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A Behavioral Attention Task for Investigating Rumination in Borderline Personality Disorder

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Introduction

Rumination is defined as repetitive, self-focused thought and can be conceptualized as a maladaptive form of emotion regulation (Seegerstrom, Stanton, Alden, & Shortridge, 2003). Rumination has been linked to behavioral dysregulation in Borderline Personality Disorder (BPD), self harm, interference with problem solving, depression, and anxiety (Baer & Sauer, 2011; Selby, Anestis, Bender, & Joiner, 2009; Selby, Connell, & Joiner, 2009; Watkins, 2008, 2009).

While previous research has demonstrated the importance of anger rumination in BPD, these studies have relied primarily on self-report measures of rumination. Although several self-report measures have been extensively validated for assessment of rumination, these instruments may be subject to reporting biases and are limited to assessment of trait-level rumination. The development of a behavioral task sensitive to anger rumination would provide an important tool to research the role of rumination in psychological dysfunction.

One aspect of behavior that has both been associated with rumination and used for lab tasks is attentional biases. The extent of these biases toward emotional content has been demonstrated to be correlated with depressive rumination (LeMoult, Arditte, D'Avanzato, & Joormann, under review); however, there has not been research to date on the association of attention biases and anger rumination.

These previous studies on attentional biases in depression and anxiety have used computer tasks, such as the emotional exogenous cueing task (Posner, 1980). The emotional exogenous cueing task involves presenting the participant with a word, either neutral or emotional, on either the left or right side of a computer screen. The word is then removed and a reaction target, either an "E" or a "F", is presented in on either the same or opposite side that the cue word appeared on. Participants are asked to respond to the target by pressing the corresponding key on the keyboard as quickly as possible. The task is designed to show attentional bias towards emotional stimuli relative to neutral stimuli. If the reaction target is displayed on the same side as the cue word, the trial is called a *valid trial*; if the target is presented on the opposite side, the trial is called an *invalid trial*. Valid trials do not require moving attention away from the cue word; therefore, faster reaction times are expected. Faster reaction times for valid over invalid trials is called the *cue validity effect*. An advantage of the

exogenous cueing task over other attention tasks is that it allows measurement of two components of attention: initial orienting of attention and disengaging attention. If the benefit of valid trials for a particular emotion category is greater than it is for neutral trials, that increased benefit is called *facilitated engagement* and is taken as an indication of faster initial orienting of attention for stimuli of that valence. If the reaction time penalty for invalid trials is greater for a particular emotion category than it is for neutral trials, that penalty is called *delayed disengagement* and is taken as an indication of difficulty pulling attention away from stimuli of that particular valence.

The present study extends previous research using the emotional exogenous cueing task to anger rumination. We have modified the emotional exogenous cueing task (EECT) in several additional ways in order to maximize sensitivity to ruminative processes and anger-related content, as described below. We will use the task to measure attention engagement and disengagement from anger related stimuli. We hypothesize that difficulty disengaging attention from words relevant to anger rumination, compared to words in other categories, will be correlated with trait-level tendency to ruminate about anger

Method

We have, to-date, completed developing our method, including pilot testing our experimental protocol.

Our initial recruitment plan was to recruit a sample with a sufficient number of participants high in anger rumination tendencies by asking instructors of summer classes at the University of Kentucky for permission to conduct voluntary in-class or online screening of their students. Students would be given a short form of the Anger Rumination Scale (ARS, Sukhodolsky, Golub, & Cromwell, 2001) in order to recruit participants with a wide range of scores from the ARS. However, of the 21 professors contacted, we received permission to recruit from two instructors of physical classes and one instructor of an online class, resulting in 24 completed surveys. After e-mailing the first 21 instructors, we discontinued this recruitment process due to the low response rate. We plan instead to conduct further screening and recruitment using the Psychology Department Human Subject Pool at the University of Kentucky this fall semester, where the ARS will be administered as part of a mass screening.

Pilot testing was performed to provide an initial impression of the effectiveness of the experimental procedures and to explore the protocol for elements that might be improved. Pilot participants were recruited from personal contacts of the experimenter.

Participants were asked to complete one block of trials from our modification of EECT, then undergo an anger rumination induction, and then

asked to complete a second block of trials of the EECT. At the end of the experimental session, participants were asked to complete a test of recognition of cue words from the task and several questionnaires. A subscale consisting of the anger and sadness related words from the Positive and Negative Affect Scales – Expanded Version (PANAS-X, Watson, Clark, & Tellegen, 1988) will be given to participants before the first block of trials, before and after the anger induction, and after the second block of trials in order to measure the effectiveness of the anger induction and to evaluate the relationship between participant's mood state and reaction times on the cueing task.

Emotional Exogenous Cueing Task. The exogenous cueing task will be presented using E-Prime on a Windows 7 computer. Participants are given instructions, a walk-through of the activity, and twelve practice trials before being given the first block of trials.

The initial screen for the task consists of two empty rectangles, one on the left side of the screen and one on the right, flanking a cross in the center of the screen. This is presented for 500 ms at the beginning of the trial, during which the cross blinks: it turns red after 125 ms and remains red for 125 ms before turning black again. Participants are instructed to return their gaze to the cross when it blinks. Next a cue word is presented in one of the rectangles for 1500 ms, followed by another 50 ms presentation of the empty rectangles, and finally presentation of the reaction target (E or F) until the participant responds with a key press. A new trial begins immediately once a participant responds.

The cue word presentation consists of a word between 5 and 10 letters of one of the four categories (neutral, angry, sad, or positive) being presented in either the left or right rectangle. Previous research with the EECT has used words relating to an emotional category such as sad or positive, e.g. Koster, De Raedt, Goeleven, Franck, & Crombez, 2005. To more specifically activate attention mechanisms involved in rumination, we selected words for their relevance to rumination or repetitive thinking of various types: the sad category contains words relevant to depressive ruminations such as “dismayed” or “worthless”, the anger category contains words related to anger rumination such as “infuriated” or “unfair”, and the positive category contains words related to repetitive positive thinking such as “energetic” and “pleased”. . The cue words we have selected are matched across categories (neutral, angry, sad, and positive) for number of letters and frequency of occurrence. Frequency of occurrence is rated using the SUBTLEXus database $\text{LOG}_{10}(\text{word frequency} + 1)$ score (Brysbaert & New, 2009). Cue words are presented in upper case in a 16 point Arial font.

The reaction target is presented in a 12 point Century font. Observations from pilot testing suggest that this presentation results in participants directing

their gaze at the target in order to discriminate between the potential reaction targets, as opposed to being able to react based on information from the peripheral visual field.

Participants are given instructions and several practice trials at the beginning of the first block to ensure that they understand the task. In order to encourage engagement in the task, participants are told that if their reaction times are the fastest 25% of typical results for the task they will be paid \$10 more, when in fact all participants will receive the \$10.

Initially, instructions included multiple directions for participants to return their gaze to the cross at the center of the screen between trials. This resulted in some participants attempting to either maintain or continuously return their attention to the cross, so instructions have been changed so that there is only one reference to returning attention to the cross and that direction says to return attention to the cross when it blinks red. The procedure and instructions were changed during pilot testing to replace a cue word recall test after the reaction time activity with a recognition test. The word recall test was initially included to ensure semantic processing of the cue words. Due to concerns that participant efforts to memorize words and distress during the recall test might distort attention processes and questionnaire results, the test was changed to a recognition test and the emphasis placed on its importance in the instructions was reduced.

Anger Induction. Participants are instructed to write for six minutes about a past event that made them angry and that still makes them angry. Pilot participants were initially asked to write for 10 minutes, but several participants reported that near the end of the task they found themselves without much to write, therefore, later pilot participants were asked to write for 6 minutes. PANAS-X scores and participant reports suggest that this time produces a more effective anger rumination induction..

Questionnaires. In addition to its use as a screening instrument, the ARS is included in the questionnaires that participants are asked to complete at the end of the session. The ARS asks participants to rate how applicable to them 19 statements regarding anger-related thinking are; statements such as “I ruminate about my past anger experiences.”

Several other questionnaires will be administered to assess associations between task performance and constructs related to anger rumination, including depressive rumination (Ruminative Responses Scale; Nolen-Hoeksema, 1991), aggressive behavior (Buss-Perry Aggression Questionnaire; Buss & Perry, 1992) BPD features (Personality Assessment Inventory Borderline Features; Morey, 1991), general distress (Depression, Anxiety, and Stress Scales; Lovibond, 1995), trait level negative affect (PANAS-X, Watson et al., 1988) and mindfulness

(Five-Factor Mindfulness Questionnaire; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006).

Results

Due to difficulties recruiting participants, analyses addressing hypotheses have not been completed; however, further data collection will continue during the fall semester using the refined procedure. To-date we have obtained preliminary information regarding the effectiveness of the experimental procedure from pilot participants. Pilot testing has demonstrated areas where the test protocol can be improved while also suggesting that certain elements of the experimental design function as intended.

One of the primary concerns addressed by pilot testing was the effectiveness of the anger rumination induction. The subscale of anger and sadness related words from the PANAS-X is given to participants at four time points and the induction occurs between time 2 and time 3. Mean scores and standard deviations of the PANAS-X subscale scores of the pilot participants ($n=9$) were 30.0(6.6) at Time 1, 27.3(3.4) at Time 2, 42.0 (15.6) at Time 3, and 36.1(18.1) $n=9$. These findings, while underpowered to show an effect, provide some preliminary support for the efficacy of the induction, especially as modified as discussed above.

When data has been collected, we expect the results to show a correlation between trait anger rumination as measured by the ARS and difficulty disengaging attention from anger rumination related words and that this association will be significant over and above trait-level anger and general distress. We expect that this difference in high trait ruminators will exceed differences in difficulty disengaging attention from depressive rumination words or positive words. We also expect these task results to correlate positively with aggressive behavior and BPD features.

Discussion

Preliminary pilot testing suggests that the inductions planned for this study are inducing anger and has been useful in refining modifications of the emotional exogenous cueing task for the study of anger rumination. Once data has been collected this fall, this task will be evaluated for suitability in research on anger rumination. If difficulty disengaging attention from anger related stimuli demonstrates significant associations with self-reported anger rumination, then that data would suggest an important role for basic attention processes in the tendency to ruminate. This task could be useful in further research on the effects of anger rumination and psychological dysfunction and disorders, such as BPD. Regardless of nature of the results, the data will contribute to continuing efforts to develop a behavioral measure to further these important areas of research.

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