THE DEVELOPMENT AND TESTING OF A MULTI-COMPONENT EMOTION
INDUCTION METHOD

DISSERTATION

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By

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ABSTRACT

The purpose of this research was two-fold. First, I attempted to develop and test a method to induce discrete emotional states (anger, fear, and disgust) in experimental participants using visual and physical stimuli. Second, I intended to assess the effect of the emotional induction manipulation on participant’s appraisal of, and approach tendencies toward, a novel/ambiguous situation and/or target individual/group.

The design of this induction method draws from multi-component theories of emotion, specifically, emotion appraisal, action tendencies, and embodiment theory. The multi-component appraisal theory of emotion describes emotional experience as arising from visceral reaction, cognitive appraisal, physiological arousal and proprioceptive cues. Theories of emotion action-tendencies suggest that discrete appraisal patterns yield the experience of discrete emotional states which in turn lead to predictable response tendencies. For example, one straightforward emotion action-tendency is to avoid a stimulus that elicits a feeling of disgust or fear. Embodiment theory suggests that emotion-relevant information is available to one not only in the form of cognition, but across many modalities. Of interest to the design of the present study is the information that one may derive from bodily sensations such as proprioceptive feedback and general physiological arousal.
By manipulating the cognitive component of emotion along with general physiological arousal and proprioceptive cues via participant experience of approach or avoidance, I endeavored to create an emotional state that would be outside of participant awareness and would be projected onto a target. Based on multi-component theories, I hypothesized that when one performs an action theorized to be consistent with the presentation of an emotion-evoking stimulus (e.g., avoiding a shark), the projected emotional experience would be intensified.

To test this hypothesis, a series of pilot studies and a full implementation study were conducted. The initial pilot study yielded little in the way of significant effects and was subsequently decomposed into its individual elements in a series of component tests. The component testing results led to a significant redesign of the methodology employed in the full implementation study.

The results of the full implementation study lend some support to the theories from which this method was conceived and designed, but also suggested some important modifications. Most of the findings of interest were obtained from the conditions designed to elicit the emotion of fear. Although no effects were found on specific projected ratings of fear, a higher frequency of fear response endorsements on the open-ended measure was observed in the “inconsistent” fear/step forward condition, counter to my prediction that emotion would be intensified in the consistent conditions (i.e., fear/step back). It was also found that participant ratings of discomfort were elevated
when they had enacted an approach response to a fear-evoking stimulus. These effects were obtained for female participants only. For male participants, the opposite was true: avoiding a fear-evoking stimulus created increased discomfort. These findings are not inconsistent with the basic premise of embodiment theory, namely that multiple information sources inform one’s experiential state. However, they do suggest that one moderator of the effect of bodily feedback on experienced emotion is the consistency between action tendencies and the socially expected response.

Overall, the results of these studies suggest that emotion theory in general, and theories of emotion action tendencies specifically, should be broadened to include a wider range of information that informs emotional experience as well as emotional response.
Dedicated to all those who find little satisfaction in the reflections at the surface and dive deep to experience the wonder of the complexities below.
I wish to thank my adviser, Marilynn Brewer for her tireless efforts in assisting me with this project.

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CHAPTER 1
A REVIEW OF EMOTION INDUCTION THEORY AND METHODS

The purpose of this research is two-fold. First, I am attempting to develop and test a method to induce discrete emotional states in experimental participants using visual and physical stimuli. Second, I intend to assess the effect of the emotional induction manipulation on participant’s appraisal of, and action orientation toward another person in an ambiguous situation.

Background to this Investigation

The relationship of experienced emotion to judgments of individuals and groups has a long history in social psychology. Emotion-influenced judgments include (but are certainly not limited to) intolerance, suspicion, prejudice, and perceived appropriateness of punitive responses. Intolerance and suspicion are thought to be the result of increased disgust, anger, and fear generated by perceptions of both symbolic and realistic threats (Maddux, Galinsky & Polifroni, in prep; Rucker, Polifroni, Tetlock & Scott, 2004; Stephan et al, 2002). The experience of prejudice and prejudiced responses to outgroups (as well as individual outgroup members) is strongly associated with one’s emotional reaction to an outgroup (Allport, 1954). Whether we decide to approach or avoid an outgroup is dictated by the emotion we experience toward that social group (Alexander,
Brewer, & Herrmann, 1999; Alexander, Brewer, & Livingston, 2005; Mackie, Devos, & Smith, 2000). How we decide to punish transgressors and to what degree we punish them, has been shown to be influenced by our emotional reaction to those transgressors such that increased anger leads to increased punishments (Goldberg, Lerner, & Tetlock, 1999; Lerner, Goldberg & Tetlock, 1998; Rucker, Polifroni, Tetlock & Scott, 2004).

In my past studies of punitiveness toward transgressors, the extent to which punitive responses are mediated by emotions other than anger has proved to be an experimentally difficult connection to make. My attempts at manipulating emotions other than anger have largely resulted in an absence of significant effects. Angry experimental participants have been shown to favor more aggressive punitive strategies (e.g., hard labor and minimal amenities) as reflective of the retributive theory of justice (Rucker, Polifroni, Tetlock & Scott, 2004). The question of interest that remains unanswered is whether fearful jurors will favor incarceration (e.g., long sentences and minimal opportunity for reentry into society) as reflective of incapacitation theories of punishment. Attempts to answer this question in previous research have led to my dissatisfaction with existing emotional induction paradigms, particularly in the case of inducing fear, and have therefore prompted my quest for an emotion induction method that will reliably induce discrete emotional states.

If such a method could be developed, its utility is not confined to the study of the effect of discrete emotional states on punishment preferences. Another arena of experimental inquiry in which I have participated is the influence of appraisals of outgroup characteristics that yield specific emotional responses to that outgroup. For example, image theory suggests that appraisals of relative strength, goal compatibility,
and status affect one’s emotional response to a particular outgroup (Alexander, Brewer, & Hermann, 1999). However, few relationships in the real world are unidirectional, so it is possible that one’s experience of a specific emotion toward an outgroup might affect one’s appraisals of the outgroup. For instance, it has been demonstrated that an appraisal of an outgroup as having equal strength, goals that signal competition in a zero-sum game, and whose status is equal to that of the ingroup elicits anger toward that group (Alexander, Brewer, & Herrmann, 1999). Is it true as well that when one experiences anger toward a group, that one’s appraisals of the outgroup’s standing on those dimensions will be shaped by that emotional experience? Or in the case of a fearful reaction to an outgroup, would this influence one’s perception of that outgroup as being stronger than the ingroup?

The effect of one’s experienced emotion on the perception of others as well as one’s response to those others is common to these diverse areas of research. To facilitate further study of such effects, an effective method of inducing discrete emotional states in experimental participants would be of great benefit. My proposed emotion induction method, inspired by an integration of multi-component theories of emotion, will combine cognitive and proprioceptive cues under conditions of moderate physiological arousal to create specific emotional states in experimental participants.

In the sections that follow, I will review and discuss individual components of emotional experience that underlie my efforts to create this multi-component method of emotion induction. I will begin by differentiating different types of affective experience to support the existence of discrete emotional states. Following that is a review of existing emotion induction methods that are most closely related to the cognitive
component of my proposed multi-component method. Then I will discuss literature relevant to approach and avoidance that is relevant to the proprioceptive component of this method. The third component, physiological arousal, will then be discussed. In the final section of this chapter is a discussion and critique of emotion measurement methodology.

Differentiating Types of Affective Experience

Affective experience can be separated into three categories: positively or negatively-valenced evaluations, positive or negative moods, and discrete emotional states. Positive and negative evaluations are the basis of one’s attitudes toward attitude objects and represent a simple categorization of objects as relatively good or bad. These valenced evaluations are the simplest forms of affective experience, and can be described also as “sentiments” that reflect one’s evaluative predispositions to objects in the environment (Frijda, 1994; Lazarus, 1994).

There still exists a great deal of debate regarding the differentiation between moods and discrete emotional states.¹ The stance that guides the induction method described in this paper views moods, at their simplest conception, as distinguished by being either positive or negative experienced states that are diffuse, non-specific, and affect cognitive processing (Davidson & Ekman, 1994). In contrast to moods, emotions arise from a specific object, are discretely experienced, and bias action (Davidson, 1994). Emotions are adaptively beneficial based on their relationship to effective behavioral

¹ Beedie, Terry, & Lane (2005) have concluded that the distinction between mood and distinct emotion is a debate that should continue and is best informed by both naïve psychological theories and biological/neurological evidence. According to the authors, current stances on this debate are as much derived from one’s philosophical stance as from empirical evidence.
responses to environmental stimuli (Keltner & Gross, 1999; LeDoux, 1996; Zajonc, 1998). The nature of that adaptive response, in terms of approaching or avoiding the instigating stimulus, will be discussed in a later section.

Emotions are also more complex in their antecedents than moods. Differentiated emotions, according to appraisal theorists, result from differentiated and distinct patterns of cognitive assessments of the stimulus and its implications for the self (Frijda, Kuipers, & ter Shure, 1989; Roseman & Smith, 2001; Smith & Ellsworth, 1985). This appraisal process underlies the likelihood that the experienced emotion and subsequent elicited behavior will generate an effective response (Ellsworth & Smith, 1988; Smith, 1991). Appraisals can be the result of automatic or conscious processing (Roseman & Smith, 2001). Greater complexity can also be observed in the experience and consequence of an emotion compared to the experience of a mood. A multiple component view of emotions suggests that emotions contain the following components: conscious verbal reports, predictions/interpretations of one’s own behavior, activation effects, action tendencies, autonomic effects, and the interpretation of other’s behavior (Stapel, 2004). This complex, multi-component view of emotional experience inspires the emotion induction technique described in this paper and will be returned to later in the sections that follow.

A Review of Affect/Emotion Induction Manipulations

Emotion induction manipulations have generally been limited to paradigms that are heavily focused on the cognitive component of emotional experience. Typical of these manipulations are various techniques that subliminally or supraliminally prime semantic associates to the affective or behavioral state under study. One technique flashes positively or negatively-valenced words on a computer screen and assesses the rapidity to
which a participant can move a lever simulating approach or avoidant reactions as a measure of resultant affect (e.g. Chen & Bargh, 1999). In a test of the semantic approach to priming emotion, it has been demonstrated that while emotion concepts are successfully primed by such a technique, ratings of participant emotional experience can remain unaffected (Innes-Ker & Niedenthal, 2002).

In another emotion induction method, participants are exposed to emotion-evoking stories with or without accompanying photographs or video clips (e.g. DeSteno, Petty, Wegener & Rucker, 2000; Lerner, Goldberg & Tetlock, 1998; Roseman, 1984). Robinson and Clore (2001) tested the effects of emotion images compared to text descriptions of the same images and found little difference in emotion intensity ratings and emotion/appraisal correlations, suggesting that image and vignette methods might be equally effective. These are relatively easy manipulations to use in a laboratory setting and typically use a “two experiment” cover to separate the emotion induction from the subsequent task to which the induced emotion is projected. One disadvantage to these methods is that they are relatively idiosyncratic in their effectiveness. What might evoke anger in one participant can evoke fear in another. It is important when using these techniques to find stimuli that consistently and reliably induce the intended emotion and not activate other untended concepts that might influence responses to the manipulation. Another disadvantage to these methods is that they are potentially reactive. Because participants are consciously aware of the affect-laden stimulus, manipulation checks used to assess the effectiveness of the induction may do little more than tap into the participants’ naïve theory of emotion.
Yet another type of induction method requires the participant to write about (e.g. Lerner & Keltner, 2001, experiment 4) or recall (e.g. Frijda, Kuipers, & ter Shure, 1989) an emotion evoking event. One unique advantage of this method is that it is idiosyncratic and avoids possible within condition variability owing to differential participant interpretation of stimuli designed to evoke a given emotion. Unfortunately, it is retrospective and therefore possibly tainted by the participant’s experience that the emotion has passed and thus has an ephemeral or temporal quality. Participants may also engage in justificatory or defensive cognitions that further confound the retrospective reporting of the experienced emotion and/or its intensity (Frijda, 1993) or the emotion’s correspondence to appraisals related to that emotion (Rosenberg & Ekman, 1994).

Arguably more effective than the preceding methods (and at least less cognitive and more “visceral”), are experimentally manipulated emotion-evoking situations such as a confederate calling the participant an offensive name (Cohen, Nisbett, Bowdle & Schwarz, 1996). This technique arouses “real” emotion, but its effectiveness comes at the relatively higher cost of implementation (the use of confederates) or the possible direction of anger toward the experimenter (rather than the target). Additionally, if a similar technique were to be applied to the arousal of fear, Institutional Review Board approval of the experimental paradigm might be difficult if not impossible to obtain if one were attempting to induce an emotion of sufficient intensity (Lazarus, 1995). Even if the method was approved, in the case of fear, suppression of that emotional experience may result. In past research, experimental participants have remained sitting still while smoke is being pumped into the room in which they were seated, a manipulation that should evoke fear and an escape response (Latane & Darley, 1970). This leads to the
conclusion that even a compelling fear manipulation may be subject to a level of introspective interference and/or suppression.

In sum, pre-existing emotion induction methods have both strengths and weaknesses. The goal of the present research program is to develop, test, and demonstrate the effectiveness of a new emotion induction method that is synthesized from existing successful methods, and at the same time minimizes the shortcomings of those methods. This new method should create not only the cognitive component of emotion, but use proprioceptive cues, and general heightened physiological arousal as well. Additionally, it should possess the property of “sourcelessness,” allowing participants to misattribute (e.g. Schacter & Singer, 1962) and therefore project their emotional experience to a target (Zillman, 1983).

In recent research similar to my own, Stapel (2004) has pilot tested a method to induce discrete emotional states (disgust and fear) in experimental participants outside of participants’ conscious awareness. Participants are exposed to images on a computer screen where presentation rates are short enough (20 ms or less) not to allow conscious recognition of the images. For example, to induce disgust, participants are exposed repeatedly to the image of a very dirty toilet. These images are intended to operate viscerally and not rely on traditional semantic/associational priming paradigms such as flashing the word “disgust” on the screen as a stimulus, thus activating associational (and primarily evaluative) links to disgust rather than the visceral experience of disgust.

While this method uses emotion image primes in a way that is similar to my proposed multi-component method, as a single-component method it lacks the proprioceptive feedback and the physiological arousal that I feel will intensify the
emotional experience in experimental participants. Based on Stapel’s preliminary results, the effect of these shortcomings can be observed. To assess the effectiveness of the manipulation, Stapel used three types of dependent measures: word stem completion, projective scenarios, and emotion self-ratings. The effect of order in which two of these dependent measures were presented is highly informative about the effectiveness of the manipulation. When the word stem completions of semantic associates were presented first and the projected scenario was presented second, participant emotion responses to the projective scenario were consistent with the emotion prime condition. But when the projective scenario preceded the word stem completions, participant responses to the projective scenario were not significantly affected by emotion prime condition (Stapel, 2004). It may be that the word stem completions served as a semantic “booster” to the successful manipulation of projected participant emotion responses to the projective scenarios. If this is the case, the use of emotion image primes alone (i.e., as a single component manipulation) may offer little beyond what has been achieved through previous methods that function via semantic activation.

I feel that this emotion induction method can be considerably strengthened. In particular, this method can be elaborated to incorporate approach/avoidance tendencies so central to the experience of emotion (Mackie, Devos, & Smith, 2000; Smith, 1993). A review of the concept of emotion-action tendencies follows.

Emotion-Action Tendencies

Considerable empirical evidence has been amassed to demonstrate the relationship between the experience of an emotion and the activation of a corresponding action tendency. The experience of fear and disgust both lead to avoidance action
tendency (Mackie, Devos & Smith, 2000; Smith, 1993). Anger, on the other hand is not as well correlated with a single action tendency. According to one point of view, the experience of anger, although classified as a negative state, leads to an approach tendency (Mackie, Devos & Smith, 2000; Smith, 1993). In the case of anger and fear, the response tendencies are largely based on appraisals of relative strength, power and control (Mackie, Devos & Smith, 2000). In addition, the appraisal of one’s perceived ability to “deal with” a given situation is especially important with respect to the experience of anger. Looking at frontal lobe activation (thought to be associated with an approach tendency), Harmon-Jones (2004) has found that participant’s reported level of anger was the same regardless of coping potential, but a perceived inability to cope with a situation resulted in a lower activation of left frontal lobe activity suggesting lower approach potential. This suggests that the relationship between anger and approach is moderated by additional appraisals of perceived “control potential” in the face of the situation (Berkowitz & Harmon-Jones, 2004a, 2004b; Roseman, 2001, p. 68).

Further complicating a prediction of a one to one correspondence of the experience of anger to an approach response is that anger is often not experienced as a discrete emotion, but “blended” with other emotions such as fear (Berkowitz & Harmon-Jones, 2004). Studies have found that not only is anger often found co-occurring with fear, but sadness as well (Berenbaum, Fujita, & Pfenning, 1995; Scherer & Tannenbaum, 1986). Induction of a blended state of anger and fear or anger and sadness presents the possibility that an avoidant reaction tendency will be prevalent as a result of the relationship of avoidance to fear and sadness.
Approach/Avoidance as a Dependent Measure

Approach and avoidance tendencies have been measured as a dependent variable in the laboratory using a push/pull lever paradigm to simulate either flexion or contraction, respectively. Several researchers have measured the level of facilitation of the pushing or pulling of a lever in a direction consistent with positive or negative evaluations such that negative evaluations tend to facilitate lever pushing (avoidance) while positive evaluations facilitate lever pulling (approach) (Chen & Bargh, 1999; Duckworth, Bargh, Garcia & Chaiken, 2002; Neumann & Strack, 2000; Solarz, 1960). Duckworth et al concluded that automatic evaluation of a stimuli leads to the automatic activation of an approach/avoidance tendency. The stimuli used in these studies were positively/negatively valenced words or images. Similar research has been conducted with images of angry (negative) or happy (positive) faces (Rooteveel & Pfaf, 2004). In these studies, participant arm flexion or contraction was facilitated when the target facial expression was consistent with negative or positive expressions respectively, as long as the participant was instructed to affectively evaluate the stimuli. When the participant was instructed to categorize the faces on the dimension of gender rather than affect, facilitation of arm movement did not occur (Rooteveel & Pfaf, 2004, experiment 2). Based on their findings, Rooteveel & Pfaf contend that automatic action tendencies are not necessarily the result of automatic evaluations. Taken together, one can conclude that motor action that is consistent with the evaluation of a stimulus is facilitated when the stimuli and movement are consistent as long as affective evaluation is the goal in this particular experimental paradigm.
While somewhat instructive to my proposed research, past research in this area has confined itself to a positive/negative stimuli categorization, rather than the generation of discrete emotional states and the corresponding action tendencies to those emotional states. In all these cases, contraction/flexion has been an operationalization of approach/avoidance and has served as a dependent measure associated with positive or negative evaluations.

**Approach/Avoidance as a Manipulation**

I intend to use the flexion/contraction paradigm as a method of supraliminal induction of approach and avoidance tendencies, in tandem with images designed to subliminally prime a discrete emotional state. This study will not be the first to employ the flexion/contraction paradigm as an experimental manipulation of evaluative states. Cacioppo et al (1993) used a flexion/contraction manipulation (pushing on the top or underside of a table, respectively) while participants viewed Chinese ideographs. Participants rated ideographs more positively when pressing up on the table (contraction) than when pressing down on the table (flexion). Others, using a push/pull paradigm, have found that the consistency of the primed stimulus evaluation to the direction of the lever manipulation is important in the recall of negative or positive information (Centerbar & Clore, 2004; Forster & Strack, 1997, 1998; Neumann et al, 2003) and the mood experienced by the experimental participant (Centerbar & Clore, 2004).

It is also important to note at this point that my use of the push/pull paradigm is not intended to induce an emotional/affective state directly. Research has demonstrated that flexion/contraction manipulations may produce no effect when employed alone, but rather depend on the interaction of those manipulations with motivationally compatible or
incompatible stimuli (Centerbar & Clore, 2006). For those stimuli, I will use visual images presented subliminally. With this context, the approach avoidance manipulation will gain a situated meaning consistent with cognitive embodiment theory of affect and evaluation (Niedenthal, Barsalou, Ric, & Krauth-Gruber, 2005a; Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005b).

In terms of cognitive embodiment theory, the use of an approach-avoidance action manipulation can be considered a “back door approach” to intensifying a laboratory induced emotional state consistent with the physical self as a source of information of one’s affective state (James, 1890). Cognitive embodiment theory suggests that bodily states can produce affective states (Niedenthal et al, 2005a, 2005b). Evidence for this element of cognitive embodiment theory derives from numerous experimental manipulations designed to induce such states, such as slumping or sitting upright in one’s chair affecting one’s experience of pride (Stepper & Strack, 1993) or holding a pen in one’s mouth in such a way to either simulate a frown or a smile and the effect of that instruction on one’s ratings of cartoons (Strack, Martin & Stepper, 1988). Via embodiment in the form of an action tendency consistent with the cognitive component of an emotion induced by a visual image, I propose that the emotion induction experience will be intensified by the proprioceptive experience for the participant. Partial support for this intensification of reported emotion when proprioceptive cues are consistent with cognitions was demonstrated in a correlational study of bereaved spouses. Using coded online narratives and corresponding facial expression coding, evidence was found for greater intensity in verbal expressions of anger and sadness when accompanied by corresponding facial expression (Bonanano & Keltner, 2004).
The importance of the consistency between action (lever direction) and accompanying emotion and/or accompanying affective valence leads me to an important experimental design issue. Given that previous research associating approach/avoidance actions with affect has been based on valence alone (contraction = good, flexion = bad) or used to induce only one emotion of interest in my research program (i.e., happy equals flexion), there is no experimental precedent for associating lever direction with different negative emotions; anger, disgust, and fear. Because of this, it will be important to fully cross the approach/avoidance manipulation with the image prime manipulation to fully explore the interactive effects of the two manipulations.

Arousal and Emotion

The third component of the proposed emotion induction method is the level of physiological arousal in the experimental participant. One function of arousal is that it focuses one’s attention on a target and additionally can increase one’s reliance on the use of stereotypes (Kim and Baron, 1988) and sensitivity to threats (Alexander, Brewer, & Hermann, 1999). A second element of arousal is that it accompanies the experience of many emotions, both negative and positive. Finally, arousal is easily misattributed from one source to another in a process known as excitation transfer (Zillman, 1983). Misattribution of the source of arousal was demonstrated by Dutton and Aron where fear-based arousal from crossing a rickety bridge was misattributed to attraction-based arousal from contact with an experimental assistant (1974). Moving beyond the simple misattribution of arousal to the level of emotional response to a target, anger at one target has been shown to carry over to response to a second target when that anger was left unresolved in relation to the first target (Lerner, Goldberg & Tetlock, 1999). Given the
strong association between arousal and the negative emotions of interest here, a successful emotion induction technique needs to include some degree of physical exertion that will increase physiological arousal to at least a moderate level.

Synthesis of Three Components of Emotion

I propose to combine an emotion-laden image prime with directional manipulation of a spring loaded lever as an approach/avoidance manipulation, done at a quick enough pace against a relatively strong spring that the approach/avoidance manipulation should simultaneously increase participant arousal. I believe that combining these previous experimental methods of cognitive/physical/arousal components can yield an experimental method of considerable effectiveness in the induction of discrete non-conscious emotional states that are relatively low in susceptibility to demand and/or correction.

The last criterion, low susceptibility to correction, is desirable given that emotions are thought to be rather fragile and especially susceptible to the passage of time (Rosenberg & Ekman, 1994) and the effect of defensive processes, justifications, and/or cognitive elaboration (Frijda, 1993) as previously discussed. Additionally, priming stimuli, if connected to the experimental dependent measures, often results in a corrective process by the participants (Bargh & Chartrand, 2001). By presenting the emotion-laden images subliminally and concealing the true nature of the approach/avoidance manipulation, I hope to minimize the participant’s ability to make any connection between the two elements of the study and engage in any correction process.
Measuring Mood and Emotion as a Dependent Variable

Techniques that are commonly used for measuring mood and emotion inductions pertinent to the proposed research can be placed into two categories: self-report and projective tests. To assess discrete emotional states, self-report has been used to the greatest extent. In the following sections, I will discuss examples of the use of each of these techniques, beginning with participant self-report.

Self-report Measures

Perhaps the most frequently employed emotional assessment methods are participant self reports of emotional experience, typified by the Positive and Negative Affect Schedule (PANAS: Watson, Clark & Tellegen, 1988). The PANAS measures the participant’s emotional experience by asking the participant “Right now, how angry do you feel?” The response scale has 6 points, anchored on one end by “Not at all” and on the other end by “Extremely”. As a direct self-report, there are several potential problems with this method of assessing participant emotion. First, our experience in debriefing participants in previous research indicates that they make the connection from an emotion induction stimulus to this oft used manipulation check quite readily. If a participant reads an angering story and is then asked to indicate to what extent they experienced any of twelve emotions, it obvious to the participant that they should have an elevated level of anger and that is what they typically report. Unfortunately, this is a cognitive appraisal of their emotional state tainted by the transparency of the experimenters’ intentions. The result is often an over-estimation of the success of the experimental emotion induction’s effectiveness. At the same time, it is possible that the PANAS may underestimate the impact of an emotion induction given that the measure is
typically placed after the dependent variables of greatest interest. For example, if a participant is experimentally induced to experience anger at a target and is then given the opportunity to assign punishment to the target, the anger may immediately begin to dissipate thus lowering the perceived amount of anger the PANAS is later used to measure.

PANAS and similar self-report measures may also confound participants’ actual emotional experience with the expression of information about participants’ naïve theories of emotional experience, antecedent appraisals, and response tendencies (Robinson & Clore, 2001). Despite these potential shortcomings of the PANAS (and similar measures), emotional self-report remains a consistently employed measure in emotion research and is considered by many researchers to be the best method of assessment of emotional experience (Robinson & Clore, 2002; Watson, 2000).

The decision to use this type of measure is obviously contingent upon the assessment of emotional states of which the participant is aware. Paradoxically, emotion self-reports have also been used to demonstrate the lack of participants’ conscious awareness of affect state in the study of unconscious affective states. For example, in one study, emotion self-reports did not demonstrate the effect of subliminally presented angry/happy faces but the faces did affect participant consumption of beverages such that happy-primed participants poured and consumed more of a test beverage (Winkielman & Berridge, 2004). Thus, the self-report measure is well positioned to assess either the awareness or lack of awareness of emotional experience. But to assess the presence of effects of the proposed subliminal emotion induction, indirect, projective emotion ratings may be more appropriate.
Projective Measures

Projective measures rely on the application of a participant’s current or recently experienced state to judgments about or reactions to a target that is sufficiently ambiguous to allow for such application. Historically, Rorshach inkblot or Thematic Apperception Tests have been employed to uncover an individual’s true feelings that are outside of the individual’s conscious awareness either as a result of a general lack of access or more motivated repression of those feelings. By asking a participant to evaluate an actor’s ambiguous behavior as either adventurous or careless, the participant’s response is thought to be determined, in large part, by the participant’s recent experience (Higgins, Rholes, & Jones, 1977). At the heart of this technique is the misattribution of the participant’s current activated concepts or emotional state onto the perceptual target. In the case of the projection of an emotion onto an ambiguous target, “sourcelessness” will be a central requirement. That emotions are often source specific decreases the probability of their being misattributed to other targets (Keltner, Locke, & Audrain, 1993). But, when an emotion is characterized by “sourcelessness” or when an emotion goes unnoticed, its projective influence is likely to be increased (Baumeister & Vohs, 2003).

This relationship of introspection to sourcelessness was demonstrated by Rucker, Polifroni, Tetlock & Scott (2004) in a series of experiments. Participants’ experience of anger in response to low arrest rates was readily projected onto a scenario defendant in the form of increased punitive responses. When participants were subsequently told that the arrest rate information might have biased their punishment recommendations, participants were observed to correct for their misattributed rage toward the defendant.
and reduce levels of recommended punishment. Essentially, when the source of their anger was made salient to the participants (i.e., systemic threat operationalized as arrest rate), they responded by correcting for their anger toward the individual perpetrator (Rucker et al, 2004).

In the proposed emotion induction method to be developed in the present project, every effort will be made to ensure that the source of the participants’ experienced emotion will remain outside of conscious awareness. Under these conditions, a projective measure of emotional state is apt to be more sensitive to the effects of the induction manipulations than a direct self-report measure such as the PANAS. Thus, to gauge the effectiveness of the induction, participants will be asked to assess the emotional state of an ambiguous target and the likely approach/avoidance tendency of that target.

In all, this research method draws its inspiration from a multi-component view of emotional experience where one is informed of one’s current affective state not only from one’s cognitions, but also from embodied proprioceptive cues. To facilitate the projection of that affective information onto a target, the method draws from a rich body of research that has demonstrated the effectiveness of subliminal and supraliminal priming techniques that will provide this information to the experimental participant outside of their conscious awareness.
CHAPTER 2

PILOT STUDY AND SUBSEQUENT COMPONENT TESTING

My general dissatisfaction with existing emotion induction paradigms and the measures that demonstrated the effectiveness of those induction paradigms led me to develop a new method for inducing discrete emotional states in experimental participants. By synthesizing several experimental techniques, this new method was designed to manipulate three components of emotional experience associated with anger, fear and disgust: cognitive, proprioceptive, and a general increase in physiological arousal. A new projective emotional experience measure was designed as well and was used in conjunction with the usual self-report emotion rating measure.

As the first stage of this dissertation research, a pilot study was conducted to assess the effectiveness of subliminal emotion priming paired with a supraliminal approach/avoidance manipulation. By combining both manipulations, I hoped to create discrete emotional states in participants that would affect their experienced emotions as assessed by self-report and by emotions and action tendencies projected to an actor in an ambiguous scenario. The emotion induction involved subliminally presented affect-laden images, and the supraliminal approach/avoidance manipulation employed a flexion/contraction lever task. In accord with previous research (discussed in the preceding chapter), the assumption was that pulling the lever toward oneself (contraction) would emulate an approach action tendency, whereas pushing the lever (flexion) would emulate an avoidance action.
It was expected that any significant effects would be found as a result of the interaction of the emotion priming and approach/avoidance manipulation rather than the main effect of either. The main focus of interest is the level of specific emotions expressed when the emotion implied by the primed image and the proprioceptive feedback associated with the approach or avoidance manipulation are theoretically consistent. For example, the experience of fear is consistent with an avoidant response. In this case, being assigned to a condition where one must exhibit an avoidant response to fear-evoking stimuli create an experience of heightened fear by adding additional “information” consistent with the fear-evoking stimulus. Put another way, the participant’s experience of fear be amplified because the physical experience supports, or gives greater credence to, the cognitive experience (consistent/amplification hypothesis).

Since disgust is also associated with avoidance, I also expect that the impact of disgust primes on the experience of the disgust emotion would be amplified when participants were in the avoidance (lever push) movement condition. Although anger is also a negatively-valenced emotion, previous research (reviewed in the previous chapter) suggests that it is associated with approach action tendencies, rather than avoidance. Thus, I was particularly interested to determine whether the pull (approach) manipulation, in combination with the anger prime, would amplify experience of the anger emotion.

This amplification hypothesis is consistent with the multiple component view of emotional experience, but leads to questions concerning the potential amplifying or suppressing effects of theoretically inconsistent experimental conditions. It is possible that a participant assigned to a condition where they must approach fear-evoking stimuli
may experience an intensified experience of fear (an inconsistent/amplification effect) or will the mismatch of the proprioceptive experience to the cognitive stimuli reduce the level of experienced of fear (inconsistent/suppression effect)? My hypothesis of an interaction between prime and lever push/pull conditions is based on the expectation that emotions will be differentially affected by consistent versus inconsistent action tendencies, being amplified in the former and dampened in the latter. However, the actual effect of combining emotional images and induced actions has yet to be demonstrated empirically.

This chapter reports the results of preliminary studies designed to test the effectiveness of the manipulations of subliminal priming and action tendencies. Based on the results of the pilot study, I found it necessary to decompose the manipulations to component parts for more detailed testing of those components in isolation. Results of the pilot study and individual component testing together led to the design of the full experiment reported in Chapter 3.

PILOT STUDY

Design

In this initial study, both image prime and lever movement were manipulated independently yielding a 3 (prime: anger, disgust, and fear) x 2 (lever direction: push or pull) between subject design. Because this was a pilot study, I was interested only in determining whether there would be variation across the emotion-eliciting conditions, so no control conditions were included. The study was described as a “reaction time” experiment in which participants were instructed to either push or pull a large spring loaded lever in response to “flashes” (image primes) on the computer screen. Following
the experimental manipulations, participants read a scenario and responded to questions
designed to assess the effectiveness of those manipulations to elicit different emotional
states.

Method

For the three emotion prime conditions, image primes were images presented
foveally on a computer screen at presentation durations thought to insure subliminal
exposure (Bargh & Chartrand, 2001). Duration of exposure for the prime (full screen)
was 16 ms immediately followed by a pattern mask (full screen) presented for 20 ms.
The anger prime was an extended middle finger, the fear prime a shark jaws open, and
the disgust prime was a very dirty toilet filled with human waste. Primes were presented
repeatedly in rapid succession for a total of twenty exposures; between image intervals
varied between three and eight seconds. Each participant saw only one type of emotion
prime and the prime/mask combination appeared simply as a flash of triangular shapes on
the computer screen.

To manipulate approach/avoidance movement, there was a floor mounted lever to
the participant’s right, tall enough to be grasped comfortably while seated in front of the
computer monitor. Participants were instructed to grasp the lever and push or pull
(depending on assigned condition) when the participant saw a flash on the screen. The
spring loaded lever was adjustable and required considerable force to push or pull to its
stop point. Being spring loaded in both directions, the return of the lever to its start
position was “spring-assisted” and required no physical effort. The combination of the
rapid presentation of primes on the screen and the resistance of the spring-loaded lever
were designed to create a level of heightened general arousal in the participant, in addition to inducing an approach or avoidance physical response.

Dependent Measures

Three types of measures were used in the pilot study to assess emotional responses following the manipulations. The first type was direct, self-report of participant emotional experience. The second type was a less direct, projective assessment that involved presenting participants with a brief scenario and asking them to respond to open-ended questions about the actor in the scenario. The third type of measure was physiological, specifically the measurement of pre and post manipulation pulse rate to assess participant arousal.

The first measure was a truncated version of the Positive and Negative Affect Schedule (PANAS: Watson, Clark & Tellegen, 1988). The PANAS measures the participant’s emotional experience by asking the participant “Right now, how angry do you feel?” The response scale has 6 points, anchored on one end by “Not at all” and on the other end by “Extremely”. I used the PANAS because it is the most commonly used method of assessing explicit emotions in the research literature. Despite the various shortcomings of the PANAS (and similar self-report measures) discussed in the preceding chapter, the PANAS remains a consistently employed measure in emotion research and is an obvious choice of dependent measure to compare the present study to existing studies of emotion.

To address potential shortcomings associated with the PANAS, especially as a sole measure of the effects of the experimental manipulations, a second dependent measure was designed. This was a projective measure I designed to tap experienced
emotion less directly than the PANAS. The indirect measure was introduced with the following instructions:

In this task, we would like you to imagine an ordinary person in the described situation. Once you have considered this scenario, please choose the response that you imagine is most likely from this imagined person.

After leaving late in the evening from the library to return home, a student sees a bum begging for money while sitting on the sidewalk against a building partially blocking the student’s path.

What do you think the student is feeling? (Please write a sentence or two describing what you think the student is feeling)

What do you believe the student will do next? (Please explain in a few sentences)

Participant responses to the projective measure were coded for both projected emotion and approach/avoidance response.

The third dependent measure was change in pulse rate as a measure of the participant’s general level of arousal following the induction. The difference between baseline heart rate and post-manipulation heart rate has been used as a measure of general arousal in prior research (e.g., Alexander, Brewer, & Herrmann, 1999).

Participants

Seventy-eight Psychology 100 students participated in the study for partial course credit. Participant age ranged from 16 to 34 with a mean age of 19.6 years. There were 43 female and 35 male participants.
Procedure

Each participant was greeted in the waiting area and brought back to the cubicle by the experimenter. The participants signed up for a “Reaction Time Study” and were run one participant at a time. Prior to the start of the experimental task, participant pulse rate was measured by the experimenter to assess participant’s resting state. Participants were then asked to fill out a short form that was used to collect demographic information and participant exercise patterns (as part of the cover story).

Participants were then given the instruction to push or pull the lever, depending on assigned condition, every time they saw a “flash” on the screen. The experimenter first demonstrated the use of the lever and then had the participant manipulate the lever to become acquainted with its operation. When the participant responded that they were ready to begin, the experimenter started the Direct R/T program that was used to present the images on the computer monitor. Upon starting the program for the participant, the experimenter left the cubicle and waited in a chair in the hallway.

Immediately after the participant completed all trials of the task, the experimenter returned to the cubicle and measured the participant’s pulse rate a second time. After taking the participant’s pulse rate, the experimenter informed the participant that the experimenter “will be right back after I check to see that your reaction time data downloaded properly on our server in the next room”. The participant was then asked if they would fill out a couple of questionnaires that the experimenter was testing for next quarter while the experimenter was gone.

The first of these questionnaires was the PANAS and the second was the projective measure (see Appendix A for both measures). Upon completion of these
measures, the experimenter returned to the cubicle and asked the participant to describe
the “flash” on the computer screen. Participants almost universally reported seeing a
“pattern of white triangles on a black background” or something that appeared to be like
a “broken mirror”. One participant said that they thought they saw a shark (in the fear
prime condition), but dismissed it as their imagination. The experimenter then re-ran the
Direct R/T program for that participant to see if the participant could, in fact, see the
shark. After viewing the priming manipulation for a second time, the participant stated
that they saw nothing other than the pattern mask. Another participant suggested that the
lever “was strange” pointing out that if we were assessing reaction time, why didn’t the
experimenter just use the keyboard. Participants were quite amazed that images had
been presented prior to the mask. Participants were debriefed as to the true nature of the
experiment. Finally, the experimenter answered any questions or addressed any concerns
that the participant might have had. Participants expressed no concerns and several
participants said it was the most interesting study in which they had participated to date.

Results

Pulse Rate

Participants’ starting pulse rate ranged from 48 to 120 (M = 76.8; sd = 13.82). Several participants volunteered that they had run to the experiment to arrive on time. Ending pulse rates ranged from 57 to 108 (M = 80.0; sd = 12.88). Pulse increase was calculated by subtracting pre-manipulation pulse rate from post-manipulation pulse rate and an overall increase in pulse rate was observed (mean increase = 3.3) which differed significantly from a null hypothesis of no increase (t(77) = 3.71, p < .001). A two-way ANOVA was run to test the effects of the manipulations on pulse increase. There was no
effect for the direction of the lever (push/pull; \( F(1, 72) < 1 \)) nor was there any effect for the emotion prime condition (\( F(2, 72) = 1.83, p = .17 \)). There was a significant lever direction x prime condition interaction (\( F(2, 72) = 3.1, p = .05 \)) driven primarily by the difference in the anger/pull (\( M = -.21 \)) and disgust/pull (\( M = 7.36 \)) conditions (see Table 2.1). Since there was nothing systematically meaningful about this interaction pattern, it most likely resulted from random differences in starting pulse rates across the different conditions of the experiment.

<table>
<thead>
<tr>
<th>Prime Condition</th>
<th>Lever Direction</th>
<th>Mean</th>
<th>Std. Error</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
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<tr>
<td></td>
<td></td>
<td>Lower Bound</td>
<td>Upper Bound</td>
<td></td>
</tr>
<tr>
<td>Anger</td>
<td>Push</td>
<td>2.714</td>
<td>1.904</td>
<td>-1.067</td>
</tr>
<tr>
<td></td>
<td>Pull</td>
<td>-0.214</td>
<td>1.904</td>
<td>-3.996</td>
</tr>
<tr>
<td>Disgust</td>
<td>Push</td>
<td>2.600</td>
<td>1.840</td>
<td>-1.053</td>
</tr>
<tr>
<td></td>
<td>Pull</td>
<td>7.364</td>
<td>2.148</td>
<td>3.098</td>
</tr>
<tr>
<td>Fear</td>
<td>Push</td>
<td>6.250</td>
<td>2.057</td>
<td>2.166</td>
</tr>
<tr>
<td></td>
<td>Pull</td>
<td>1.333</td>
<td>2.057</td>
<td>-2.751</td>
</tr>
</tbody>
</table>

Table 2.1: Participant Pulse Rate Increase for Image Prime x Lever Manipulation

PANAS

In the analysis of PANAS ratings, participant gender was taken into account because previous studies have consistently observed gender differences in intensity of self-reported emotions, and I was also concerned that males and females might respond differently to the image primes. A three-way ANOVA was conducted for each of the 16 PANAS items to test the effects of the 3 (image prime) x 2 (lever manipulation) x 2 participant gender factors. The F-values for main effects and interactions obtained for each of the PANAS emotions scales are reported in Table 2.2. To begin, the image prime
had no significant main effect on any of the emotion measures. Only the disgust ratings approached conventional levels of significance \((F(2, 78) = 2.4, p = .10)\) with ratings in the disgust and fear prime condition (Ms: disgust = 1.2, fear = 1.3) higher than in the anger condition (M = 1.0).

<table>
<thead>
<tr>
<th></th>
<th>Analysis</th>
<th>F (p)</th>
</tr>
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<tbody>
<tr>
<td>Prime</td>
<td>Lever</td>
<td>Gender</td>
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<tr>
<td>Interested</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Distressed</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Excited</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Happy</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Jittery</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Scared</td>
<td>ns</td>
<td>3.8 (.05)</td>
</tr>
<tr>
<td>Hostile</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Energized</td>
<td>ns</td>
<td>3.6 (.06)</td>
</tr>
<tr>
<td>Disgusted</td>
<td>2.4 (.10)</td>
<td>ns</td>
</tr>
<tr>
<td>Irritable</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Afraid</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Angry</td>
<td>ns</td>
<td>2.7 (.10)</td>
</tr>
<tr>
<td>Sad</td>
<td>ns</td>
<td>3.4 (.07)</td>
</tr>
<tr>
<td>Uneasy</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Delighted</td>
<td>ns</td>
<td>ns</td>
</tr>
</tbody>
</table>

Table 2.2: Three-way ANOVA Results for the 16 Emotion Rating Items

Four of the 16 PANAS items showed mean differences as a function of the lever manipulation: energized, angry, sad, and scared. For energized, the mean was higher in the push condition than the pull condition (Ms: push = 3.9, pull = 3.4). The opposite effect was observed for angry (Ms: push =1.1, pull = 1.4), sad (Ms: push = 1.3, pull = 1.7), and scared (Ms: push = 1.2, pull = 1.5), where the means for these measures were higher in the pull rather than the push conditions.
Contrary to previous research, there were no significant main effects for participant gender on any of the 16 PANAS emotions self-ratings. Importantly, there were also no significant image prime x gender interactions nor image prime x lever direction x gender interactions on any of the items. The two-way lever direction x gender interaction did have a significant effect on participant ratings on the energized, afraid, and uneasy items and a fourth item, happy, approached a conventional level of significance. For the energized item, males had a higher mean than females in the push condition (Ms push: males = 4.3, females = 3.5). Males also showed the highest mean rating in the pull condition for the afraid item while females showed the lowest mean rating (Ms pull: males = 1.3, females = 1.0). Males showed the lowest mean rating for the happy item in the pull condition (Ms pull: males = 3.6, females = 4.2). Finally, for the uneasy item, a reverse pattern of means for the gender x lever interaction was observed, such that males rated uneasy highest in the pull condition (Ms males: push = 1.2, pull = 2.0) while females rated uneasy highest in the push condition (Ms females: push = 1.8, pull = 1.5). In all, the data suggest that men rated positive emotion items more highly when pushing rather than pulling the lever and two negative emotion items (afraid and uneasy) were rated more highly by men when pulling the lever, a pattern inconsistent with the predicted effects of approach (contraction) and avoid (flexion) action tendencies.

Two emotion items that approached conventional levels of significance for the critical prime x lever interaction were sad and scared. For the sad measure, the pull lever condition produced higher means than the push condition with anger and fear primes, but the reverse was found for the disgust prime (see Table 2.3). The anger/pull and fear/pull
conditions produced the highest mean ratings of sadness. The scared measure showed a similar pattern, with the fear/pull and the disgust/push conditions showing the highest mean ratings on the scared item (see Table 2.4). None of these patterns of effects was consistent with the predicted amplification of self-reported emotions in the supposedly action-consistent conditions.

<table>
<thead>
<tr>
<th>Sad Item</th>
<th>Image Prime</th>
<th>Lever Direction</th>
<th>Mean</th>
<th>Std. Error</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
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<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Lower Bound</td>
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<tr>
<td>Anger</td>
<td>Push</td>
<td>1.21</td>
<td>0.19</td>
<td>0.83</td>
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<td></td>
<td>Pull</td>
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<td>0.19</td>
<td>1.26</td>
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<tr>
<td>Disgust</td>
<td>Push</td>
<td>1.40</td>
<td>0.18</td>
<td>1.03</td>
<td>1.76</td>
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<tr>
<td></td>
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<td>0.22</td>
<td>0.75</td>
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<tr>
<td></td>
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<td>1.89</td>
<td>0.22</td>
<td>1.44</td>
<td>2.31</td>
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</tbody>
</table>

Table 2.3: Image Prime x Lever Manipulation Interaction for Sad Emotion Item

<table>
<thead>
<tr>
<th>Scared Item</th>
<th>Image Prime</th>
<th>Lever Direction</th>
<th>Mean</th>
<th>Std. Error</th>
<th>95% Confidence Interval</th>
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</thead>
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<td></td>
<td></td>
<td></td>
<td>Lower Bound</td>
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<tr>
<td>Anger</td>
<td>Push</td>
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<td>0.18</td>
<td>0.64</td>
<td>1.36</td>
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<td>0.18</td>
<td>1.06</td>
<td>1.77</td>
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<td>0.18</td>
<td>1.19</td>
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<td></td>
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<td>0.93</td>
<td>1.73</td>
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<tr>
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<td>Push</td>
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<td>0.20</td>
<td>0.60</td>
<td>1.40</td>
</tr>
<tr>
<td></td>
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<td>1.69</td>
<td>0.20</td>
<td>1.28</td>
<td>2.09</td>
</tr>
</tbody>
</table>

Table 2.4: Image Prime x Lever Manipulation Interaction for Scared Emotion Item

Projective Scenario Measures

Participants were asked to assign an emotion to the student actor in the projective scenario. The questions were open-ended and the following emotion codes were used to
categorize the participant responses: anger, disgust, fear/apprehension, sadness, guilt, pity/sympathy, other, and none. Coders were allowed to assign two emotion codes to each response, both a primary and secondary emotion. Inter-rater agreement for the coding of emotion categories was very good. Cohen’s Kappa for all three categories exceeded .63 (p < .01). Frequencies were calculated for only the primary emotion for the effect of lever direction, emotion condition, and the lever direction x emotion condition interaction. No discernable pattern was apparent when the frequencies were examined visually, and no statistical tests were performed on the data. Fear/Apprehension was the most often listed emotion (by a wide margin) and did not systematically vary with lever direction, emotion condition, or the interaction of the two manipulations.

Participant response to the question of the type of action likely to be displayed by the scenario actor was coded as well. Four coding categories were available into which participant responses could be coded: approach, avoid, both, and no mention. Differences between conditions on this measure did not reach significance for lever direction, emotion condition, nor for the interaction of the two manipulations.

The last coded measure assessed whether the participant thought it was likely that the scenario actor would give the “bum” in the scenario any money. The three possible response categories were: yes, no, and no mention. There was a small effect for lever direction on the projected likelihood of giving the bum money; those in the push condition saw it as more likely that the bum would be given money than those in the pull condition ($X^2(2) = 4.62, p = .10$). The effect of prime condition was not significant for this measure ($X^2(4) = 6.73\ p = .15$), although the fear prime condition showed an observed frequency of not giving money to the bum higher than would be expected
The lever direction x prime condition interaction did have a significant effect on the give money variable ($X^2(10) = 22.67, p = .01$). This effect appears to be driven by the fear/pull condition that differed from the other seven other conditions in that this was the only condition were the “no” response exceeded the “yes” response (observed = 6, expected = 1.4; adjusted residual = 4.4).

Discussion

An increase in post-manipulation pulse rate was expected and I did observe a significant increase in this measure. This indicates that the experimental manipulation has the desired physiological effect on participants. The lever direction/emotion interaction approached conventional levels of significance for differences in pulse rate increase, but the comparison of the means across those conditions is confusing and without any obvious explanation. Perhaps the biggest problem with the pulse rate measure was the result of my attempt to run as many participants as quickly as possible. As mentioned previously, starting pulse rate was sometimes higher than what would be considered normal as a result of participants hurrying to the experiment to be on time. Future starting pulse rate measurements must allow for a resting period for the participant to eliminate increased variance in this measure that results from participants at different states of rest. Additionally, measuring pulse rate served as an integral part of the cover story and this measure should probably be retained in future studies for that reason alone.

---

2 As Agresti suggests, the chi-square test statistic and associated p value assess the effect of the manipulation(s) with respect to the null hypothesis while the adjusted residuals (“that exceeds about 2 or 3”) indicate a lack of fit to the null hypothesis for individual cells (Agresti, 1996, pp. 31-32).
Overall, the PANAS measure did not produce many results that would validate the effectiveness of the manipulations, either separately or in combination. A few of the PANAS ratings showed significant effects of the manipulations. As far as a main effect for the image prime, the only emotion item that approached statistical significance was the disgust item; the means for this item were elevated for both the fear and disgust primes compared to the anger prime. This does suggest that the primes did produce some differential affective response, but the absence of any main effects of prime on fear or anger ratings suggests that images alone do not produce concomitant emotional states. As I stated at the opening of this chapter, it was in the interaction of image prime and lever manipulation that I expected to see an effect on the dependent measures, so a failure to see strong effects on the emotion items most closely associated to the three image primes alone is neither surprising nor disappointing.

That being said, that several of the emotion items were significantly affected by the lever bears a closer look. Of the four emotion items that were affected by the lever manipulation, only one was not qualified by an interaction: the rating of participant anger. The anger item showed a (marginally significant) elevated mean for the pull (approach) condition (across all primes), but this does not shed much light on the effectiveness of the lever manipulation, nor should it be expected to. As discussed in the first chapter, anger can be associated with either an approach or avoidance reaction contingent upon appraisals of relative strength, felt confidence, and relative certainty. The effect of lever direction on the remaining three emotion rating items were all qualified by either a lever x participant gender or by a prime by lever interaction. As to the former, the mean for the energized measure was elevated in the push condition and
this effect was observed in the male participants in the study. If we were to consider males more inclined to an approach tendency, then this would be consistent with the idea that the lever push was actually an approach (rather than avoid) action (as well as the other three items that were affected by a participant gender x lever interaction).

In the case of the prime x lever interactions, the sad emotion item had higher mean ratings in the pull conditions combined with anger and fear primes, while the scared emotion item had lower means in the push conditions combined with anger and fear primes. Again, both of these could be inconsistent with a push equals avoid and pull equals approach interpretation of the effect of the lever manipulation. Admittedly this is very weak evidence that the pull condition is instead inducing an avoidant response (rather than pulling stimuli toward oneself) and that the push condition is inducing an approach response (rather than pushing stimuli away from oneself). However, the lever manipulation in this study probably deviates sufficiently from previous flexion and contraction manipulations that the existing findings for that type of manipulation are not necessarily derived from analogous proprioceptive sensations. (This will be discussed at greater length in the following section.) Finally, if the PANAS is more sensitive to supraliminal rather than subliminal manipulations, the fact that more emotion measures demonstrated effects of the lever manipulation rather than the image prime may be a function of less “source” confusion. Again the data indicating this is no more than a weakly supported supposition at best.

The observed effects on the coded emotion responses indicate, more than anything, that the projective scenario was not ambiguous enough to be sensitive to the experimental manipulations. Fear and avoidance responses were spread virtually equally
across all experimental conditions and comprised the overwhelming majority of participant assigned emotions and action tendencies. Perhaps, had the PANAS not been given prior to the projective scenario I would have seen more condition dependent movement on the coded emotion responses on this projective measure.

The coded action tendency was also dominated by avoidant responses and further indicates the failure of my goal to craft a truly ambiguous scenario. Only the “give money” code demonstrated a significant effect of the manipulations and that observed effect was for the image prime x lever interaction. Overall, participants were more likely to suggest that the scenario actor would give the bum in the scenario money in the “push” conditions than in the “pull” conditions, where the participants demonstrated a preference to not give the bum money. This again would seem to indicate that the “push” conditions stimulated an approach response, consistent with the effects of the lever manipulation observed on a few of the emotion rating items. As far as a main effect of the image prime on the “give money” measure, in the fear conditions, participants were equally likely to endorse the “yes” and “no” response, unlike the other emotion conditions where there was a clear “yes” preference. In the “fear/pull” condition in particular, a reversal was observed such that the endorsement of “no” was greater than that of the “yes”, indicating an avoidant response consistent with the emotion of fear bolstered by the pulling of the lever as generating avoidance. However, I did not see a similar effect for the disgust/pull condition where it would seem just as theoretically plausible that endorsement of not giving the bum money would be the likely choice.
Future Directions and Possible Modifications

As intended of a pilot study, results should provide some direction for improvement of manipulations and measures. The most obvious and pressing modification on the dependent variable side of this experimental design is the need to develop a more ambiguous projective scenario to better capture the effects of the experimental manipulations. A second possible dependent variable modification is to use close-ended responses to the projective scenario.

For the independent variable side of the experimental paradigm, several possible changes that might improve the induction are suggested by the experiences in this first pilot study. First and most easily accomplished, the number of exposures to the subliminal images could be varied. Twenty presentations of the subliminal stimuli may have been too many and might have led to habituation to the prime. Affective habituation has been shown to reduce the rated extremity of target words subliminally presented previously in a semantic priming task (Dijksterhuis & Smith, 2002). It might be beneficial to present fewer exposures for each emotion induction condition, thus reducing this possibility of habituation. The experimental paradigm might have been akin to a flooding technique that unintentionally reduced the impact of the subliminal image on the participant’s affective state.

While varying image presentation frequency is an easy modification to test, modifications to the lever as an approach/avoidance manipulation are a bit more challenging. It is unfortunate that the results of the pilot study shed little empirical light on the effect of the lever direction and its effectiveness as an approach/avoidance manipulation. Based on the data, it is still unclear whether pushing the lever simulates an
approach or avoidant reaction. Observation of the participants offers some insight beyond that provided by statistical analysis of the experimental results. Pulling or pushing the lever required moderate effort that appeared to involve more than simple arm flexion and contraction. Given the size, height, and resistance of the lever, it appeared that participants used quite a bit of body movement in addition to arm movement. I believe this contributed to the participant’s overall proprioceptive experience of moving backward (avoidance) in the pull condition and moving forward (approach) in the push condition. If this is the case, I inadvertently created a technique that puts two proprioceptive cues in competition with each other, that is, flexion/approach and contraction/avoidance.

One alternative option would be to use a small lever that requires no “body english” to manipulate and thus isolates the flexion/contraction effect. Unfortunately, that would most likely eliminate the observed induced increase in arousal (measured as pulse rate increase). A second option is a possible change in the paradigm that might greatly enhance the approach/avoidance operationalization. Rather than have participants manipulate a lever, a more direct manipulation of approach/avoidance would be to have participants step toward or step away from the computer monitor in response to the “flash” on the screen. There should be little argument that stepping back is an avoidant reaction while stepping forward is an approach reaction.

COMPONENT TESTING

Several component studies were designed to investigate possible reasons for the non-significant effects of the first pilot study and the effectiveness of alternative strategies. The possible reasons under investigation were: the projective measure’s
dependence on open-ended responses, the nature of the manipulation of approach/avoidance, the number of subliminal prime presentations, and the use of the self-report for assessing levels of emotion. In effect, the initial pilot study manipulations and measures were deconstructed to various component pieces and those components were tested independently of each other.

Given the constraints of the reduced participant pool during the time this component testing was done, not all desired component testing could be conducted. Individual components were prioritized for testing on the basis of their estimated probability of being relevant to the large number of null results in the pilot study.

The results of the component tests are organized in the following sections by the components tested as well as by the comparisons that logically follow from the component testing design. The first component test reported is a comparison of the new projective scenario to the projective scenario used in the pilot study.

Component 1: Projective Scenario

Several modifications were made to the projective scenario dependent measure for the component testing. The “bum” scenario was retained, but was modified to occur during the daytime rather than late at night. This modification was intended to lessen the response tendency that was too fear-heavy in the pilot study. Additionally, whereas responses were open-ended in the pilot study, I employed closed-ended responses in the second study that were in part derived from an analysis of the open-ended responses in the first study. To assess participant’s approach/avoidance response to the modified scenario, as well as the emotional correlate to that response, participants were given a forced-choice of one of four response options. For example, an avoid/fear response was
“Cross the street before reaching the bum; one can never be too careful”. For avoid/disgust, the following option was available: “Avoid getting too close to the bum by walking to the outside edge of the sidewalk and try to shake off the sudden feeling of having to take a shower” (see Appendix B for the complete questionnaire).

Further modifications of the response measures following the projective scenario included comparing scenario actor-experienced emotion to projection of participant’s own emotional state in that situation. Five separate rating scale items were used to assess: anger, disgust, fear, happiness, and sadness. All were rated on the same 6-point scale as the PANAS: 1 = “not at all”, 2 = “very slightly”, 3 = “a little”, 4 = “moderately”, 5 = “quite a bit”, 6 = “extremely.” This eliminated the need to code the open-ended response items as in the first study and allowed me to avoid exclusive reliance on non-parametric techniques for data analysis. The results obtained with the new closed-ended emotion dependent variables will be discussed in the sections that follow. All tested components used this new scenario and the new dependent measures.

The effectiveness of the scenario modifications was tested in conjunction with other component manipulations (to be discussed below). For the comparison of the pilot scenario to the new scenario, eight component conditions were used. The conditions were: image prime (anger 5 and 20 presentations, fear 5 and 20 presentations) and approach/avoidance (push lever, pull lever, step forward, step back). Results from the two versions of the scenario were aggregated across these conditions (pilot nighttime scenario: n = 78; component testing daytime scenario: n = 92). The change in the scenario and response scale was effective in reducing the prevalence of fear responses observed in the first study by increasing disgust response dramatically (see Table 2.5).
Only in one condition (when the fear image was presented 20 times) was there a higher proportion of fear than disgust responses.

<table>
<thead>
<tr>
<th></th>
<th>Anger</th>
<th>Disgust</th>
<th>Fear</th>
<th>Give Money</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot Study</td>
<td>7.1%</td>
<td>1.0%</td>
<td>64.6%</td>
<td>17.2%</td>
</tr>
<tr>
<td>(Nighttime Scenario)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Component Testing</td>
<td>9.8%</td>
<td>44.6%</td>
<td>20.7%</td>
<td>25.0%</td>
</tr>
<tr>
<td>(Daytime Scenario)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2.5: Comparison of Proportion of Emotion Responses and “Give Money” Measure in “Bum” Scenario for Pilot Study and Subsequent Component Test

The overall instability of the response pattern shifting from fear in the pilot to disgust with what would seem a relatively minor change is troubling. This is especially troubling given that this increase in disgust responses is across almost all prime and approach/avoidance component conditions and that there was no disgust-image condition used in this pilot study. That the anger image conditions showed a higher proportion of disgust rather than anger responses is certainly inconsistent with my goal of inducing a discrete emotional state. It is becoming very clear, given the results of pilot and subsequent component test studies, that the scenarios are quite possibly more powerful than the manipulations. New, more ambiguous dependent variables will be discussed following the full reporting of the results of the other component testing.
Component 2: Manipulation of Approach/Avoidance

A new approach avoidance manipulation was tested against the previously used push/pull lever paradigm. Both the old and the new manipulations were used without any subliminal images during the second component test. Only the previously used pattern mask (presented 20 times) was used to signal the participants to move in the proscribed manner. In all other ways, the experimental procedure was identical to the procedure used in the pilot.

Method

The new manipulation was designed as a simpler alternative mechanically, physically, and conceptually. Participants were instructed to stand at the center of a 20” x 4’ board on the floor. The center of the board had a 3” wide strip of metallic “sensor” tape crossing its 20” width. At either end of the board was another 3” wide “sensor” strip of metallic tape as well. On the right side of the board, a circuit box was attached to the metallic tape “sensors” with bogus wiring running from each circuit box to the next and finally, from the last box, wiring running to the back of the computer. Participants were instructed to either step forward or step back (depending on assigned condition) onto the forward or rear sensor with both feet to measure their reaction time. Participants were further instructed that once they stepped on the sensor, they were to return to the center sensor and wait for the next flash on the computer screen before once again either stepping forward or stepping back depending on their assigned condition. Participants did not express any suspicion that the step board device was not actually measuring reaction time.
Mechanically, this was a far simpler procedure. During the first pilot test, I did have a cable break on the lever that required cable replacement and I did lose a day’s use of the lever. “Breakage” to the new step board would consist of wear to the sensor tape that can be replaced in only minutes. Additionally, the cost of constructing additional step boards is about one tenth of constructing additional levers. This would allow us to run multiple sessions simultaneously in three separate cubicles.

Physically, the new step board creates a more consistent physical sensation for participants than the spring-loaded lever. Regardless of participant size or strength, the act of stepping forward or stepping backward has less variation then pushing or pulling the lever.

Conceptually, the new step board paradigm tackles the approach/avoid construct validity issue in a far simpler manner than the push/pull lever paradigm. The most straightforward interpretation of the lever’s effect is pushing something away or pulling something toward one’s self, that is, flexion or contraction respectively. Even in their most straightforward manipulation, flexion and contraction are somewhat conceptually distant from avoiding or approaching. Combined with the somewhat questionable construct validity, the interpretability of this approach/avoidance operationalization is diminished if one considers that the manipulation of the spring-loaded lever I used requires a certain amount of body motion. If one has to lean forward to push the lever forward, it is quite possible that flexion is being confounded with moving one’s body forward; e.g. moving toward while pushing away. This confounding of flexion/approach and contraction/avoidance undoubtedly created considerable uncertainty as to whether pushing or pulling the lever was the proprioceptive equivalent to conceptually
approaching or avoiding (or vice versa) during the planning phase of this approach/avoidance manipulation. In sum, it is a far more straightforward operationalization of the approach/avoidance concept to simply have the participant either step forward toward (approach) or step backward away (avoid) in response to the stimulus image.

Forty-four Ohio State University undergraduates participated in this component test for partial course credit. The procedure was identical to the procedure used in the pilot study with the exception of the previously described use of the pattern mask without subliminal images and the use of the new projective scenario and dependent measures. Participants were randomly assigned to one of four experimental conditions: step forward, step backward, push lever or pull lever. Upon completing the manipulation, participants read the scenario and completed the dependent measures. Participants were then fully debriefed.

Results

Participants’ projected approach/avoidance reaction was recoded from the four previously described forced-choice options that followed the daytime “bum” scenario. “Crossing the street…” or “Avoid getting close…” were coded as avoidant reactions. “Stride quickly toward…” or “Stop briefly to toss some change…” were coded as approach reactions. For the four approach/avoid manipulations, there were 33 avoid responses and 11 approach responses. This would be consistent with the finding that the scenario itself tilted toward the emotion of disgust and any approach manipulation would be essentially fighting an “uphill battle”.

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The effect of step board manipulation was subjected to Chi square analysis and it was found that while not significant ($X^2(1) = .952, p = .329$), the effects were in the expected direction: the step forward condition did have the highest proportion of approach responses (see Table 2.6). The push-pull comparison for the lever manipulation was not significant ($X^2(1) = .253, p = .615$; see Table 2.7).

<table>
<thead>
<tr>
<th></th>
<th>Approach</th>
<th>Avoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step Forward</td>
<td>4 (40%)</td>
<td>6 (60%)</td>
</tr>
<tr>
<td>Step Back</td>
<td>2 (30%)</td>
<td>8 (80%)</td>
</tr>
<tr>
<td>Total</td>
<td>6 (30%)</td>
<td>14 (70%)</td>
</tr>
</tbody>
</table>

Table 2.6: Frequency (Proportion) of Approach and Avoid Responses for Step Manipulation

<table>
<thead>
<tr>
<th></th>
<th>Approach</th>
<th>Avoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push</td>
<td>2 (16.7%)</td>
<td>10 (83.3%)</td>
</tr>
<tr>
<td>Pull</td>
<td>3 (25.0%)</td>
<td>9 (75.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>5 (20.8%)</td>
<td>19 (79.2%)</td>
</tr>
</tbody>
</table>

Table 2.7: Frequency (Proportion) of Approach and Avoid Responses for Lever Manipulation

Effects of the approach/avoid manipulations on projected emotions were also assessed. The ANOVA analysis on the five projected emotions yielded no significant effects. These results demonstrate that physical movement alone in this experimental procedure is unlikely to influence responses on projected emotion measures, but its effects can be observed on measures that assess approach/avoidance.
Pulse Rate for Step and Lever Manipulations

In the pilot test, a significant increase in pulse rate was found for the lever manipulation. During subsequent component testing, the lever manipulation and the new step board manipulation were subjected to similar analysis for the effect of those manipulations on pulse rate. As discussed previously, resting pulse rate in the pilot study was not sufficiently controlled. In this component testing, greater attention was paid to this source of variation; participants were placed in their cubicles and were given five minutes of “quiet” time to allow their initial pulse rate measure to better reflect their actual resting pulse rate.

Once again, the lever manipulation was found to increase participant pulse rate (mean increase = 5.1) and this differed significantly from a null hypothesis of no increase (t(23) = 3.96, p = .001), thus replicating the findings for this measure in the pilot study. The step manipulation also increased participant pulse rate (mean increase = 5.7) and that increase was significant as well (t(19) = 3.44, p = .003). There was no significant difference (F(3, 40) < 1) between the four manipulations (push lever, pull lever, step forward, step back).

Component 3: Presentation Frequency of Subliminal Images

Two of the three subliminal emotion induction images were tested for the effects of presentation frequency and possible habituation effects. Four conditions were tested in all: fear 5 presentations, fear 20 presentations, anger 5 presentations, and anger 20 presentations. Twenty pattern mask presentations were retained for all conditions. In the 5 presentation conditions the first presentation of the subliminal image occurred prior to the 7th pattern mask and increased in frequency across the subsequent trials. These four
conditions also allowed me to isolate the effects of the images from the approach/avoid manipulation used in the pilot study.

Method

Forty-eight Ohio State University undergraduates participated in this component test for partial course credit. The procedure was once again identical to the procedure in the pilot study except for two modifications. First, participants were simply instructed to press the space bar after every “flash” on the screen to test their reaction time rather than manipulate the lever. Second, the new scenario and dependent measures were used. After completing the manipulation, participants read the scenario and completed the dependent measures. Participants were then debriefed as to the true nature of the study and to see if they detected the subliminally presented primes.

Results

Analysis of presentation frequency for the fear image (the shark) yielded results consistent with the expected relationship between fear and avoidance such that as the number of presentations increased, so did participant endorsement of an avoidant response to the scenario ($X^2(1) = 2.25, p = .133$; see Table 2.8). The identical analysis was conducted for the anger image (the finger) and the results were non-significant ($X^2(1) = .427, p = .513$). The results were also not in the same direction; the 5 image anger condition was slightly higher in approach endorsements than the 20 image anger condition (see Table 2.9).
A one-way ANOVA analysis for each of the five projected emotion measures was conducted to see if any of the four image prime conditions had a significant effect on those measures. None of those five analyses demonstrated a significant effect on the projected emotion rating items.

The means for each item were inspected to determine if there was any pattern consistent with the intended effect of the image primes on participant ratings. Analysis of the effects of the anger image presentation frequency on reported anger demonstrated a counter-expectation relationship: that fewer presentations of the anger prime led to higher participant rating of anger. The 5 presentation anger condition yielded a higher level of mean anger than the 20 presentation anger condition, though not significantly so (p = .255; see Table 2.10 for means). The opposite was true for the comparison of the fear
presentation frequencies. The 20 presentation fear condition yielded the highest level of reported fear of any of the four conditions while the 5 presentation fear condition yielded the lowest reported level of fear of any of the four conditions, though again not significantly (p = .210; see Table 2.10). The 20 presentation fear condition also generated greater sadness than the 5 presentation fear condition (p = .081). Finally, the 20 presentation anger condition generated more happiness than the 5 presentation anger condition (p = .157) and consistent with this, participants reported greater sadness with fewer presentations of the extended middle finger (p = .301).

<table>
<thead>
<tr>
<th>Stimulus</th>
<th># of times presented</th>
<th>anger</th>
<th>disgust</th>
<th>fear</th>
<th>happiness</th>
<th>sadness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finger (anger)</td>
<td>5</td>
<td>2.3</td>
<td>3.4</td>
<td>2.9</td>
<td>1.8</td>
<td>3.7</td>
</tr>
<tr>
<td>Finger (anger)</td>
<td>20</td>
<td>1.8</td>
<td>2.6</td>
<td>3.0</td>
<td>2.6</td>
<td>3.1</td>
</tr>
<tr>
<td>Shark (fear)</td>
<td>5</td>
<td>2.4</td>
<td>3.6</td>
<td>2.6</td>
<td>2.2</td>
<td>2.3</td>
</tr>
<tr>
<td>Shark (fear)</td>
<td>20</td>
<td>2.3</td>
<td>3.2</td>
<td>3.3</td>
<td>2.3</td>
<td>3.4</td>
</tr>
</tbody>
</table>

Table 2.10: Effect of Prime Presentation Frequency for Fear and Anger Primes on Means Ratings of Projected Emotions.

In all it appears that the fear image prime is relatively effective in increasing an avoidant reaction and a heightened fear rating, especially with 20 presentations. On the other hand, the anger image, based on the results of the component testing and the pilot results, appears to be at best ineffective and at worst reacted to as rather humorous.
Component 4: Projective Versus Self-Rated Emotion

The final component test was conducted to determine whether participants would make stronger emotion ratings when asked to imagine the level of emotion experienced by a scenario actor than when asked to imagine themselves as the scenario actor and to rate the level of their own experienced emotion in that scenario. To assess the difference between these procedures, 17 participants in three of the previous component conditions (push lever (no image prime), step forward (no image prime), or anger prime (20 images with no approach avoidance manipulation)) were randomly assigned to an alternative version of the projective measure. The versions differed only in the instructions and pronouns used in the scenario. The first version, asked participants to imagine themselves in the scenario situation and used the pronoun “you” in the scenario and the emotion rating items that followed (“you” condition). The other version instructed participants to imagine a “student” and used third person pronouns throughout (“other” condition).

The means on the projected emotion rating measures were compared from component test 2 conditions “push lever” and “step forward” and component test 3 condition “anger 20 images.” Almost universally, those participants with the instruction to assess the emotions of the scenario actor reported higher levels of emotion than those participants asked to report their own emotional reaction when instructed to imagine themselves in the scenario (See table 2.11). The “step forward” condition shows this most clearly where the Ns were comparable between conditions and the differences

3 Had the results of component test 3 been known when I ran this component test, I would have used either the fear 20 image condition or the anger 5 image condition rather than the anger 20 image condition.
between the versions were significant. The exception to the pattern of significantly different levels of reported emotion (in the step forward manipulation comparison) was observed for the happiness item for which participants reported essentially equal levels of happiness in the “you” condition than the “other” condition. Given these results, it appears that higher levels of negatively-toned emotions will be ascribed to an actor in a scenario compared to the self imagined in an identical scenario.

<table>
<thead>
<tr>
<th>Condition</th>
<th>reported emotion instruction</th>
<th>n</th>
<th>anger</th>
<th>disgust</th>
<th>fear</th>
<th>happiness</th>
<th>sadness</th>
</tr>
</thead>
<tbody>
<tr>
<td>push lever</td>
<td>you</td>
<td>3</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>3.00</td>
<td>1.67</td>
</tr>
<tr>
<td>push lever</td>
<td>other</td>
<td>12</td>
<td>1.75</td>
<td>2.25</td>
<td>2.33</td>
<td>2.97</td>
<td>2.50</td>
</tr>
<tr>
<td>step forward</td>
<td>you</td>
<td>9</td>
<td>1.44</td>
<td>1.78</td>
<td>1.78</td>
<td>2.89</td>
<td>2.33</td>
</tr>
<tr>
<td>step forward</td>
<td>other</td>
<td>10</td>
<td>2.20</td>
<td>3.00</td>
<td>2.80</td>
<td>3.30</td>
<td>3.80</td>
</tr>
<tr>
<td>anger image</td>
<td>you</td>
<td>4</td>
<td>2.00</td>
<td>2.25</td>
<td>2.00</td>
<td>2.75</td>
<td>2.50</td>
</tr>
<tr>
<td>anger image</td>
<td>other</td>
<td>12</td>
<td>1.75</td>
<td>2.58</td>
<td>3.00</td>
<td>2.58</td>
<td>3.08</td>
</tr>
</tbody>
</table>

Table 2.11: Comparison of Projected Emotion Ratings for “You” versus “Other” Scenarios

Component Testing- Discussion and Implications

Based on the results of the pilot test and subsequent component tests, several observations emerged. First, the comparison of the coded projected emotion responses in the pilot to the forced-choice projected emotion measures in the first component test
demonstrate that changes in the scenario had a powerful effect on shifting participant response patterns. This scenario-driven effect, most likely operating via activated behavioral scripts, swamps the intended effect on participant response to the experimental manipulations. That a “bum” is scary at night and disgusting during the day is consistent with a naïve view of person perception, but not useful in the context of attempting to test a novel method of emotion induction in the laboratory.

The one exception to this observed scenario-driven effect was in the fear prime condition where participant fear responses predominated in the daytime “bum” scenario. From this, I conclude that the fear prime image is relatively effective. The anger image, on the other hand, failed to be effective in increasing participant ratings of projected anger; it actually appeared to be amusing given the increased happiness ratings for the anger condition. This conclusion receives additional support from the results of the third component test where decreasing the number of presentations of the anger image from 20 to 5 had the effect of increasing rated anger and decreasing rated happiness. Coupled with the increased fear ratings in the third component test for the fear prime condition when 20 presentations were used, rather than the 5, it is clear that habituation to the prime in general did not cause lower projected ratings of emotion.

Not only did reducing the number of presentations of prime images seem to decrease the effectiveness of those prime images on projected emotion ratings, so did asking participants to imagine themselves as the scenario actor. By changing the pronouns in the scenario and dependent measures from “a student” to “you”, lower levels of projected emotion ratings were observed overall.
Finally, the new step manipulation compared favorably to the lever manipulation. Not only is it a more direct manipulation of approach/avoidance than using the lever, it successfully increased participant arousal (pulse rate difference) and showed a more power effect on projected approach/avoidance responses in the intended direction for that manipulation.

FUTURE DIRECTIONS AND MODIFICATIONS

Overall, component testing proved useful. Several additional modifications to the dependent measures and the manipulations are apparent from the results of these component tests. First, the previously discussed observed shift from a high frequency of fear to a high frequency of disgust responses on the forced-choice projected measures suggests that the scenario that precedes the dependent measures needs to be made yet more ambiguous. Virtually all participants have encountered a bum begging for change and have developed a response script for that situation. To expect that these experimental manipulations would overcome those scripts appears optimistic given the rather weak observed effects of those manipulations. The scenario approach becomes even more problematic when one attempts to develop a scenario that is equally pliable for three emotions: anger, fear, and disgust. Certainly it would be easier to craft a scenario that would test the effects of only two emotion primes. For example, recently I showed several friends a large yellow garden spider that has set up shop in the hibiscus in my back yard. Responses were equally split between “that’s scary” and “that’s gross”. No one got angry at Boris the spider. Not only would it be difficult to push someone from describing Boris as disgusting to seeing Boris as scary, to further push that person to describing their experience of Boris as angering seems as daunting an effort as the flies
attempting to free themselves from Boris’ web. Having given this dependent variable
challenge a great deal of thought, I conclude that further exploration of a scenario-type
stimulus is better left for future studies and that it makes more sense to develop a more
ambiguous nonverbal projection target to which participants will rate a projected
emotional state.

One type of ambiguous target that has been employed in previous research is
cartoon fish, used by Morris and Peng (1994) to assess cross-cultural perceptions of
causality. While it might be a bit of a stretch to ask participants to rate the emotional
experience of a fish, I believe that they might do so quite readily for a more
anthropomorphic target such as human stick figures. By presenting two stick figures to
participants and asking whether the target stick figure is more likely to approach or avoid
the other stick figure, it is unlikely that prior scenario associated scripts will be employed
by the participants to answer the question. Further, participants could then be asked to
rate levels of emotions that one stick figure is feeling toward the other stick figure.
Finally, participants can be asked to write a few sentences about why the stick figure
might approach/avoid and feels the way “it” does toward the other stick figure.
Additionally, the “stick figure paradigm” can lend itself nicely to extending this research
to perceptions of individuals to groups by simply increasing the number of stick figures.
While this paradigm seems at first a bit far-fetched, I would argue it is certainly no less so
than asking participants to assign motives to fish.

Several possible benefits accrue from this new projection target that addresses
deficiencies observed in the pilot study and component testing. First, it is very
ambiguous. Second, it capitalizes on the projective technique tested in the component

testing study that showed participants assign higher levels of emotion to others rather than themselves. Third, it readily allows for the use of closed-ended variables to assess approach/avoidance and emotion as well as a codeable open-ended response format that allows participants to create a story about the stick figure interaction.

As far as the manipulations are concerned, it is clear that the anger prime manipulation is not nearly as effective as I had hoped it would be. Based on the results of the pilot and component studies, the image of the extended middle finger will need to be replaced or augmented. If we return to the idea that anger is a relatively complex emotion requiring a certain amount of appraisal, an extended middle finger, sans any context, may mean different things to different people at different times. It is worth repeating at this time that participants in this pilot study demonstrated increased happiness when being exposed to the “finger” prime 20 times rather than 5 times.

An image I have used in the past to supraliminally prime anger (in conjunction with a story) is an image of an American flag being burned. The next study will therefore rely on three different anger images, in an effort to create a less potentially variable context: the extended middle finger, a burning American flag, and an image of an adult striking a child.

Finally, the step board will replace the lever as the approach/avoidance manipulation. Not only is it a more conceptually direct manipulation of approach and avoidance, it showed superior effects, albeit not at statistically significant levels, but that I will attribute, at least in part, to insensitivity of the dependent measures. I also intend to drop the interim pulse rate measurement that was done between the manipulation and the dependent variable. Both the lever and the step board manipulations demonstrate a
significant elevation of participant pulse rate. I am concerned that participant contact with the experimenter following the manipulation and preceding the administration of the projection target and dependent measures is a source of variation that is best avoided.

All of these suggested modifications of manipulation procedures and measures were incorporated in the design and method of a new study designed to test the full model of emotion elicitation, as reported in the next chapter.
CHAPTER 3

FULL IMPLEMENTATION STUDY

The goal of the full implementation study was to test a method designed to induce a discrete emotional experience in experimental participants that would affect their perception of an ambiguous projection target. In addition to testing the validity of a multi-component model of emotions, the creation of a successful induction method could, in future research programs, be used to better understand the relationship of emotional experience to prejudice, comparative appraisals of others, and punitive responses to targets to name but a few research arenas.

The full implementation study combined subliminal priming via affect-laden images with a supraliminal approach/avoidance manipulation that was intended to not only activate a cognitive component of emotional experience, but also to increase participant arousal and supply proprioceptive cues that are either consistent or inconsistent with that emotional experience. For example, while the experience of fear is clearly linked to an avoidant response, the following study tested both consistent pairings (exposure to fear inducing images and then stepping back) and inconsistent pairings (exposure to fear inducing images and then stepping forward). While attention was certainly to be paid to the effect of each manipulation independently, it was the interaction of these manipulations that held the greatest interest. Specifically, the experiment was designed to test the consistency/amplification hypothesis against an
inconsistency/amplification hypothesis (as described in Chapter 2). For instance, would participants project a higher level of fear onto a target when they step toward a fear evoking image (an inconsistent condition)? Or would the “consistent” pairing of viewing a fearful image and then stepping back generate a greater projected fear, that is, with the body and mind working in concert?

Design and Method

Based on the results of the pilot study and subsequent component studies, the full implementation of this study used a 4 (prime images: anger, fear, happy, and neutral) x 3 (step manipulation: step forward, no step, and step backward) full factorial design. For the prime manipulation, the disgust condition (used in the pilot) was replaced with a happiness condition. As I discussed earlier, anger can be associated with either approach or avoidance. Happiness is more unambiguously associated with an approach tendency. Happiness will constitute a more interesting comparison condition to anger than will disgust. Any comparison to anger that disgust allows is already present in the fear condition given that fear and disgust are both negatively toned emotions linked to an avoidant reactions. Unlike the previous pilot study, a control condition has been included for the approach/avoidance manipulation with the addition of a “no step” condition thus allowing me to assess the sole effect of image primes. The addition of a neutral image prime condition will similarly allow me to assess the effect of the step manipulation alone.

Dependent measures for this study were selected based on findings from the previous pilot studies. Measures of affective states following the experimental manipulations were of three types. A rating of general comfort/discomfort during the
induction phase of the experiment was added to the design to assess whether the different conditions resulted in different immediate, general affect. A projective measure was used to assess both approach/avoidance action tendencies and specific emotional experience. Responses to a set of structured and open-ended questions were used to assess cognitive appraisals that might accompany the projected emotions. In this study the PANAS self-report measure of emotion was not used because our pilot research indicated that participants are more likely to express emotions projected to another person that for themselves, and because the inclusion of the PANAS was judged to be reactive.

Method

Participants were randomly assigned to one of twelve experimental conditions. For the prime images, three images were presented for each prime condition, in random order, with each image presented six or seven times yielding a total of twenty images. For the anger condition, the images were of an extended middle finger, a burning American flag, and a woman and child being hit by a man. The fear condition used images of a great white shark with open mouth, a snake about to strike, and a very vicious dog bearing its teeth. For the happiness condition, the images were a birthday cake, a smiling infant, and Mickey and Minnie Mouse. Finally, the neutral condition used pictures of a box of Kleenex, a wicker basket, and a blue coffee cup. Images were subliminally presented for 16 milliseconds in the center of the computer monitor and were all full screen images. A pattern mask of a random pattern of white triangles on a black background immediately followed each priming image for 50 milliseconds.

The approach/avoidance step manipulation used a 20” x 4’ board with three strips of stainless steel duct tape (each 4” in width) across the width of the step board at the
center and each end of the board. Attached to the top of the board on each “sensor” tape was an electrical box with a wire connected that electrical box to the next electrical box. The electrical box at the forward end of the step board had a second electrical cable that appeared to be attached to the back of the computer in the cubicle. Participants were to step forward, step backward, or remain stationary and press a button each time they saw a flash on the computer monitor depending which condition they were assigned to.

After being exposed to the subliminal image primes and stepping forward, stepping backward or remaining stationary and pressing the button in response to each image presentation, participants completed the dependent measures. The first set of dependent measures queried participants as to the likelihood of various states of “Person A”, a stick figure presented in a brief “person perception” cartoon that depicted two stick figures interacting. In the second set of dependent measures, participants answered several questions about their own experience of the “reaction time” experiment in which they just participated. Demographic information was collected after the dependent measures.

Procedure

Participants were 291 Ohio State University undergraduate students (209 female and 82 male) participating for partial course credit. Participants were randomly assigned to one of three cubicles that had been preconfigured to one of the twelve experimental conditions. Initially, all participants were taken into one cubicle by the experimenter to explain the experiment. The experimenter instructed participants that for the “reaction time” study, they were to either step forward, step back, or remain on the center sensor and press a button each time they saw a flash on the computer screen depending on the
experimental condition to which they were assigned. The experimenter then physically
demonstrated the step manipulation to the participants as noted on the computer monitor
“Welcome” screen (e.g. “Welcome to the experiment. Please Step Forward when you
see the flash”). Participants were then told that their response to the flash might differ
based on the condition to which they were assigned and they would be individually
instructed once they were in their own cubicle. Each participant was later taken to their
own cubicle and asked to assume their position on the step board and practice the
required response when the experimenter said the word “flash”.

Participants were then told that due to the short time they would spend on the
“reaction time” study, they would participate in a “person perception” experiment
immediately afterwards to make better use of the ½ hour credit they were receiving for
their participation. They were further instructed that once the “reaction time” was
finished, the computer would automatically load up the second study and they were to sit
at the computer, watch a brief cartoon, and then answer the questions. Finally,
participants were instructed upon completing the questions that they should come out into
the hallway and let the experimenter know they had completed the experiment and were
ready to be debriefed.

Upon finishing the “reaction time” experiment, participants sat down in front of
the computer monitor with the instruction to press a button to continue on to the “person
perception” experiment. The on-screen instructions further explained that people are
natural “people perceivers” and that even with a minimal amount of information or brief

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4 During pilot testing, I found that this procedure greatly enhanced the “reaction time” cover story; participants were readily able to form a simple hypothesis as to the purpose of the study.
observation, people are quite good at discerning a wide range of details about people of interest. When participants pressed the button, they were presented a 12-second cartoon in which a stick figure was standing at the right edge of the screen. A second figure enters at the left side of the screen and walks toward the figure at the right side of the screen, stopping at a distance comparable to about six feet away from the target figure, Person A. As the second figure, Person B, approached and stopped, Person A turned slightly toward Person B and made a few additional subtle movements.5 In the final frame of the animation, the labels “Person A” and “Person B” appeared above each stick figure and this frame persisted for two seconds before the dependent measures were presented (see Appendix C for a sample of animation frames).

The first question asked the participant to rate the likelihood that Person A would move toward or move away from person B on a bipolar 7-point scale with “neither move toward or away” as its center point and anchored on either end by “very much toward” and “very much away” respectively. The next six questions assessed projected emotions, using PANAS inspired 6-point unipolar rating scales anchored on one end with “not at all” and on the other end with “extremely”, to indicate the extent to which the participant thought that Person A was feeling the following emotions: anger, happiness, fear, hostility, nervousness, and delight. Following those measures, three appraisal items assessed A’s strength relative to B, A’s certainty of what B will do next, and A’s confidence in A’s ability to deal with B’s next move. The strength appraisal rating was

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5 Pre-testing with undergraduate students in an upper level Psychology course had shown that these additional movements were ambiguous at the very least and provided nothing in the way of informing a viewer as to anything beyond the most obvious observation that one figure approached the other figure.
constructed on a 7-point bipolar scale with a center point of “equal strength” and end points of “much stronger” and “much weaker”. The certainty and confidence items used 6-point rating scales; the end points of the certainty item were “very uncertain” and “very certain” and the endpoints of the confidence item were “very confident” and “very unconfident”. Finally, an open-ended response question asked participants to write a few sentences about what A was feeling and what A was most likely to do next (see Appendix D for complete questions and response options).

Once the participants completed these items, they were presented with a question about their experience of the earlier reaction time task, specifically their level of comfort with the task (rated on a 6-point scale anchored at 1 by “very uncomfortable” and at 6 by “very comfortable”). Participants were then presented a manipulation check that asked them to report the step condition to which they were assigned: “step forward”, “step back”, or “press button”. The final two questions gathered demographic information--age and gender (see Appendix E for questions and response options).

As soon as all participants completed the experiment, they were taken into one cubicle by the experimenter and queried as to their perception of the study and then told the true nature of the experiment. This questioning began with the experimenter asking participants to describe the “flashes” on the screen; participants typically stated that they looked like a “bunch of triangles” or a “broken mirror”. Participants were then asked if they saw anything else. Fourteen participants stated that they thought they saw something else, but were unsure of what it was. These participants were asked what it might be that they saw and only four described an image which they were actually presented. Those participants were queried as to what the image might have to do with
the experiment and none of those participants could supply a hypothesis even remotely suggesting that the experimental deception was in anyway compromised; no participants were omitted on the basis of detection of images. At this point, the experimenter described the emotion component of the study, told each participant which images they had been presented and asked if they saw those specific images. The description of the images was greeted almost universally with disbelief and laughter (especially those in the anger condition being told about the middle finger image: “you were flipped off seven times during the experiment”).

Participants were then asked about the “person perception” experiment. Participants readily agreed that there was little obvious information present in the cartoon on which to base their judgments about Person A. Finally, participants were informed that the “reaction time” and “person perception” experiments were actually two components of a single experiment and asked what they might have to do with each other. A few participants, given this information, were able, with some thought, to then generate a hypothesis consistent with the purpose of the experiment. At this point the experimenter explained the true purpose of the experiment and the need to use deception and asked the participants if they had any questions. Participants were then asked to maintain the experimenter’s confidence by not divulging the true nature of the experiment to their friends and classmates.

Results

The following analyses, with the exception of the preliminary assessment of possible gender effects and the emotion prime condition, are ordered, for the most part, by their explicitness in assessing the effects of the manipulations on emotional
experience. I begin with what is best described as the participants’ most immediate experiential affective reactions (retrospectively assessed) -- participant rating of comfort/discomfort during the “reaction time” task. I then assessed the effects of the experimental manipulations on the approach/avoidance tendency ascribed to Person A, an indirect measure of the respondent’s own response orientation. An analysis of the most explicit emotion attributions to Person A then follow. Finally, the results section concludes with the analysis of action tendency appraisal variables and the analysis of the open-ended responses.

Special attention, in some of these analyses, will be given to the exploration of theoretically compatible and incompatible step/prime experimental conditions. Compatible (consistent) conditions are those in which the expected action tendency in response to the prime is consistent with the forward or backward movement on the step task, for instance, fear images coupled with step back (avoidance). Incompatible (inconsistent) conditions are those where action and image are obviously at odds, for example, a step forward manipulation coupled with fear evoking images. For anger images, theoretical expectations regarding the consistency of prime and movement is mixed; evidence has been found for both approach and avoidant responses to experienced anger. As discussed in Chapter 1, an approach or avoidance response to experienced anger is likely based on additional appraisals of situational context: assessment of relative strength, certainty of the effect of one’s response, and confidence in the efficacy of one’s response.
Preliminary Analyses

Preliminary analyses of the data were disappointing. Little in the way of significant effects was observed. The lack of significant effects was perplexing in light of the participant comments elicited during the extensive debriefing sessions. Many participants volunteered reactions that seemed consistent with intent of the experimental manipulations, yet these responses were not observed in the analyses of the data. This led me to acknowledge the possibility of a potential source of variability in the data for which I had not controlled. The data were again analyzed, this time using the most obvious moderator at my disposal: participant gender. Even though relevant effects of gender did not emerge in my initial pilot study, it seemed important to determine whether gender differences did influence outcomes in this full implementation experiment.

Gender Differences in Emotion and Action Tendency Responses

Previous research exists that suggests that female and male participants would react differently to approaching or avoiding fear and anger stimuli. Gender has been found to have an influence on risk taking behavior such that males are more willing to take risks than females given certain contexts (Fagley & Miller, 1990; Hirschberger, Florian, Milulincer, Goldenberg & Pyszczynski, 2002). Gender has also been found to affect a preference for different types of aggressive behavior: males are more inclined to use physical aggression while females have been found to more likely use emotional/relational aggression often via more indirect passive-aggressive behaviors (Archer, 2000; Crick & Rose, 2000; Galen & Underwood, 1997).

To assess whether such gender effects were present under this experimental paradigm, I analyzed four conditions (anger/approach, anger/avoid, fear/approach, and...
fear avoid) with condition and participant gender as independent variables in a two-way ANOVA. Analysis was limited to these four experimental conditions, based first on conformance to previous gender difference findings being limited in large part to phenomenon associated with fear and anger, as well as the necessity to maintain enough statistical power given the relatively low number of males in the data set. Three dependent variables were tested in these analyses: participant comfort with the experimental task, participant ratings of the likelihood of Person A’s approaching/avoiding Person B, Person A’s level of fear, and person A’s level of anger.

Participant comfort was analyzed in a two-way ANOVA with experimental condition and gender as independent variables. There was no effect for the main effect of condition (F<1) on participant comfort. There was a significant main effect for participant gender (F(1, 88) = 4.9, p = .03) such that male participants, overall, reported being more comfortable with the reaction time task than female participants (Ms: male = 5.3, females = 4.5). The condition x gender interaction was also significant (F(3, 88) = 3.2, p = .03). The only condition where males demonstrated less comfort than the other three conditions was the fear/step back condition. For females, the lowest comfort was in the anger/step back and fear/step forward conditions (see Figure 3.1). The fear conditions showed the greatest reversal effect; men experienced greater discomfort stepping back in response to the fear primes while women’s comfort was highest when stepping back in response to fear primes.

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6 Running additional males participants was another option, but would have unfortunately confounded gender with the “late in the quarter” participant difference effect observed in the Ohio State University participant pool, that this, all females would be early quarter, while 2/3 of the males would be late quarter.
For Person A’s approach/avoidance likelihood, neither condition nor gender had a significant effect (Fs < 1). There was, however, a significant condition x gender interaction (F(3, 88) = 2.95, p = .037), such that females rated A’s likelihood of moving away as greater in the anger/avoid and fear/approach conditions while males rated A’s likelihood of moving away as greater in the anger/approach and fear/avoid conditions (see Figure 3.2). It is apparent from these data that the image primes coupled with the step manipulation have different effects on male and female participants. Focusing on consistent versus inconsistent conditions for females, it appears that stepping forward in response to fear evoking images (inconsistent) increases predictions of avoidance while moving away from a fearful stimulus (consistent) increases the perceived likelihood of
approach. For males the effect was reversed, stepping back while exposed to fear images (consistent) led to greater endorsement of avoidance tendency while the opposite was observed in the inconsistent fear/step forward condition. This relationship of manipulations to dependent variables was reversed for the anger prime conditions.

Figure 3.2: A’s Likelihood of Moving Toward/Away from B: Condition x Gender Interaction

Participants’ ratings of A’s level of anger yielded no significant results for condition (F < 1), participant gender (F(1, 88) = 2.34, p = .13), nor the condition x gender interaction (F(3, 88) = 1.47, p = .23). Though not statistically significant, the mean rating for A’s level of anger was greater for females (M = 2.4; 95% C.I. = 2.08, 2.73) than for males (M = 1.9; 95% C.I. = 1.41, 2.45), and this was particularly true in the anger/avoid
condition where females rated A as being significantly more angry (M = 2.94; 95% C.I. = 2.32, 3.57) than did males (M = 1.33; 95% C.I. = .24, 2.42) (see Figure 3.3).

The analysis of participants’ ratings of A’s level of fear yielded non-significant effects for condition (F < 1), gender (F(1, 88) = 1.66, p = .20), and the condition x gender interaction (F <1). Overall, males rated A as being more afraid (M = 3.38; 95% C.I. = 2.79, 3.96) than did females (M = 2.93; 95% C.I. = 2.57, 3.29).

The observed lack of significant effects for condition, gender, and the condition x gender interaction on the anger and fear measures combined with the observed significant effects observed for the comfort and approach/avoidance measures leads me to suggest that the prime images were not interpreted differently based on participant gender. It
appears that a more likely reason for the observed disparity of effects may derive from differing expectations of what constitutes an acceptable action tendency for males as opposed to females in response to emotion evoking stimuli.

Based on these observed gender differences, I decided to omit male participants in the subsequent analyses. It is obvious that males and females react differently to the critical combinations of emotion-evoking images and actions, and given the low number of males in the experimental sample insufficient power was available to conduct meaningful analyses with gender as a moderator for all dependent variables. Thus all remaining analyses are based on the 209 female participants in the experiment.

Assessment of Happy and Neutral Prime Conditions

Given the relatively low observed power in the previous analyses, I conducted a preliminary assessment of the impact of the emotion primes for the possibility of collapsing two of the emotion prime conditions (happy and neutral images) to increase power of subsequent analyses. For the emotion dependent measures, no significant differences were observed for the happy image or neutral image conditions. It is likely that the images in the happy prime condition did not generate a high enough level of positive affect to differentiate it to any significant degree from the neutral condition. Based on this, all further analyses are based on a three emotion prime design: anger image, fear image, and neutral image conditions, where the neutral image and happy image conditions have been collapsed.
Main Analyses

The main analyses follow a general pattern of assessing the effectiveness of the image prime at three levels (anger, fear, and happy/neutral) and the step manipulation at three levels (forward, no step, backward) for female participants only. Where additional trimming of the number of levels of the experimental manipulations may increase statistical power to acceptable levels, more focused analyses were also conducted.

Comfort Ratings. I hypothesized that participant comfort with the reaction time task would be, at least in part, affected negatively in the inconsistent conditions: fear/step forward, happy/step back and perhaps, anger/step back. A two-way ANOVA was conducted to assess the main effects for the emotion prime and the step manipulation, but most importantly for the interaction effects of the consistent/inconsistent conditions. Neither main effect was significant (Fs < 1). The interaction effect did approach a conventional level of significance (F(4, 200) = 2.19, p = .068). For female participants in the anger prime condition, stepping backward yielded the lowest level of participant comfort while stepping forward yielded the greatest comfort. For participants in the fear condition, those in the no step and step forward conditions showed the greatest discomfort and those in the step back condition showed the greatest comfort. For the happy/neutral condition, there was no appreciable difference in the effect of participant step condition.

Given that there was little effect of the step manipulation in the happy/neutral prime condition, the analysis was rerun omitting that condition and focusing only on the two negative emotion prime conditions. This yielded a 2 (prime image: anger and fear) x 3 (step manipulation: forward, no step, and step back) between subject analysis to look
more deeply at the prime by step interaction in the critical conditions. The interaction in this analysis did reach statistical significance (F(2, 96) = 3.9, p = .02)(see Figure 3.4).

Female participants reported a great deal more comfort when stepping forward than backward while viewing anger primes. The opposite was true with the fear primes, where stepping forward or remaining stationary greatly increased their discomfort. This retrospective measure of participant comfort was systematically influenced by the interaction of the experimental manipulations in a way that was consistent with the hypothesized relationship of emotion and action-tendency. When in a condition that is clearly consistent (e.g., fear/step back), participant comfort is at its highest. When in a condition that is clearly inconsistent (e.g., fear/step forward), discomfort is at its highest.

Interestingly, while the no step condition was conceived to serve as a control condition to allow me to assess the effects of just the image prime, it appears to have transcended that simple intent. Participants standing still in the face of fear-evoking stimuli experienced discomfort to the level equal to that of approaching those stimuli. It is worth mentioning that while this discomfort was explicitly reported, the source of that discomfort is entirely outside of the participants’ conscious awareness, that is moving (or not) in response to subliminally presented affect-laden images.
Figure 3.4: Effect of Prime and Step Direction on Participant’s Self-reported Comfort with Reaction Time Task

Approach/avoidance responses. The rated likelihood of Person A approaching/avoiding Person B was subject to a two-way ANOVA analysis. Neither the step manipulation (F(2, 200) = 1.8), the prime (F(2, 200) = 1.1), nor the interaction of step condition and prime condition (F(4, 200) = 1.5) were statistically significant. However, two of the interaction condition means stood out starkly from the other ten condition means: anger/step backward and fear/step forward, both of which can be argued to be inconsistent conditions for female participants. These conditions produced
the highest ratings of the likelihood that Person A would avoid person B. Given these observed results, I once again reanalyzed the data to test the prime x step interaction for only the anger and fear prime conditions. The interaction in the 2 (prime: anger and fear) x 3 (step: forward, no step, and step back) between subject analysis was significant (F(2, 96) = 3.0, p = .05) (see Figure 3.5). Female participants rated A’s avoidance tendency as highest for the anger/step back and fear/step forward conditions. Interestingly, the no step conditions showed virtually no difference from the anger/step forward and fear/step back conditions.

Figure 3.5: Effect of Prime and Step Direction on Person A’s Approach/Avoidance Tendency
Emotion attributions. The projected emotional state of “person A” was rated on six emotions. Pairs of related emotions were aggregated to reduce the total number of emotion dependent variables to three. Combined pairs were anger/hostility, fear/nervous, and happiness/delight. (See Table 3.1 for emotion rating dependent measure correlations).

<table>
<thead>
<tr>
<th></th>
<th>Anger</th>
<th>Happiness</th>
<th>Fear</th>
<th>Hostility</th>
<th>Nervousness</th>
<th>Delight</th>
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<td>-0.318**</td>
<td>-0.200**</td>
<td>-0.182**</td>
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</tr>
</tbody>
</table>

* significant at the p = .05 level
** significant at the p = .01 level

Table 3.1: Emotion Rating Correlations

To test the overall effectiveness of the emotion induction manipulations, a 3 x 3 x 3 mixed ANOVA was conducted with the three emotion measures (aggregate anger, fear, and happiness) as the within-subject factor. The emotion prime condition (anger, fear, happy/neutral) and the step manipulation were between participant factors. The within-subject effect was significant (F(1, 200) = 9.9, p < .01) indicating that participants rated...
the level of the three emotions differently overall. The mean rating for the anger index across all conditions was 2.2, the mean rating for the fear index was 3.1, and the mean rating for the happiness index was 2.5.

The within-subject x step manipulation was also significant (F(2, 200) = 4.7, p = .01) (see Table 3.2 for condition means). The between-participant effects were not significant (emotion prime: F(2, 200) = 1.6, p = .20; step manipulation: F(2, 200) = 1.7, p = .19), nor was their interaction (F = 1), nor was the three-way step x prime x emotion dependent variable interaction (F < 1). Overall, mean ratings of Person A’s emotional state were higher for fear than the other emotion items regardless of step condition and these ratings were virtually identical regardless of step condition. Person A’s rated anger was highest in the step backward condition and Person A’s rated happiness was highest in the no step condition.

<table>
<thead>
<tr>
<th>Step Condition</th>
<th>Emotion Measure</th>
<th>Mean</th>
<th>Std. Error</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>step forward</td>
<td>Anger</td>
<td>2.2</td>
<td>0.14</td>
<td>1.89</td>
<td>2.45</td>
</tr>
<tr>
<td></td>
<td>Fear</td>
<td>3.0</td>
<td>0.18</td>
<td>2.62</td>
<td>3.32</td>
</tr>
<tr>
<td></td>
<td>Happy/Neutral</td>
<td>2.4</td>
<td>0.15</td>
<td>2.09</td>
<td>2.69</td>
</tr>
<tr>
<td>no step</td>
<td>Anger</td>
<td>1.9</td>
<td>0.15</td>
<td>1.65</td>
<td>2.24</td>
</tr>
<tr>
<td></td>
<td>Fear</td>
<td>3.1</td>
<td>0.18</td>
<td>2.76</td>
<td>3.47</td>
</tr>
<tr>
<td></td>
<td>Happy/Neutral</td>
<td>3.0</td>
<td>0.16</td>
<td>2.69</td>
<td>3.31</td>
</tr>
<tr>
<td>step backward</td>
<td>Anger</td>
<td>2.5</td>
<td>0.15</td>
<td>2.21</td>
<td>2.80</td>
</tr>
<tr>
<td></td>
<td>Fear</td>
<td>3.1</td>
<td>0.18</td>
<td>2.73</td>
<td>3.45</td>
</tr>
<tr>
<td></td>
<td>Happy/Neutral</td>
<td>2.6</td>
<td>0.16</td>
<td>2.26</td>
<td>2.88</td>
</tr>
</tbody>
</table>

Table 3.2: Within Participant Means for Emotion Measures x Step Manipulation
As suggested by previous analyses, I further reduced the number of conditions to focus on the anger and fear primes. This yielded a 2 (prime: anger and fear) x 3 (step: forward, no step, and backward) x 2 (emotion measure: anger and fear) with the emotion measure as a within participant factor. The emotion measure x step manipulation interaction approached conventional levels of significance (F(2, 96) = 2.4, p = .09) while the emotion measure x prime interaction remained non significant (F(2, 96) = 1.6, p = .21). The three-way interaction was again non significant (F < 1). Nevertheless, the within-subject x step manipulation was explored further by reanalyzing the data for each step condition separately, yielding three emotion measure x prime analyses. In only the step forward data set did this analysis approach a conventional level of significance (see Table 3.3). This effect was driven primarily by a decrease in the rating of Person A’s happiness in the fear/step forward condition (M = 1.9) compared to the rating of Person A’s happiness in the fear/no step condition (M = 2.8) and fear/step back condition (M = 2.6). The lower happiness can be viewed as consistent with a fear prime/step forward condition, but little else is suggested by these analyses regarding the effectiveness of the manipulations in inducing a discrete emotional state in the experimental participants for any of the image primes other than the fear primes. Based on these, and previously reported analyses, it appears that the projected PANAS-style emotion level measures were relatively insensitive to the experimental manipulations.
<table>
<thead>
<tr>
<th>Emotion Measure Within Participant Effects</th>
<th>df</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>step forward only</td>
<td>2, 136</td>
<td>8.1</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>no step only</td>
<td>2, 132</td>
<td>12.7</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>step back only</td>
<td>2, 132</td>
<td>3.5</td>
<td>0.035</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emotion Measure x Prime Within Participant Effects</th>
<th>df</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>step forward only</td>
<td>4, 136</td>
<td>1.9</td>
<td>0.11</td>
</tr>
<tr>
<td>no step only</td>
<td>4, 132</td>
<td>&lt;1</td>
<td></td>
</tr>
<tr>
<td>step back only</td>
<td>4, 132</td>
<td>&lt;1</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.3: Within Participant Tests for Emotion Measures and Emotion Measures x Prime Condition Separated by Step Manipulation Condition

Appraisal Variable Analyses. Three dependent variables suggested by the emotion/appraisal literature relating to fear and anger were analyzed. Whether one experiences anger or fear (and subsequently exhibits an approach or avoidance response) in reaction to a target can be based on one’s assessment of one’s strength relative to a target, the certainty of the target’s motive(s) or what the target will do next, and the confidence one has in one’s ability to deal with the target successfully. For example, if one feels that the target is stronger than one’s self and is uncertain of one’s ability to successfully counter the target’s next move, one will likely experience fear and will most likely exhibit an avoidance reaction. On the other hand, if one feels equal in strength (or stronger) than a target and is confident that one can successfully counter the target’s next move; one is likely to experience anger and manifest and approach response. Given the
general absence of observed effects of the image prime on the emotion rating measures, these appraisal measures offer the possibility of less direct evidence that the manipulations produced the desired effects.

The first appraisal measure was participants’ ratings of Person A’s strength relative to Person B. The second appraisal measure assessed participant rating of Person A’s certainty with Person B’s next course of action. Finally, the third appraisal measure was the participants’ ratings of the level of Person A’s confidence in their ability to “deal with” Person B’s next move. Correlations of the three appraisal measures were run to assess the relationships among these measures. As Person A’s perceived strength relative to Person B increased, the certainty of B’s next move decreased (albeit it non-significantly and somewhat paradoxically \( r = .145, p = .15 \)) and as Person A’s confidence increased, so did Person A’s perceived ability to “deal with Person B’s next move” \( r = .481, p < .01 \). Finally, and predictably (but not significantly), as Person A’s certainty increased, so did Person A’s perceive ability to deal with Person B’s next move \( r = .106, p = .29 \).

The assessed impact of the emotion prime manipulation, the step manipulation and the interaction of the two independent variables on the A’s perceived strength were all found to be non significant in the two-way ANOVA analysis. Interestingly five of the six condition means were virtually identical with one deviating condition; the anger/no step condition had the highest rating of A’s perceived strength \( M = 2.71 \) which was outside of the lower bound of the 95% CIs of the other 5 condition means. It appears that “holding one’s ground” in the presence of the anger prime image led to the female participants viewing A as stronger than any other condition.
The two-way ANOVA analysis of Person A’s certainty of Person B’s next move was non significant for both main effects and their interaction (Fs< 1). As for the rating of Person A’s confidence in dealing with Person B’s next move, both main effects were non significant while the interaction of emotion prime and step manipulation was found to be significant (F(2, 96) = 3.64, p = .03). The lowest perceived confidence was in the anger/no step condition (M = 3.0) while the highest perceived confidence was in the anger/step forward condition (M = 4.2). Almost equally high perceived confidence as the anger/step forward condition was observed in the fear/no step condition (M = 4.1) (see Figure 3.6). It appears that standing still (i.e. no step) in the anger condition is quite a bit different than standing still in the fear condition. Perhaps standing still in the fear condition serves as a cue to greater perceived confidence, while standing still in the anger condition serves as an indication of lower perceived confidence. Unfortunately, this is somewhat inconsistent with the results for the Person A’s perceived relative strength dependent measure. Logically one would expect that the highest level of strength would be found in the same condition as the highest level of confidence (anger/step forward) rather than the seemingly inconsistent finding where the highest level of strength was found in the anger/no step condition.
Open-ended Response Measures. Following the approach tendency, emotion, and appraisal dependent variables, participants were given the following instruction: “Please write a few sentences explaining why Person A might move away from or toward Person B and why Person A might be feeling the emotion(s) that they are feeling in this situation.” I hoped to augment the findings from the closed-ended dependent variables with participant explanations of A’s emotional state and A’s behavioral tendency.

The participant responses were given to undergraduate research assistants for coding with no identifying information other than participant number; coders were therefore blind to participant condition. Two coders were assigned to code for information about Person A.
Coding was done on three categories: participants’ description of Person A’s emotional state, Person A’s likely approach/avoidance response, and any mention of the relationship between Person A and Person B (see Table 3.4 for coding categories). While the two former coding categories may at first seem to assess information redundant to that assessed in the closed-ended dependent variables, I believe that assessing Person A’s level of emotion for the six closed-ended emotion dependent measures is qualitatively different than measuring an open-ended response regarding the predominant emotion that Person A was exhibiting. Similarly, I believe there is a qualitative difference between the closed-ended measure of the likelihood of Person A’s approach/avoidance compared to the participants’ open-ended assessment of what Person A will do next. Finally, the third coding category, Person A’s relationship to Person B, was intended to capture one possible interpretation of Person A’s response to Person B that might have been affected by participant condition. For example, a participant in the fear condition might be more likely to view the relationship between Person A and Person B as “enemy” rather than “friend”.
<table>
<thead>
<tr>
<th>Person A's Emotion</th>
<th>Person A's Approach Tendency</th>
<th>Person A and Person B's Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>sad</td>
<td>move away</td>
<td>friend</td>
</tr>
<tr>
<td>fear/apprehension/nervous/intimidated</td>
<td>move toward</td>
<td>romantic friend</td>
</tr>
<tr>
<td>happy</td>
<td>both</td>
<td>stranger</td>
</tr>
<tr>
<td>sad</td>
<td>neither</td>
<td>enemy</td>
</tr>
<tr>
<td>curious</td>
<td>no mention</td>
<td>competitor</td>
</tr>
<tr>
<td>other</td>
<td>no mention</td>
<td>no mention</td>
</tr>
<tr>
<td>no mention</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.4: Coding Categories for Open-ended Responses of Perceptions of Person A

Inter-rater agreement for the coding of the three categories was very good.

Cohen’s Kappa for all three categories exceeded .65 (p < .001). All three coded variables were subjected to the following chi-square analyses: the effect of the four participant emotion conditions, the effect of the three participant step conditions, and the effect of the twelve participant emotion x step conditions (as well as further partitioned analyses where deemed appropriate).

The effect of emotion condition on participant open-ended assessment of Person A’s emotional state was not significant ($\chi^2(12) = 17.9$, p = .12). Three cells of this analysis stand out based on their adjusted residuals (ar): fear prime/fear rating (expected = 28.1, observed = 35, ar = 2.3), neutral prime/fear rating (expected = 61.4, observed = 50, ar = -3.2), and neutral prime/no mention of Person A’s emotion (expected = 16.4,
observed = 23, ar = 2.5). The latter is consistent with the possibility that participants in the neutral prime condition were less ready to mention Person A’s emotional state. For the two former cells, participants rated Person A as experiencing fear in greater numbers when in the fear prime condition than when in the neutral prime condition. These results for the fear and neutral primes are consistent the intended purpose of the experimental manipulation.

Coding of participant perception that A would move toward, away, both, neither, or no mention of Person A’s movement, were subjected to two separate analyses: the emotion prime and the step manipulation. The overall chi-square analysis for the emotion prime was significant ($\chi^2(8) = 15.8$, $p = .05$). It appears that this was driven primarily by the participants in the neutral condition such that fewer than expected participants gave a “move toward” response and more than expected participants gave a “no mention” of movement response. Participant perception that Person A was likely to move away was also higher in both the fear and anger conditions, but with adjusted residuals of 1.7 and 1.5 respectively, statistical support for these observed frequencies is weak. Nonetheless, these observed endorsements of Person A’s likely avoidant behavior could be construed as consistent with both anger and fear primes for the female participants. The effect of the step manipulation had no significant effect on coding of participants’ perceptions of Person A’s approach/avoidance behavior ($\chi^2(8) = 5.9$, $p = .65$).

Two further partitioned analyses were run for two conditions: fear/step forward and fear/step backward and the endorsement of Person A exhibiting a fear or anger response and Person A’s approach or avoidance tendency. The overall Chi-square
approached a conventional level of significance ($\chi^2(1) = 3.0, p = .08$). Those participants in the fear/step back condition ascribed fewer than expected fear responses to Person A than did those participants in the fear/step forward. This supports the previous findings that the fear/step forward condition is more “fear evoking” than the fear/step back condition. For the approach/avoidance truncated analysis, the overall Chi-square was non significant ($\chi^2(4) = 6.8, p = .15$), but the avoidance response was heavily influenced by the fear prime x step interaction. Participants in the fear prime/step forward condition endorsed far more move away responses (ar = 2.4) than the participants in the fear/step back condition (ar = -2.4). This too is consistent with the previously reported observations that the fear/step forward condition generates not only more fear than the fear/step back condition, but generates a stronger avoidance reaction as well.

The final analysis of coded responses for Person A was the participant’s perceived relationship of Person A and Person B. Neither manipulation demonstrated a significant effect for this response category, and given the rather small number of participant responses for this category, I am hesitant to attempt an interpretation of the individual cell adjusted residuals.

Discussion

Based on the foregoing analyses, it is quite easy to view this emotion induction technique as a failure. However, I believe that upon consideration, such a conclusion is unnecessarily harsh, especially given the novelty of this induction paradigm. The manipulations are not without effects, and although those effects fall short of what was desired, the observed effects were for the most part consistent with both the existing literature and common sense where the literature fails to inform. The most
straightforward test of the image primes, the PANAS-styled projected emotion ratings, were insensitive to the priming manipulation. Better results were achieved for the open-ended emotion response variables: observed fear responses were higher than expected for the fear prime condition.

The most direct test of the step manipulation was the assessment of A’s likelihood of approaching/avoiding B. In this case, either stepping forward or stepping backward both elicited higher avoidance responses than the no step condition. The step forward condition certainly yielded results contrary to what was expected.

The observed significant results (and those that approached a conventional level of significance) were almost universally a function of image prime by step manipulation interactions. Most notably was that fear and avoidance tendencies for females were increased in the fear/step forward condition and anger/step back conditions. That the “action” was in the interaction of the two manipulations is consistent with the goals of this research: to develop an emotion induction paradigm that employed a multi-component approach to inducing emotional states in experimental participants. The relative absence of effects for the neutral and happy prime conditions is evidence that a certain level of “discretion” was achieved. Not surprising is that the fear priming was most effective. Fear stimuli, in the form of images, are relatively straightforward to create. Anger stimuli are more challenging to design. Anger is a more complex emotion, relying on more complex appraisals and therefore, what are intended to be anger stimuli, sans a broader context, becomes stimuli with a greater variability than fear stimuli.
Certainly interesting, but just as certainly daunting, given my goal of developing an effective emotion induction technique, was the presence of relatively powerful gender effects. It is becoming obvious that a “one size fits all” emotion induction technique will most likely have come in at least two “sizes”, that is, it will probably need to be gender specific.
CHAPTER 4

CONCLUSIONS AND IMPLICATIONS

Most of us, at one time or another have reacted emotionally to a friend, relative, co-worker, or significant other in a way that we later consider somehow inappropriate or somehow unwarranted. For example, we reacted angrily to a statement or behavior of another and upon reflection we were at a loss to understand why we reacted with such hostility. Our introspection led us to the troubling conclusion that somehow our experienced emotional state (and reaction toward the other) was without good cause, or perhaps the intensity of our reaction was somehow stronger than the identified cause warranted. We were left wondering, “Where on earth did that come from?” Perhaps we retraced our steps and discovered the source of our emotional state, then realized our error and an apology was required. Alternatively, the interaction with the other escalated, our anger instigating anger in the other and though we were at one point unaware of the original source of that anger, the original source was supplanted by our then “warranted” and very real anger at the other. And still other times, the cause of the misapplied emotional reaction remained a mystery to us and our emotional experience became a “legitimate” entry into our recorded relational history with the other.

While the relational damage of misdirected emotions can be severe at the dyadic level, the number of victims is relatively small. When the misapplied emotional reaction
is applied to a group of others, the severity of the consequences is necessarily multiplied. When we move from fear, disgust, or anger in response to an individual, to the same felt emotions toward a group of others, the generated prejudice can lead to avoidance resulting in the limiting of opportunities for the target group. But, as Allport (1954) cautioned, it rarely stops there; our avoidance often evolves into approach that manifests itself as attack, either verbal or physical. That anger instigates an approach response and fear an avoidance response is suggested by research on emotion-action tendencies (Devos, Silver, Mackie, & Smith, 2003). This relationship of experienced emotion to a target and subsequent behavioral response toward that target lies at the heart of this research project.

By combining an emotion-evoking image with a subsequently performed approach or avoidance response, my intent was to bring this phenomenon into the laboratory, thus facilitating the study of emotion-based phenomena such as prejudice, interpersonal relationships, and punitive responses to transgressors. By creating discrete emotional states in experimental participants, with the source of those emotional states beyond participants’ conscious awareness, we might be able better understand how a “sourceless” emotional state in an experimental participant affects their perceptions of, and responses to, a variety of targets.

The induction of emotional states in the laboratory is not a new endeavor. As discussed in Chapter 1, the priming of semantic associates to conceptualized emotion, the use of emotion-evoking stories or video clips, and placing the participant in emotion-evoking situations have all been employed. Only the first, when done subliminally, meets my criteria of “sourcelessness”. But as I have previously suggested, manipulations
of this type are heavily cognitive and therefore fail to achieve the visceral quality so defining to emotional experience, resulting in little more than activating semantic associates (Innes-Ker & Niedenthal, 2002). The latter two methods go much further in creating the visceral experience of emotion and the creation of an emotional state, but allow the participant to attribute the source of that emotion to the method to varying degrees.

Common to the designs tested in both the pilot studies and full implementation study described in this paper are: the use of subliminally presented emotion-laden images, a physical approach/avoidance response either consistent or inconsistent with those images, and an increase in physiological arousal consistent with the visceral experience of the induced emotions under study. Juxtaposed between the pilot and full implementation studies were a series of component tests that allowed a better analysis of the effectiveness of the experimental manipulations as discrete elements rather than in combination.

In the initial pilot study, an attempt was made to induce three different negative emotional experiences: anger, disgust, or fear. Subliminal images were presented on the computer monitor and participants were instructed to manipulate a spring-loaded lever either forward or backward (depending on assigned condition) to simulate either an approach or avoidance response under the guise of participating in a “reaction time” task. Upon completion of the task, participants read and responded to a scenario designed to assess the effectiveness of the experimental manipulations.

Based on extensive debriefing, I found that the procedure used in the pilot was effective in concealing the true purpose of the experiment. Participants had no idea that
the experiment was intended to induce an emotional state. They did not detect the subliminal images, nor did they have any idea that the lever was an approach/avoidance manipulation. Thus if the manipulations successfully induced an emotional state, the procedure fulfilled my requirement that the experiential effects obtained would not be attributable to experimental procedure. Additionally, pre and post manipulation pulse rate measures demonstrated that the manipulation did significantly increase participant physiological arousal. Beyond that, the observed effects of the pilot study fell far short of the intended effect of inducing discrete emotional as assessed by the dependent measures.

The self-reported emotion-rating scales (based on PANAS items) showed no significant effects of the emotion primes. The lever manipulation demonstrated effects on four of the sixteen emotion rating items and those effects were inconsistent with the hypothesized function of the lever that approach was operationalized as pulling the lever and avoidance was operationalized as pushing the lever. For example, an elevated rating of “energized” was observed in the push condition while elevated ratings of “sad” and “scared” were observed in the pull condition. Open-ended responses were employed to assess the projected reaction of a student encountering a bum begging for change. The coded emotional experience of the scenario actor showed no effect of either manipulation, nor any interaction of those manipulations. The coded response that was somewhat sensitive to the manipulations was whether or not the actor in the scenario would give the bum money. In the fear/pull condition, coded “no” responses had the highest frequency of any of the other conditions, more consistent with the idea that pulling the lever simulated an avoidance reaction, rather than the originally intended approach tendency.
Based on the results of the pilot, individual component testing was conducted. Several conclusions were drawn based on the component tests. First, the number of images presented was varied across two emotions, anger and fear, to determine whether number of image presentations served to habituate the participant to the emotion primes, thus reducing their intended effect. It was found that habituation was not occurring; in the fear conditions, projected fear ratings were reduced as a function of reducing the fear prime presentation frequency. Thus a 20 image presentation frequency was retained for the full implementation study.

Second, the lever, as a manipulation of approach/avoidance, was compared to a new approach/avoidance manipulation that consisted of simply stepping toward or stepping away from the image prime. The new step manipulation was found to be as effective in increasing participant arousal as was the lever (again operationalized as pulse rate increase). Additionally, participant responses to the approach/avoid likelihood ratings demonstrated changes consistent with the desired effect: participants in the step forward condition had a higher frequency of approach ratings than those in the push lever condition. Therefore the lever manipulation was replaced by the step manipulation in the full implementation study.

Finally, the scenario used in the pilot was modified in an attempt to reduce the observed prevalence of fear responses, to make it more ambiguous and therefore more sensitive to the manipulations. The simple change from the scenario occurring during the nighttime (pilot) to occurring during the daytime (component tests) moved the predominant response from fear in the former to disgust in the latter, thus not achieving the goal of increased ambiguity/sensitivity. The only exception was in the fear prime
condition where the predominant projected emotion response was fear as intended. Still, a new more ambiguous projection stimulus target was needed and was subsequently developed for the full implementation study.

The full implementation study was conceptually similar to the pilot study, but procedurally modified. First the number of emotion-evoking images was increased from one to three for each priming condition in an effort to address the observed ineffectiveness of the anger manipulation. Second, the new step board approach/avoidance manipulation was used as a more direct operationalization of approach or avoidance. Third, a new, more ambiguous, projection target was employed. The new stimulus target was a stick figure animation on which participants could base their projected emotions and approach/avoidance tendencies. Fourth, control conditions were included for each manipulation. For the image prime manipulation, a neutral image condition was added. Additionally, the disgust condition was replaced with a happy condition that would differ from the anger and fear conditions on the valence dimension and from the fear condition on the approach/avoidance dimension. For the approach/avoidance manipulation, a “no step” control condition was added. Finally, additional dependent measures were developed to assess the effectiveness of the manipulations over a wider range of participant experience, from the relatively direct experience at the time of the task (i.e., participant comfort) to more indirect assessment of participant experience as projected onto the stimulus target (i.e., projected emotion ratings).
Assessing the Effectiveness of the Induction Manipulations

Assessing the effectiveness of this new emotional induction method can be done at two levels. First, did the manipulations produce an effect on the dependent measures? Second, if an effect was observed, what was the nature of the effect and was it consistent with the intention of and predictions for the manipulations? To the first question, the answer is yes; several effects on the dependent measures were observed. As to the second question, the answer is yes and no: several effects were obtained that were consistent with my expectation, but at the same time, those effects were not entirely consistent with the theoretical predictions.

The primary prediction was that the effectiveness of the manipulations would be observed in the interaction of the image prime and the approach/avoidance manipulation such that the participant’s rated intensity of emotion would be amplified in the consistently paired conditions. For example, exposure to a fear prime, coupled with the response of physically avoiding (stepping back from) that image, along with increased physiological arousal (i.e. increased pulse rate), would heighten the projected rating of fear. The results indicated that was not the case. It was in the condition where the participant approached the fear-evoking stimuli (i.e., the inconsistent pairing) that the highest level of participant discomfort was observed. To a lesser extent, in the condition where the participant stood still in response to the fear prime (again an inconsistent pairing), an increased rating of discomfort was observed as well.

Both these experimental conditions can be depicted as creating a failure to perform a correct (satisfying) response to an emotion-laden stimulus, thereby intensifying (rather than attenuating) the experience of that emotion. If emotions are indeed for doing,
then the failure to manifest the correct behavioral response to a threatening stimulus could be expected to result in an intensification of experienced discomfort, to further urge the performance of the satisfying behavior (in this case, avoidance). In the condition of fear/approach, stepping forward while viewing a shark intensified the experience of discomfort because the participant moved toward the fear stimulus, a response inconsistent with the purpose of fear, to move away. In the condition where the participant stood still in response to the fearful stimulus, again a mismatch occurs (to a lesser degree), and as described in the cliché, the participant experiences being “frozen in one’s tracks”. In a condition where the correct (satisfying) response was performed, the function of the emotion was satisfied, and the level of the experienced discomfort can then decrease. That the observed consistent pairing of fear prime and stepping back response demonstrated increased experienced comfort ratings is consistent with this satisfying response explanation as well.

While the experience of discomfort when performing the theoretically inconsistent action tendency (e.g., stepping toward a fear-evoking stimulus) can be interpreted as evidence of an increased experience of fear, more direct evidence for the increased experience of fear is required to make a definitive statement about the effectiveness of the induction method. Supporting evidence was found in the open-ended response measures of the effect of performing an inconsistent response to a stimulus. Fewer participants in the fear/step back condition ascribed a fear response to the projection target than participants in the fear/step forward condition. This observed difference was based on the comparison of adjusted residuals of individual cell
frequencies and I am therefore reticent to offer it as anything more than weak supporting
evidence for increased fear in the experimental participants in the fear/step forward
condition.

These findings appear to be contradictory to past literature that would suggest a
consistency amplification hypothesis where affective response would be intensified by
consistent pairing of stimuli with approach or avoidance behavior. For example, flexion
(approach) performed while viewing an ambiguous stimulus increases positive evaluation
of that stimulus. The important element to the consistency amplification hypothesis is
that the evidence that supports it has been observed when participants have evaluated a
stimulus.

Further, in previous research the combination of a negative prime and an
avoidance action (flexion) has enhanced the negativity attributed to the stimulus object in
the environment, again an evaluation of the stimulus. The proprioceptive information is
used as additional evaluative information and therefore amplifies the valenced evaluation
when the two sources of information are consistent.

In the current study, participants were asked to report (or project) their
experiential state. When it comes to evaluating one’s current affective/emotional state (or
that projected to another), having completed an emotion-compatible behavioral response
may actually serve to reduce the emotional state rather than reinforce it. (After all, the
function of the emotion has been fulfilled). In that case, it is the failure to respond
compatibly (i.e., the inconsistent condition) that leads participants to evaluate their
emotional state as fearful. Proprioceptive cues still serve an informational function and
the information is being used evaluatively, but the evaluation is not of stimulus, it is of
the current affective state of the self. In sum, different dependent measures appear to tap into different judgment processes that determine how proprioceptive cues are utilized. In the case of the projected fear and discomfort ratings, the ratings arise from an evaluation of the participants’ current affective state, which is intensified when an emotion-incompatible behavior has been enacted. As well, Markman and Brendl (2005) have demonstrated that the construal of the self plays an important role in the relationship of motor action and approach avoidance. If the self is construed as outside the body (i.e., as in a projective task) the meaning of approach and avoidance movements can be reversed from the meaning of those movements if the self is construed as being in the physical body (Markman & Brendl, 2005).

Although the combination of subliminal fear images and proprioceptive cues showed some evidence of evoking discomfort and fear-associated responses, inducing anger or happiness with the method employed in this study did not prove to be effective. There is a bit of irony in this, given that in my past efforts using established methods, inducing anger had been relatively easy. Using story primes, the ability to produce anger in experimental participants was consistently achieved and anger was often identified as a significant mediator in the relationship between outcome severity and increased assigned punishment (Polifroni, 2001; Rucker, Polifroni, Tetlock, & Scott, 2005; Tetlock et al, in press). It was always fear that proved elusive as an effectively induced emotional state in my earlier experiments.

It is possible that the happy and anger induction conditions could be improved by using different images that are more powerful elicitors of the intended emotions. However, in the case of anger, static images may not provide enough context to generate
appraisals necessary to the experience of anger in experimental participants. One possible way to increase the contextual quality for the anger prime in this method may be to sequentially present individual images that have been tested as a whole sequence with demonstrated effectiveness in generating anger when presented supraliminally. Even if this modification proved successful, at least two such subliminally presented anger-evoking “movies” will likely be needed. Based on the observed moderating effect of gender on several dependent measures used in these studies, the anger prime may also have to be gender specific.

Fear does not seem to share this contextual requirement to the same degree; seeing a shark or a snake is a cue that needs little context to provide the desired fear response\(^7\) and the meaning of these stimuli is not moderated by gender. However, the moderating effect of gender cannot be ignored when priming fear in combination with the approach/avoidance manipulations. Gender-based responses to fear-evoking stimuli have their source in cultural and gender bound action-tendencies scripts that are highly context dependent. Men are expected to confront (approach) a wider variety of fear-evoking stimuli than women.\(^8\) Women are stereotypically allowed (or expected) to avoid the same stimuli across a wider range of contexts. This is consistent with the observed reversal in the retrospective participant-experienced comfort ratings during the reaction

\(^7\) This is a matter of degree though, as Niedenthal et al (2005a) point out, if the experience of fear was not moderated by context prior to the encounter of the fear-evoking stimulus, then a trip to the zoo would probably be too threatening to undertake.

\(^8\) I conducted an informal study with the my students in an upper level psychology class. Males students were unanimous in acknowledging that they would be perceived as weak if they were to avoid a fear evoking situation. A majority of the females students stated they would not consider themselves as weak for avoiding the same fear-evoking stimulus.
time task. Males experienced the greatest discomfort when they were in the fear/step back condition while females experienced the least discomfort in the same condition.

Assessment of the Projective Measures of Emotions

The measures created to assess projected responses to the stick figures demonstrated various levels of effectiveness. The projected emotion rating scales were insensitive to the main effect of the emotion primes. Significant effects were observed for several of the projective measures for the image prime x approach/avoidance manipulations. For example, the projected likelihood of Person A moving away from person B was higher for females in the fear/step forward (approach) condition than in the fear/step back (avoidance) condition. That the inconsistent condition (fear/step forward) showed a greater projected likelihood of Person A exhibiting an avoidant response is consistent with the possibility that the increased discomfort for the female participants in this condition was projected as an avoidant response on to Person A. The opposite effect on Person A’s projected approach/avoidance behavior was observed for male participants thus conforming to the reversal observed in the participant comfort measure. For males, greater discomfort was observed in the fear/step back condition and in this condition males rated the likelihood of Person A avoiding Person B higher.

The projected measures that were insensitive were the projected emotion rating items. This cannot be taken as incontrovertible evidence that the emotion induction was unsuccessful. It is possible that projecting an emotional state onto a stick figure is a bit beyond the bounds of what a participant deems rational. That the stick figures displayed
movement may have made it seem more reasonable to participants to rate the likelihood (and direction) of future movement of those figures.

Given the success of some of the projective measures, I believe the stick figure animation deserves further development as an ambiguous projection target; it is very flexible. For example, it can be used, as it was this experiment, to study dyadic phenomena and it should be amenable as well to the study of group processes simply by increasing the number of figures in the animation. It should be further tested using established priming methods and dependent measures. One such established method could that could be used to further test the stick figure stimulus is the “Donald” paradigm where semantic associates for “recklessness” or for “adventurousness” could be primed and an ambiguous behavior performed by the stick figure could be rated on those dimensions.

Conclusions

With further modifications and testing, it appears possible to use these novel methods and measures to induce and assess discrete emotional states in a laboratory that arise from a source outside conscious awareness. To successfully do so will add a new way to research the effect of the misattribution of emotional states to a wide variety of targets important to the study of prejudice, intolerance, and punitive responses. This is especially important to understand the role that the media plays in shaping our perceptions, reactions, and responses. The increased prevalence of “sound bites,” relative to actual information about people and events represents a shift toward emotion-evoking stimuli rather than rational analysis that guides one’s perceptions of the world. Certainly such heightened emotional arousal and the increasingly uninformed misattribution of the
source of that arousal can readily lead to increased prejudice, intolerance, and approach or avoidance behaviors that carry with them dire consequences.

The implications of the observed results in this experiment go beyond a simple testing of a new laboratory method for inducing nonconscious emotional states. At a more abstract level, the findings offer insight to several theoretical issues. First, the results add support to a multi-component view of emotion. Proprioceptive cues combined with cognitive stimuli either increased or decreased the experience of fear in experimental participants. If emotional experience was a single component phenomenon, these effects would not have been observed. Additionally, participants’ experience of discomfort with the reaction time task supports not only the multi-component view of emotion; it supports theory of the relationship between emotion and action tendencies. Performing an inconsistent action in response to an emotion-evoking stimulus created both greater discomfort and higher projected fear ratings. The reversal of this effect, based on participant gender, suggests that emotional experience and its relationship to action tendencies is relatively complex and can be context dependent. It no longer suffices to say that fear yields an avoidant response. The theories of emotion action tendencies need to be expanded to not only include appraisals of the emotion instigating target and the capabilities of the person for dealing with that target, but social expectations for the person as well. Perhaps most interesting is that these social expectations, proprioceptive experiences, and emotion-evoking stimuli combine outside of one’s conscious awareness to affect one’s experienced emotion, level of experienced comfort and behavioral likelihood estimates for a target. Clearly, emotions are for doing, but doing what is not determined simply.
BIBLIOGRAPHY


Maddux, W. M., Galinsky, A., & Polifroni, M. (in prep). *When Being Good is Good... And Bad: The dilemma of Asian Americans as the model minority in the United States*.


APPENDIX A

PILOT STUDY:
PARTICIPANT EMOTION SELF-RATING,
“BUM” SCENARIO MEASURE, AND
DEMOGRAPHIC QUESTIONNAIRE
Please check the response that applies to how you are feeling right now for each question.

Indicate to what extent you feel interested right now:

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very</th>
<th>slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
</table>

Indicate to what extent you feel distressed right now:

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very</th>
<th>slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
</table>

Indicate to what extent you feel excited right now:

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very</th>
<th>slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
</table>

Indicate to what extent you feel happy right now:

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very</th>
<th>slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
</table>

Indicate to what extent you feel jittery right now:

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very</th>
<th>slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
</table>

Indicate to what extent you feel scared right now:

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very</th>
<th>slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
</table>

Indicate to what extent you feel hostile right now:

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very</th>
<th>slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
</table>

Indicate to what extent you feel energized right now:

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
</table>
Indicate to what extent you feel disgusted right now:

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
</table>

Indicate to what extent you feel irritable right now:

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
</table>

Indicate to what extent you feel afraid right now:

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
</table>

Indicate to what extent you feel angry right now:

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
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</table>

Indicate to what extent you feel sad right now:

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
</table>

Indicate to what extent you feel uneasy right now:

<table>
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<tr>
<th>Not at all</th>
<th>very slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
</table>

Indicate to what extent you feel delighted right now:

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
</table>

112
In this task, we would like you to imagine an ordinary person in the described situation. Once you have considered this scenario, please choose the response that you imagine is most likely from this imagined person.

After leaving late in the evening from the library to return home, a student sees a bum begging for money while sitting on the sidewalk against a building partially blocking the student’s path.

What do you think the student is feeling? (Please write a sentence or two describing what you think the student is feeling)

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

What do you believe the student will do next? (Please explain in a few sentences)

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Information Form

Before participating in our reaction time study, please take a moment to provide us with some background information. Much of the information requested following has been shown to correlate strongly with reaction time ability. Please take your time and answer as fully and accurately as possible.

Age: _______   Gender: _____
Weight: _______   Height: _______

Handedness: (please circle one)
Right-Handed   Left-Handed   Ambidextrous

How would you rate your reaction time ability? (please circle one)
Very Poor   Poor   Average   Good   Very Good

How would you rate your general athletic ability? (please circle one)
Very Poor   Poor   Average   Good   Very Good

How often do you do moderate to heavy exercise? (please circle one)
Never   Seldom   Weekly   Several times a week   Daily

Do you play any sports, and if so, at what level?______________________________

Thank you for taking time to provide us with basic information for our study. When you have finished, notify the proctor, and you will be directed on how to continue.

Resting Pulse Rate ______
Finish Pulse Rate ______
APPENDIX B

COMPONENT 1 TESTING:
“BUM” SCENARIO AND DEPENDENT MEASURES
**Projective “Other” Version**

In this task, we would like you to imagine an ordinary person in the described situation. Once you have considered this scenario, please choose the response that you imagine is most likely from this imagined person.

After leaving class one sunny and hot afternoon to return home, a student sees a bum begging for money while sitting on the sidewalk against a building partially blocking the student’s path.

Does the student? (check the most likely response):

- ____ Cross the street before reaching the bum; one can never be too careful.
- ____ Stride quickly past the bum and mutter under one’s breath, “get a job”.
- ____ Avoid getting close to the bum by walking to the outside edge of the sidewalk and try to shake off the sudden feeling of needing to shower.
- ____ Stop briefly to toss some change in the bum’s cup while saying “hello”.

To what extent is the student experiencing the following emotions?

**Anger (Please check one).**

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very</th>
<th>slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
</table>

**Disgust (Please check one).**

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very</th>
<th>slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
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</table>

**Fear (Please check one).**

<table>
<thead>
<tr>
<th>Not at all</th>
<th>very</th>
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<th>a little</th>
<th>moderately</th>
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</table>

**Happiness (Please check one).**

<table>
<thead>
<tr>
<th>Not at all</th>
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<th>extremely</th>
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</table>

**Sadness (Please check one).**

<table>
<thead>
<tr>
<th>Not at all</th>
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</thead>
</table>
"You" Version
In this task, we would like you to imagine yourself in the described situation. Once you have considered this scenario, please choose the response that you imagine is most likely from yourself.

After leaving class one sunny and hot afternoon to return home, you see a bum begging for money while sitting on the sidewalk against a building partially blocking the your path.

Do you? (check the most likely response):

____ Cross the street before reaching the bum; you can never be too careful.
____ Stride quickly past the bum and mutter under your breath, “get a job”.
____ Avoid getting close to the bum by walking to the outside edge of the sidewalk and try to shake off the sudden feeling of needing to shower.
____ Stop briefly to toss some change in the bum’s cup while saying “hello”.

To what extent are you experiencing the following emotions?

Anger (Please check one).

<table>
<thead>
<tr>
<th>Not at all</th>
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</table>

Disgust (Please check one).

<table>
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</table>

Fear (Please check one).

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</table>

Happiness (Please check one).

<table>
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</table>

Sadness (Please check one).

<table>
<thead>
<tr>
<th>Not at all</th>
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<th>a little</th>
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</table>
APPENDIX C

FULL IMPLEMENTATION STUDY:
STICK FIGURE ANIMATION EXAMPLE FRAMES
<table>
<thead>
<tr>
<th>Time</th>
<th>Person A</th>
<th>Person B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
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<td>7</td>
<td></td>
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<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX D

FULL IMPLEMENTATION STUDY:
PROJECTIVE MEASURES
**Approach/Avoidance Measure**
Is Person A more likely to move toward or move away from person B?

- A is very much more likely to move toward B
- A is somewhat more likely to move toward B
- A is slightly more likely to move toward B
- A is neither more likely to move away nor move toward person B
- A is slightly more likely to move away from B
- A is somewhat more likely to move away from B
- A is very much more likely to move away from B

**Projected Emotion Measures**
To what degree is person A feeling angry?
To what degree is person A feeling happy?
To what degree is person A feeling afraid?
To what degree is person A feeling hostile?
To what degree is person A feeling nervous?
To what degree is person A feeling delighted?

- Not at all
- Very Slightly
- A little
- Moderately
- Quite a bit
- Extremely

**Appraisal Measures**
Does Person A think they are stronger or weaker than person B?
- Much Stronger
- Somewhat Stronger
- Slightly Stronger
- Equal Strength
- Slightly Weaker
- Somewhat Weaker
- Much Weaker

How certain is Person A about what Person B will do next?
- Very uncertain
- Somewhat uncertain
- Slightly uncertain
- Slightly certain
- Somewhat certain
- Very certain
How confident is Person A about his/her ability to deal with whatever person B does next?
Very confident
Somewhat confident
Slightly confident
Slightly unconfident
Somewhat unconfident
Very unconfident

**Open-ended Response Measure**
Please write a few sentences explaining why Person A might move away from or toward Person B and why Person A might be feeling the emotion(s) that they are feeling in this situation.
APPENDIX E

FULL IMPLEMENTATION STUDY;
PARTICIPANT EXPERIENCE MEASURES AND
DEMOGRAPHIC QUESTIONS
Demographic Questions
What is your gender?
Female
Male

What is your age?

Manipulation Check
In the first experiment, were you required to?
Step forward
Step backward
Push button

Participant Experience Measure
During the reaction time experiment, how comfortable were you with the procedure?
Very uncomfortable
Somewhat uncomfortable
Slightly uncomfortable
Slightly comfortable
Somewhat comfortable
Very comfortable