680.7.3.237

Mobbs, D., Marchant, J.L., Hassabis, D., Seymour, B., Tan, G., Gray, M., Petrovic, P., Dolan, R.J., & Frith, C.D. (2009). From Threat to Fear: The neural organization of defensive fear systems in humans. *J Neurosci, 29(39),* 12236-12243. doi:10.1523/JNEUROSCI.2378-09.2009

Molet, M., Leconte, C., & Rosas, J. M. (2006). Acquisition, extinction and temporal discrimination in human conditioned avoidance. *Behavioural Processes, 73,* 199-208. doi: 10.1016/j.beproc.2006.05.009

Myers, C. E., VanMeenen, K., McAuley, J. D., Beck, K. D., Pang, K. C. H., & Servatius, R. J. (2012a). Facilitated acquisition of eyeblink conditioning in veterans with high behavioral inhibition, a risk factor for post-traumatic stress disorder (PTSD). *Stress, 15(1),* 31-44. doi: 10.3109/10253890.2011.578184

National Institute of Mental Health (n.d.). Post-Traumatic Stress Disorder (PTSD) (NIMH Publication No. 08 6388). Retrieved from the National Institute of Mental Health website: http://www.nimh.nih.gov.

Schlund, M.W. & Cataldo, M.F. (2010). Amygdala involvement in human avoidance, escape, and approach behavior. *NeuroImage, 53,*769-776. doi: 10.1016/j.neuroimage.2010.06.058

Yoon, S. J., Jun, C. S., An, H.-y., Kang, H. R., & Jun, T.-Y. (2009). Patterns of temperament and character in patients with posttraumatic stress disorder and their association with symptom severity. *Comprehensive Psychiatry, 50,* 226-231. doi: 10.1016/j.comppsych.2008.08.003

Appendices

Appendix A: Demographic Questionnaire.....36

Appendix B: Adult and Retrospective Measures of Behavioural Inhibition (AMBI/RMBI).....37

Appendix C: Tridimensional Personality Questionnaire (TPQ).....39

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Demographics Questionnaire

Please fill in or answer each question below. Your data will remain confidential and will only be identified by your individual participant code.

Information about yourself:

1) Age: _____

2) Year at Seton Hall (circle one): 1st 2nd 3rd 4th Other _____

3) Race (please check or indicate):

Asian American: _____

African American: _____

Caucasian: _____

American Indian: _____

Other (indicate): _____

4) Ethnicity (please check or indicate):

Hispanic: _____

Non-Hispanic: _____

4) Socio-economic status (please checking which best describes your family as you were going up):

Upper class: _____

Middle-Upper class: _____

Middle class: _____

Lower-Middle class: _____

Lower class: _____

5) Do you have corrected vision? Y or N

If yes, did you remember to bring your glasses/contacts? Y or N

6) Are you currently sick with an illness or taking any medication that affects your vision, level of attention, or other cognitive abilities? Y or N

7) Do you have a language or learning disability, dyslexia, or any other conditions that may affect your ability to read from a short distance? Y or N

Participant number: _____ Date: _____ **AMBI**

When you enter a new or unfamiliar social situation or whenever you are faced with new and unfamiliar surroundings or people: ***(Please check the most relevant option)***	**Yes/ most of the time**	**Some of the time**	**No/ hardly ever**
1. Do you tend to become vigilant and wary of your surroundings?	☐	☐	☐
2. Do you feel awkward when you are approached by someone new?	☐	☐	☐
3. Do you tend to become quiet?	☐	☐	☐
4. Do you tend to approach people whom you don't know and talk to them?	☐	☐	☐
5. Do you tend to spend time observing strangers from a distance first, before being able to mix in?	☐	☐	☐
6. Do you tend to be chatty in conversation when you are speaking to someone new?	☐	☐	☐
7. Are you likely to spend most of your time next to a person whom you know well?	☐	☐	☐
8. Do you tend to feel physically anxious (e.g. racing pulse, sweaty, butterflies)?	☐	☐	☐
9. Do you tend to introduce yourself to new people?	☐	☐	☐
10. Do you tend to keep a fair distance away from strangers?	☐	☐	☐
11. Do you tend to withdraw and retreat from those around you?	☐	☐	☐
Generally, not just in new or unfamiliar situations:			
12. Do you prefer your own company over the company of others?	☐	☐	☐
13. Do you usually enjoy going to social events with large crowds of people?	☐	☐	☐
14. Would you tend to choose solitary leisure activities over spending time with close friends?	☐	☐	☐
15. Do you prefer to be surrounded by lively activity rather than a quiet gathering?	☐	☐	☐
16. If physically able, would you enjoy adventure holidays with some element of risk?	☐	☐	☐

Participant number: _____ Date: _____ **RMBI**

Please answer the following questions by considering how you usually felt, behaved or reacted as a child before the age of 13 (i.e. before high school). *(Please check the most relevant option)*	**Yes/ most of the time**	**Some of the time**	**No/ hardly ever**
1. When unfamiliar visitors came to your home, would you hide or leave the room?	☐	☐	☐
2. At school, did you tend to stand back and watch other children play?	☐	☐	☐
3. Were you reluctant to go to school on your first day or the first day after holidays?	☐	☐	☐
4. Did you prefer parties with crowds of children rather than small gatherings?	☐	☐	☐
5. Were you always 'on the go'?	☐	☐	☐
6. When unfamiliar visitors came to your home, did you feel fearful or nervy?	☐	☐	☐
7. When you went on outings with your family to new places, would you tend to wander off?	☐	☐	☐
8. Were you fearful around other people's pets?	☐	☐	☐
9. At school, did you find it difficult to approach and play with new children?	☐	☐	☐
10. When you went on outings with your family to new places, would you spend most of the time next to your mother or father	☐	☐	☐
11. Did you want to be surrounded by people and activity?	☐	☐	☐
12. Did you consider that you were a shy child?	☐	☐	☐
13. Did you tend to take risks during play, sport, or other physical activities?	☐	☐	☐
14. Was it difficult for you to stand up in front of the class?	☐	☐	☐
15. Were you outgoing and talkative with other children?	☐	☐	☐
16. When you went on outings with your family to new places, would you become quiet or 'freeze up'?	☐	☐	☐
17. Did you cry during the school day?	☐	☐	☐
18. When unfamiliar visitors came to your home, would you cling to your mother or father (or caregiver)?	☐	☐	☐

DATE: _____ ID#_____

T P Q

In this booklet you will find statements that people might use to describe their attitudes, opinions, interests, and other personal feelings.

Each statement can be answered TRUE or FALSE. Read the statement and decide which choice best describes you.

We would like you to fill out this questionnaire on your own using a pencil. When you are finished, please return the questionnaire.

HOW TO FILL OUT THIS QUESTIONNAIRE

To answer you only need to circle either "T" or "F" after each question. Here is an example:

EXAMPLE:	TRUE	FALSE
I understand how to fill out this questionnaire.	T	F

(If you understand how to fill out this questionnaire, circle "T" to show that the statement is TRUE.)

Read each statement carefully, but do not spend too much time deciding on the answer.

Please answer every statement, even if you are not completely sure of the answer.

Remember, there are no right or wrong answers – just describe your own personal opinions and feelings.

		TRUE	FALSE
1.	I am usually confident that everything will go well, even in situations that worry most people.	T	F
2.	I often try new things just for fun or thrills, even if most people think it is a waste of time.	T	F
3.	I like to discuss my experiences and feelings openly with friends instead of keeping them to myself.	T	F
4.	When nothing new is happening, I usually start looking for something that is thrilling or exciting.	T	F
5.	Usually, I am more worried than most people that something might go wrong in the future.	T	F
6.	I don't mind discussing my personal problems with people whom I have known briefly or slightly.	T	F
7.	I would like to have warm and close friends with me most of the time.	T	F
8.	I nearly always stay relaxed and carefree, even when nearly everyone else is fearful.	T	F
9.	I usually demand very good practical reasons before I am willing to change my old ways of doing things.	T	F
10.	I often have to stop what I am doing because I start worrying about what might go wrong.	T	F
11.	I hate to change the way I do things, even if many people tell me there is a new and better way to do it.	T	F
12.	My friends find it hard to know my feelings because I seldom tell them about my private thoughts.	T	F
13.	I like it when people can do whatever they want without strict rules and regulations.	T	F
14.	I often stop what I am doing because I get worried, even when my friends tell me everything will go well.	T	F
15.	It wouldn't bother me to be alone all the time.	T	F
16.	I like to be very organized and set up rules for people whenever I can.	T	F
17.	I usually do things my own way – rather than giving in to the wishes of other people.	T	F
18.	I usually feel tense and worried when I have to do something new and unfamiliar.	T	F

		TRUE	FALSE
19.	I often feel tense and worried in unfamiliar situations, even when others feel there is little to worry about.	T	F
20.	Other people often think that I am too independent because I won't do what they want.	T	F
21.	Even when most people feel it is not important, I often insist on things being done in a strict and orderly way.	T	F
22.	I often do things based on how I feel at the moment without thinking about how they were done in the past.	T	F
23.	I often feel tense and worried in unfamiliar situations, even when others feel there is no danger.	T	F
24.	I often break rules and regulations when I think I can get away with it.	T	F
25.	I don't care very much whether other people like me or the way I do things.	T	F
26.	I usually stay calm and secure in situations that most people find physically dangerous.	T	F
27.	I feel it is more important to be sympathetic and understanding of other people than to be practical and tough minded.	T	F
28.	I lose my temper more quickly than most people.	T	F
29.	I am usually confident that I can easily do things that most people would consider dangerous (such as driving an automobile fast on a wet or icy road).	T	F
30.	I often react so strongly to unexpected news that I say or do things that I regret.	T	F
31.	People find it easy to come to me for help, sympathy, and warm understanding.	T	F
32.	I am much more reserved and controlled than most people.	T	F
33.	When I have to meet a group of strangers, I am more shy than most people.	T	F
34.	I am strongly moved by sentimental appeals (like when asked to help crippled children).	T	F
35.	I almost never get so excited that I lose control of myself.	T	F
36.	I have a reputation as someone who is very practical and does not act on emotions.	T	F

		TRUE	FALSE
37.	I often avoid meeting strangers because I lack confidence with people I do not know.	T	F
38.	I usually stay away from social situations where I would have to meet strangers even if I am assured that they will be friendly.	T	F
39.	I usually push myself harder than most people do because I want to do as well as I possibly can.	T	F
40.	I am slower than most people to get excited about new ideas and activities.	T	F
41.	I often push myself to the point of exhaustion or try to do more than I really can.	T	F
42.	I would probably stay relaxed and outgoing when meeting a group of strangers, even if I were told they were unfriendly.	T	F
43.	It is difficult for me to keep the same interests for a long time because my attention often shifts to something else.	T	F
44.	I think I would stay confident and relaxed when meeting strangers, even if I were told they were angry at me.	T	F
45.	I could probably accomplish more than I do, but I don't see the point in pushing myself harder than is necessary to get by.	T	F
46.	I like to think about things for a long time before I make a decision.	T	F
47.	Most of the time I would prefer to do something a little risky (like riding in a fast automobile over steep hills and sharp turns) rather than having to stay quiet and inactive for a few hours.	T	F
48.	I often follow my instincts, hunches, or intuition without thinking through all the details.	T	F
49.	I try to do as little work as possible even when other people expect more of me.	T	F
50.	I often have to change my decisions because I had a wrong hunch or mistaken first impression.	T	F
51.	Most of the time I would prefer to do something risky (like hang-gliding or parachute jumping) rather than having to stay quiet and inactive for a few hours.	T	F
52.	I am satisfied with my accomplishments, and have little desire to do better.	T	F

	TRUE	FALSE
53. I see no point in continuing to work on something unless there is a good chance of success.	T	F
54. I have less energy and get tired more quickly than most people.	T	F
55. I usually think about all the facts in detail before I make a decision.	T	F
56. I nearly always think about all the facts in detail before I make a decision, even when other people demand a quick fix.	T	F
57. I often need naps or extra rest periods because I get tired so easily.	T	F
58. I don't go out of my way to please other people.	T	F
59. I am more energetic and tire less quickly than most.	T	F
60. I am usually able to get other people to believe me, even when I know what I am saying is exaggerated or untrue.	T	F
61. I find it upsetting when other people don't give me the support I expect from them.	T	F
62. I can usually do a good job of stretching the truth to tell a funnier story or play a joke on someone.	T	F
63. I usually can stay "on the go" all day without having to push myself.	T	F
64. I am usually more upset than most people by the loss of a close friend.	T	F
65. I have trouble telling a lie, even when it is meant to spare someone else's feelings.	T	F
66. I am better at saving money than most people.	T	F
67. Even after there are problems in a friendship, I nearly always try to keep it going anyway.	T	F
68. I recover more slowly than most people from minor illnesses or stress.	T	F
69. I need much extra rest, support, or reassurance to recover from minor illnesses or stress.	T	F
70. I often spend money until I run out of cash or get into debt from using too much credit.	T	F
71. I seldom get upset when I don't receive the recognition I deserve.	T	F
72. Because I so often spend too much money on impulse, it is hard for me to save money – even for special plans like a vacation.	T	F

	TRUE	FALSE
73. It is extremely difficult for me to adjust to changes in my usual way of doing things because I get so tense, tired, or worried.	T	F
74. If I am feeling upset, I usually feel better around friends than when left alone.	T	F
75. I usually feel much more confident and energetic than most people, even after minor illnesses or stress.	T	F
76. Some people think I am too stingy or tight with my money.	T	F
77. I often keep trying the same thing over and over again, even when I have not had much success in along time.	T	F
78. It is hard for me to enjoy spending money on myself, even when I have saved plenty of money.	T	F
79. I seldom let myself get upset or frustrated: when things don't work out I simply move on to other activities.	T	F
80. I recover more quickly than most people from minor illnesses or stress.	T	F
81. I hate to make decisions based only on my first impression.	T	F
82. I think I will have very good luck in the future.	T	F
83. I am often moved deeply by a fine speech or poetry.	T	F
84. If I am embarrassed or humiliated, I get over it very quickly.	T	F
85. I like "tried and true" ways of doing things better than trying "new and improved" ways.	T	F
86. I like to keep my problems to myself.	T	F
87. I enjoy saving money more than spending it on entertainment or thrills.	T	F
88. Even when I am with friends, I prefer not to "open up" very much.	T	F
89. I feel very confident and sure of myself in almost all social situations.	T	F
90. I usually like to stay cool and detached from other people.	T	F
91. I never worry about terrible things that might happen in the future.	T	F
92. I am more hard-working than most people.	T	F
93. In conversations, I am much better as a listener than as a talker.	T	F

	TRUE	FALSE
94. I like to please other people as much as I can.	T	F
95. Regardless of any temporary problem that I have to overcome, I always think it will turn out well.	T	F
96. I like to stay at home better than to travel or explore new places.	T	F
97. I am usually so determined that I continue to work long after other people have given up.	T	F
98. I usually have good luck in whatever I try to do.	T	F
99. I like to pay close attention to details in everything I do.	T	F
100. It is easy for me to organize my thoughts while talking to someone.	T	F

DATE:_____ Group:_____ ID#_____

BDI-II MODIFIED

INSTRUCTIONS: This questionnaire consists of 20 groups of statement. Please read each item carefully and circle the number next to the **ONE** answer that best describes how you have been feeling the past two weeks, including today. If several statements in the group seem to apply equally well, circle the one with the highest number.

A.

0. I do not feel sad.
1. I feel sad.
2. I am sad all the time and can't snap out of it.
3. I am so sad or unhappy that I can't stand it.

B.

0. I am not particularly discouraged about the future.
1. I feel discouraged about the future.
2. I feel I have nothing to look forward to.
3. I feel that the future is hopeless and things cannot improve.

C.

0. I do not feel like a failure.
1. I feel I have failed more than the average person.
2. As I look back on my life, all I can see is a lot of failures.
3. I feel I am a complete failure as a person.

D.

0. I get as much satisfaction out of things as I used to.
1. I don't enjoy things the way I used to.
2. I don't get real satisfaction out of anything anymore.
3. I am dissatisfied or bored with everything.

E.

0. I don't feel particularly guilty.
1. I feel guilty a good part of the time.
2. I feel quite guilty most of the time.
3. I feel guilty all of the time.

F.

0. I don't feel I am being punished.
1. I feel I may be punished.
2. I expect to be punished.
3. I feel I am being punished.

G.

0. I don't feel disappointed in myself.
1. I am disappointed in myself.
2. I am disgusted with myself.
3. I hate myself.

H.

0. I don't feel I am any worse than anybody else.
1. I am critical of myself for my weaknesses or mistakes.
2. I blame myself all the time for my faults.
3. I blame myself for everything bad that happens.

I.

0. I don't cry any more than usual.
1. I cry now more than I used to.
2. I cry all the time now.
3. I used to be able to cry, but now I can't cry even though I want to.

J.

0. I am no more irritated by things than I ever was.
1. I am slightly more irritated now than usual.
2. I am quite annoyed or irritated a good deal of the time.
3. I feel irritated all the time now.

K.

0. I have not lost interest in other people.
1. I am less interested in other people than I used to be.
2. I have lost most of my interest in other people.
3. I have lost all of my interest in other people.

L.

0. I make decisions about as well as I ever could.
1. I put off making decisions more than I used to.
2. I have greater difficulty in making decisions than I used to.
3. I can't make decisions at all anymore.

M.

0. I don't feel that I look any worse than I used to.
1. I am worried that I am looking old or unattractive.
2. I feel that there are permanent changes in my appearance that make me look unattractive.
3. I believe that I look ugly.

N.

0. I can work about as well as before.
1. It takes an extra effort to get started at doing something.
2. I have to push myself very hard to do anything.
3. I can't do any work at all.

O.

0. I can sleep as well as usual.
1. I don't sleep as well as I used to.
2. I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
3. I wake up several hours earlier than I used to and cannot get back to sleep.

P.

0. I don't get tired more than usual.
1. I get tired more easily than I used to.
2. I get tired from doing almost anything.
3. I am too tired to do anything.

Q.

0. My appetite is no worse than usual.
1. My appetite is not as good as it used to be.
2. My appetite is much worse now.
3. I have no appetite at all anymore.

R.

0. I haven't lost much weight, if any, lately.
1. I have lost more than five pounds.
2. I have lost more than ten pounds.
3. I have lost more than fifteen pounds.

S.

0. I am purposely trying to lose weight by eating less.
1. I am not currently trying to lose weight by eating less.

T.

0. I am no more worried about my health than usual.
1. I am worried about physical problems such as aches or pains, or upset stomach, or constipation.
2. I am very worried about physical problems, and it's hard to think of much else.
3. I am so worried about my physical problems that I cannot think about anything else.

TOTAL POINTS: _____