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Behavioral Inhibition and Avoidance: Identifying Vulnerabilities to Avoidant Behavior

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BEHAVIORAL INHIBITION AND AVOIDANCE:
IDENTIFYING VULNERABILITIES TO AVOIDANT BEHAVIOR

A Thesis
presented in partial fulfillment of requirements
for the degree of Master of Arts
in the Department of Psychology
The University of Mississippi

by

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December 2018

ABSTRACT

Avoidance is characterized as the inability of an individual to interact with a stimulus for the purpose of reducing distress. Avoidance increases the likelihood that distress and symptoms related to anxiety will increase. This may lead to further impairment and anxious pathology across the lifespan. Reinforcement Sensitivity Theory (RST) describes a temperamental vulnerability that influences approach (Behavioral Approach System; BAS) and avoidance (Behavioral Inhibition System; BIS) behaviors. The purpose of the study was to identify, using observed behavioral approach tasks, whether or not BIS/BAS influenced avoidant behavior above and beyond other avoidance vulnerabilities (anxiety sensitivity and emotion dysregulation). Participants (N=297) completed a packet of questionnaires, a series of behavioral approach tasks, and then were asked to report anxiety levels following task completion. Results indicated that BIS was not a significant predictor of approach distance [$F(13, 189) = .96$, $p = .50$] or self-reported anxiety [$F(15,250) = 1.26$, $p = .23$]. However, anxiety sensitivity was a significant predictor of reported anxiety across all stimuli [$F(1, 268) = 24.761$, $p < .01$]. These results suggest that anxiety sensitivity may be the best predictor of avoidance and anxiety. Future research may involve evaluating different behavioral stimuli, different modalities to assess sensitivity to cues of punishment, or other transdiagnostic vulnerabilities that may be influence avoidant behavior.

LIST OF ABBREVIATIONS AND SYMBOLS

RST – Reinforcement Sensitivity Theory

BIS – Behavioral Inhibition System

BAS – Behavioral Activation System

DERS – Difficulty in Emotion Regulation Scale

ASI – Anxiety Sensitivity Index

BAT – Behavioral Approach Task

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I. INTRODUCTION

Current literature has begun to define specific vulnerabilities that may influence individual's tendencies to approach or avoid novel stimuli (Elliot & Thrash, 2010; Kashdan, Barrios, Forsyth & Steger, 2006). These temperamental differences tend to be stable throughout the lifespan and may underlie other cognitive vulnerabilities (anxiety sensitivity, emotion dysregulation etc.; Hirshfeld-Becker et al., 2008; Viana, Kiel, Alfano, Dixon & Palmer, 2016). These affective variables can also be parsed into tendencies for individuals to avoid situations (which may lead to other vulnerabilities) or to approach stimuli (which may lead to impulsive behaviors).

A theory on such temperamental vulnerabilities, Gray's original Reinforcement Sensitivity Theory (RST; Gray, 1987) was developed to account for differing behavioral approaches and affective tendencies amongst individuals. These tendencies in affective style were attributed to neurobiological differences and sensitivities to cues of potential rewards and punishment. Sensitivities to reward and punishment are characterized by tendencies to approach or avoid novel situations and stimuli. RST was later revised to include affective styles specifically associated with immediate fight-flight responses in specific situations.

According to the Revised Reinforcement Sensitivity Theory (rRST; Gray & McNaughton, 2000), there are two distinct motivational systems that underlie affective and behavioral response tendencies: the behavioral inhibition system (BIS) and the behavioral activation system (BAS). The BIS is the punishment-oriented system that influences avoidant type behaviors, while the BAS promotes approach/reward behavior (Carver & White, 1994;

Davidson, 1994; Gomez, Cooper, & Gomez, 2005; Gray, 1970; Harmon-Jones & Allen, 1997; Henriques & Davidson, 1991). Considered to be relatively stable temperamental vulnerabilities, sensitivity in either system impacts tendencies to approach or avoid stimuli.

More specifically, the BAS is sensitive to cues of potential reward or non-punishment by approaching ambiguous or novel situations (Gray, 1984). Individuals who are more sensitive to BAS activation are more likely to approach novel stimuli for the potential of being rewarded. Those sensitive to BIS activation are more likely to experience heightened anxiety and orient behavior away from stimuli to avoid the physiological "anxious" arousal. As stated, these sensitivities are general guidelines to orient behavior, however, they are not deterministic. Additionally, sensitivity to BIS and BAS activation are not mutually exclusive and rather, exist as orthogonal dimensions. Individuals can be more or less sensitive to the activation of a specific system, which then impacts behavioral tendencies, to avoid or to approach novel stimuli.

To further identify the differences between BIS and BAS, being sensitive to cues of reward and approach behavior must be separated from avoidant behavior. BAS sensitivity involves the temperamental tendency to approach novel stimuli for the potential of reward or non-punishment (Corr & McNaughton, 2012). Additionally, components and behaviors that have been related to BAS sensitivity include being responsive to rewards when novel stimuli are presented, behavioral activities that 'drive' an individual to pursue novel stimuli, and to actively seek out novel sensations (Carver & White, 1994). Thusly, BAS sensitivity or a proneness to begin or increase goal-seeking behaviors, may indicate impulsive behavior and has been related to behaviors consistent with (hypo)mania, positive affect, and heightened engagement with goal-oriented behavior (Depue & Iacono, 1989; Kim & Kwon, 2017; Carver & White, 1994). More specifically, individuals high in BAS sensitivity have demonstrated issues related to childhood

disorders related to impulsivity, conduct disorder, and attention deficit-hyperactivity disorder (Quay, 1988; 1993).

A second orthogonal motivational system involves sensitivity to novel stimuli that may signal potential punishment or lack of reward (Corr & McNaughton, 2012). Thusly, individuals who experience heightened BIS sensitivity are more likely to inhibit approach behavior (Gray, & McNaughton, 2000). This inhibition of approach behavior has been characterized as influencing avoidant behaviors, and when activated in response to potential threats has been described as a 'cautious approach' paradigm (Campbell-Sills, Liverant, & Brown, 2004). This 'cautious approach' paradigm separates reactions of potential threat from reactions related to fear, immediate danger, or activation of the fight, flight, freeze system (introduced with the revised RST). Additionally, the paradigm suggests that individuals highly sensitive to BIS activation will tend to orient behavior to avoid novel situations to relieve anxious physiological responses (Corr, & McNaughton, 2012). As a temperamental vulnerability, sensitivity to cues of potential punishment result in increased physiological responses related to anxiety (i.e increased heart rate, increased sweating etc.). Sensitivity to BIS activation and inhibition of behavior (avoidance) has been linked to increased reported anxiety (Lahat, Hong, & Fox, 2011). Finally, BIS sensitivity has been related to the tendency to avoid ambiguous or potentially negative situations, with this avoidance relating to the potential development of anxious pathology (Pickett, Bardeen, & Orcutt, 2011).

Considered a temperamental vulnerability, BIS sensitivity is seen early in life, and is considered to be relatively stable throughout the life span. A study conducted by Kiel and Maack (2012) demonstrated that BIS sensitivity in mothers predicted both the likelihood of overprotective parenting and also internalizing problems in their infants. Internalizing problems

within infants were characterized by anxious, depressive, and avoidant tendencies. Mothers (N = 96) completed a series of self-report measures to assess the tendency of their infants to avoid novel stimuli and inhibit their behavior. Results indicated that maternal BIS sensitivity predicted the presence of toddler's internalizing behaviors. Additionally, maternal BIS sensitivity was predictive of overprotective parenting (a potential result of heightened attentional biases to cues of punishment). These results support the assertion that BIS sensitivity is a neurobiological vulnerability that can be identified early, and is stable throughout the lifespan.

Another study conducted by Vervoort, Wolters, Hogendoorn, de Haan, Boer, & Prins, (2010) utilized a sample of children (N = 175, aged 8-18 years old) to assess the connection between BIS sensitivity and anxious presentation. Participants were assessed using the Child Behavior Checklist to determine eligibility for either clinically-anxious or control groups. Additionally, upon group determination, participants were assessed using the Anxiety Disorders Interview Schedule for DSM IV – Child and Parent Version (ADIS-IV:C/P) to identify specific pathology and protocol for treatment. Results indicated that upon intake, when comparing anxious (ANX) and control (CON) groups, ANX groups scored higher on an anxiety measure (as measured by the Revised Child Anxiety and Depression Scale – Short Version/ RCADS25) and rated higher on the BIS subscale using the children's version of the BIS/BAS scale (Muris, Meester, de Kanter, & Timmerman, 2005). Further, results demonstrated that the BIS subscale was predictive of RCADS25 anxiety symptoms in both the ANX and CON groups. Overall, these results demonstrated that despite age (controlled for in the primary analysis) BIS sensitivity was predictive of anxiety scores across both clinically anxious groups and control groups.

To support the role of BIS in the maintenance and development of pathology, results from a study by Paulus, Backes, Sander, Weber and von Gotard, (2015) used retrospective parent

reports of infant's BIS tendencies to predict anxiety symptomatology years later. Specifically, parents (n = 1342) during a school entry medical exam, completed the Child Behavior Checklist (CBCL; Achenbach 1991) to identify any current psychological symptomatology, as well as the Retrospective Infant Behavioral Inhibition Scale (RIBI; Gensthaler et al. 2013) to identify inhibited behavior at two years of age. Parent reports of behavioral inhibition at age two predicted anxiety symptomatology later in life when the cohort was re-assessed between the ages of 4 and 7 (M_{age}=6.1). Results from logistic regression indicated that the RIBI scores at age two accounted for 7.6% variance in the prediction of any anxiety disorder at age six. Behavioral inhibition was demonstrated to be a predictive factor not only for the presence of a single anxiety disorder, but also those individuals at greater risk to suffer from comorbid anxiety disorders (Social Anxiety Disorder, Generalized Anxiety Disorder, Social Phobia, Specific Phobia; Paulus et al., 2015). The results of the study demonstrated that BIS sensitivity was predictive of the presence anxious presentation and pathology later in life, supporting temperamental vulnerabilities as predictive of later issues.

Numerous studies have indicated high BIS sensitivity may play a role in the expression of avoidance more generally (Kimbrell, Nelson-Gray, & Mitchell, 2012; Ly, & Gomez, 2013; Myers, VanMeenen, & Servatius, 2012). For example, Kimbrel, Nelson-Gray, & Mitchell (2012) assessed the relation of BIS and cognitive bias with anxious presentation during social situations. The authors hypothesized that heightened BIS sensitivity (along with lowered BAS sensitivity) would be related to both higher self-report measures of anxiety and also observable anxiety. Participants (N=163), presented to the lab and completed a number of self-report measures related to general anxiety and sensitivity to potential punishment. After measure completion, participants completed a memory task and a social-threat induction task. During the social threat

task, audience members (research assistants and other participants) were asked to rate how anxious the speech giver appeared on a 5-point Likert-type scale (1 = not nervous at all, 5 = very nervous). Using structural equation modeling, results indicated that BIS was indeed related to self-reported trait anxiety as well as others' observed anxiety during the social-threat induction task. Additionally, cognitive biases (expectancy, memory, perception of threat biases) mediated the connection between BIS and socially anxious presentation. Concisely, this research adds to the literature relating BIS sensitivity and anxiety expression in general.

In addition to general avoidance, BIS sensitivity has been associated with experiential avoidance as well. Experiential avoidance (EA) is defined as the techniques that an individual utilizes to alter or avoid the potential experience of perceived aversive, internal events (increased physiological responses, distressing emotions etc.). In a study conducted by Pickett, Bardeen, and Orcutt (2011), it was hypothesized that BIS sensitivity would be related to the severity of 6osttraumatic stress symptoms (PTSS) as moderated by experiential avoidance. An undergraduate sample of students who endorsed experiencing a traumatic event (N = 851) completed a series of self-report measures to assess BIS reactivity, experiential avoidance, and posttraumatic stress symptoms. Correlational analyses indicated that BIS, EA and PTSS were all significantly related. Additionally, regression analyses demonstrated that BIS was independently predictive of PTSS and EA. Further, the relation between BIS and PTSS was found to be moderated by experiential avoidance. This study highlights the association between BIS sensitivity, other cognitive vulnerabilities (i.e. EA) and the experience of anxious symptomatology.

Finally, Myers, VanMeenen, and Servatius (2012), conducted a study in military veterans that assessed the presence/severity of PTSD symptoms and behavioral inhibition. Veterans

seeking health care services (N=109) were recruited and asked to complete a number of questionnaires assessing behavioral inhibition, anxiety, and posttraumatic stress symptoms. Behavioral inhibition was assessed using the Adult and Retrospective Measures of Behavioural Inhibition (AMBI/RMBI; Gladstone & Parker, 2005). Specifically, the AMBI is a measure used for participants to describe and quantify current avoidance when responding to novel stimuli. Additionally, the RMBI is meant to assess memories of inhibited behaviors from childhood (prior to veteran status; Gladstone & Parker, 2005). Results indicated that behavioral inhibition, measured concurrently and retrospectively via self-report measures, predicted the severity and presence of avoidant tendencies related to traumatic experiences (measured by the PTSD Checklist-Military version; Blanchard, Jones-Alexander, Buckley, & Forneris, 1996). This study further contributes to the literature suggesting BIS sensitivity as an associated vulnerability to avoidance and anxious presentations.

The BIS, as defined by the rRST, is the punishment-oriented system that (depending on individual sensitivity) inhibits approach behavior and is related to heightened attention to physiological anxious responses (Corr & McNaughton, 2012). Such attentional biases to cues of punishment can result in a pattern of avoidance. The aforementioned studies demonstrated BIS sensitivity is closely related to avoidance tendencies, which in turn may be related to potential anxious pathology. Overall, individuals sensitive to BIS activation are more likely to develop patterns of avoidance (to reduce negative physiological symptoms) that paradoxically maintain the cycle of avoidance. Additionally, this avoidant pattern may contribute to other cognitive vulnerabilities such as the inability to effectively regulate one's affective state (i.e. emotion regulation).

i.   **Emotion Regulation**

Emotion regulation is the ability for individuals to be able to reappraise or suppress emotional responses to continue engaging in goal-directed behavior (Fox, 2008). For example, if an individual is unable to reappraise or suppress physiological arousal from emotions, s/he may be more likely to avoid situations that would elicit distressing emotions. Emotion regulation then is how an individual acts to alter the length or magnitude of emotions (Zlomke & Hahn, 2010). Conversely, emotion dysregulation is the inability of an individual to alter emotions to keep engaging in goals related to their values. Emotion dysregulation is a cognitive vulnerability demonstrated across pathologies (Gratz & Roemer, 2004). More specifically, the inability to regulate one's emotions can also be considered an underlying factor promoting the avoidance of stimuli and experience of more intense emotions (Gratz & Roemer, 2004).

Indeed, understanding the expression of avoidant behaviors may be related to emotion dysregulation. In general, emotions are the combination of an individual's subjective perspective, a physiological response, and an expressive outcome (Fox, 2008). Firstly, emotions are interpreted by the individual experiencing them, making the emotions subjective. For example, two individuals may approach the same stimuli (presentation of a spider), however, each individual may experience different attentional biases towards that stimuli based on their previous learning histories. Secondly, emotions elicit a physiological response. Physiological responses to emotion elicitation involving fear or anxiety, may include increased heart rate and perspiration, trembling, hyperventilation etc. After the interpretation of the presented stimuli (spiders and their potential threat), the physiological response occurs. Finally, in response to the presented stimuli, individuals engage in overt behavior to alter the length or magnitude of the emotional/physiological responses. This can be seen as an individual either approaching the stimuli (to increase positively valenced emotions) or avoiding stimuli (to decrease negatively

valenced emotions). Combined, these responses and patterns make up a basic emotional response in reaction to a presented stimulus.

Emotion regulation then is a combination of overt and covert patterns of behavior that allow an individual to effectively manage or organize emotional responses to achieve goal-directed behavior (Hilt, Hanson, & Pollack, 2011). Emotion dysregulation occurs when individuals are unable to alter effectively their emotional experiences (decreased emotional awareness, increased emotional reactivity, emotional rigidity, inability to engage in goal-directed behavior; Agostino, Covanti, Monti, & Starcevic, 2017) leading to unhealthy coping responses.

In a study conducted by McHugh, Reynolds, Leyro, and Otto (2012), it was found that inability to access emotion regulation skills and distress intolerance were related to avoidance behavior. In this study, two groups (community sample, N = 300; clinical sample seeking treatment, N = 100) were compared on these domains. Participants completed self-report measures of distress intolerance (Distress Intolerance Index; DII; McHugh & Otto, 2012), emotion dysregulation (Difficulties in Emotion Regulation Scale; DERS; Gratz & Roemer, 2004), and experiential avoidance (Acceptance and Action Questionnaire; AAQ; Hayes et al., 2004). The clinical sample reported higher rates of both distress intolerance and emotion regulation difficulties then the non-clinical group. Additionally, results across groups indicated that distress intolerance and emotion regulation difficulties were associated with experiential avoidance. Finally, a regression analysis demonstrated that these vulnerabilities (i.e. distress intolerance and emotion dysregulation) were predictors of experiential avoidance, within both the community sample (55% of variance) and the clinical sample (66% of variance). This study demonstrated that both emotion dysregulation and distress intolerance contribute to avoidance, and that in clinical samples, is more highly associated with experiential avoidance.

Another study further supported the connection between emotion dysregulation and avoidance in individuals diagnosed with borderline personality disorder (BPD; Iverson, Follette, Pistorello, & Fruzetti, 2012). This study aimed to replicate previous results connecting emotional dysregulation and experiential avoidance with BPD severity (see Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2006; Gratz, Tull, & Gunderson, 2008). Participants (N=40) were outpatients being treated for BPD. Participants in the study completed a series of self-report measures to assess for difficulties in emotion dysregulation, and avoidance (DERS; Gratz & Roemer, 2004; AAQ-2; Hayes et al. 2004). The study hypothesized that the combination of emotional functioning (emotional dysregulation and experiential avoidance) would be predictive of BPD severity. Regression analyses demonstrated that emotional functioning was predictive of BPD symptom severity. Additionally, each construct measured (emotion dysregulation and experiential avoidance) was independently predictive of BPD severity. Finally, when controlling for emotion dysregulation and potential co-morbidities (depressive symptoms), the only significant predictor of BPD severity was experiential avoidance. This study replicated research indicating emotion dysregulation and distress intolerance are primary predictors to BPD severity. Expanding on previous studies, these results demonstrated that experiential avoidance offered a unique contributor to BPD severity controlling for emotion dysregulation and depressive symptoms.

Additionally, Reese, Zielinski and Veilleux, (2015) conducted a study assessing the relations between BIS, mindfulness, and emotion dysregulation. This study (N=246) aimed to test if BIS sensitivity was connected to emotion dysregulation through the inability to use specific facets of mindfulness. Specifically, a series of self-report measures to identify BIS sensitivity (BIS/BAS Scale; Carver & White, 1994), emotion dysregulation (DERS; Gratz &

Roemer, 2004) and applied mindfulness techniques (Five Facets of Mindfulness Questionnaire; Baer et al., 2006) were completed. Using mediation analysis (PROCESS; Hayes, 2013), results indicated that BIS was indirectly related to higher emotion dysregulation through lack of skills related to mindfulness (lack of one's ability to: act with awareness, non-judgment of one's actions, and non-reactivity to distressing situations). Specifically, the mediation model demonstrated that although BIS was not directly related to emotion dysregulation, the combination of BIS sensitivity and the inability to engage in mindful practices indirectly resulted in heightened emotional dysregulation. Overall, results of this study demonstrated the interconnections among BIS sensitivity, emotion dysregulation and coping skills.

In sum, emotion dysregulation is the inability to alter the magnitude of emotion experiences, and the inability to engage in goal-directed behavior (by avoiding situations that may be distressing). The previous studies provide support for emotion dysregulation as a vulnerability and potential precursor to heightened avoidant strategies. Additionally, inhibited behavior and avoidance, when combined with the inability to regulate emotions, may be an important factor for consideration in avoidant presentations.

ii.   Anxiety Sensitivity

A second vulnerability associated with anxious expression (i.e. avoidance) is anxiety sensitivity.

Anxiety sensitivity is defined as the tendency for an individual to believe that anxious feelings have negative consequences (Taylor et al. 1992). Examples of heightened anxiety sensitivity are the perception of an individual to believe that a racing heart may lead to a heart attack, or that an inability to concentrate will lead to mental incapacitation. Individuals who exhibit heightened sensitivity to anxiety responses are more likely to avoid situations where these types of responses

tend to occur (e.g. physical exercise that increases heart rate or situations with numerous distractions). Heightened sensitivity to anxiety increases the probability that an individual will negatively interpret ambiguous situations based on the anticipation of negative anxious feelings (Keogh & Cochrane, 2002). Additionally, anxiety sensitivity has been connected to anxiety severity and anxious expression, most notably in panic disorder, social anxiety, and generalized anxiety (Olatunji & Wolitzky – Taylor, 2009).

A study conducted by Wilson and Hayward (2006) aimed to assess anxiety sensitivity in avoidant behavior across time. The study, conducted over a four-year period in an adolescent sample (N=1, 804), used a series of self-report measures, including the Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986) and the Fear Questionnaire (FQ; Marks & Matthews, 1979) to measure avoidant tendencies on an annual basis. Results indicated that over the four-year period, baseline anxiety sensitivity severity predicted anxiety sensitivity and avoidant behavior over the study period. This study was unique in that it measured anxiety sensitivity and avoidant patterns in adolescents longitudinally. The results supported the hypothesis that individuals who experience heightened anxiety sensitivity are more likely to endorse and experience more avoidant patterns of behavior.

Another study describing anxiety sensitivity and its relations to behavioral inhibition and cognitive biases was conducted by Viana and Gratz (2012). Viana and Gratz hypothesized that behavioral inhibition and anxiety sensitivity would be directly associated to anxiety symptoms, which would then in turn result to other interpretive cognitive biases. The study administered a series of self-report measures to identify behavioral inhibition (AMBI; Gladstone & Parker, 2005), anxiety sensitivity (ASI-3; Taylor et al., 2007) cognitive biases (Positive and Negative Cognitive Error Questionnaire; Henriques & Leitenberg, 2002) and general anxiety ratings

(State-Trait Anxiety Inventory – Trait Version; Speilberger, Gorsuch, & Lushene, 1970). Structural equation modeling indicated that direct and indirect links existed between anxiety sensitivity, behavioral inhibition, and anxiety symptoms through potential cognitive biases (specifically interpretive and judgement biases). These results can be interpreted as temperamental vulnerabilities (behavioral inhibition and anxiety sensitivity) can help account for anxiety symptoms in that individuals how were more sensitive to anxiety and inhibition, also tended to cognitive biases and interpretations that led to heightened general anxious presentations.

A third study connecting BIS sensitivity and AS was conducted by Mihic, Colovic, Ignjatovic, Smerederavac, & Novovic (2015). The studies aim was to assess the relation between rRST constructs, anxiety sensitivity and intolerance of uncertainty as a constellation of vulnerabilities that may affect the presentation of anxiety disorders. Specifically, the study assessed separate components of rRST (FFFS, BIS, BAS) and their unique contributions to other cognitive vulnerabilities. Using a sample of Serbian college students (N = 223) participants were asked to complete a series of self-report measures assessing rRST systems (Reinforcement Sensitivity Questionnaire; Smederevac, Mitrovic, Colovic, & Nikolasevic, 2014), AS (ASI-3; Taylor et al., 2007) and intolerance of uncertainty (IUS; Freeston, Rheaume, Letarte, Dugas, & Ladeceur, 1994). Results indicated that BIS was able to predict scores on all subscales of the ASI-3 and both IUS subscales: Inhibitory and Prospective anxiety. Results support the role of BIS sensitivity in the presentation of other anxiety related vulnerabilities often associated with avoidance.

II. PRESENT STUDY/ HYPOTHESIS

As the above constructs have demonstrated relationships with each other and avoidant tendencies, this study aimed to explicate and observe that relationship using a behavioral task. In this study, behavioral inhibition, emotion dysregulation, and anxiety sensitivity were evaluated for their contributions to avoidant behavior during a series of 8 behavioral tasks. During the tasks, participants were measured on the amount of anxiety they felt completing the task, and the total distance approached across all stimuli. Hypothesis for the study are as follows:

1. Positive correlations will be seen between heightened BIS sensitivity, emotion dysregulation, anxiety sensitivity, and reported anxiety during behavioral avoidance tasks.

2. Heightened BAS sensitivity will be negatively correlated between emotion dysregulation, anxiety sensitivity, and reported anxiety during behavioral approach tasks.

3. Individuals with heightened BIS sensitivity will engage in fewer steps in the behavioral approach tasks than those with lower BIS sensitivity.

4. Individuals with higher BAS sensitivity will engage in more steps during the behavioral approach task than those with lower BAS sensitivity.

5. Controlling for anxiety sensitivity and emotion dysregulation, BIS sensitivity will significantly predict reported anxiety on the behavioral approach tasks.

III. METHODS

i.   Participants

The study used archival data from a University of Mississippi IRB approved lab study. The sample included college students from a large southeastern university. Participants (N=297) were primarily female (75.8%), with a mean age of 19.11 (SD =1.55). The ethnic breakdown of the sample was as follows: White (N = 205; 69.7%), Black/African American (N = 63; 21.4%), Asian (N = 9; 3.1%), Native American or Alaskan Native (N = 1, 0.3%), Asian or Pacific Islander (N = 2, 0.7%), and Multiracial (N = 14, 4.7%). Data cleaning procedures involved excluding individuals with more than 5% percent missing data across measures and approach tasks (N =104). Additionally, initial analysis to identify skewness in self-report measures and non-normal distributions revealed that the BIS/BAS scale (BAS subscale only), DERS and ASI had non-normal distributions. As such, these measures were transformed into Z-scores.

ii.   Measures

Difficulties in Emotion Regulation Scale

The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) is a 36-item self-report questionnaire assessing how individuals identify and modulate emotional experiences. Items on the DERS are rated on a 5-point scale from 1 being 'this statement almost never applies to me' to a 5 being 'this statement almost always applies to me'. Higher scores on the total measure suggest more difficulties in self-regulation of emotions. For this study, the DERS total score exhibited good internal reliability ($\alpha = .88$), which is similar to the original psychometric internal consistency found ($\alpha = .93$; Gratz & Roemer, 2004).

Anxiety Sensitivity Index – 3

The Anxiety Sensitivity Index – 3 (ASI-3; Taylor et al. 2007) is an 18-item self-report measure used to assess physiological fears of arousal related to the experience of anxiety. The measure employs a 5 point Likert-type scale where individuals are asked how much they agree with the statement presented ('It scares me when my heart beats rapidly'; 0 = Not like me at all, 4 = very much like me). The ASI-3 has three subscales, physical concerns (pounding heart will lead to heart attack), cognitive concerns, (concentration difficulties will lead to becoming crazy), and social concerns (observable anxiety i.e. trembling, will lead to rejection and ridicule; Taylor et al., 2007). However, recent research has indicated that the ASI-3 subscales do not provide additional information above and beyond a general sensitivity factor (Ebesutani, McLeish, Luberto, Young, & Maack, 2013). As such, the total score was used in this study. The ASI-3 demonstrated good internal consistency (α = .89) similar to published psychometrics (α = .88; Ebesutani et al., 2013).

Behavioral Inhibition System/ Behavioral Activation Scale

The Behavioral Inhibition Scale/ Behavioral Activation Scale (BIS/BAS; Carver & White, 1994) is a 24 item self-report measure used to describe the tendency for an individual to approach (BAS) or avoid (BIS) situations. The BIS/BAS Scale contains items that include statements rated on a 4-point Likert type scale with a 1 being 'not like me at all' and a 4 being 'very much like me' (Carver & White, 1994). Higher scores on the individual scales indicate higher sensitivity to that particular system. BIS sensitivity is consistently connected to both increased anxious presentation and avoidant behaviors. BAS sensitivity is related to reward seeking behavior and drive to engage in goal-oriented behavior, thusly the BIS and total BAS subscales will be utilized. The BIS scale has demonstrated acceptable internal reliability (α =.74;

Carver & White, 1994). Although the BAS scale can be broken down into three separate

subscales (Reward Responsiveness, Drive, and Fun Seeking) for the purposes of this study, the

BAS was combined to create a single total score for BAS sensitivity. A single BAS factor (as

opposed to subscales) has demonstrated acceptable reliability ($\alpha = .79$; Bjørnebekk, 2009). For

this study, the BIS subscale demonstrated poor internal consistency ($\alpha = .40$) and the BAS

subscale also demonstrated poor internal consistency ($\alpha = .61$).

Behavioral Approach Tasks (BATs)

Behavioral Approach Tasks (BATs) are tasks involving the presentation of a potentially

emotional provoking stimuli and asking the participant to approach and taking different

emotional ratings (Cougle, Wolitzky-Taylor, Lee, & Telch, 2007). BATs have demonstrated

efficacy in producing anxious responses (Deacon & Maack, 2008; Deacon & Olatunji, 2007;

Olatunji, Cisler, Meunier, Connolloy, & Lohr, 2007). For this study, eight different disgust

related BATs were presented. These BATs were based on previously researched BATs related to

disgusting stimuli (see Figure I for an in depth explanation of each task; Deacon & Maack, 2008;

Olatunji et al., 2007). Each of the eight BATs in the proposed study were divided into three steps,

with each step meant to increase the elicitation of emotion. The first, deemed 'Approach', asks

the participant to approach the stimuli. The distance the participant approaches each stimuli

(from 0 inches to 120 inches – next to stimuli) is recorded. Following the 'Approach' task

(regardless of the distance approached) the individual is asked to rate his/her experience of

anxiety and disgust. Using verbal subjective units of distress scale (SUDS) the participant rates

the experience from 0-10 for both the emotion of anxiety and disgust (0 being no anxiety/disgust,

5 being moderate anxiety/disgust, and 10 being extremely intense anxiety/disgust). The second

step, deemed 'Touch', involves the participant interacting with or touching the stimuli. The

participant is asked again to rate his/her anxiety/disgust in relation to touching the stimuli. The

final step, deemed 'Immersion', involves the participant coming into immersive contact with the

stimuli. Again, the individual rates his/her anxiety/disgust on the 0-10 scale. At each step of the

BAT, the participant may refuse to complete the task, however, the individual is still asked to rate

anxiety and disgust. To assess avoidance behavior of anxiety/disgusting stimuli, the distance

approached towards each stimuli (0-120 inches) will be used. Additionally, the verbal anxiety

SUDS rating of each participant will be used as a dependent variable to assess whether or not

BIS sensitivity is predictive of self-reported anxiety scores.

iii.   Procedure

Data collected for the study was archival and collected from the years 2013-2016. As part

of the overall study, university students were recruited from the psychology research pool via

SONA systems. Participants were asked to present to the ADEPT lab where written informed

consent form was provided. Following consent, a semi-structured clinical interview was

administered by a research assistant (Anxiety Disorders Interview Schedule for DSM-IV, ADIS-

IV), followed by completion of a paper/pencil questionnaire packet. Only the aforementioned

questionnaires were included in analyses for the study. After completing the packet of measures,

the participants were asked to complete the 8 Behavioral Approach Tasks (BATs). Students were

given research/extra course credit for participation. Participants were debriefed to any deception

following study completion.

iv.   Analytic Strategy

Prior to completing analyses, data was cleaned by excluding participants with more than

5% missing data during BATs (approach distance and self-reported anxiety across each stimuli).

Additionally, participants were excluded from analysis if the individuals did not complete the

three self-report measures used during analysis (BIS/BAS, DERS, and ASI-3; 5% missing data per measure). A mean score for the total BATs available was used to calculate and replace missing data if there was less than 5% missing across tasks. Outliers were identified (scores +/- 2 standard deviations from mean) and excluded from analysis. All data was analyzed using IBM SPSS data analysis (version 21). Correlational analyses were run to identify any relations between BIS, BAS, DERS, ASI-3, and reported anxiety during the BATs. Additionally, two separate one-way ANOVA's were conducted to determine whether or not within-group variance on BIS sensitivity and BAS sensitivity would indicate increases or decreases in distance approached across BAT stimuli. Finally, a linear regression was conducted using BIS/BAS as a primary predictor variable and other vulnerabilities as covariates (emotion dysregulation and anxiety sensitivity) to determine whether or not BIS/BAS sensitivity would predict total steps taken during the BATs.

IV. RESULTS

Due to non-normal distributions amongst measures (BIS/BAS, ASI-3, and DERS), the scales were transformed into Z-scores prior to data analysis. To assess potential relations between constructs of interest, correlations were run between the DERS, BIS, BAS, ASI-3, and reported anxiety (BAT_ANX) during the behavioral approach tasks (see Table 1). BIS was positively related to all other constructs ($p < .01$) with the exception of self-reported anxiety (BAT_ANX) during the BAT. Consistent with literature BAS was not correlated with vulnerabilities of avoidant tendencies. However, BAS was related to BIS ($p < .01$), indicating the orthogonal nature of the construct with BIS and a necessity for further analysis during the behavioral task.

Table 1. Correlation Table.

Measures	1	2	3	4	5	N	*M*	*SD*
1. BIS	-	.16**	.34**	.08	.27**	297	22.40	2.58
2. BAS	.16**	-	.10	.08	.04	297	44.45	3.86
3. DERS	.34**	.10	-	.27**	.54**	296	81.57	21.35
4. BAT_ANX	.08	.08	.27**	-	.37**	294	40.32	42.36
5. ASI	.27**	.04	.54**	.37**	-	270	13.27	11.07

Note. 1. Behavioral Inhibition System, 2. Behavioral Activation System, 3. Difficulty in Emotion Regulation Scale, 4. Behavioral Approach Task Self-Reported Anxiety, and 5. Anxiety Sensitivity; *M* = Mean score of measure, N = Number of valid participants, *SD* = Standard Deviation.
**Correlation is significant at the < .01 level (2-tailed).

Overall, the results supported the preliminary hypothesis that the self-report measures positively correlated with each other. BIS and other vulnerabilities to avoidant behavior were related to each other (BIS, DERS, and ASI). Surprisingly, BAT_ANX during the behavioral task was not associated with either BIS or BAS, but was significantly associated with DERS and ASI.

Following the correlational analysis, two separate one-way ANOVAs were conducted to determine whether variability in BIS/BAS sensitivity would reflect changes in BATs distance approached. Approach distance was totaled across all eight stimuli with a minimum score of 0 (indicating that the participant did not approach any stimuli) and 960 (indicating that the participant approached every stimuli). Results indicated that neither BIS nor BAS was a significant predictor of total distance approached across behavioral tasks (See Tables 2 and 3). Results of a one-way ANOVA to compare the effect of BIS sensitivity on total distance during a behavioral task found a non-significant effect [$F(13, 189) = .958$, $p = .494$]. Additionally, results of a second one-way ANOVA to compare the effect of BAS sensitivity on total distance during a behavioral task found a non-significant effect [$F(16, 186) = .789$, $p = .697$]. These results demonstrated that neither system of Reinforcement Sensitivity Theory was able to predict approach distance when participants were presented with a series of novel stimuli.

Table 2. Behavioral Inhibition System as a predictor of total distance approached during BAT

Tests of Between-Subjects Effects

Dependent Variable: Total_Dis

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	852275.371[a]	13	65559.644	.958	.494
Intercept	42886739.27	1	42886739.27	626.739	.000
BIS_TOTAL	852275.37	13	65559.644	.958	.494
Error	12932957.10	189	68428.344		
Total	117968992.00	203			
Corrected Total	13785232.47	202			

a. R Squared = .062 (Adjusted R Squared = -.003)

Table 3. Behavioral Approach System as a predictor of total distance approached during BAT

Tests of Between-Subjects Effects

Dependent Variable: Total_Dis

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	876304.128[a]	16	54769.008	.789	.697
Intercept	39387703.438	1	39387703.44	567.523	.000
BAS_TOTAL	876304.128	16	54769.008	.789	.697
Error	12908928.345	186	69402.841		
Total	117968992.00	203			
Corrected Total	13785232.473	202			

a. R Squared = .064 (Adjusted R Squared = -.017)

Note. Behavioral Activation System is measured via a self-report measure. Total distance during BATs is measured during the 'Touch' portion and is measured on a 0 (did not approach) to 120 (approached fully) scale.

After identifying potential covariates, a linear regression was conducted to determine whether or not BIS sensitivity could predict self-reported anxiety during BATs while controlling for ASI and DERS. Self-reported anxiety was totaled for each of the presented BAT stimuli (8 stimuli, 3 steps per stimuli, scale of 0 to 10 for anxiety per step). Scores could range from 0 to 240 (0 indicating no anxiety reported across all stimuli and 240 indicating maximum anxiety across all stimuli). Scores from this sample ranged from 0 to 210. Results indicated that BIS did not significantly predict BATs anxiety while controlling for DERS and ASI [$F_{(15, 250)} = 1.263$, $p = .23$]. Additionally, DERS did not significantly predict BAT anxiety [$F_{(1, 250)} = 1.184$, $p = .18$]. However, contrary to the primary hypothesis, ASI was found to offer unique variance in the prediction of BAT anxiety [$F_{(1, 250)} = 24.761$, $p < .001$].

i.   **Post-hoc analyses**

A series of linear regressions were conducted post hoc to test if BIS was predictive of anxiety when assessing BATs individually (again with emotional dysregulation and anxiety sensitivity as covariates). Of the eight stimuli, BIS was found only to be predictive of self-reported anxiety with the smelly shirt [$F_{(15, 235)} = 5.46$, $p < .01$]. These results are generally consistent with the main analysis findings that BIS was not predictive of self-reported anxiety when participants were presented with novel stimuli.

Additionally, a series of post-hoc linear regressions demonstrated that, reflective of the main analysis, ASI was indeed predictive of self-reported BAT anxiety in all 8 of the stimuli presented (all stimuli $p < .05$, $\beta = .18 - .43$). Anxiety sensitivity predicted self-reported anxiety best in relation to the Bedpan stimuli {$R^2 = .19$, $F_{(1, 243)} = 56.14$, $\beta = .43$, $p < .01$} and least in relation to the cow eyeball {$R^2 = .03$, $F_{(1, 259)} = 8.234$, $\beta = .18$, $p < .01$}. These analyses further support the findings from the original analysis in that anxiety sensitivity is the best

predictor of self-reported anxiety when participants are presented with proximal novel stimuli

Finally, an additional post-hoc analysis was conducted to determine if BAS would be a significant predictor of self-reported anxiety during individual BATs (using emotion dysregulation and anxiety sensitivity as covariates). Through a series of linear regressions, results indicated that BAS was only a significant predictor for one stimuli, the moldy orange [$F_{(18, 242)} = 1.93$, $p = .02$)]. However, consistent with previous results, ASI was still a significant predictor of self-reported anxiety.

V. DISCUSSION

The purpose of this study was to identify vulnerabilities related to avoidant behavior and reported anxiety related to avoidant tendencies. Specifically, Gray's Reinforcement Sensitivity Theory (Gray, 1987) with BIS and BAS as temperamental vulnerabilities has been implicated in influencing avoidant and approach behavior. Anxiety sensitivity and difficulties in emotion regulation have also been implicated in avoidant behavior. This study assessed all three vulnerabilities to determine contributions to avoidant behavior during observed behavioral tasks.

Results of the preliminary analysis indicated that BIS was indeed correlated with BAS, DERS and ASI, indicating some association between the constructs. Consistent with previous literature, BIS was also correlated to avoidant behavior. The small-medium effect sizes found between constructs suggest that although there is some relation, these constructs are measuring different aspects of anxious/avoidant behavior. Further, BIS may also share some overlapping variance with other cognitive-emotional vulnerabilities (i.e.: general worry, distress intolerance, lack of positive coping mechanisms). The ability to continue to parse out the variance and overlap between constructs that influence avoidant behavior and self-reported anxiety could prove helpful in understanding transdiagnostic elements of avoidant related symptoms.

Contrary to primary hypothesis, BIS was not able to predict the BAT_ANX score nor the total distance approached during BAT. Although previous literature has supported that the BIS is related to avoidant behavior, increased risk of anxious pathology, and self-reported anxiety, the relation with avoidant behavior and self-reported anxiety was not supported in the current study.

The nature of the BAT not being a 'forced task', may have influenced the inactivity of the BIS and BAS. As such, this leaves an explanation for why anxiety sensitivity was more readily able to predict BAT_ANX. For example, certain participants who were high in BIS sensitivity did not choose to engage with stimuli, which then would not activate the BIS and in turn would not reflect a potential increase in self-reported anxiety. This could explain why BIS sensitive was not found to have any significant effect on the total distance or engagement with the stimuli $[F(13, 189) = .958, p = .494]$.

Similarly, non-significant results were found with the BAS in that BAS sensitivity did not have an effect on stimuli engagement $[F(16, 186) = .789, p = .697]$. The BAS may not have been activated due to the lack of specific reward cues which would encourage participation. Thus, BIS or BAS reactivity, would have no effect on the engagement with stimuli in this study. This non-association suggests that the tasks themselves did not activate the BIS/BAS systems. Review of the data revealed that given the choice to engage with the BATs, most participants either participated fully with each stimuli (17+ steps completed during BATs, N=53, 19.5% of total participants) or not at all (< 8 stimuli engaged with, N=78, 30%). This lack of variability in stimuli approached and no required engagement to activate either system may account for the non-significant results.

Additionally, results demonstrated that BIS and BAS sensitivity had no effect on self-reported anxiety. This non-effect again may be related to BIS not being activated during the BAT when given the choice to engage or not with the stimuli. If not engaged, the 'cautious approach' paradigm of the BIS would not be activated and in turn would not elicit increased physiological arousal. Similarly, the BAS may not have been activated (no effect on approach behavior) due to not providing a sufficient reward to BAT engagement.

As BIS/BAS did not predict BAT_ANX in the current study, this further supports the idea that the procedure for particular BATs (i.e. not requiring the individual to approach) may have been problematic. When the BATs were evaluated as individual BAT stimuli (post-hoc analyses), neither BIS nor BAS had any effect on self-reported anxiety except one stimuli each (smelly shirt and moldy orange, respectively). Similar to primary analyses, anxiety sensitivity continued to be the primary predictor in identifying self-reported anxiety across all BAT stimuli. This may be explained in that if the participant engaged in the task, anxiety sensitivity may be the more salient response and act as a 'danger cue'. Because anxiety sensitivity is the noticing of specific temporally salient cues of arousal, this sensitivity may account for the significance of ASI on BAT_ANX. Therefore, if the individual who is highly sensitive to BIS activation is given the option to not engage, BIS may not activate. These post-hoc analyses further support that across all BATs (combined and individually assessed) anxiety sensitive is a better predictor of self-reported anxiety than the BIS.

Another consideration as to why the non-relation between BIS and BAT_ANX was found could be that the stimuli used during this study were meant to elicit reactions related to disgust (as opposed to anxiety). The stimuli presented for this study was initially geared to identify disgust related constructs. As such, vulnerabilities more salient to disgust (eg. Harm avoidance, fear) might account for more avoidance than the BIS construct. The tasks during the BATs specifically are categorized into disgust domains (rotten fruit relates to 'core disgust', sanitized pencil relates to 'contamination disgust' etc.). If individuals are more sensitive to cues of disgust (disgust propensity), then BIS sensitivity, may not be the primary vulnerability that the BAT tasks were evaluating. However, this also opens the door for further avenues of study, specifically, using tasks that are related to sensitivity of punishment and reward (Go/No-Go

tasks, Iowa Gambling Task, etc.), rather than tasks that may be confounded with other vulnerabilities or emotions.

Another potential explanation for the null findings could be difficulties in BIS measurement. The BIS/BAS scales did not exhibit good internal consistency in this study, as the BIS subscale exhibited only an $a = .40$ and BAS subscale exhibited only $a = .61$. This lack of internal consistency may indicate that this particular scale is not measuring the construct of interest. In this case, the items meant to evaluate the BIS and BAS constructs did not correlate at an acceptable level with each other. Furthermore, the self-report measure used for the BIS and BAS evidenced very little variance in scores. On the BIS subscale, participants mean score was 22.4 with a SD 2.58 and on the BAS subscale a mean 44.45 with an SD of 3.86. This suggests that the sample collected was not sensitive to identifying individuals within the higher or lower quartiles of scores, due to the bunching of scores primarily around the median score of each subscale (BIS median = 46, BAS median = 23). This bunching suggests that the sample itself may not have been diverse enough in regards to BIS/BAS sensitivity. This lack of diversity may have further influenced the non-effect in total distance and self-reported anxiety.

Future research may incorporate other measures meant to assess sensitivity to punishment (Sensitivity to Punishment/Sensitivity to Reward Questionnaire; SPSRQ). Additionally, there may be utility to incorporating a measure of behavioral inhibition aside from a behavioral task (Adult Measure of Behavioral Inhibition: AMBI). Another potential avenue to further parse out fear responses to presented stimuli, from 'cautious approach' anxiety responses may involve using alternate 'fear' measures (Jackson-5), in conjunction with behavioral inhibition measures. Identifying and separating fear responses from anxiety responses (Jackson-5, or the Fight-Flight-Freeze Questionnaire).

Contrary to hypothesis, anxiety sensitivity (AS) was the only unique predictor of self-reported anxiety (controlling for emotion regulation and BIS). This suggests that although BIS is meant to signal cues of punishment and AS is meant to signal 'danger' when confronted with physiological cues of anxiety, AS may be a stronger 'signaling' tool than perception of punishment. The perception of potential punishment cues is a diffuse general tendency to notice punishing (or non-rewarding) stimuli; AS cues are more pointed due to primary physiological arousal. Perhaps when participants engaged with the stimuli, the salience of the physiological cues (not the potential of punishment for approaching the stimuli) may account for this significance. As BIS is primarily related to avoidant behavior entirely, ASI may be a stronger predictor of anxiety whether an individual chooses to engage with stimuli or not. Furthermore, AS, as the significant predictor for anxiety during a behavioral task, then implicates that the general arousal for physiological reactions may have some overlap between anxiety and disgust, as well as predictive power for avoidant tendencies.

Although the primary hypotheses were not supported in this study, further analysis to understand BIS functioning in avoidance across different behavioral tasks could prove beneficial. Research using specific anxiety promoting stimuli across experimental modalities, such as the Trier task, taking physiological measures across IAPS anxiety pictures, etc. could lead to different results. Ensuring that the BATs or other stimuli actually lead to activation of the BIS system in subsequent studies such as presenting anxiety provoking video clips (major speeches, spiders, and other potentially embarrassing social situations) or present a sealed, opaque container containing a tactile stimulus and asking the client to insert their hand. These other BAT activities may further help researchers understand anxious relations to BIS functioning.

Though this study added to the literature there are limitations to note. There was a lack of diversity in the collected sample. Although the demographics of this study were consistent with demographics of the university (University of Mississippi, 2017), most participants in this study were Caucasian, and under 21, which may lead to difficulties with generalization to a larger population as a whole. Additionally, the gender was skewed for female participants (gender ratio at the University of Mississippi is roughly equal). The ethnic breakdown of primarily Caucasian was also similar to University of Mississippi (roughly equal to student ethnic identity); however, ethnic diversity was a limitation. As such, a potential future avenue of research is to utilize a community sample with revised BATs, primarily individuals who are older and more divers so as to further expand on the effects of BIS as a prevailing tendency to avoid as a stable vulnerability. As the constructs being analyzed are meant to be relatively stable and temperamental (BIS/BAS), this study would have benefited from a longitudinal study to identify generalizable avoidance across time points.

Finally, there may be differences in avoidant tendencies and vulnerabilities that could be found within a clinical sample, rather than a non-clinical sample. As BIS and the other study constructs have demonstrated associations with different psychopathology, a clinical sample compared to a non-clinical sample may provide a further understanding of these vulnerabilities as the activation of the BIS is likely to be more pronounced in a clinical sample. Using a clinical sample may better enable researchers to parse out stable general vulnerabilities from immediate anxious arousal. Through the use of a clinical sample researchers may be better able to identify salient vulnerabilities such as prolonged anxiety sensitivity or inability to engage in goal directed behaviors due to an inability to control emotional responses. Previous literature has identified stability in BIS and its predictive power over time for the development of anxious pathology.

These studies have been done in primarily in children prior to pathological anxious development. Additionally, identifying the types of vulnerabilities that further maintain pathology versus those that place individuals at risk for development of pathology may further parse out the differences between BIS (as a stable temperament) and other vulnerabilities that overlap with BIS (distress intolerance, worry, emotion dysregulation, etc.).

Overall, the present study aimed to determine how BIS and BAS sensitivity contributed to approach/avoidance behavior via an observed behavioral task. Results indicated that BIS and BAS sensitivities were not able to predict approach behavior or self-reported anxiety. This project does provide a context for future research (alternate behavioral inhibition measures, alternate presented stimuli, or further identification of other vulnerabilities) in identifying factors to avoidant tendencies. Further, this study demonstrated that anxiety sensitivity was predictive of avoidant tendencies, meaning that sensitivity to physiological cues of danger may have the best predictive power of immediate anxiety. This particular study demonstrated during an observed behavioral task, that anxiety sensitivity was most related to anxiety and avoidance, above and beyond emotional dysregulation and sensitivity to cues of punishment.

Although BIS/BAS as primary predictors to avoidant tendencies were not statistically significant, the process of the study raises more potential avenues of research to identify how each construct relates to avoidance. The study demonstrated overlap between BIS and other vulnerabilities that should be further examined as they relate to avoidant behavior, anxious pathology, and potential implications for further research.

Figure 1. Individual stimuli for each Behavioral Approach Task with description of stimuli

Stimuli Name	Description	Approach	Touch	Immersion
Urn*	A ceramic urn containing ashes. Participants are told the ashes are "human remains" *	"Are you willing to approach the urn" Distance is measure from 0 to 120 inches. "On a scale of 0-10 with 0 being no anxiety/disgust at all, 5 being moderate anxiety/disgust, and 10 being extreme anxiety/disgust, how anxious/disgusted do you feel during this step"	"Are you willing to touch the inside of the urn" Anxiety = 0-10 Disgust = 0 – 10	"Are you willing to touch the ashes" Anxiety = 0 -10 Disgust = 0 – 10
Clothing	A plastic bag contains a shirt that was placed in a dog kennel for a number of days. It has trace amounts of urine and feces.	"Are you willing to approach and open the bag to smell the shirt" Distance is measure from 0 to 120 inches. "On a scale of 0-10 with 0 being no anxiety/disgust at all, 5 being moderate anxiety/disgust, and 10 being extreme anxiety/disgust, how anxious/disgusted do you feel during this step"	"Are you willing to touch the shirt" Anxiety = 0-10 Disgust = 0 – 10	"Are you willing to remove the shirt, smell it, and return it to the bag" Anxiety = 0-10 Disgust = 0 – 10
Earthworm	A live earthworm is placed on a table	"Are you willing to approach the earthworm" Distance is measure from 0 to 120 inches. "On a scale of 0-10 with 0 being no anxiety/disgust at all, 5 being moderate anxiety/disgust, and 10 being extreme anxiety/disgust, how anxious/disgusted do you feel during this step"	"Are you willing to touch the earthworm" Anxiety = 0-10 Disgust = 0 – 10	"Are you willing to pick up the earthworm and let it crawl in your hand" Anxiety = 0-10 Disgust = 0 – 10
Stained Underwear**	A pair of male, white briefs with a brown stain is presented. The participant is told the stain is feces. *	"Are you willing to approach the underwear" Distance is measure from 0 to 120 inches. "On a scale of 0-10 with 0 being no anxiety/disgust at all, 5 being moderate anxiety/disgust, and 10 being extreme anxiety/disgust, how anxious/disgusted do you feel during this step"	"Are you willing to touch part of the underwear" Anxiety = 0-10 Disgust = 0 – 10	"Are you willing to touch the stain" Anxiety = 0-10 Disgust = 0 – 10
Cow Eye	A tray with a preserved bovine eye ball and syringe containing water is presented	"Are you willing to approach the eye" Distance is measure from 0 to 120 inches. "On a scale of 0-10 with 0 being no anxiety/disgust at all, 5 being moderate anxiety/disgust, and 10 being extreme anxiety/disgust, how anxious/disgusted do you feel during this step"	"Are you willing to touch the eye with your finger" Anxiety = 0-10 Disgust = 0 – 10	"Are you willing to inject the eye with this syringe" Anxiety = 0-10 Disgust = 0 – 10
Sanitized Pencil	A standard #2 graphite pencil is presented. Participants are told that the pencil were dropped in the toilet that morning, but had been thoroughly sanitized.	"Are you willing to approach the pencil." Distance is measure from 0 to 120 inches. "On a scale of 0-10 with 0 being no anxiety/disgust at all, 5 being moderate anxiety/disgust, and 10 being extreme anxiety/disgust, how anxious/disgusted do you feel during this step"	"Are you willing to touch the pencil" Anxiety = 0-10 Disgust = 0 – 10	"Are you willing to hold the pencil in your hand" Anxiety = 0-10 Disgust = 0 – 10
Orange	A rotting orange is presented to the participant	"Are you willing to approach the orange" Distance is measure from 0 to 120 inches. "On a scale of 0-10 with 0 being no anxiety/disgust at all, 5 being moderate anxiety/disgust, and 10 being extreme anxiety/disgust, how anxious/disgusted do you feel during this step"	"Are you willing to touch the orange" Anxiety = 0-10 Disgust = 0 – 10	"Are you willing to hold the orange in your hand" Anxiety = 0-10 Disgust = 0 – 10
Bedpan ‡	A bedpan filled with yellow liquid is presented to the participant. They are told that the liquid is urine.*	"Are you willing to approach the bedpan" Distance is measure from 0 to 120 inches. "On a scale of 0-10 with 0 being no anxiety/disgust at all, 5 being moderate anxiety/disgust, and 10 being extreme anxiety/disgust, how anxious/disgusted do you feel during this step"	"Are you willing to put on a latex glove and put your hand in the urine" Anxiety = 0-10 Disgust = 0 – 10	"Are you willing to remove the glove and submerge your hand in the bedpan" Anxiety = 0-10 Disgust = 0 – 10

Items marked with * involve the use of deception.
* Urn – The urn contains ash collected from a fire containing wood and paper.
** Stained Underwear – The underwear is stained with a combination of chocolate pudding and chocolate syrup.
‡ Bedpan – The liquid is a combination of apple juice, and two drops of "buck urine" scent

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Education

Department of Psychology, Clinical Psychology, University of Mississippi, Oxford, MS (Fall 2015 – Present)

Master's Thesis: Behavioral Inhibition and Avoidance: Identifying Vulnerabilities to Avoidant Behavior (Spring 2018)

Department of Psychology, Southern Illinois University – Carbondale, Carbondale, IL (2011-2015)
1. **Bachelor of Arts in Psychology, Magna Cum Laude (Spring 2015)**
2. **Southern Illinois Honors Diploma (Spring 2015)**

Honors Thesis: Moderators That Affect Sensations of Pain and the Effectiveness of a Brief Mindfulness Intervention (Spring 2015)

Research Experience

- Research Assistant for Dr. Danielle Maack: Anxiety, Depression, Emotion, Personality, and Temperament Lab (A.D.E.P.T.), Psychology Department, University of Mississippi (Fall 2015 –Present)

- Research Assistant for Dr. Sarah Kertz, Anxiety, Behavior and Cognition Research Lab, Psychology Department, Southern Illinois University-Carbondale (Fall 2013 – Fall 2015)

- Research Assistant and Volunteer for Dr. Rodriguez, Fear Lab, Psychology Department, Southern Illinois University-Carbondale (Fall 2013-Spring 2015)

Research Presentations

Poster Presentations

- Kramer, S., **Pineau, D.**, Ruhde, D., Kertz, S. (2014, November). *Predicting Socially Anxious Group Membership Using Reinforcement Sensitivity Theory.* Poster session presented at Association for Behavioral and Cognitive Therapies, Philadelphia, PA.
- **Pineau D.**, Kertz S., Lewandowski C., Seidler D., Breazeale C., Rodriguez, B. (2015, November). *An Examination of Moderators That Effect Sensations of Chronic Pain and the Effectiveness of Brief Mindfulness Interventions*. Poster session presented at Association for Behavioral and Cognitive Therapies, Chicago, IL.
- Breazeale C., Lewandowski C., Seidler D., **Pineau, D.**, Rodriguez, B. (2015, November). *Relationships Among Alexithymia and Measures of General and Specific Psychological Distress During an Analogue Pain Induction Task.* Poster session presented at Association for Behavioral and Cognitive Therapies, Chicago, IL.
- Zhao, M., Scott, S., Tynes, B., **Pineau, D.**, Young, J., Maack, D. (2015, November). *Individual Differences in Emetophobic Symptoms: Anxiety Sensitivity Predicts Emetophic Symptoms Above and Beyond Difficulties with Emotion Regulation.* Poster session presented at Association for Behavioral and Cognitive Therapies, Chicago, IL.
- Lewandowski C., Breazeale C., Seidler D., **Pineau, D.**, Rodriguez, B. (2015, November). *The Effects of Mindfulness on Acute Pain: Examination of Brief Training and Individual Differences.* Poster session presented at Association for Behavioral and Cognitive Therapies, Chicago, IL.
- Seidler, D., Lewandowski, C., Breazeale, C., **Pineau, D.**, Rodriguez, B. (2015, November). *An Exploration of the Relationship Among Self-Ratings, Observer Assessment and Objective Measures of Pain Tolerance in a Cold Pressor Task.* Poster session presented at Association for Behavioral and Cognitive Therapies, Chicago, IL.
- Matalgah, H., **Pineau, D.**, Scott, S., Tynes, B., Maack, D. (April, 2016). *Contamination Disgust and the Potential Connection to Social Phobia*. Poster session presented at the Annual University of Mississippi Research Day, Oxford, MS.
- Zhao, M., Maack, D., Tynes, B., Scott, S., **Pineau, D.**, Sapp-Spence, B., Wickenhauser, M. (November, 2016). *Disgust Domains and Fear of Contamination Predict Safety Behavior Usage in an Analogue Sample*. Poster session presented at Association for Behavioral and Cognitive Therapies, New York, NY.
- Scott, S., Tynes, B., Zhao, M., **Pineau, D.**, Wickenhauser, M., Sapp-Spence, B., Maack, D. (November, 2016). *Bible Burning, Dog Fighting, and Partner Violence: Is Moral Disgust a Real Construct? Piloting a Multimethod Assessment of Moral Disgust.* Poster session presented at Association for Behavioral and Cognitive Therapies, New York, NY.

Oral Presentations

- **Pineau, D.**, Scott, S., Tynes, B., Maack, D. (April, 2016). *What anxiety lies beneath? Anxiety sensitivity mediates the relation between behavioral inhibition and emotion dysregulation.* Oral presentation at Annual University of Mississippi Research Day, Oxford, MS.

- Hebert, E., Ho, L., **Pineau, D.**, White, S., Fulwiler, J. (April, 2016).*Graduate Student Panel: What graduate school is REALLY like!* Panel presented at Annual University of Mississippi Research Day, Oxford, MS.
- **Pineau, D.** (March, 2017). *Approach or Avoid: Which would you choose?* Oral presentation at '3 Minute Thesis' competition at the University of Mississippi, Oxford, MS.
- **Pineau, D.**, Maack, D. (April, 2017). *Behavioral Inhibition Sensitivity and the Tendency to Avoid*. Oral presentation at Annual University of Mississippi Research Day, Oxford, MS.
- **Pineau, D.** (August, 2018). *Vulnerabilities to Avoidant Behavior and Self-Reported Anxiety During a Behavioral Approach Task*. Oral Presentation at Mississippi Psychological Association Conference, Biloxi, MS.
- **Pineau, D.**, Maack, D. (April, 2018). *Behavioral Inhibition and Other Vulnerabilities to Avoidant Behavior during an Observed Behavioral Task*. Oral Presentation at Annual University of Mississippi Research Day, Oxford, MS.

Clinical Experience

Graduate Clinician at North Mississippi Regional Center, Psychology and Behavior Services, Oxford, Mississippi (July 2016-July 2017)
- **Duties Include:**
  - Individual therapy sessions for clients with mild to severe intellectual and developmental disabilities
  - Functional assessments of behavior for clients with mild to severe intellectual and developmental disabilities
  - Assessment of intellectual disabilities, autism, ADHD, and learning disorders
  - Group therapy and behavior training for individuals with mild to severe intellectual disabilities

Psychological Services Center, University of Mississippi, Oxford, Mississippi (August 2016– Present)
- **Duties Include:**
  - Individual therapy sessions for clients of varying age ranges and symptom pathology
    - Primary age of clients: 8-40 years old
    - Primary method of treatments involve behavioral interventions through evidence-based psychological approaches (CBT, ACT, DBT, ABA, MI)

University Counseling Center, University of Mississippi, Oxford Mississippi (August 2017 – Present)
- **Duties Include:**
  - Individual and group therapy sessions for students attending the University of Mississippi
  - Collaboration with a diverse and multi-approach team to provide supervision and interventions for a diverse student body.

Teaching Experience

- Teaching Assistant for Undergraduate Level Introduction to Psychology course, Psychology Department, Southern Illinois University – Carbondale (Fall 2013 – Spring 2014)
- Guest Lecturer for Undergraduate Psychology Courses (online courses included), Psychology Department, University of Mississippi (Spring 2016- Present)
- Graduate Teaching Assistant for Undergraduate Psychology Courses, Psychology Department, University of Mississippi (Summer 2016, Summer 2017)
- Graduate Teaching Assistant for Abnormal Psychology and Applied Behavioral Analysis Undergraduate Psychology Courses, Psychology Department, University of Mississippi (Fall 2017 – Spring 2018)