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An investigation of verbal events as motivating operations : the effects of mood induction on the reinforcing value of consequences

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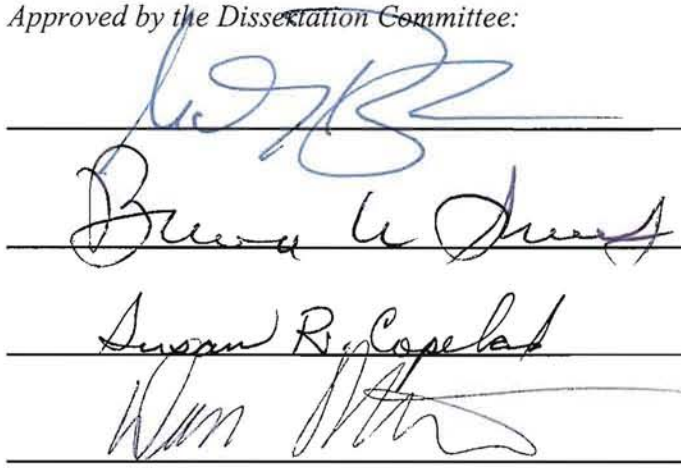

, Chairperson

AN INVESTIGATION OF VERBAL EVENTS AS MOTIVATING OPERATIONS: THE EFFECTS OF MOOD INDUCTION ON THE REINFORCING VALUE OF CONSEQUENCES

BY

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DISSERTATION

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ABSTRACT

This experimental study aimed to show the motivational effect of mood-altering verbal events on consequential functions through use of a within-subjects, repeated-measures design. Specifically, the effects of mood-induction on the self-reported value of various activities were investigated using explicit and implicit measurement. The Implicit Relational Assessment Procedure (IRAP) was used as an indirect measure of changes in the reinforcing value of pleasant and unpleasant cognitive activities after mood induction. Implicit assessment allowed for minimization of demand characteristics together with assessment of cognitive preferences that participants were unaware of or reluctant to report.

Data from 30 university undergraduates were analyzed and predicted effects regarding the differential reinforcement value of pleasant and unpleasant overt and covert activities after positive and negative mood induction were demonstrated. Pleasant activities were more reinforcing after positive mood induction and less reinforcing after negative mood induction, when unpleasant activities increased in reinforcing value.

Interestingly, participants' explicit report of mood state was often incongruent with their explicit and implicit preferences for overt and covert activities. Specifically,

many participants did not explicitly report a negative affective state after negative mood-induction procedures, but they nonetheless preferred pleasant activities less. The reinforcing value of pleasant and unpleasant activities changed regardless of the mood state reported, based on contact with verbal environmental events. Altogether, these findings support the claim that verbal mood-altering antecedent events can function to alter the reinforcing value of activities, thus contributing to existing evidence that they function as motivating operations.

Additionally, this study underscores the importance of implicit assessment, and highlights the potential utility of the IRAP as a clinical tool.

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Introduction

One of the most interesting and prolific areas of psychological study, both clinically and experimentally, concerns the relationship between affect and cognition. For decades, researchers have attempted to elucidate how thinking and feeling are related, while clinicians have devised interventions to modify this relationship. More recently, the role of the affect-cognition relationship has been a primary interest in the field of motivation.

Background

People's thinking tends to match how they feel, such that when they are happy they have pleasant thoughts and memories, and when they are sad they have unpleasant thoughts and memories. This phenomenon of selective attention and recall for material whose emotional valence matches current mood-state is referred to as mood-congruency, and the relation is widespread and well documented. A typical experimental procedure involves using mood-induction, like having participants read a story and/or listen to music, and comparing a control group to a positive mood induction group and a negative mood induction group on some dependent measure. Dependent variables have ranged across studies and have included reaction time, word recall, autobiographical memory recall, length of gaze at pictures, and interpretations of ambiguous pictures. When clinically-depressed participants have been used, study procedures have involved measuring performance at different times of the day when depression is worse or better, or comparing currently depressed individuals to previously depressed individuals and never-depressed controls. Findings across studies are generally consistent and demonstrate differences between mood groups along these variables.

A number of studies have found that research participants report more negative thoughts and attitudes during both experimentally-induced and clinically-depressed mood and fewer negative thoughts and attitudes when in a positive or neutral mood (Bodenhausen, Sheppard, & Kramer, 1994; Gotlib, Lewinsohn, Seeley, Rohde, & Redner, 1993; Hollon, Kendall, & Lumry, 1986; Miranda & Persons, 1988). Bower (1991) found that participants experiencing a good mood show increased attention to the positive aspects of a stranger, while a sad mood was associated with increased attention to the stranger's negative aspects. Further, happy participants looked longer at happy pictures, and sad participants looked longer at sad pictures (Bower, 1991, 2000). Additionally, a recent mood-induction study from our lab showed that participants responded faster to negative self-statements after negative mood induction than after positive mood induction, and faster to positive self-statements after positive mood induction than after negative mood induction (Freund, 2007). Distilling these findings, the pattern of participants' responses indicates an increased salience and selection of mood congruent stimuli.

Results for attribution style and memory parallel these findings. During negative mood, people tend to make self-critical attributions, whereas positive mood evokes self-enhancing attributions (Coyne & Gotlib, 1983; Follette & Jacobson, 1987; Forgas, et al., 1990; Forgas & Locke, 2005; Fresco et al, 2006; Gotlib et al, 1993; Raps, et al., 1982). Likewise, unpleasant material (e.g., autobiographical events, facts from a story, personality trait words) is recalled more frequently than pleasant material when people are in a negative mood (Bower, 1981; Bower, 1987; Bower, Gilligan, & Monteiro, 1981; Challis and Krane, 1988; Clark & Teasdale, 1982, 1985; Hertel & El-Messidi 2006; Itoh,

2004; Natale & Hantas, 1982; Teasdale, 1983; Teasdale and Russell, 1983; Teasdale & Taylor, 1981). Conversely, recall is greater for pleasant material when in a positive mood (Bower, 1987; Challis and Krane, 1988; Teasdale, 1983; Teasdale and Russell, 1983).

Taken together, these results demonstrate selective salience of stimuli that agree with one's prevailing mood state, concurrent with decreased salience of mood-*in*congruent stimuli. Said another way, people appear to think and act in mood-congruent ways and thus, respond differentially to stimuli in the world that match how they feel. Mood-congruent behavior is characteristic of clinically depressed individuals who lose interest in previously enjoyed activities and ruminate on failures and incompetencies. Social activity, exercise, and self-encouragement are exchanged for isolation, sleeping, and self-criticism. In a manner of speaking, we might say that individuals are motivated to act in accord with their current mood.

Motivating Operations

In behavior analysis, motivation is not defined in terms of internal states or predispositions to respond. Rather, the focus is on the environmental events that produce motivational effects. The issue here is not semantic, but rather practical, as identifying environmental determinants aids in exerting influence over behavior by manipulating or re-arranging these environmental variables.

The technical behavior-analytic term for events that have motivating effects is "motivating operations", and these events are defined functionally (Laraway, Snycerski, Michael, Poling, 2003; Tapper, 2005). Motivating operations function to enhance or establish the reinforcing effects of certain consequences, increase behavior that in the past has been successful in obtaining those established consequences, and increase the

salience of stimuli associated with those consequences. In other words, the environment acts on the organism and the organism becomes "motivated" to behave in a certain way. For example, when people diet or restrict intake of certain foods, they may increasingly crave those foods or feel like they are constantly reminded of the forbidden foods. As the reinforcement value of those foods is enhanced via extended deprivation, the salience of stimuli associated with those foods (e.g., fast food restaurants, vending machines) increases, and the likelihood that the person will seek out and eat those foods increases.

Several authors have referred to mood-changing events—including verbal events like self-statements and mood-induction procedures—as motivating operations (Dougher & Hackbert, 1994, 2000; Durand, 1998; Olson & Austin, 2001; Poling, 2001). Across the several studies cited above, both clinical and experimental samples demonstrated that mood-altering events enhance stimulus control increase relevant behaviors. While these results offer evidence of the motivating effect of verbal mood-altering events on stimuli and behavior, data demonstrating the effects of verbal antecedent events on consequences is scarce. Thus, there is insufficient evidence in the literature to substantiate verbal events as motivating operations. The analysis of mood-altering stimuli as motivating operations is incomplete without demonstration that verbal mood-changing events differentially affect consequential function as well.

Importantly, previous investigations of non-verbal motivating operations such as deprivation and satiation have demonstrated changes in the reinforcement strength of certain stimuli such as food or toys (McAdam et al., 2005; Tapper, 2005). Although it makes logical sense to conclude that mood-changing events function to establish the reinforcing function of mood-congruent activities, this needs to be shown empirically. In

other words, it is not adequate to infer that because events that evoke mood exert behavior-altering effects over an organism (e.g., differential recall of mood-congruent material), that the value of reinforcers has been altered (i.e., mood-congruent material is more reinforcing). The value-altering effects on consequences are said to be independent, though simultaneous, to the behavior-altering effects (Michael, 2000; Tapper, 2005).

A review by Bower (2000) summarized a few studies providing promising results in this direction. The review reported findings that people with temporary sad mood reported a plan to spend more time in solitary and serious activities, whereas happy people reported a plan to spend time engaging in enjoyable and light-hearted activity. Additionally, happy people expected their partners to be more cooperative and less competitive in a bargaining situation than unhappy people. A particularly relevant study mentioned in this review showed that after negative mood-induction participants expected decreased enjoyment from over 300 pleasant events compared to increased enjoyment of these events after positive mood induction (Carson & Adams, 1980). They interpreted these results as showing that “the onset of depressive affect is accompanied by a decrease in the reinforcement potential of previously rewarding activities, independent of a reduced level of activity” (p.374).

These findings suggest the potential effects of verbal mood-inducing events on the reinforcement value of certain activities. However, a methodological limitation of these studies is that the dependent variables were explicit self-report measures that are subject to demand characteristics. Recent developments in implicit assessment methodologies allow for indirect behavioral measurement, reducing the influence of demand characteristics.

Implicit Assessment

Two implicit assessment measures are the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998) and the Implicit Relational Assessment Procedure (IRAP; Barnes-Holmes, et al., 2006). Both are computer tasks that are used to measure cognitive behavior that is out of one's awareness or that one may prefer to conceal. This cognitive behavior may be subtle or automatic, and/or socially undesirable. Thus, implicit measurement controls for demand characteristics or self-censorship. Like other implicit measures, the task involves indirect measurement via response latencies. Faster response latencies reflect stronger stimulus relations, while slower response latencies reflect weaker stimulus relations.

Though the IAT and IRAP are similar, the IRAP is distinct from the IAT in one key respect. While IAT provides a measure of relative association strength among stimuli, the exact nature of the relation remains unknown and could reflect a range of different relations (similar, different, true, false, etc.; Barnes-Holmes, Murphy, Barnes-Holmes, & Stewart, 2010). In contrast, the IRAP allows for assessment of specific relations among stimuli on each trial when participants are asked to respond to a particular relation between sample and target stimuli (Barnes-Holmes et al., 2010). Thus, IRAP procedures indicate the nature of the relationship among stimuli, whereas the IAT merely indicates an association. Additionally, previous research suggests that the IRAP is not easily faked (McKenna, Barnes-Holmes, Barnes-Holmes, & Stuart, 2007).

Most existing IRAP studies have used this procedure to measure implicit social and cultural biases, which participants tend not to report on explicit measures. Faster responses typically occur for relations that are consistent with social norms, providing

evidence of the historical and contextual influence (i.e., individual learning history) on relational repertoires (Barnes-Holmes, Murphy, Barnes-Holmes, & Stewart, 2010; Drake et al., 2010). For instance, Barnes-Holmes et al. (2010) demonstrated pro-White stereotyping (stronger pairing of White with safe and Black with dangerous) among an all-White sample of Irish citizens. Similarly, Drake and colleagues (2010) observed racial, religious, and gender biases using the IRAP with the relational terms true/false, yes/no, and right/wrong.

For this study, the purpose of using the IRAP was to measure subtle changes in cognition after mood-induction procedures. Specifically, changes in reported preferences or likelihood of engaging in pleasant and unpleasant activities as a result of mood-altering events were investigated. In other words, the IRAP was used as an indirect measure of changes in reinforcing value of pleasant and unpleasant cognitive activities after mood induction. Although the IRAP is typically used to assess implicit social biases in comparison to explicit report, there is little reason to suspect that it cannot be used to measure changes in relational strength as a function of mood induction or other experimental manipulation. There is some evidence that the IAT was sensitive to changes in association strength based on experimental manipulation (Dasgupta & Greenawald, 2001). Relative preference for White individuals over Black individuals weakened after participants were shown pictures of liked Black individuals and disliked White individuals. Use of the IRAP to assess the flexibility of relational repertoires enhances its clinical utility as well.

Purpose and Predictions

The purpose of the current study was to investigate further the effects of verbal mood-altering events on the self-reported value of various activities. If the present mood induction procedures indeed function as motivating operations, then pleasant activities should be rated as preferred (i.e, more reinforcing) after successful positive mood induction, whereas unpleasant activities would be preferred after successful negative mood induction. In other words, participants were expected to show an explicit preference for pleasant activities and amplified pleasant implicit thinking patterns when in a positive mood, and a decreased explicit preference for pleasant activities in addition to decreased unpleasant implicit thinking patterns when in a negative mood.

This study has advantages over previous studies for three major reasons. First, in addition to using explicit measurement, demand characteristics were minimized via indirect measurement of changes in reinforcement value across moods. Second, indirect measurement also allowed for assessment of cognitive effects that participants were unaware of or reluctant to report. Third, a within-subjects, repeated-measures design facilitated study of differences in the reinforcing value of activities within individuals across mood states. As a result, this research provides a significant addition to the existing research base by examining the effect of mood-induction procedures on explicit ratings of pleasant activities, as well as changes in implicit thinking patterns.

Method

Participants

In total, 63 University of New Mexico undergraduates were recruited to participate in this study via a web-based recruitment process used by the Department of Psychology. Students enrolled in the study by signing up online for available timeslots

posted by the experimenter. Participants received one class credit in their current psychology course for each hour of participation, which typically resulted in two credits. All procedures were approved by the IRB, which placed constraints on participation. Per the terms of IRB approval, individuals with current depression or a history of depression were to be dismissed from participation because of risk of subjecting them to unpleasant mood-altering statements.

Seven participants were excluded from participation in the study because they reported current depression or a history of diagnosis of or treatment for depression. Currently depressed participants were excluded from participation because of the IRB constraints mentioned above, and also for the sake of internal validity. Existing depression needed to be ruled out as a potential confound. Exclusion criteria for current depression was an overall score greater than 20 or an item rating greater than zero to the suicidality item (number nine) on the Beck Depression Inventory (BDI-II). Exclusion criteria for a history of diagnosis and/or treatment of depression was based on students' self-report on a short demographics questionnaire. Three additional participants were excluded because they did not follow instructions.

Twenty of the remaining 53 participants were excluded due to a single baseline design flaw in the proposed study. This flaw is discussed in more detail in the procedures below. Thus, 33 participants were included in the study. Participants ranged in age from 18-51 and the mean age of the final sample was 22.15 (*SD* = 7.657). Twenty-six participants (78.8%) were female and 7 (21.2%) were male. Ethnically, 14 participants (42.4%) identified as Hispanic, 11 (33.3%) as White, 3 (9%) as Asian, 3 (9%) as American Indian, 1 (3%) as African American, and 1 (3 %) as mixed ethnicity.

Materials and Measures

A short self-report questionnaire was administered to collect demographic information such as age, sex, ethnicity, current medications and depression history (see Appendix A).

The BDI-II (Beck, Ward, Mendelson, Mock, Erbaugh, 1961) was used to assess current depressive symptoms. This self-report inventory is composed of 21 items concerning mood during the past 2 weeks. Each item includes several statements that vary in degree of symptom severity, and participants circled the number that corresponded to the statement that best described how they felt in the past two weeks in each domain (e.g., appetite, sleep, feelings of guilt, concentration). Higher scores indicate more depressive symptomology, with scores below 20 indicating an absence of depression to a mild mood disturbance, and scores above 20 indicating moderate to severe depression within the past two weeks. Participants were excluded if their BDI-II score was above 20.

Velten (1968) mood-induction procedures were used in combination with music to induce negative and positive mood states. The statements used in this study have been used successfully in previous research to induce mood states (Richell & Anderson, 2004; Seibert & Ellis, 1991; Velten, 1968). For this study some items were slightly modified to make the statements more concise or straightforward. For example, the statement “I feel a little down today.” was changed to “I feel down today.” and “Even when I give my best effort, it just doesn’t seem to be enough.” was changed to “Even my best efforts aren’t good enough.”(see Appendices B and C). These procedures required participants to read 31 self-referent statements that were intended to induce a positive or negative mood.

Each statement was printed on a separate 4x6-inch index card. Participants were instructed to read each statement silently once and then read the statement aloud, while actively trying to get into the mood state suggested by each statement. Participants were further instructed that getting into each mood state would be facilitated by believing that the statements were true, or by thinking about events that were congruent with the statements. They were asked to focus on each statement for 20 seconds.

Together with the Velten procedures, instrumental music was used to facilitate mood induction. *Diary of Hate* by the Michael Nyman Band was played while participants read the negative self-statements, and Guarneri Underground's *Darwin* was played while participants read the positive self-statements. This music was selected because it had been used effectively in a prior study to induce negative and positive mood (Freund, 2007). Participants listened to the music while they read the statements and throughout completion of dependent measures.

A visual analog scale (VAS) was used as an explicit independent variable check to ensure that the mood induction was effective. Visual analog scales are typically used to measure variables whose values fall along a continuum. The VAS is typically 100mm in length and involves an anchor labeled '0' at one end and an anchor labeled '100' at the other end, and participants mark a point on the scale that describes them. The scale used for this study was 100mm long and labeled 'unpleasant/0' at one end and 'pleasant/100' at the other end. Participants were asked to mark the place that described how they were feeling "right now." A standard metric ruler was used to calculate the score for each VAS administered. The VAS score equaled the number of millimeters that corresponded to the mark on the line. Mood criteria cutoff scores were set at ≥67mm to qualify as being in a

positive mood and ≤33 to qualify as being in a negative mood. These cutoff scores were chosen because they represent the upper and lower thirds of the scale and were thought to differentiate positive and negative mood states from each other and from neutral mood. Scores falling between these cutoff scores qualified as indicating neutral mood.

An activities questionnaire (see Appendix D) was designed for this study and was used to assess how much participants would like to do six different activities typically associated with positive mood. The activities questionnaire is a face valid instrument used as a brief explicit measure of change in reinforcing value of pleasant events. Participants were asked to rate how much they would like to do things like laugh/smile, relax, and spend time with friends on a 7-point scale from "0, not at all" to "6, a lot."

As described above, the Implicit Relational Assessment Procedure (IRAP; Barnes-Holmes, et al., 2006) was used to measure implicit preference for pleasant and unpleasant cognitive activities. During the IRAP task, a sample stimulus appears at the top-center of the computer screen, a target stimulus appears mid-center, and two relational responses are located on the bottom-left and bottom-right of the screen (see Figure 1). Participants answer by pressing the 'd' or 'k' keys to choose the left or right response, respectively. The relational responses alternate positions randomly throughout the task in order to control for position effects. When two stimuli that share a response are strongly related according to the specified relation (e.g., similar/different, true/false, etc.), response latencies are faster and fewer errors are made. Conversely, longer response latencies and more errors are interpreted as revealing weaker relational strength among pairs of stimuli.

Figure 1

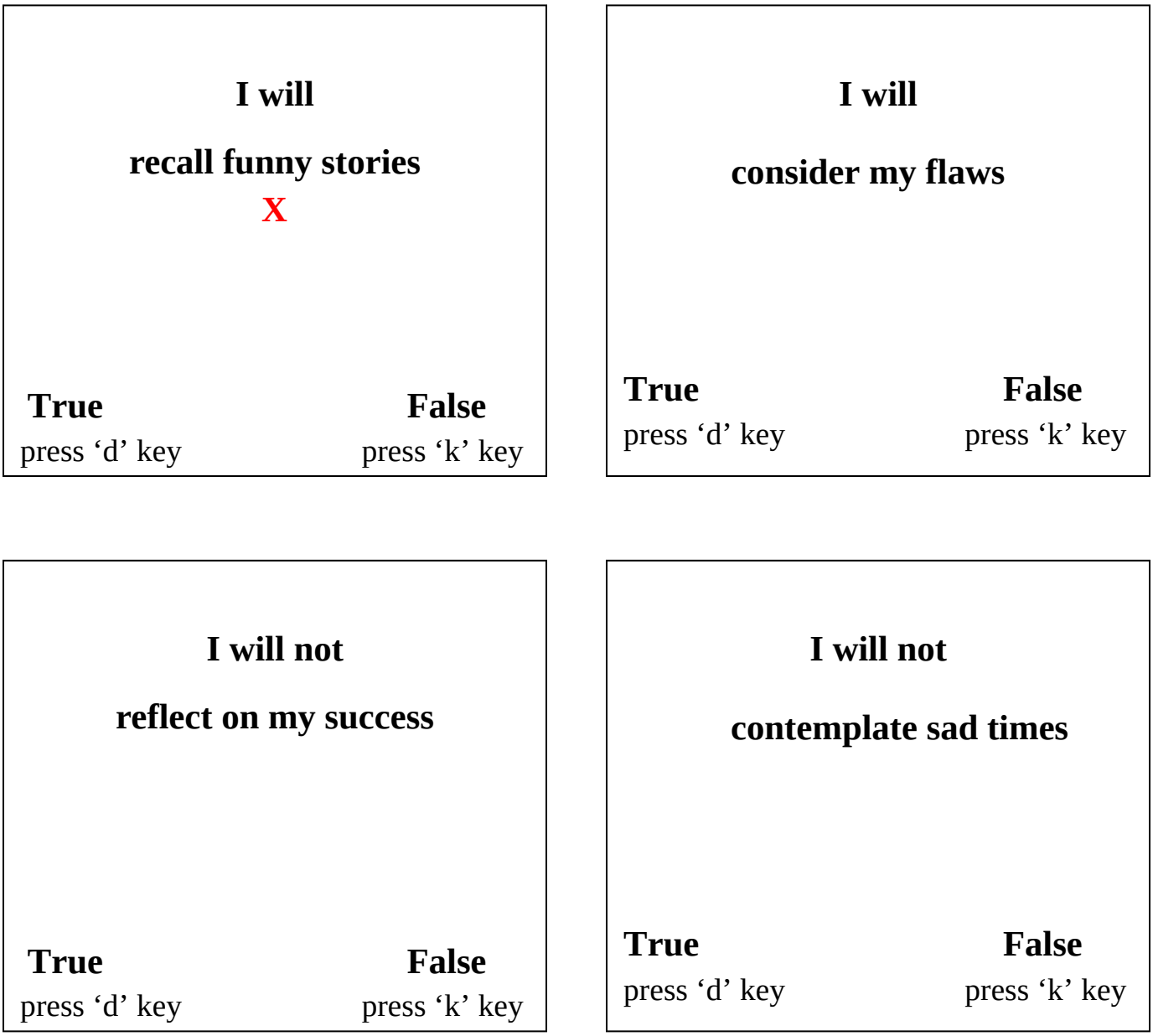

Figure 1. These four panels show examples of the four IRAP trial types. The first panel shows an example of an IRAP trial that has been answered incorrectly. Correct answers depend on whether the consistent or inconsistent frame is in effect.

Each block of the IRAP task is made up of two phases—a consistent response condition and an inconsistent response condition. In the consistent response condition, participants respond in a way "consistent with" their belief/cultural norm, whereas the inconsistent condition requires them to respond "inconsistent with" their belief/social norm. The correct answers change in accordance with the response condition, and participants must answer correctly to move on to the next trial. In other words, the correct answers in the consistent phase are reversed during the inconsistent phase, such that participants must relate stimuli in a way that they do not normally (e.g., they must choose 'False' when their typical answer would be 'True'). A red "X" appears on the computer screen when incorrect responses are made and the participant must choose the correct answer. Thus, wrong answers have inherently longer latencies.

This study utilized the Ole Miss IRAP Version 2.0 (Drake, 2006) which allows the experimenter to program stimuli that are particularly relevant to a specific experimental question. In this case, the experimenter programmed both practice and test trials.

Because of the complexity of the task, practice trials were administered to familiarize participants with the procedures. Participants were oriented to the task, specifically the necessity of quick responding and the reversal of correct responses between the consistent and inconsistent phase, via the practice trials. Practice trials consisted of sample stimuli ("I am" or "I am not") paired with target stimuli (e.g., "in New Mexico"/"in South Dakota", "sitting"/"standing", etc.), and relational response stimuli ("True"/"False").

For the test IRAP, the correct answers for the consistent frame were cognitive (covert) activities assumed to be consistent with positive mood (e.g., recall funny stories, contemplate happy times, reflect on my success, consider my talents, expect good grades, believe life will work out), while the correct answers for the inconsistent frame were cognitive activities assumed to be inconsistent with positive mood (e.g., recall serious stories, contemplate sad times, reflect on my failures, consider my flaws, imagine poor grades, doubt things will improve). Specifically, the consistent frame required participants to choose "True" (relational response) when "I will" (sample stimulus) was paired with pleasant cognitive activities (target stimuli). Likewise, "False" was the correct response when "I will" was paired with unpleasant cognitive activities. Conversely, when "I will not" was the sample stimulus in the consistent condition, "True" was the correct answer for the unpleasant cognitive activities and "False" was the correct answer for the pleasant cognitive activities. In the inconsistent frame, the correct answers for each of the four trial types were reversed.

Procedures

The procedures described here are slightly different than those originally proposed due to a design flaw that was recognized during the initial stages of implementation. The original procedures contained a single baseline, with no baseline mood assessment between mood induction conditions. Without this measurement it was not possible to determine whether participants were still under the effect of the initial mood-induction procedures when the second mood-induction procedures were administered, or whether they had in fact returned to baseline (i.e., neutral mood).

Therefore, the procedures were modified by adding a second mood assessment before the second mood induction procedure.

A repeated-measures, within-subjects design was used, and participants were run individually. Procedures took place in a basement laboratory at either of two computers designated for this study. Each computer sat on a large desk and included a 15-inch monitor and standard keyboard. Upon arrival in the laboratory, participants read and signed the consent form, and were subsequently administered the BDI-II and demographics questionnaire. Participants were excluded from further participation if they (a) scored above 20 on the BDI-II, (b) rated the suicide item greater than zero on the BDI-II, or (c) self-reported a history of diagnosis of and/or treatment for depression. Excluded participants were debriefed and dismissed. Participants who scored 0-20 on the BDI-II were eligible for the study.

Eligible participants then completed practice trials on the IRAP. The practice trials (four blocks, 8 phases, 160 individual trials) required participants to respond to non-evaluative self-referent statements (e.g., “I am”/”I am not” paired with “a student”/“a doctor”, “a woman”/“a man”, etc.) by pressing the ‘d’ and ‘k’ keys which corresponded to the relational statements “True” and “False”. For practice trials, the consistent phase was always presented first.

Following the IRAP practice trials, participants were administered the first-mood assessment, which was referred to as either negative baseline or positive baseline, depending on the mood-induction procedures it preceded. Participants were asked to report their current mood state on the VAS and to complete the activities questionnaire according to how much they felt like doing the various activities given their current mood

state. Next, participants completed the first set of IRAP test trials (3 blocks, 6 phases, 144 trials). This first set of test trials served to establish baseline IRAP performance and orient the participants to the IRAP test stimuli. The order of consistent and inconsistent phases was counterbalanced across participants during the test blocks.

After a brief introduction to the task, participants were asked to read the following instructions presented on the computer screen:

> You are about to engage in a series of sorting tasks. The computer will display a set of words on the screen. Two will be in the middle near the top of the screen, and two will be below near each side of the screen. (Continue) The words at the bottom are your choices. You will select them by pressing the 'd' key for the word on the left and the 'k' key for the word on the right. These words will change unpredictably during the task, so look at them carefully each time you make a choice. (Continue) Press the 'd' key with your left index finger, and the 'k' key with your right index finger. Keep your fingers on top of these keys throughout the sorting task so that you can respond quickly. (Continue) Your task is to use the feedback from the computer to learn to sort each set of words as fast as you can. (Continue) If you make an error, you will see a red 'X' appear in the middle of the screen. When this happens, you have to make the correct response to proceed. (Continue) In some parts of the experiment the feedback from the computer may make sense to you, but in other parts it may not. This is part of the experiment. Please do the best you can. (Continue) The most important thing for you to do is to RESPOND QUICKLY and to make as FEW ERRORS as you can. (Continue) If you didn't understand these instructions, please ask the

experimenter before proceeding. Otherwise, place your index fingers on the ‘d’ and ‘k’ keys and hit the spacebar when you are ready to begin. Good luck!

At the end of the first phase (either 24 consistent or inconsistent trials), participants read instructions on the screen that informed them that the correct answers for the next part of the experiment would be reversed. Again, correct answers on the IRAP task depend on whether the consistent or inconsistent phase is being completed.

Subsequently, mood-induction was initiated, with positive and negative mood-induction procedures counterbalanced across individuals to control for order effects. During the mood-induction procedures, the experimenter sat a couple feet away from the participant to conduct the procedures. Each statement was handed individually to participants, and the experimenter listened to the participant read the statements and kept track of the time. Either positive or negative mood-induction procedures were implemented, followed by administration of the VAS and activities questionnaire, and then participants completed the second set of IRAP test trials. As with the first mood assessment, this second baseline was referred to as either positive baseline or negative baseline, depending on the mood-induction procedures it preceded.

Once completed, the participants were given a 5-minute break while the second set of mood procedures and tasks were prepared. After the break, participants returned and completed the second baseline mood assessment as before with the activities questionnaire and the third set of IRAP test trials.

Finally, the second mood induction was implemented and participants again completed the VAS, activities questionnaire, and the fourth set of IRAP test trials.

To conclude, participants watched a 10-minute film clip from *Kung Fu Hustle* that was found in a previous study (Freund, 2007) to effectively induce a neutral/positive mood. Return to neutral/positive mood was checked with the VAS. Following this, participants were debriefed and dismissed.

Data Treatment and Analysis

First, data were reconciled with experimenter notes for each participant in order to remove participants for whom there were technical problems. Next, VAS, AQ, and IRAP scores and/or means (see below) were computed across four time points. Mood state and changes in mood state were determined by participants' responses on the VAS. Participants were categorized as being in a negative mood (VAS $\leq$ 33), a neutral mood (VAS 34-66), or a positive mood (VAS $\geq$67) at each time point, and subsequently sorted into a Mood Group or a No Mood Group. A chi-square test was performed to determine whether the Mood and No Mood Groups differed in terms of sex or ethnicity. A one-way ANOVA was carried out to confirm similarity in terms of age, BDI-II score, order of mood induction, and order of IRAP conditions between these groups.

Next, AQ mean scores were calculated for each participant for each time point, and mean response latencies for each IRAP block were calculated by averaging the mean response latencies across the three consistent and inconsistent phases in each block at each time point. After these initial calculations, paired-samples t-tests were used to analyze AQ data within groups, according to mood group membership. Mean ratings from the AQ were compared across mood conditions for participants in both mood groups. It was expected that participants for whom the mood induction was successful, as measured by the VAS, would have lower mean AQ scores after negative mood induction

than at baseline or after positive mood induction. Participants for whom the mood induction procedures did not result in reported mood change were not expected to have differences in mean AQ scores across the four time points.

Individual-subject analyses and within-groups analyses were used to analyze response latency data from the IRAP for each mood group. Data from each participant were examined to determine whether mean response latencies were faster during the consistent phase—compared to the inconsistent phase—for all time points except after negative mood induction. After negative mood induction mean response latencies were expected to be faster during the inconsistent phase than the consistent phase. This shift would suggest that in a neutral or positive mood participants prefer pleasant activities and that in a negative mood pleasant events are less reinforcing (i.e., less preferred). In other words, for IRAP data, it was predicted that successful mood induction procedures would evoke a reversal in their activity preferences. Mean differences in response latencies for each block of consistent- and inconsistent-phases were compared using paired-sample t-tests to determine whether IRAP differences were significant between the two mood groups.

Group analysis involved six t-test comparisons of AQ and IRAP data. These comparisons were (1) positive baseline to positive mood induction, (2) positive baseline to negative baseline, (3) negative baseline to positive mood induction, (4) negative baseline to negative mood induction, (5) positive baseline to negative mood induction, and (6) negative mood induction to positive mood induction. For comparisons with a hypothesized directional effect, one-tailed tests were used, and for non-directional

hypotheses two-tailed tests were used. To control for Type I error, a Bonferroni adjustment was made, resulting in a new alpha level ($\alpha = .05/6 = .008$).

Based on the results of these planned analyses, follow-up analyses were completed.

Results

Excluded Data

Three additional participants were excluded from analysis because of technical problems with the computer program or reported negative mood at the first baseline. Thus, the data from 30 participants were included in the final analysis.

Visual Analog Scale (VAS) Data

Six participants (20%) reported mood changes consistent with both sets of mood-induction procedures and were designated as the Mood Group. The remaining 24 participants reported a neutral to positive mood at each time point and were designated as the No Mood Group. In other words, most participants in the No Mood Group showed little or no response to the negative mood induction.

Chi-square analysis comparing sex and ethnicity between the Mood and No Mood Groups were non-significant, $\chi^2(1, N=30) = .419$, $p = .517$, and $\chi^2(5, N=30) = 2.692$, $p = .747$, respectively. Moreover, one-way ANOVA revealed no significant differences between these groups for Age [$F(1,28) = .597$, $p = .446$]; BDI-II score [$F(1,28) = .153$, $p = .699$]; order of Mood-Induction Procedures [$F(1,28) = .031$, $p = .861$] or order of IRAP conditions [$F(1,28) = 1.643$, $p = . 210$].

Activities Questionnaire (AQ) Data

As a general trend, five of the six Mood Group participants showed an increase in mean ratings on the AQ after positive mood induction and a decrease in mean ratings

after negative mood induction. Two-tailed, paired-samples t-test comparisons were made to determine whether there were differences between positive and negative baseline scores and between positive mood induction scores and each baseline, and no differences were expected. Alternatively, both baseline AQ scores as well as positive mood induction AQ scores were expected to be higher than those after negative mood induction. Therefore, one-tailed paired-samples t-test comparisons were made between negative mood induction scores and each baseline, and between negative mood induction AQ scores and positive mood induction AQ scores.

With the Bonferroni adjustment, four of the six comparisons were not significant. As expected, there were no significant differences found between positive baseline and negative baseline AQ scores, $t(5) = -1.962$, $p = .107$, two-tailed; between positive baseline and positive mood induction AQ scores, $t(5) = -2.704$, $p = .043$, two-tailed; or between negative baseline and positive mood induction AQ scores, $t(5) = 1.833$, $p = .126$, two-tailed. Two of the three expected significant differences in AQ scores were obtained. Participants rated pleasant activities on the AQ higher at negative baseline than after negative mood induction, $t(5) = 3.810$, $p = .0065$, one-tailed. Additionally, mean AQ scores were higher after positive mood induction than after negative mood induction, $t(5) = 4.366$, $p = .0035$, one-tailed. AQ scores were not found to be significantly higher at positive baseline than after negative mood induction, $t(5) = 1.473$, $p = .1005$, one-tailed.

No Mood Group participants were not expected to show significant differences in AQ scores across experimental conditions, because they reported less variability in mood states and, for the most part, reported a positive mood. However, two-tailed, paired-samples t-tests with adjustment for multiple comparisons ($\alpha = .05/6 = .008$) revealed

otherwise. Results mimicked those of the Mood Group participants. Namely, there were no significant differences between negative and positive baseline AQ scores, t(23) = -1.388, p = .179, two- tailed; between positive baseline and positive mood induction AQ scores, t (23) = -.915, p = .370, two-tailed; or between positive mood induction and negative baseline AQ scores, t (23) = -.352, p = .728, two-tailed. However, significant differences were found in line with the predicted effects for the Mood Group. AQ scores were significantly different between negative baseline and negative mood induction, t(23) = 3.970, p = .001, two-tailed, and between positive baseline and negative mood induction, t(23) = 3.382, p = .003, two tailed. Although there was not a significant difference between positive and negative mood induction AQ scores, there was a trend toward significance, t(23) = 2.807, p = .010, two-tailed.

IRAP Data

Individual-subject analyses revealed that three of the six Mood Group participants showed a pattern reversal between negative and positive mood-induction conditions, while three participants showed a trend toward this pattern. Pattern reversal is defined as faster responding to pleasant cognitive activities than unpleasant cognitive activities after positive mood induction while also responding faster to unpleasant cognitive activities than pleasant cognitive activities after negative mood induction (see Figure 2 as an illustration). Although three of the participants did not show a pattern reversal between mood states, the difference between their reaction times during the consistent and inconsistent phases decreased post negative-mood induction compared to post positive-mood induction (see Figure 3 as an illustration). In other words, although these latter participants responded faster to pleasant cognitive activities and slower to unpleasant

Figure 2

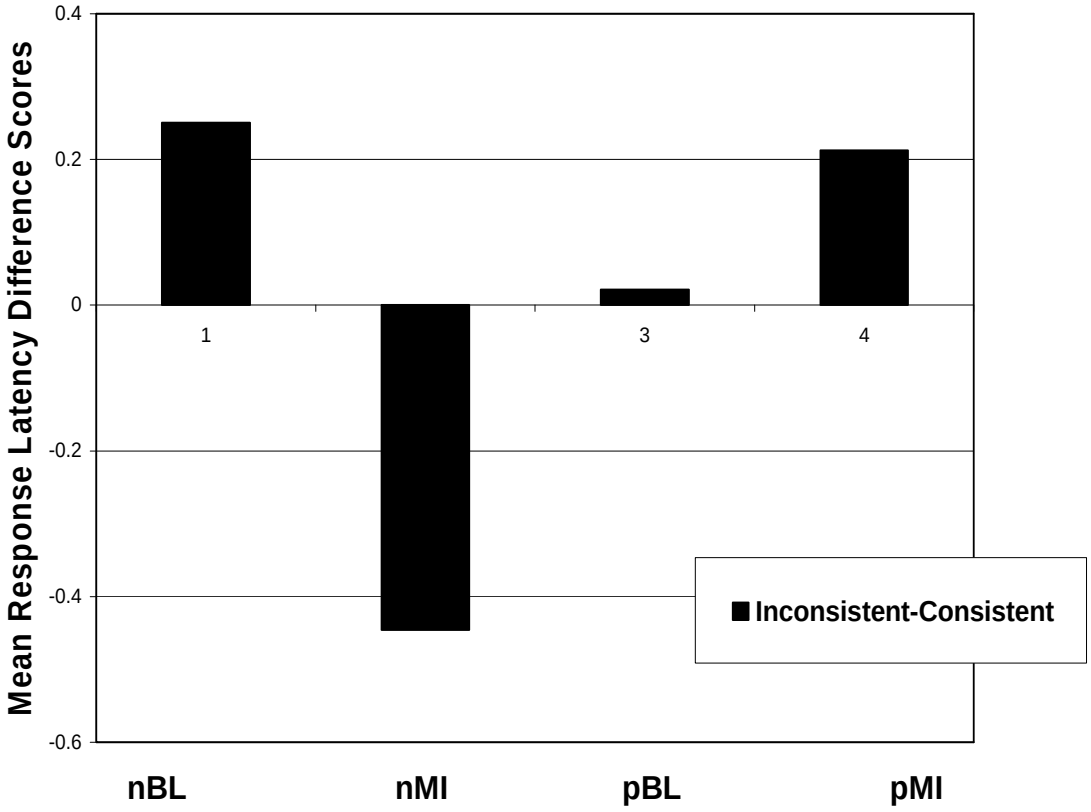

Figure 2. Performance of one participant as an example of pattern reversal. Response latencies were faster during the consistent phase than the inconsistent phase for the negative baseline (nBL), positive baseline (pBL), and positive mood induction (pMI), conditions, but this pattern was reversed after negative mood induction (nMI) when response latencies were faster during the inconsistent phase.

Figure 3

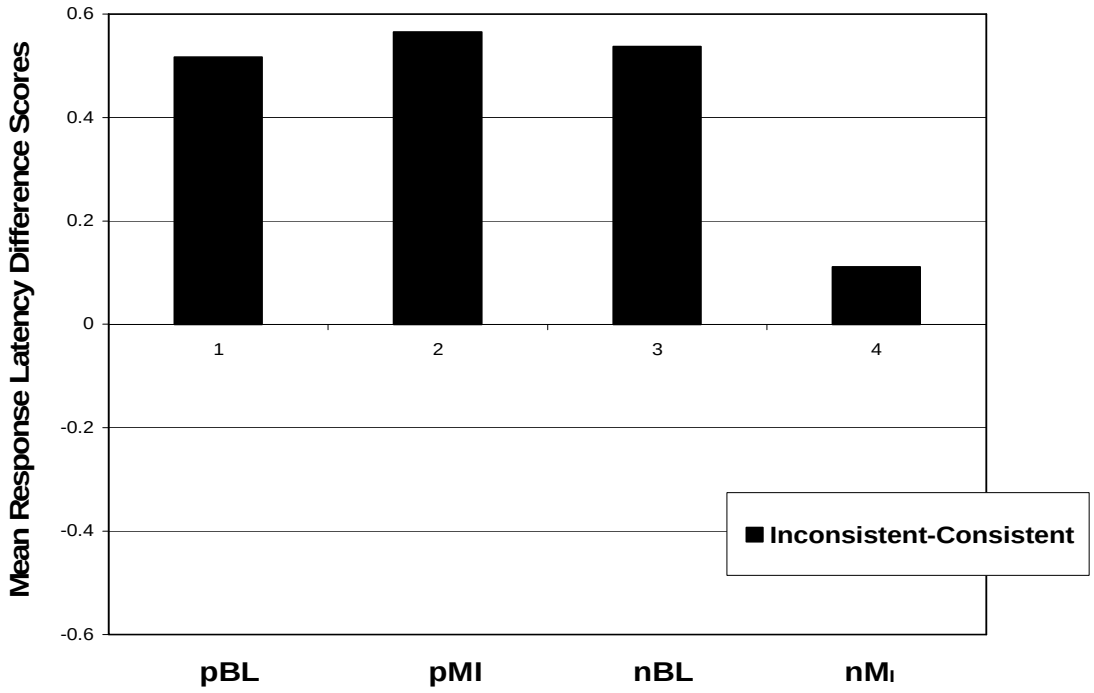

Figure 3. Performance of one participant as an example of a trend toward the reversal effect. Although response latencies were faster in the consistent phase across all conditions, the difference between consistent and inconsistent phase response latencies narrowed after negative mood induction.

cognitive activities after both positive and negative mood induction, the difference between reaction times for pleasant and unpleasant activities was smaller when they reported a negative mood than it was when they reported a positive mood. This reduction in reaction time difference is in line with the expected effect. Furthermore, when data for these six participants were aggregated, an overall pattern of reversal was demonstrated (see Figure 4).

These data were compared to the remaining 24 No Mood Group participants. This comparison was made in order to determine that the performance between those who reported mood changes and those who did not was in fact due to differential influence of the mood-induction procedures. When analyzed individually, 11 of these participants showed no clear pattern reversal or of a trend toward pattern reversal as described above. These data were quite variable, with no indication of effects clearly related to the mood-induction procedures. The other 13 participants did show either a pattern reversal (seven participants) or a trend toward pattern reversal (six participants), however. Additionally, aggregated data for the No Mood Group indicated an overall pattern reversal, although more slight than that observed in the Mood Group (see Figure 5).

Follow-up Analyses

In order to test whether these unexpected effects were driven by participants whose reported VAS scores were close to, but above, the negative mood criteria cut off ($\leq$33), further analyses were carried out. In other words, it might have been the case that the mood criteria set in this study was not sensitive enough to identify all the participants who were affected by both mood inductions, in effect creating an “Almost Mood” Group.

Figure 4

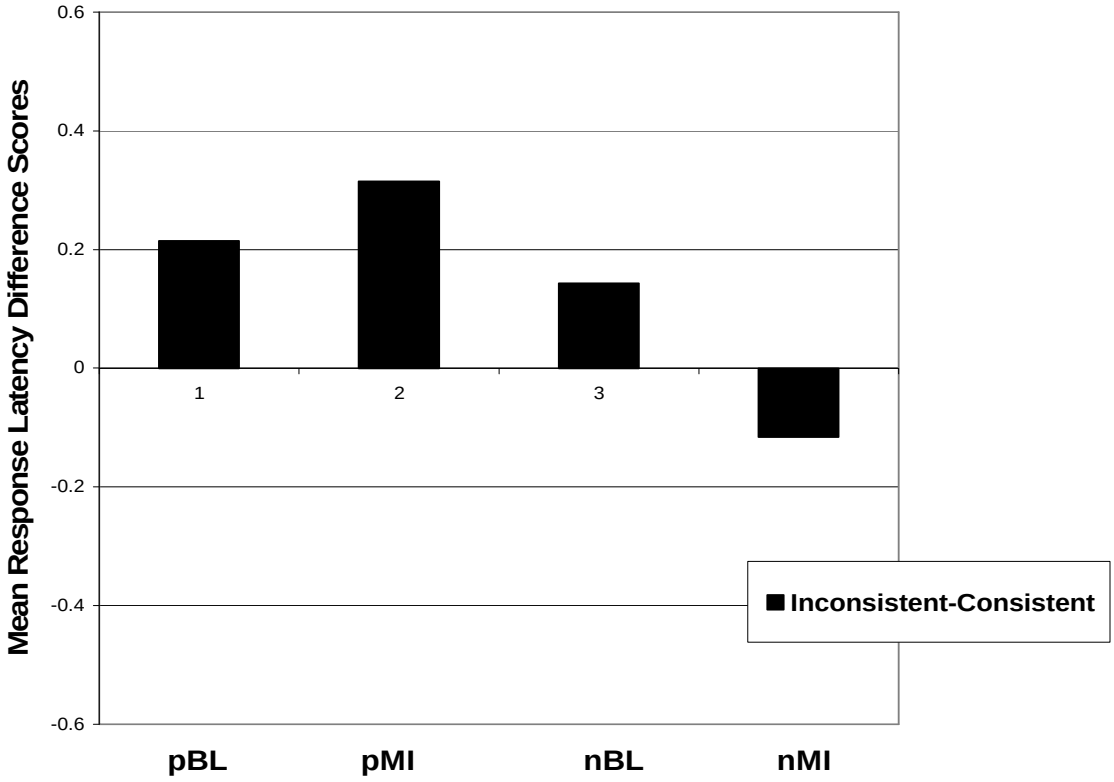

Figure 4. Aggregated data from the six Mood Group participants. Reversal effect observed.

Figure 5

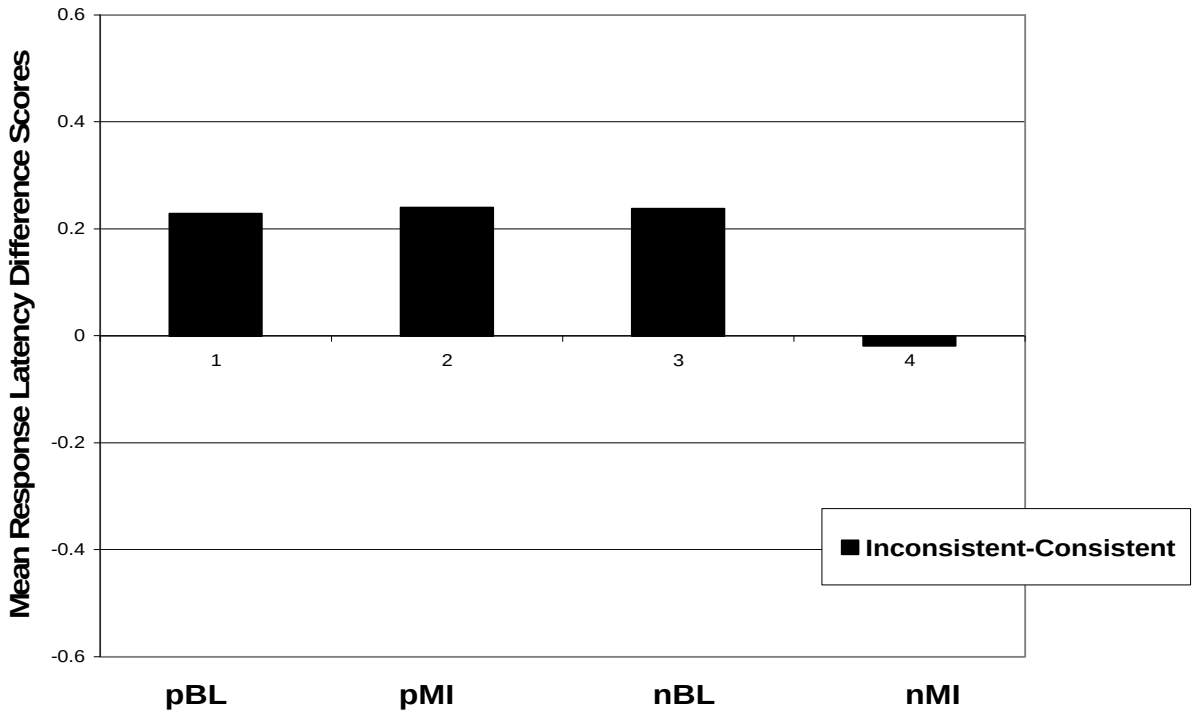

Figure 5. Aggregated data from the 24 No Mood Group participants. Reversal effect observed.

If that were true, then participants whose VAS scores were close to the cutoffs may have shown the expected IRAP effects resulting in the observed reversal effects in this group.

To examine this question, the data from the 24 No Mood Group participants were divided into four subgroups: those who reported VAS scores ≥67 across all experimental conditions (i.e., never negative or neutral); those who reported VAS scores ≥50 across all experimental conditions (i.e., never negative); those who reported VAS scores ≥40 across all experimental conditions (i.e., near negative) , and a final group of participants who fell short of meeting criteria for both moods by 3-11 points on the VAS (Almost Mood Group). The second group included participants from the first group, and the third group included participants from the former two groups. The fourth group included six participants from the ≥40 group, but also included participants not included in any of the three other groups—those who had VAS scores from 36-39 after negative mood induction and one participant who reported a negative mood (VAS = 25), but was 3 points shy of meeting criteria for positive mood after induction (VAS = 64). This resulted in subgroups of 8, 13, 21, and 10 participants.

Data for each group was aggregated across participants and all four groups showed the reversal effect. Of particular interest, there was a linear trend in the opposite direction of what was expected. The largest reversal effect was observed in the group reporting the most positive mood (≥67) across conditions, followed by the next most positive mood (≥50) group, followed by group with VAS scores ≥40 across conditions, followed by the group of participants almost meeting criteria for both mood inductions. Thus, participants who reported exclusively positive moods throughout the study performed more similarly to the six Mood Group participants than those participants

reporting neutral to positive moods—despite the fact that scores for the latter group were sometimes as close as three points from meeting the negative mood criteria.

Statistical analyses were performed to determine the level of significance of the effects reported above. Difference scores were analyzed within the Mood (6 participants) and No Mood (24 participants) Groups to determine whether there were significant performance differences between the IRAP phases. Paired-samples t-tests for six comparisons were made for each group and data are summarized in Tables 1 and 2.

Table 1

Paired-samples T-test Comparisons for Mood Group IRAP Data

D-Scores Compared	M	t	df	p-value	
posBL • posMI	.0999	-2.349	5	.066	two-tailed
posBL • negMI	-.3303	5.055	5	.002[a]	one-tailed
posBL • negBL	-.0717	.487	5	.647	two-tailed
posMI • negBL	-.1716	1.002	5	.362	two-tailed
negBL • negMI	-.2586	1.915	5	.057	one-tailed
posMI • negMI	-.4303	4.758	5	.0025 [a]	one-tailed

Note. pos = positive; neg = negative; BL = baseline; MI = mood induction
[a] Significant difference with Bonferroni adjustment (.05/6)than unpleasant cognitive

Table 2

Paired-samples T-test Comparisons for No Mood Group IRAP Data

D-Scores Compared	M	t	df	p-value	
posBL • posMI	.0114	-.156	23	.877	two-tailed
posBL • negMI	-.2470	2.711	23	.012	two-tailed
posBL • negBL	.0090	-.114	23	.910	two-tailed
posMI • negBL	-.0024	.027	23	.978	two-tailed
negBL • negMI	-.2561	2.542	23	.018	two-tailed
posMI • negMI	-.2585	2.530	23	.019	two-tailed

Note. pos = positive; neg = negative; BL = baseline; MI = mood induction
[a] Significant difference with Bonferroni adjustment (.05/6)

Despite the observations noted above regarding the similarity of performance between the Mood and No Mood Groups, the a priori hypothesis for the No Mood Group was that there would be no difference in response latencies across conditions; therefore, all tests conducted were two-tailed. As in the AQ data analyses, two-tailed tests were used for Mood Group comparisons in which no differences were predicted (between the positive and negative baselines and between each baseline and positive mood induction), while one-tailed tests were used when there was a hypothesized direction of difference (between each baseline and the negative mood induction and between the positive and negative mood inductions).

As illustrated in Table 1, findings were generally as expected for the Mood Group analyses. There were no differences in IRAP performance between the positive and negative baselines, or between each baseline and the positive mood induction. As for directional effects, the Mood Group showed larger differences in reaction time (between consistent and inconsistent IRAP phases) at positive baseline than after negative mood induction, and also after positive mood induction compared to after negative mood induction. In other words, participants responded faster to pleasant cognitive activities than unpleasant cognitive activities during positive baseline and positive mood. Simultaneously, they responded faster to unpleasant cognitive activities than pleasant cognitive activities after negative mood induction. Contrary to expectations, differences in reaction times between the negative baseline and negative mood induction were not significant.

The No Mood Group analysis is shown in Table 2. No significant effects were observed, but there was a trend toward significance for three comparisons. This pattern corresponds with the unanticipated reversal effect discussed above.

Taken together, these effects indicate a change in reported preferences for activities such that pleasant activities were reported as less reinforcing after negative mood induction, while unpleasant activities were reported as more reinforcing. Similarly, after positive mood induction, pleasant activities were reported as more reinforcing and unpleasant activities were reported as less reinforcing.

Because both Mood and No Mood Groups showed an overall reversal effect, a one-way ANOVA was carried out to examine whether there were significant differences in performance on the IRAP blocks (i.e., inconsistent/consistent phases at four time points). This analysis revealed no significant between-group differences at positive baseline, [$F(1, 28) = .001$, $p = .979$]; after positive mood induction, [$F(1, 28) = .271$, $p = .607$]; at negative baseline, [$F(1, 28) = .361$, $p = .553$]; or after negative mood induction, [$F(1, 28) = .438$, $p = .514$].

Given the lack of differences between the groups, it was decided to analyze the data of all participants together. Paired-samples t-test results for the AQ are summarized in Table 3. In line with predictions, mean AQ scores were significantly lower after negative mood induction compared to positive baseline, negative baseline, and positive mood induction. Additionally, there were no significant differences between mean AQ scores after positive mood induction and at negative baseline, or between mean AQ scores at positive baseline and at negative baseline. Unexpectedly, differences between

Table 3

Paired-samples T-test Comparisons for AQ scores: All Participants

D-Scores Compared	M	t	df	p-value	
posBL • posMI	-.5678	-2.831	29	.008[a]	two-tailed
posBL • negMI	.5868	3.685	29	.0005[a]	one-tailed
posBL • negBL	-.4772	-2.589	29	.015	two-tailed
posMI • negBL	.0903	.740	29	.465	two-tailed
negBL • negMI	1.064	5.458	29	.0000035[a]	one-tailed
posMI • negMI	1.154	5.084	29	.00001[a]	one-tailed

Note. pos = positive; neg = negative; BL = baseline; MI = mood induction
[a] Significant difference with Bonferroni adjustment (.05/6 = .008)

mean AQ scores at positive baseline and after positive mood induction reached significance.

With regards to the IRAP, data aggregated across all 30 participants show an overall reversal pattern consistent with the results reported above, although the pattern is less distinct (see Figure 6). Specifically, reaction time differences between consistent and inconsistent conditions were slight (~0.01s) at positive baseline and after positive mood induction. In contrast, the typical reaction time differences for the previously-reported grouped data at positive baseline and positive mood induction were between 0.2-0.3s.

Finally, paired-samples t-test comparisons of IRAP data were made, with predicted effects equivalent to those of earlier comparisons. As illustrated in Table 4, significance occurred as expected. Specifically, mean reaction time differences were significantly greater at both baselines as compared to negative mood induction, and post positive mood induction when compared to post negative mood induction. No significant differences were observed in mean reaction times between positive and negative baselines, or between each baseline and positive mood induction.

Table 4

Paired-samples T-test Comparisons for IRAP Data: All Participants

D-Scores Compared	M	t	df	p-value	
posBL • posMI	.0270	-.453	29	.654	two-tailed
posBL • negMI	-.2659	3.603	29	.0005[a]	one-tailed
posBL • negBL	-.0094	.136	29	.893	two-tailed
posMI • negBL	-.0363	.456	29	.652	two-tailed
negBL • negMI	-.2566	3.052	29	.0025[a]	one -tailed
posMI • negMI	-.2929	3.483	29	.001[a]	one -tailed

Note. pos = positive; neg = negative; BL = baseline; MI = mood induction
[a] Significant difference with Bonferroni adjustment (.05/6 = .008)

Figure 6

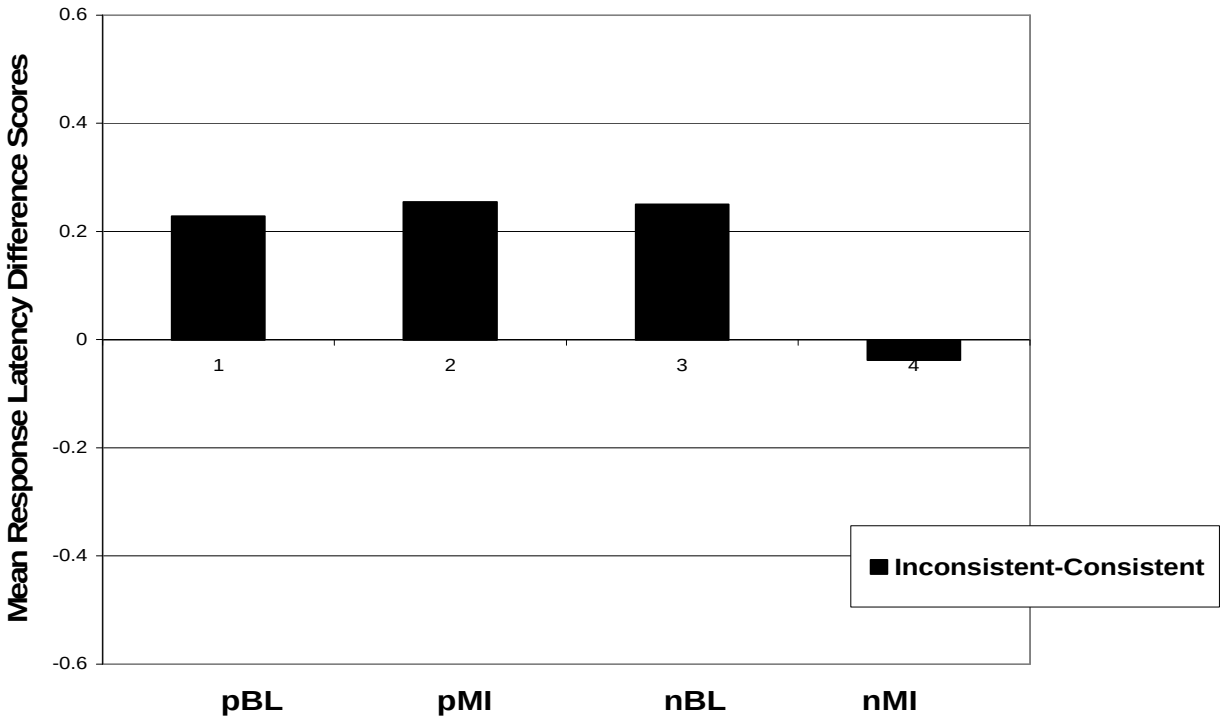

Figure 6. Aggregated data from 30 included study participants. Reversal effect observed.

Discussion

This study aimed to show the motivational effect of mood-altering verbal events on consequential functions. Few studies have focused on changes in the reinforcing value of activities as a result of verbal events, and the findings presented here provide preliminary support that verbal mood-altering events can function as motivating operations. Hypothesized effects regarding the differential reinforcement value of pleasant and unpleasant overt and covert activities after positive and negative mood induction were demonstrated. Pleasant activities were more reinforcing after positive mood induction and less reinforcing after negative mood induction, when unpleasant activities increased in reinforcing value.

The initial data analysis suggested that the mood-induction procedures were not very effective for the majority of this sample of never-depressed people. However, expected effects were demonstrated for the 6 Mood Group participants (20%) who reported successful positive and negative mood induction, lending credence to claims that mood-changing events can alter the reinforcing function of certain activities. Both explicit report on the activities questionnaire, and implicit data from the IRAP showed variation of consequential function post mood induction.

As hypothesized, pleasant activities were more reinforcing than unpleasant activities after positive mood-induction procedures, while unpleasant activities were more reinforcing than pleasant activities after negative mood induction procedures. Scores for the activities questionnaire indicated a significant decrease in reinforcement value of pleasant activities after negative mood induction. Also, the IRAP data showed pattern reversal or trends toward reversal for all Mood Group participants individually, and also

when data were aggregated. Significant differences in response latencies indicated that Mood Group participants preferred pleasant cognitive activities over unpleasant cognitive activities following positive mood induction and preferred unpleasant cognitive activities following negative mood induction.

The observed pattern of results for these remaining 24 No Mood participants (80%) were perplexing, however, and appeared incongruent with this study's original predictions. AQ scores were significantly lower after negative mood induction than at baseline, and there was a trend for significantly lower scores compared to post positive mood induction scores. These scores indicate a decreased reinforcement value of pleasant activities post negative mood induction. Additionally, several No Mood Group participants (65%) showed a pattern reversal or trend toward reversal for cognitive activities, and aggregated IRAP data further correspond with this observation. No Mood participants reported thinking about unpleasant events as more reinforcing than thinking about pleasant events after negative mood induction and thinking about pleasant events as more reinforcing than unpleasant events after positive mood induction.

These results are inconsistent with the a priori predictions that were based on the assumption that the VAS would serve as an independent variable manipulation check. As such, VAS scores were expected to differentiate those for whom the mood procedures were functioning as a motivating operation from those for whom they were not. Thus, it was hypothesized that participants not reporting both positive and negative mood states (No Mood Group) would not show mood congruent changes in the reinforcing value of pleasant activities on the explicit measure (AQ) or with regard to implicit cognitive activities (IRAP).

However, both groups—those meeting VAS mood criteria for both positive and negative mood, and those not meeting criteria—performed similarly. Specifically, participants in both groups showed an overall shift from preference for pleasant activities after positive mood induction to a preference for unpleasant activities after negative mood induction. In other words, the mood induction procedures appeared to differentially affect reinforcing value of both overt and covert pleasant and unpleasant activities, even when participants were not reporting an affective change.

In accounting for these data, one possibility is that the mood-induction procedures are not accounting for the observed effects and that the data are an artifact of experimental procedures or other confound. However, given the consistency of the data, a more likely explanation of the data is that the a priori assumption that the VAS was a valid independent variable check may have been faulty. In fact, the purpose of using the IRAP in this study was to bypass problems with explicit verbal report.

Recent research has highlighted the discrepancies between IRAP effects and explicit reports when examining social biases (Power, Barnes-Holmes, Barnes-Holmes, & Stewart, 2009). Although this study investigated mood-congruency effects rather than social biases, it makes sense that the results would show the same divergence. This is especially the case given the IRB restrictions, which limited recruitment to individuals with no reported history of depression. Perhaps, people who have never been depressed actively work to change affective states, such that during or after the mood-induction procedures these people were engaging in "negative mood reversal" strategies. Evidence for such mood management strategies—actively seeking out mood-*in*congruent activities or material—has been documented for clinically- and experimentally-depressed people

(Bower & Forgas, 2000; Swinkels & Giuliano, 1995). Then again, given that the procedures appear to have had an effect on the reinforcing value of pleasant and unpleasant actvities, this explanation seems unlikely.

A more probable account is that individuals who have never been depressed are less aware of their negative affective states and/or are more reluctant to report negative mood states. This could explain the changes in reinforcement value for overt and covert pleasant and unpleasant activities, despite the lack of negative mood reported on the VAS. These participants may not recognize a shift toward negative mood or may not label these feelings negatively, but nonetheless they don't feel as motivated to engage in pleasant activities or thinking patterns. This fits with the unanticipated observation that participants who reported positive mood states (VAS $\geq$ 67) across all conditions of the study performed most similarly to those who reported negative affect after negative mood induction. This subset of participants was the least likely to report feeling bad, but their IRAP data indicate that pleasant and unpleasant activities were differentially potentiated as reinforcers.

This suggests that the attributions or interpretations of private experiences that individuals make could influence their report of these experiences, such that for the never-depressed participants in this study, a lack of perceived negative affective state resulted in not reporting VAS scores less than or equal to 33. A study comparing agoraphobic participants to simple phobic and non-disordered control participants found that agoraphobics were more likely to excessively attend to physiological arousal and interpret these sensations as catastrophic (Belfer & Glass, 1992). They noted that agoraphobic participants seemed to have an impoverished or overgeneral repertoire for

labeling emotions, such that all sensations were interpreted negatively, which further increased and maintained their anxiety.

Similarly, Mellalieu, Hanton, and Jones (2003) highlighted the importance of interpretation or attribution of negative affective states related to sports competition. They found that negative affective states like nervousness and anxiety had a facilitative effect on preparation for competition and sports performance when these states were paired with interpretations like motivated and focused. Alternatively, when paired with interpretations such as tense and tired, these same negative affective states had a debilitative effect. Likewise, it may be that while affective changes were not labeled negatively, participants nevertheless experience changes in the reinforcing value of pleasant and unpleasant activities after mood induction procedures.

Along similar lines, individuals who are depression-resilient may be more accepting of their mood changes, including decreased negative reaction and resistance to negative affective states, than those who are not. This fits with theories of emotional avoidance (Belfer & Glass, 1992; Hayes, Wilson, Gifford, Follette, & Strosahl, 1996) that propose that resistance to having negative feelings worsens the negative feelings. Thus, it could be that people get depressed are more sensitive to mood changes, interpret these changes negatively, and attempt to “not have” the feelings. Emotional avoidance may actually foster depression, and people who don’t label their emotions negatively or attempt to control them are protected from depressive episodes.

In hindsight, it makes little sense to rely of the VAS as the measure of mood-induction effectiveness, especially given that the participants have never reported episodes of depression. Furthermore, the premise of this investigation dealt less with

affective quality than the effect of antecedent events on the value of reinforcement. Both the AQ and IRAP show predicted changes in reinforcing value of activities between the different mood-induction procedures, and could therefore be considered more relevant measures of independent variable effectiveness.

Given this realization, interpretation of post-hoc analyses makes the most sense in determining the effect of mood-induction on consequential function. When analyzed together, the power to detect an effect was increased, especially since only 6 participants were included in the Mood Group analysis. Post-hoc analyses revealed clear effects of the mood induction on the reinforcing value of pleasant and unpleasant activities, especially in regards to implicit relations.

First, AQ scores for the full sample indicate decreases in the reinforcing value of pleasant events after a negative mood induction, and increases in reinforcing value after positive mood induction. Scores were significantly higher after positive mood induction than after negative mood induction. Although a priori hypotheses predicted no differences between baseline and positive mood induction conditions, participants did report significantly higher scores on the AQ after positive mood induction when compared with the positive baseline. This observation lends support to the conceptualization of verbal events as motivating operations, however, because it suggests that pleasant activities were increasingly reinforcing as a function of positive verbal statements.

Analysis of IRAP data from all 30 participants also showed a pattern of results fully in line with predictions. Response latencies indicate that positive and negative mood induction differentially affected the reinforcing value of pleasant and unpleasant

cognitive activities. Pleasant cognitive activities were more reinforcing than unpleasant cognitive activities after positive mood induction, whereas unpleasant cognitive activities became more reinforcing after negative mood induction.

Both the AQ and IRAP data are especially interesting considering that most participants (80%) did not report a change in affective state. It appears that mood state and consequential function may be more independent of each other, and more dependent on environmental events than some theoretical accounts propose. Participants did not have to be in a positive or negative mood state to show preference for pleasant or unpleasant activities. The reinforcing value of pleasant and unpleasant activities changed regardless of the mood state reported, based on contact with verbal environmental events. Altogether, these findings support the claim that verbal antecedent events (mood-induction procedures) can function to alter the reinforcing value of activities, thus contributing to existing evidence that they function as motivating operations.

Limitations and Future Directions

Although the findings of this study are encouraging, its limitations should be addressed. First, this study did not include a “no mood induction” control group. Therefore, it is difficult to conclude definitively that the AQ and IRAP changes were due to the mood-induction procedures and not another experimental variable. It was initially thought that the No Mood Group produced by the VAS scores would serve as a control group, however, given the errors in this thinking the need for study procedures without a mood induction was illuminated.

For instance, it could be that the observed effects are the result of stimuli familiarity or recency of contact, rather than a legitimate change of consequential

function due to mood-induction procedures. The specific stimuli used in the mood induction, AQ, and IRAP task were not the same, however, but nonetheless future studies differentiating these effects are necessary. Dasgupta et al. (2003) summarize promising evidence in this regard from studies using the IAT. Investigators will have to perform similar examinations of the IRAP effects to rule out familiarity of stimuli as the explanation for observed effects.

Another limitation of this study was the allowance of variability in the IRAP response latencies. Although average latencies were typically between 2-3 seconds, placing stricter limits on the acceptable range of reaction times would increase the certainty that responses reflect implicit cognition rather than more deliberate responses. In a recent study, Barnes-Holmes et al. (2010) observed that requiring participants to respond in under 2 seconds to IRAP trials increased internal reliability and produced significantly greater implicit stereotyping effects.

This study is one of the first to utilize the IRAP in this manner. First, although the data were ultimately grouped for analysis as is typically done, individual data was also examined. More research is needed to validate the use of the IRAP to assess individual performance. In addition, this study utilized a repeated-measures design to examine malleability of IRAP performance related to verbal mood-altering antecedent events, whereas previous studies have investigated existing social biases. Despite the promising results indicating the usefulness of using the IRAP in this way, more studies are needed and further research in this direction could show the IRAP as a helpful clinical tool.

This is especially true given evidence that depressive symptoms are correlated with reduced disclosure of affective state (Jänsch, Harmer, & Cooper, 2009; Kahn &

Garrison, 2009). Accurate assessment of emotional states and emotional dysregulation, is likely to contribute to increased effectiveness in targeting clinically important behavioral repertoires. For some depressives, the problem may lie in reluctance to report private experiences, therefore reducing the effectiveness of psychotherapy that often relies upon such report. For others, the problem may be a lack of emotional awareness or emotional differentiation skills, or active attempts to avoid negative affective states. Treatment targets will be different depending on the specific issue. In a recent study, the IAT distinguished suicidal patients from non-suicidal distressed psychiatric patients and moreover, had superior predictive validity for future suicide attempts (Nock et al., 2010). This further underscores the importance of implicit assessment, because suicidality is often denied and is particularly difficult to predict. Using various stimulus and relational pairings, IRAP procedures could also be potentially useful in assessing specific client difficulties, including suicidality.

Future studies in the area of mood and motivation should also include participants who have histories of depression or anxiety, so as to compare performance of people who label changes in affective states with those who do not. Additionally, including a measure of emotional avoidance could highlight the role of this behavior in the observed effects.

Finally, research using actual engagement in pleasant or unpleasant activities as a dependent variable with pre and post measures of enjoyment would be informative. It would be interesting to see the connection between reported preference (i.e., reinforcing value) and overt behavior, as well as look at the subsequent effect on enjoyment of activities. Studies like this might have treatment implications about which events have the greatest potency as motivating operations.

In summary, this study contributes to empirical evidence that verbal mood-altering events can function as motivating operations. Specifically, the effect of these events on consequential function was examined and data show that positive mood-induction procedures establish pleasant activities as reinforcing and negative mood-induction procedures establish unpleasant activities as reinforcing.

APPENDICES

Appendix A: Demographics Questionnaire

Appendix B: Negative Mood Induction

Appendix C: Positive Mood Induction

Appendix D: Activities Questionnaire

Appendix A

DEMOGRAPHICS QUESTIONNAIRE

AGE: ETHNICITY:

CURRENT MEDICATIONS:

- Please describe length, duration, and nature of any previous episodes of depression:

- How were these episodes treated?

Appendix B

Negative Mood Induction

1. I feel down today.
2. I feel like it is all such a waste.
3. Even my best efforts aren't good enough.
4. I feel empty inside.
5. Things will only get worse.
6. I am overwhelmed by disappointment.
7. Nobody wants to be around such a failure.
8. I am misunderstood.
9. No one listens to me.
10. I am pathetic.
11. I feel ashamed of my life.
12. I feel completely incompetent.
13. No one really cares about you.
14. My work is harder than I expected.
15. Everyone else has more fun.
16. Sometimes I feel so guilty that I can't sleep.
17. No one likes the real me.
18. I feel like everything I do is wrong.
19. I doubt I'll ever make a contribution to the world.
20. I'm never going to get out of this rut I'm in.
21. I've made too many mistakes.
22. Life is such a heavy burden.
23. I'm tired of trying.
24. I don't think things are ever going to get better.
25. I feel worthless.
26. What's the point of trying?
27. Even my parents don't know who I am.
28. I feel cheated by life.
29. Why try when I can't make a difference anyway?
30. Every time I turn around, something else goes wrong.
31. There is no hope.

Appendix C

Positive Mood Induction

1. I feel energized.
2. I know if I try I can make things turn out well.
3. My dreams are possible.
4. The world is full of opportunity and I'm taking advantage of it.
5. It's great to be alive!
6. I bet things will go well the rest of the day.
7. I have the right attitude—nothing can get me down.
8. Most people like me.
9. I have great friends.
10. I can make things happen.
11. My parents are very pleased with me.
12. I can get the things I want in life.
13. I feel creative.
14. Nothing can bring me down.
15. I'm effective at solving problems.
16. Things look totally awesome.
17. I get along well in the world.
18. The relationships I have now are the best I've ever had.
19. Things get better all the time.
20. I work hard and I can make any situation turn out right.
21. I feel complete and whole.
22. I can't remember when I felt so good.
23. I'm going to have it all.
24. I know I can do it.
25. I'm going to seize the day!
26. People appreciate my sincerity.
27. I am proud of how I've lived my life.
28. My future is bright.
29. People like my ideas.
30. I'm in charge of my life and I like it that way.
31. Life is a blast!

Appendix D

Activities Questionnaire

AQ

Based on how you are feeling right now, please use this scale to rate *how much you would* **like** *to:*

0----------1----------2----------3----------4----------5----------6
not at all **a lot**

Smile or Laugh:

Work toward my goals:

Relax:

Go to a party:

Compliment myself:

Spend time with friends:

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