MINDFULNESS AS A MODERATOR OF

THE EFFECTS OF PRMING

ON MOOD

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ABSTRACT

Many studies have demonstrated the unconscious nature of information processing, specifically in terms of subliminal priming. Mindfulness, is in part concerned with the ways individuals attend to and react to stimuli. The current study sought to understand whether mindfulness moderates the effect of subliminal priming on mood.

My methods involved subliminally priming participants with either a positive or negative mood. Following this, participants completed a number of individual difference measures, including ratings of their present explicit and implicit affect and trait mindfulness. I suggested two (competing) hypotheses regarding explicit reports of mood and facets of mindfulness. First, I hypothesized that participants reporting higher levels of acceptance/nonjudgment would be less affected by the subliminal primes. Alternately, participants reporting higher levels of awareness would be more affected by the primes.

Results indicated no interaction effect of acceptance and priming condition on affect. However, I found an interaction effect of awareness and priming. Among those in the negative priming condition, higher levels of awareness were related to less negative affect (i.e., more positive affect), suggesting that those higher in awareness were less affected by the prime. This finding was contrary to my hypothesis (i.e., I predicted that this effect would be found for those higher in acceptance, not awareness).

Results from this study suggest that awareness may an important facet in helping to prevent changes in mood from negative stimuli.

TABLE OF CONTENTS

LIST OF TABLES

Table

LIST OF FIGURES

Figure

CHAPTER 1

INTRODUCTION

Mood is complex. Music, weather, food, drugs, and hormones – just to name a few – can all impact our mood. Mayer, Salovey, Gomberg-Kaufman and Blainey (1991) propose a "meta-experience of mood" model that includes emotion-related experiences (physical, emotional, and cognitive) as well as emotion-management related experiences (thoughts of whether to take action to change the environment, thought suppression, and denial). Given the complex nature of mood and the different aspects that compose it, it is not surprising that many different experiences can affect mood. In fact, there is even evidence to suggest that at times we may be unaware of the events or experiences which influence our moods (Bargh & Chartrand, 1999). Increased awareness of our surroundings, our thoughts and emotions, and our relationship to and acceptance of these phenomena (conceptualized as mindfulness) may affect how we interact with the environment and, thus, our moods.

The study of mindfulness may help us better understand human consciousness and modes of processing experiences as they relate to mood. In order to systematically study mindfulness in the context of mood, researchers may take advantage of the effects of priming. By performing experimental manipulations aimed at inducing a positive or negative mood, we are thus able to examine the cognitive processes that may be involved in the experience of mood. The proposed study will examine mindfulness as a moderator of the effects of priming on mood.

Automaticity and Priming

The notion of automaticity – that judgments, labels, concepts and ideas are often imposed automatically on what we encounter (Bargh & Chartrand, 1999) – is now accepted by

mainstream psychology. It has been argued that individuals have limited (conscious) attentional capacity (Miller, 1956); automatic mental processes serve to 'free up' some space, so that we are not exerting cognitive effort on tasks which no longer need our attention. Some common examples of this phenomenon are driving, playing an instrument, or typing on a keyboard. In these cases, skill acquisition is intentional, and the development of automaticity is contingent upon what Bargh and Chartrand (1999) identify as "frequent and consistent pairing of internal responses with external events (p. 468)." They also argue that there are times when the process of automation may itself be automatic, that is, unintentional. They propose that if we frequently and consistently use the same set of mental processes under the same circumstances, the processes may start to become automated.

Support for this theory is provided by studies showing that goals and motives can become automatically activated by situations without intention or conscious awareness. In one study, participants whose concept of 'rudeness' was primed interrupted the experimenter more frequently and quickly than those that were primed with 'politeness' stimuli. In another experiment, participants who were primed with an elderly stereotype walked more slowly down a hallway after the study than did controls (Bargh, Chen, & Burrows, 1996). This last example shows how consistent pairings can affect our cognitions and behaviors, often without our awareness. The concepts of 'elderly' and 'slow' are often paired in our society. Thus, when one encounters the concept of 'elderly', the concept (and stereotype) of 'slow' is automatically activated. Interestingly, research has also shown significant activation increases in the basal right hemisphere of the brain in both an evaluation priming (unconscious) condition and a conscious evaluation condition. In the evaluation priming condition, subjects were instructed to perform nonevaluative semantic categorizations (as opposed to explicit evaluative categorizations). In

this nonevaluative task, the same area of the brain was activated as it was among those who were consciously evaluating it (Cacioppo, Crites, & Gardner, 1996). These biological findings further support the theory of automaticity.

There are various ways to prime individuals with targeted concepts or ideas. One theory holds that individuals assign incoming perceptual information into cognitive categories, which are abstract representations of conceptually related information. The accessibility of categories determines the selection and interpretation of social information. The more accessible a category is, the more likely it is to be used. The more recently a category has been used, and the more frequently it is used, the more likely it is to be activated (Bargh & Pietromonaco, 1982). If we present individuals with target words, traits or behaviors prior to asking for their thoughts, feelings, judgments or opinions, we may capitalize on the recent categorization of the material. In the study described above where participants were primed with the elderly stereotype, they were instructed to complete a scrambled-sentence test, supposedly to measure language proficiency. The control group received a neutral-word test. The experimental group's test contained words associated with the elderly stereotype, such as 'wrinkled,' 'Florida,' 'forgetful,' and 'old' (Bargh, et al., 1996). In this type of priming, subjects are momentarily aware and conscious of the words (or traits or behaviors), but do not make the connection between the tasks at hand.

Another option for priming involves subliminal presentation of the stimulus – that is, presenting the information below the threshold for conscious awareness. The information may be presented visually, in the form of pictures, or semantically, in the form of words. In 1982, Bargh and Pietromonaco showed that by subliminally exposing participants to hostile-related stimuli,

they in turn rated an ambiguous target as more hostile than those who were not subliminally primed.

There has been much research in the last 25 years supporting the premise that subliminal priming (unconscious perception) can produce effects. The procedure used by Chartrand and Bargh (1996) is often replicated. Participants are instructed to look at a fixation point in the middle of a computer screen. Words are flashed at four points equidistant from the fixation point around the screen. These four points are outside the participant's foveal region. Participants are primed with stimulus or neutral words, depending on the condition. For the priming condition, a stimulus word is flashed for 60-ms, and then is immediately followed by 60-ms masking string of letters in the same location. This procedure makes it impossible for the participant to see the stimulus words, even if they immediately looked toward the flash of the stimulus word, thus ensuring the subliminal aspect of the method. (See Bargh & Chartrand (2000) for an in depth review of subliminal priming research and procedures, noting that information presented in the parafoveal region for a specific amount of time does not reach conscious awareness, but to a certain extent it is processed subconsciously.)

Research has shown that we can prime an individual with certain concepts and traits, but can we actually prime (and in turn induce) positive and/or negative moods? The ability to experimentally manipulate mood is important because we may then be able to study a variety of cognitive and emotional factors that accompany that mood. (Many mood induction techniques exist that require conscious awareness, such as recalling a pleasant or unpleasant memory, or watching an uplifting or depressing movie. However, we wish to examine those mood induction techniques that are unconscious and can be achieved through a priming paradigm.)

One option that may induce very basic affective reactions is the subliminal presentation of faces with varying emotional expressions. Winkielman, Berridge, and Wilbarger (2005) used this technique and found that subliminally presented happy versus angry faces subsequently affected participants' pouring, consuming and rating of a beverage. Another technique for priming mood is to expose individuals subliminally to positive or negative words. Chartrand, van Baaren, and Bargh (2006) employed this method and found mood effects in their participants, as well as differences in information processing styles.

Within the field, there has been some debate about whether priming individuals using words and then assessing for their mood is simply semantic priming. Critics have argued that the mood effects found in affective priming are actually just the effects of semantic priming, which is based on the concept of spreading activation of neural networks (Storbeck & Robinson, 2004). For example, if we prime a person with the word 'war,' and then ask about their mood, it is not surprising that the reported mood may be 'bad,' because both words are associated with negativity. Perhaps what is primed is the concept of negativity, and not actually a negative mood.

The argument for semantic priming is understandable. Research has shown, however, that mood effects are not limited to explicit reports of mood. As has already been described, individuals primed with happy faces engage in different behaviors than those primed with angry faces (Winkielman, et al., 2005). Perhaps the most interesting support for affective priming comes from studies that examine how priming affects information processing styles. Chartrand and her colleagues (2006) showed that when individuals are primed with a positive mood, stereotypes influence their judgment to a greater extent than when they are primed with a negative mood. The authors argue that these findings occur because when one's environment is filled with positive things, the environment is signaled to be safe and friendly, resulting in a

positive mood and therefore a heuristic processing style. This supports previous research that moods affect information processing style (Bless et al., 1996). These effects further support the notion that it is not simply the concept of 'positive' or 'negative' that is being primed. Priming actually induces mood states.

Some of the research noted above demonstrates behavioral effects from mood priming. In one of the studies described, Winkielman and colleagues (2005) found behavioral differences in their subjects as a result of the priming condition, but they did not find a prime effect on participants' reported explicit affect. Their behavior was in line with what would be expected from those in a positive or negative mood state – but participants' reports of explicit mood did not reflect this. How might this be? One possibility is that these participants demonstrated implicit positive (or negative) mood states, but this did not translate into explicit self-reported mood.

What exactly is implicit mood? Drawing from research and theory regarding implicit attitudes, Quirin and colleagues (2009a) suggested that mood results from the way we process information. Researchers have conceptualized implicit attitudes as involving two types of information processing systems: An associative information processing system exists alongside a reflective system. The associative system (implicit) operates through the automatic spreading as different representations are activated. The reflective system (explicit), however, involves conceptual classifications (Strack & Deutsch, 2004). Following this theory, Quirin and colleagues (2009a) defined implicit affect as "the automatic activation of cognitive representations of affective experiences." The authors suggest that implicit affective experiences operate at a preconscious level, involve the activation of a great amount of affective information at the same time, and occur through a more holistic processing style. The reflective system, on

the other hand, typically involves sequential/analytic processing; this system is what is tapped when examining explicit reports of mood. Priming may affect both implicit and explicit mood via the activation of both systems.

Mindfulness

Building on the concept of automaticity, it has been argued that individuals may engage in two types of information processing (Brown & Cordon, 2009). The first mode has similar consequences to automaticity and is known as our 'natural attitude' or default processing. Anything that comes into awareness is held with bare attention very briefly (or not at all) before we begin to have cognitive and emotional reactions to the stimulus. In this mode, everything is experienced subjectively, interpreting what it means 'for me.' Additionally, events are filtered through cognitive operations that are often habitual. The result is that our reactions are often evaluative – i.e., addressing whether the stimulus is good/bad, pleasant/unpleasant, etc.

According to Brown and Cordon (2009), the alternate mode of processing has been referred to as a 'phenomenological attitude.' It involves holding objects and perceptions in awareness without reacting to them. Although reactions may still occur, the individual who is engaging in this type of processing would view the reactions and observe them as a part of the experience, without getting 'caught up' in the feelings or thoughts. This second type of processing is what is being cultivated in mindfulness practice.

Much has been written about mindfulness in recent years. An operational definition has been proposed by Bishop et al. (2004):

> We propose a two-component model of mindfulness. The first component involves the self-regulation of attention so that it is maintained on immediate experience, thereby allowing for increased recognition of mental events in the present moment. The second

> component involves adopting a particular orientation toward one's experiences in the present moment, an orientation that is characterized by curiosity, openness, and acceptance. (p. 232)

How might mindfulness be beneficial in terms of mental health? Brown and Cordon (2009) offer several suggestions. They suggest that by being more sensitive to (and more aware of) objects and thoughts, we might be able to uncover and challenge our views of reality. Through attention, we might be able to better investigate and process thoughts and events, which in turn may lead to active emotion regulation. They also discuss the literature reviewing emotions, noting that we tend to experience core affect (which are subjective feelings of pleasure or displeasure). However, the emotions are usually about something – that is, we assign meanings (cognitive appraisals) to different experiences. As previously mentioned, mood is composed of many aspects, including emotional experiences (Mayer et al., 1991). A mindful approach teaches individuals to disengage from the usual (and often unconscious) evaluative process that often accompanies emotions and moods. It may also prevent cognitive distortions and misinterpretations.

Another important way mindfulness bolsters mental health is that it discourages experiential avoidance, which has been shown to be correlated with psychological distress (Plumb, Orsillo, & Luterek, 2004). Problems with emotion regulation are also common to many psychological disorders. Mindfulness practice is thought to increase the ability to tolerate negative emotions, leading to enhanced emotion regulation (Corcoran, Farb, Anderson, & Segal, 2010).

To summarize, mindfulness encourages present-moment awareness and nonjudgmental acceptance of thoughts and experiences. This leads to a decrease in evaluative judgments, and therefore less reactivity. When one is less reactive to the environment and less judgmental of

one's feelings, a greater sense of equanimity evolves. Although the feelings may remain (e.g., sadness), dropping the fight against such feelings may change the experience itself, and sadness may seem less aversive.

Mindfulness and Priming

Mindfulness has only begun to be systematically studied in the last decade with the publication of several validated measures. There is only one study known to this author that has evaluated the way mindfulness interacts with priming. Radel, Sarrazin, Legrain, and Gobance (2009) conducted their study in a natural environment – a classroom setting. Students were randomly assigned to two groups; each group received the same lecture, but with different subliminal words imbedded in a slideshow; one group was primed with autonomous motivation, with the subliminal words 'interested,' 'desire,' 'willing,' and 'free.' The controlled motivation priming condition were subliminally primed with the words, 'obligation,' 'constraint,' 'forced,' and 'ought.' Based on previous research, the authors believed that autonomous motivation priming would lead students to be more interested and attentive, and in turn lead to better performance on a test following the lecture. They also hypothesized that mindfulness would moderate performance, with students higher in mindfulness being less affected by the primes. Indeed, the authors found that among those lower in mindfulness, there was a significant difference in test performance between the controlled and autonomous conditions. Among those high in mindfulness, however, there was no difference in performance (i.e., the students were 'immune' to the primes). Because mindless individuals often act on 'automatic pilot,' it can be argued that they were more susceptible to the primes. Mindfulness, in theory, leads to more systematic processing and the exertion of control over effort and decisions, as opposed to more

reflexive processing. Thus, the findings from this study further support the notion that mindfulness enables individuals to be less affected by external stimuli and exert more control over their responses.

Although it did not assess mindfulness directly, a study conducted by Nielsen and Kaszniak (2006) may still be relevant to this review because some forms of meditation are believed to cultivate mindfulness. The study compared meditators to non-meditators and used a priming technique to detect differences in subtle emotional feelings. Participants were presented with a target stimulus for 45-ms (unpleasant or pleasant high arousal picture) that was buffered by a forward (45-ms) and backward (2910-ms) mask. After each presentation, participants rated emotions on 2 dimensions – valence and arousal. They found that nonmeditators rated masked unpleasant pictures as significantly more unpleasant than did meditators. Other results indicated that nonmeditators were sensitive to valence information in masked pictures, but meditators were not. Furthermore, the researchers found that nonmeditators rated unpleasant masked pictures as significantly more unpleasant than pleasant masked pictures – a pattern that is consistent with accurate valence discrimination. Interestingly, in contrast to the nonmeditators, meditators did not discriminate among masked pictures on the valence dimension. The authors had originally predicted that meditators would show greater discrimination, since meditation (and mindfulness) is linked to greater emotional awareness. Although the results described above contradicted their original hypothesis, their findings may still be in line with the theory of the ways in which mindfulness operates. They explain that as meditators enhance their emotional awareness, they also learn to develop an attitude of observing and then letting go of their emotions. This in turn may lead to superior emotion regulation capabilities, and prevent the elaboration of feelings (from evaluations), especially when the origin of the feelings is unknown. It seems that the

authors have interpreted the data in a way that still fits their general view of meditation; while such an interpretation may be suspect (i.e., no matter what the data showed, the authors could have been interpreted it similarly), it is also possible that this process reflects a gradual understanding of the phenomenon.

There are no known studies that examine how mindfulness interacts with the effects of priming on mood, specifically. The proposed study seeks to clarify the relationship. Given the increased interest in mindfulness and its benefits for emotional well-being, it is important to study how varying levels of mindfulness can affect a person's mood, specifically when the mood-inducing stimulus is outside of one's conscious awareness.

Hypothesis

The current study subliminally presented individuals with positive or negative valenced words, which have been shown in other studies to induce positive or negative mood states, respectively (Chartrand et al., 2006). Participants then completed scales assessing implicit and explicit mood, as well as questionnaires assessing levels of mindfulness. My goal was to examine mindfulness as a potential moderator of mood priming effects. Specifically, I wanted to evaluate whether higher levels of mindfulness would increase or decrease the effects of priming.

Two of the specific features of mindfulness led to the hypotheses for this study. First, because there is a nonelaborative component to the self-regulation of attention in mindfulness, mindful individuals tend to not get caught up in ruminative thoughts or assign meaning or judgments to experience. This in turn keeps them more grounded and less affected by external stimuli (Bishop et al., 2004). Second, the openness to and acceptance of experience leads to mindful individuals being able to fully experience their emotions (Kabat-Zinn, 1990), and

enhanced emotional intelligence and emotional clarity (Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007). Drawing from these two features, I proposed two (competing) hypotheses regarding explicit reports of mood, and one hypothesis regarding implicit mood reported after priming. Certain facets of mindfulness were expected to determine the outcome, discussed below.

Hypothesis 1. One aspect or facet of mindfulness involves nonjudgmental acceptance of situations, experiences, and emotions. It was hypothesized that participants who reported higher levels of acceptance and nonjudgment would be less affected by the subliminal primes than those with lower levels. That is, participants who reported being less accepting of their experiences and more judgmental would report more negative moods (when primed with negative words) and more positive moods (when primed with positive words) on explicit mood scales than participants with higher levels of acceptance and nonjudgment. This was anticipated because mindful individuals (i.e., those more accepting and less judgmental) may not engage in resistance to external stimuli, and by not resisting, they are able to let resulting emotions or reactions go more easily, thus 'resetting' back to their baseline emotions. This was evaluated by examining scores on the Nonreactivity and Nonjudgment subscales of the Five Facet Mindfulness Questionnaire (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006), and the Acceptance subscale of the Philadelphia Mindfulness Scale (Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008). (See Methods section for more information on these measures.)

Hypothesis 2. Another perhaps equally important aspect of mindfulness involves awareness of internal emotional experiences and bodily sensations as well as external stimuli. It was hypothesized that participants with higher levels of awareness would report more negative moods (when primed with negative words) and more positive moods (when primed with positive

words) on explicit mood scales than participants with lower levels of awareness. This was anticipated because individuals who are more aware of their affective experiences may be more readily able to identify what they are feeling. This was evaluated by examining scores on the Observe, Describe, and Act with awareness subscales of the Five Facet Mindfulness Questionnaire, and the Awareness subscale of the Philadelphia Mindfulness Scale.

Hypothesis 3. Priming was expected to have an effect on implicit mood, but this effect was not expected to be moderated by mindfulness. That is, participants who were primed with negative moods would report more negative affect, and participants who were primed with positive moods would report more positive affect as measured by the implicit mood scale. Emotional clarity and emotion regulation tend to improve as mindfulness increases, leading to differences in the explicit mood scales. Implicit mood, however, was expected to be the same regardless of levels of mindfulness. It was hypothesized that all participants, regardless of how mindful they were, would have the same initial experience in response to the primes, which can be conceptualized as implicit mood.

CHAPTER 2

METHOD

Participants

Ninety-three English-speaking college students participated in the study. The number of participants was selected in order to provide sufficient power (.80) for the study in order to detect an effect size halfway between small to medium. Four of the participants did not meet the criterion of being a native English speaker (as defined by learning English before age 10; Chartrand & Bargh, 1996) and were excluded from analyses. An additional 2 subjects were excluded because of their awareness of the manipulation (see Awareness of Manipulation in the Results section for more information). Thus, the final sample consisted of 87 participants. Ages of participants ranged from 17 – 41, with a mean age of 19.64 +/- 2.90 years. The majority of the sample was female (67%), and 33% of the sample was male. Regarding race/ethnicity, 71% of participants self-identified as Caucasian, 13% as Hispanic, 12% as Asian/Asian-American, 9% as African/African-American, and 3% as Native American. (Percentages add up to more than 100%, because 14% of the sample selected more than one race/ethnicity.) Participants were recruited from undergraduate classes in psychology at a private, mid-Atlantic university. For their participation in the study, participants received required psychology course credit or extra credit in a psychology class.

Students were excluded from participation in the study if they were non-native English speakers (as is common in subliminal priming studies), or if they had previously participated in a priming study through the Social Cognition and Automaticity Research Laboratory at the university.

Measures

The following measures were completed by participants:

Five Facet Mindfulness Questionnaire (FFMQ). (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). This 39-item questionnaire was developed by pooling existing mindfulness questionnaire items and conducting factor analyses to identify facets of mindfulness. The five facets are: Observe, Describe, Act with Awareness, Nonjudgment of Experience, and Nonreactivity. Participants choose their responses from a 5 point rating scale (with responses ranging from never or very rarely true to very often or always true).

The authors reported adequate to good internal consistency for each of the subscales, with alpha coefficients ranging from .75 to .91. All of the subscales (with the exception of the Observe and Nonjudge subscale) are modestly correlated with each other (.15 - .34), suggesting that the facets are related but distinct constructs. Construct validity of the FFMQ has also been demonstrated: the authors report significant correlations between FFMQ subscales and related constructs (e.g., Observe and openness to experience; Describe and emotional intelligence). FFMQ subscales also show significant negative correlations with constructs that theoretically reflect an absence of mindfulness (e.g., thought suppression, alexithymia). In the current study, alpha levels were as follows: FFMQ Autopilot/Act withAwareness/Concentration/Nondistraction subscale, .892 (8 items); FFMQ Describing/Labeling with words subscale, .910 (8 items); FFMQ Nonjudging of Experience subscale, .877 (8 items); FFMQ Observe subscale, .736 (8 items); FFMQ Nonreactivity to Inner Experience, .827 (7 items).

Philadelphia Mindfulness Scale (PHLMS). (Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008). The PHLMS is a newer mindfulness measure that is composed of two subscales: (nonjudgmental) Acceptance and (present-moment) Awareness. Although it is not used as

frequently, it is a valid alternative to the FFMQ. This measure was used because it conceptualizes mindfulness in a more direct (and perhaps simpler) way than the FFMQ. The authors note that, according to Kabat-Zinn (1994) and Bishop and colleagues (2004), awareness and acceptance are the two core components of mindfulness, and as such the PHLMS measures only these two components. The authors also note that the Observe subscale of the FFMQ (which may be tapping into the same construct as the Awareness subscale of the PHLMS) did not fit the hierarchical model of mindfulness in the full sample (Baer, et al., 2006). Because its subscales are not correlated (as are most of the FFMQ subscales), the PHLMS allows for examining the concepts separately.

Internal consistency for the validation analysis with a normative student sample (n=559) was adequate (alpha = .74 for the Awareness subscale) to very good (alpha = .82 for the Acceptance subscale). Convergent validity has also been demonstrated for both subscales. The Awareness subscale was significantly correlated with other instruments that measure awareness, attention, and reflection. The Acceptance subscale was positively correlated with instruments that measure acceptance and willingness, and negatively correlated with measures of thought suppression and anxiety, as expected. In regards to discriminant validity, social desirability was unrelated to the Awareness subscale and only weakly and negatively correlated with the Acceptance subscale.

The PHLMS is a shorter (20 item) measure, and participants rate each item on a 5-point rating scale (never – very often) according to the frequency with which the item was experienced over the last week. Scores are obtained by summing the responses for each of the scales, with the Acceptance scale being reverse-coded. Higher scores reflect higher levels of awareness/acceptance. In the current study, alpha levels for the subscales were: PHLMS Awareness subscale, .794 (10 items); PHLMS Acceptance subscale, .838 (10 items).

Implicit Positive and Negative Affect Test (IPANAT). (Quirin, Kazen, & Kuhl, 2009a). This scale indirectly assesses positive and negative affect by having participants rate the extent to which six artificial words subjectively convey different emotions. Participants are presented with each of the following artificial words: SAFME, VIKES, TUNBA, TALEP, BELNI, and SUKOV. Along with each artificial word, they are presented with the following emotion words: happy, cheerful, energetic, helpless, tense, and inhibited. Participants rate how well the artificial word matches with the emotion word (1=doesn't fit at all to 4=fits very well). Participants are told to let their ratings be guided by their spontaneous feelings. Scores are computed in two steps. First, scores are computed for each emotion word (e.g., cheerful) by averaging all six artificial word judgments for that word (e.g., average ratings of cheerful presented together with each word). Then, positive and negative affect scale scores are computed by averaging the scores derived from the positively valenced adjectives (happy, cheerful, energetic) and the negatively valenced adjectives (helpless, tense, inhibited). The basic idea behind this measure is that if a participant is feeling positively, he will rate the positive emotion words (happy, energetic, cheerful), as a good match for the artificial word. If they are feeling negatively, however, ratings for the negative emotion words (helpless, tense, inhibited) would be higher.

Factor analyses revealed two independent factors – implicit positive and negative affect. Internal consistency (Cronbach's alpha) for the validation sample (n=205) was .81 for both the implicit positive (PA) and implicit negative affect (NA) scales. Test-retest reliability after one week was .72 for PA and .76 for NA, suggesting that this scale may have a strong trait component. Construct validity was demonstrated by significant correlations between implicit PA and NA and state explicit affect ratings from the scales of a well validated explicit PA/NA measure, the PANAS (Watson, Clark, & Tellegen, 1988), as well as state explicit ratings of PA

and NA scales with the emotion words from the IPANAT. This indicates that state implicit affect is also being measured. The IPANAT has also been shown to be sensitive to affective stimuli. A PA induction (showing positive photographs) led to an increase in implicit PA, whereas an NA induction (showing negative photographs) led to an increase in implicit NA.

It should be noted that the IPANAT has only been validated with a German-speaking sample. However, the same artificial words used for the German language version of the IPANAT were used for this study, as they are simply a combination of letters with no meaning in English as well. Alpha levels for the current study were: Implicit Positive Affect ratings, .738 (18 items); Implicit Negative Affect ratings, .699 (18 items). After examining intercorrelations of the measures (reported later), it was noted that Implicit Positive and Implicit Negative affect ratings were positively correlated ($r=.445$, $p<.01$), an unexpected relationship. I thus calculated alpha for Implicit Positive and Negative items combined (36 items) to further examine this phenomenon. An alpha of .801 indicates that participants were generally providing similar ratings for both Implicit Positive affect and Implicit Negative affect items. One possible explanation of this surprising finding is that participants may have demonstrated a bias in their responses on the IPANAT (the Implicit Positive and Negative affect scale), such as rating all adjectives (both positive and negative valenced) as a good (or bad) match for the nonsense word. This could describe the correlation between the Positive and Negative scales, as well as the high alpha when the scales are combined; see the Discussion section for further exploration of these findings.

Modified version of the 'Affect-Arousal Scale'. (Salovey & Birnbaum, 1989). A modified version of Salovey and Birnbaum's scale has been used by other researchers to assess mood states after various priming tasks (Aarts & Dijksterhuis, 2003; Aarts, Oikawa, & Oikawa, 2010; Bargh et al., 1996; Chartrand et al., 2006; Custers, Maas, Wildenbeest, & Aarts, 2008). For a

study in which participants were primed with either a positive or negative mood (Chartrand et al., 2006), differences in self-reported mood were found between groups as assessed by this scale. In contrast, studies that did not involve a mood induction, but rather primed other concepts, such as stereotypes and goals (Aarts & Dijksterhuis, 2003; Aarts, et al., 2010; Bargh, et al., 1996; Custers, et al., 2008) did not find differences in mood between control and experimental groups (of primed individuals). Taken together, this seems to support the validity of this brief measure of mood; when we would expect individuals to report more positive moods, they do so on this scale. Conversely, when we would expect no change in mood, participants do not report more positive or negative moods on this scale.

This questionnaire contains eight bipolar items. Participants rate each dimension based on how they feel at the moment with a response scale of -5 to 5. The emotion/affect dimensions are bad-good, disappointed-satisfied, sad-happy, and displeased-pleased. The arousal dimensions are calm-excited, tired-energetic, down-elated, and sedate-aroused. The affect ratings are averaged together to generate an "affect" mean rating; the same is done for the arousal ratings. Due to an experimental error, one of the affect rating dimensions (bad-good) was removed from the questionnaire. Thus, the final affect rating consisted of the mean of 3 items. In the current study, alpha levels were: Arousal ratings, .701 (4 items); Affect ratings, .913 (3 items). On this scale, higher ratings reflect more positive affect, lower ratings more negative affect. (For the remainder of this manuscript, Affect and Arousal (capitalized) refer to the scores on this measure.)

Center for Epidemiological Studies Depression Scale. (Radloff, 1977). A subset of 58 students of the final sample (n=87) also completed this commonly used measure of depression for a separate study. It is a short (20-item) self-report scale that asks participants to read a list of common depressive symptoms and rate the extent to which they have felt that way in the last

week (rarely or none of the time, some or a little of the time, occasionally or a moderate amount of the time, or most or all of the time). Data from this measure were not used in analysis for the current study.

Attributional Style Questionnaire. (Peterson, Semmel, von Baeyer, Abramson, Metalsky, & Seligman, 1982). A subset of 58 students of the final sample (n=87) also completed this measure for a separate study; this measure assessed participants' explanatory style for good and bad events using three causal dimensions: internality, stability, and globality. Participants are presented with12 hypothetical events (half good, half bad) and write down the one major cause of each event and rated each event separately for internality, stability, and globality. Data from this measure were not used in analysis for the current study.

Emotion Regulation Profile-Revised. (Nelis, Quoidbach, Hansenne, & Mikolaiczak, 2011). A subset of 58 students of the final sample (n=87) also completed this measure for a separate study; this is a vignette-based measure that presents participants with 15 different emotion-eliciting scenarios, followed by eight possible reactions. Participants are asked to select the reaction that would likely describe them. The measure is used to assess up-regulation of positive emotions and down-regulation of negative emotions. Data from this measure were not used in analysis for the current study.

Demographics and Meditation. Basic demographic questions were asked of participants, including age, sex, ethnicity, etc. Participants were also asked about their experience with meditation, including the type and frequency. However, responses were so varied (e.g., yoga, prayer, quiet time, etc.) that they prevented appropriate categorization for analyses. Thus, responses regarding type and frequency of meditation were not used in analyses.

Procedure

I assigned participants to a positive or negative mood priming condition, with condition alternating for each successive participant. The study was conducted on a computer in a laboratory, using MediaLab and DirectRT software. The priming procedure has been used and replicated in priming studies (Chartrand & Bargh, 1996; Chartrand, Dalton, & Fitzsimons, 2007; Chartrand et al., 2006). Participants first signed a consent form indicating they would be participating in two separate, unrelated experiments. They were told that the first study involved a visual acuity task that measured their reaction time, in which they would look at a fixed point in the center of a computer screen. They were told that brief flashes would appear at various points around the screen, and that their task was to hit a designated key on the corresponding side of the keyboard (e.g., if flashes were on the left side of the screen, they were to hit the "F" key; if flashes were on the right side of the screen, they were to hit the "J" key.) They were told that the second, unrelated study simply involved answering questions about themselves.

After they signed the consent form, participants were seated at a computer. They again read instructions on the computer for the "vigilance" (priming) task. They practiced hitting the designated keys in a trial exercise before the task began. An asterisk was displayed in the center of the computer screen, where participants were told to focus their eyes. Each stimulus word was flashed at various points on the screen for 60-ms and was immediately followed by a 60-ms masking string of letters. The stimulus words chosen for this study were chosen from research by Ruys and Stapel (2008). The following words, from their mood induction subliminal priming experiment, were used in this study: "wonderful," "sweet," "positive", and "good" (for the positive mood priming condition), and "horrific," "cruel," "bad," and "negative" (for the negative mood priming condition). Of note, the Ruys and Stapel (2008) article from which these

methods were drawn has since been retracted following recent evidence of fraud on the part of Diederik Stapel. Implications are addressed in the Discussion section. This is the only known study that used these specific words. Participants engaged in 76 trials; that is, the four stimulus words (depending on the condition) were repeated in a randomized order, exposing the participant to 76 subliminal primes.

After the priming task, participants were again told that they were to participate in a separate study that involved some questionnaires. (This deception has been repeatedly used in priming studies, and the method for the present study followed those of Chartrand and colleagues (2006).) These questionnaires were also completed on the computer. Participants then completed the following measures: IPANAT, modified version of the Affect-Arousal Scale, FFMQ, PHLMS, other measures that are not part of this study (see Methods), and Demographics. The mindfulness measure was administered after the priming manipulation (and the modified Affect-Arousal scale) because administering it before the manipulation may have caused participants to be more introspective about their moods than normal. (I.e., if participants were first asked about the extent to which they notice their emotions (as they are in the mindfulness questionnaires), were primed with either positive or negative moods, and then asked to rate their moods, it is possible that their exposure to the prior questions would cause them to be more introspective than usual, thus contaminating the results.

After completing all measures, participants then completed a 'filler' task that served to eliminate the effects for those in the negative mood priming condition. (Participants were asked to write down three positive qualities about themselves.) They completed a funneled debriefing that probed for participants' suspicion of the true nature of the study. They were then fully

debriefed and thanked. All procedures were approved by the Institutional Review Board at the university.

CHAPTER 3

RESULTS

Awareness of the Manipulation

One subject reported suspecting that subliminal priming was used to induce a specific mood. Another subject did not identify the purpose of the study correctly, but did accurately identify one of the subliminally primed words ("sweet"). As previously noted, these two subjects were excluded from analyses. None of the subjects correctly identified the hypothesis of the study – whether levels of mindfulness affect priming. Upon further probing, 25 subjects guessed that the flashes of light were priming stimuli, possibly meant to affect subsequent answers, but did not identify the specific hypothesis. Five of these 25 suspected that the primes were specifically meant to affect their mood in some way/affect their emotions, although they did not report suspecting that the primes were positively or negatively valenced words. Of note, I reran analyses excluding these 25 participants; the lack of main effect of priming condition (to be discussed later) remained. Significance of the moderation analyses disappeared, although this is likely due to the decrease in statistical power resulting from a smaller sample size (n=62). (Indeed, a randomly selected sample of 62 participants from my sample produced the same lack of significance in moderation analyses.)

Descriptive Information and Preliminary Analyses

Means and standard deviations of all measures are reported in Table 1. Independent sample t-tests revealed that priming conditions did not significantly differ on any of the mindfulness subscales, nor on the depression measure. (See Appendix A for a glossary of all terms).

Table 1: Means and SD of measures

Measure	Mean	Standard Deviation
PHLMS Acceptance	28.06	7.13
PHLMS Awareness	36.10	5.69
FFMQ Act with Awareness	24.40	5.98
FFMQ Describe	28.03	6.11
FFMQ Nonjudging	26.22	6.26
FFMQ Observe	27.52	4.65
FFMQ Nonreactivity	20.99	4.88
CESD Total	16.91	8.66
Affect Score	1.59	2.02
Arousal	-1.47	1.42
Implicit Positive Affect	2.00	0.43
Implicit Negative Affect	1.89	0.38

Independent sample t-tests were conducted to compare the effect of gender on all measures. Females (M=1.91, SD=1.86) reported more positive Affect than did males (M=0.95, SD=2.22), t(85)=2.13, p=.036 (as evidenced by higher mean Affect scores). Scores also differed between genders on the PHLMS Acceptance subscale (males: M=30.86, SD=8.31; females: M=26.66, SD=6.07; t(85) = -2.69, p=.009) and the FFMQ Nonreactivity subscale (males: M=22.48, SD=5.07; females: M=20.24, SD=4.66; t(85) = -2.06, p=.043). Males were more accepting and nonreactive than females. Exploratory analyses were run controlling for gender, and I found that all those effects which were statistically significant when not controlling for gender remained at a p value of <.1 when controlling for it. (That is, when I ran the analyses without controlling for gender, I found statistical significance in several areas. When I reran the analyses controlling for gender, the statistical significance was reduced, but remained at < 0.10. The reduction in statistical significance may be due to the reduction in power that results from controlling for gender. In subsequent analyses, I present analyses without controlling for gender.

Intercorrelations between Measures

The correlation matrix (Table 2) displays the relationships between measures in this sample. The PHLMS Awareness subscale (which measures present-moment awareness of thoughts, emotions, physical sensations and the external environment) showed a large correlation with the FFMQ Observe subscale (r=.73, p<.001). Likewise, it appears that the PHLMS Acceptance (which measures nonjudgmental acceptance of thoughts and emotions) and FFMQ Nonjudgment scale may be tapping into the same construct, as they were also largely correlated (r=.59, p<.001).

Importantly, the PHLMS Acceptance subscale was not correlated with the PHLMS Awareness subscale (r= -.02, p=.88). This provides support for the discriminative nature of the PHLMS mindfulness measure. It further allows examination of the separate components of mindfulness, which is important given the hypothesis that acceptance and awareness may moderate the effects of priming in different ways.

Table 2: Correlation matrix of measures

		PHLMS Acceptance	PHLMS Awareness	FFMQ Act with Awareness	FFMQ Describe	FFMQ Nonjudge	FFMQ Observe	FFMQ Nonreactivity	Implicit Positive Affect	Implicit Negative Affect	Affect Ratings	Arousal Ratings
PHLMS Awareness	Pearson Correlation	-.02	--	--	--	--	--	--	--	--	--	--
FFMQ Act with Awareness	Pearson Correlation	.35**	.21*	--	--	--	--	--	--	--	--	--
FFMQ Describe	Pearson Correlation	.25*	.50**	.21*	--	--	--	--	--	--	--	--
FFMQ Nonjudge	Pearson Correlation	.59**	.05	.37**	.14	--	--	--	--	--	--	--
FFMQ Observe	Pearson Correlation	-.06	.73**	.05	.22*	-.03	--	--	--	--	--	--
FFMQ Nonreactivity	Pearson Correlation	.31**	.35**	.25*	.29**	-.08	.27*	--	--	--	--	--
Implicit Pos Affect	Pearson Correlation	.05	.18	.11	.15	.11	.13	.04	--	--	--	--
Implicit Neg Affect	Pearson Correlation	-.00	.02	.02	.06	.13	.03	-.02	.45**	--	--	--
Affect Ratings	Pearson Correlation	.18	.17	.25*	.03	.29**	.17	.00	.22*	.34**	--	--
Arousal Ratings	Pearson Correlation	.20	.06	.12	.03	-.01	.09	.07	.07	.03	.18	--
CESD (Depression)	Pearson Correlation	-.39**	-.10	-.45**	-.28*	-.27*	.04	-.36**	.18	-.08	-.28*	-.06

**	p <.01
*	p < .05

Measures	
PHLMS Awareness	Awareness subscale of the PHLMS
FFMQ Act with Awareness	Act with Awareness subscale of the FFMQ
FFMQ Describe	Describe subscale of the FFMQ

FFMQ Nonjudge	Nonjudge subscale of the FFMQ
FFMQ Observe	Observe subscale of the FFMQ
FFMQ Nonreactivity	Nonreactivity subscale of the FFMQ
Implicit Pos Affect	Positive Affect subscale of the IPANAT
Implicit Neg Affect	Negative Affect subscale of the IPANAT
Affect Ratings	Mean ratings of explicit Affect words
Arousal Ratings	Mean ratings of explicit Arousal words
CESD (Depression)	Total score of CES-D (Depression symptoms measure)

Effects of Priming Condition

To determine whether the priming manipulation was effective, the means of all dependent variables were examined by priming condition. Table 3 shows the results. Surprisingly, no significant differences were found in Affect, Arousal, implicit PA or implicit NA scores – a result that is contrary to previous studies utilizing this procedure. This result is explored further in the Discussion section. Although this lack of an effect was an unexpected finding, possibly suggesting that the manipulation was not effective, I decided to continue with further analyses. Specifically, it is possible that the effect of priming is only present among a certain subset of participants, which would be revealed by moderation analyses.

Table 3: Means and SD of dependent variables by priming condition

Measure	Positive Prime	Negative Prime
Affect Mean Score	1.59	1.60
SD	1.81	2.23
t-score	.02	
Arousal Mean Score	-1.49	-1.44
SD	1.41	1.44
t-score	.17	
Implicit Positive Affect Mean Score	1.97	2.02
SD	.42	.44
t-score	.53	
Implicit Negative Affect Mean Score	1.92	1.87

SD	.35	.42
t-score	-.59	

Effects of Mindfulness and Priming on Affect

Hierarchical multiple regression analyses were conducted in order to test the differential effects of subliminal (affect-inducing) primes on affect and arousal and whether this effect was moderated by trait mindfulness. The dependent variables were: explicit Affect ratings and explicit Arousal ratings. (As previously noted, I did not analyze Implicit Positive Affect (PA), and Implicit Negative Affect (NA) as dependent variables due to the questionable validity of the measure in our sample.) Participants' mindfulness scores on a variety of measures (PHLMS and FFMQ – all subscales), priming conditions (coded +1 for positive mood prime condition and -1 for negative mood prime condition), and all possible double and triple interactions served as predictors. All variables were mean-centered before analyses were conducted. A mindfulness variable and priming condition was entered in step 1. In step 2, 2-way cross products (condition and mindfulness variable) were added to examine interaction effects.

A total of 14 separate analyses were conducted - 7 mindfulness variables (PHLMS Awareness and Acceptance, FFMQ Observe, Nonreact, Nonjudge, Describe and Act with Awareness), and 2 outcome variables (explicit Affect and Arousal) (14 tests). From these 14 tests, I was able to examine significance among main effects (3 significant main effect results) and interactions (2 significant interaction effect results). I did not have a specific hypothesis regarding the interaction effects on arousal ratings, although I ran all the analyses to determine if such an effect existed. I found no interaction effects on arousal. Thus, only results specific to my hypotheses are presented below.

Hypothesis 1

There was no significant interaction of any acceptance variables and priming condition on Affect, contrary to my hypothesis. (Interaction of condition with PHLMS Acceptance: β = .02, $t(83) = .77$, $p = .45$; with FFMQ Nonreactivity: $\beta = .06$, $t(83) = 1.34$, $p = .18$; and with FFMQ Nonjudgment: $\beta = -.04$, $t(83) = -1.11$, $p = .27$.)

Hypothesis 2

Awareness. The interaction of PHLMS Awareness scores and priming condition significantly predicted explicit Affect scores, $\beta = -.08$, $t(83) = -2.14$, $p = .04$. To further investigate this finding, correlations were computed for PHLMS awareness and explicit Affect scores for both priming conditions. Among those in the positive priming condition, no relationship was apparent ($r = -.06$, $p = .69$). However, in the negative priming condition, PHLMS awareness scores and explicit Affect scores were correlated ($r = .36$, $p = .02$), such that as self-reported awareness increased, so did positive Affect ratings.

In an additional examination of this interaction, I followed the standard procedure of conducting a simple slope analysis (Aiken & West, 1991) by decomposing the interaction at 1 SD above and below the mean of Awareness. This analysis showed that there was a main effect of awareness on Affect in the negative priming condition ($\beta = .14$, $t(84) = 2.67$, $p = .01$), but not in the positive priming condition ($\beta = -.02$, $t(84) = -.37$, $p = .71$). Additionally, there was no main effect of condition on Affect scores among those high in Awareness ($\beta = -.92$, $t(84) = -1.54$, $p = .13$) or low in Awareness ($\beta = .88$, $t(84) = 1.47$, $p = .14$).

Taken together, these results indicate that in the positive prime condition, awareness did not have an effect on reported Affect, but in the negative prime condition, higher awareness predicted more positive Affect. (See Figure 1).

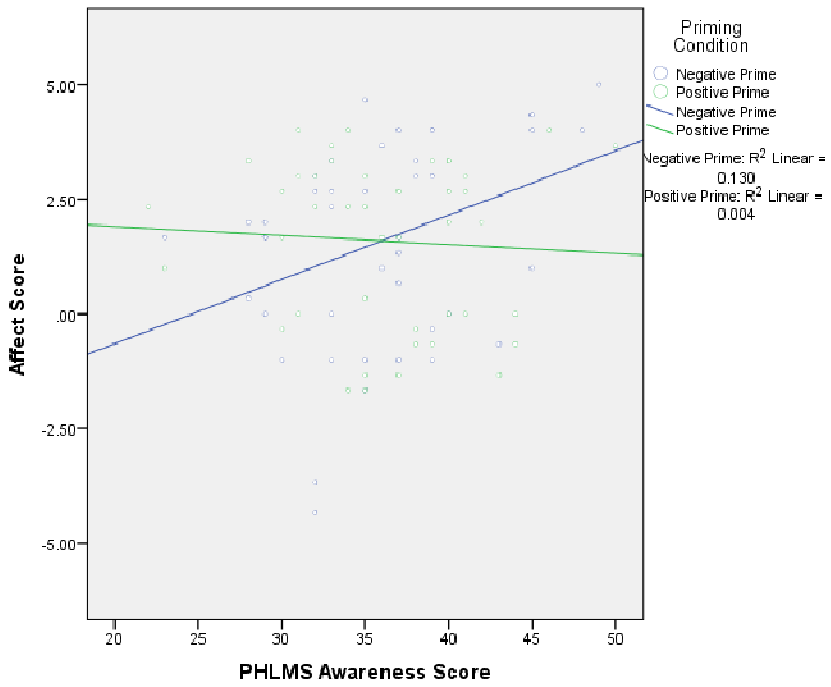

FIGURE 1: Scatter plot with fit lines for negative and positive primes showing interaction of explicit Affect and PHLMS Awareness scores by priming condition.

Observe. A nearly identical pattern was observed with the interaction of FFMQ Observe scores and priming condition on explicit Affect scores, $\beta = -.09$, $t(83) = -2.04$, $p = .04$, which was expected, given the strong correlation between the PHLMS Awareness and FFMQ Observe subscales ($r = .73$, $p < .001$), which appear to be measuring very similar constructs. The same procedure for exploring this finding was repeated by examining correlations between FFMQ Observe and explicit Affect scores for both priming conditions. Consistent with the findings of the PHLMS awareness scale, FFMQ Observe scores were not correlated with explicit Affect

scores in the positive priming condition (r=-.05, p=.76). In the negative priming condition, however, the two were correlated (r=.35, p=.02).

Describe, Act with Awareness. There was no significant interaction of the Describe facet of the FFMQ and priming condition on Affect, contrary to my hypothesis. (Interaction of condition with FFMQ Describe: β = -.03, t(83) = -.91, p =.37.)

Similarly, there was no significant interaction of the Act with Awareness facet of the FFMQ and priming condition on Affect, contrary to my hypothesis. (Interaction of condition with FFMQ Act with Awareness: β = .06, t(83) = 1.75, p =.08.)

Hypothesis 3

I found an unexpected moderate positive correlation between the measure of Implicit Positive Affect and Implicit Negative Affect (r=.45, p<.001). This strong, positive relationship is inconsistent with previous studies using this measure. Thus, I questioned the validity of this measure with my data, and deemed it inappropriate to evaluate the effect of mindfulness and priming condition on implicit PA or NA. I was therefore unable to test Hypothesis 3. This is further explored in the Discussion section.

Exploratory Analyses - Main Effects.

Although not central to my hypotheses, I first examined whether any of the mindfulness variables predicted participants' explicit affect or arousal, regardless of priming condition, as a way to better understand relationships in my data.

Not surprisingly, many of the mindfulness variables predicted participants' Affect scores. FFMQ Act with Awareness scores significantly predicted explicit Affect ratings ($\beta = .08$, $t(84) = 2.18$, $p = .03$), regardless of priming condition. Higher self-reported nondistraction predicted more positive affect (i.e., higher explicit Affect scores). Additionally, FFMQ Nonjudgment of Experience scores significantly predicted explicit Affect ratings ($\beta = .10$, $t(84) = 2.97$, $p < .001$), regardless of priming condition. Higher self-reported nonjudgment predicted more positive affect (i.e., higher explicit Affect scores).

Additionally, PHLMS Acceptance scores predicted Arousal ($\beta = .05$, $t(84) = 2.28$, $p = .03$). Those who were more accepting reported more arousal.

Exploratory Analyses - 3-way Interactions

Because mindfulness involves awareness and acceptance, these two PHLMS subscales were examined along with priming condition to explore possible interactions, using all outcome variables (explicit Affect and Arousal). When examining effects on explicit Affect or Arousal, Acceptance, Awareness, and condition were entered in Step 1. Product terms for Acceptance X Condition, Awareness X Condition, and Acceptance X Awareness were entered in Step 2. The product term of all 3 variables (Acceptance, Awareness, and Condition) were entered in Step 3. No 3-way interactions were found for these outcome variables (explicit Affect and Arousal).

Exploratory Analyses – Relation of Implicit and Explicit Mood

In their research, Brown and Ryan (2003) found greater concordance between implicit and explicit reports of affect among those individuals scoring higher in their measure of

mindfulness (the MAAS), which assesses an individual's awareness and tendency toward automatic pilot. These researchers used an IAT task to assess implicit affect. Although my findings suggest that the IPANAT (measure of implicit affect) was not valid in my sample, I nevertheless sought to test whether mindfulness moderated the relation of implicit and explicit affect.

To test this, I ran hierarchical multiple regressions. Explicit affect served as the dependent variable. In Step 1, the predictors were Implicit PA or Implicit NA, and a mindfulness variable (PHLMS Acceptance, PHLMS Awareness, FFMQ Act with Awareness subscale score, or total FFMQ score). (I chose to examine the FFMQ Act with Awareness subscale score as the only subscale moderator from the FFMQ because most of the items on this scale were drawn from the MAAS, which Brown & Ryan (2003) used in their research described above). In step 2, I entered the interaction term of the predictors in Step 1. The combination of these variables led to 8 different analyses.

Of the 8 analyses, only one was statistically significant (with all t statistics having an absolute value of <1.44, and all p values > .15). The interaction of implicit PA and PHLMS Awareness predicted explicit Affect scores, $\beta = .21$, $t(83) = 2.28$, $p = .03$. To further investigate this, I ran correlations of implicit PA and explicit Affect separately for those above the mean of PHLMS awareness scores, and then again for those below the mean. Among those above the mean, implicit PA and explicit Affect were correlated at $r=.47$, $p<.01$. Among those below the mean of PHLMS Awareness scores, implicit PA and explicit Affect were not at all correlated, $r=-.01$, $p=.94$. These results suggest that those higher in Awareness had greater concordance in their implicit Positive Affect and their explicit Affect scores.

CHAPTER 4

DISCUSSION

The aim of this study was to determine if mindfulness moderates the effects of subliminal priming on mood. The unconscious nature of information processing has been highlighted in studies using subliminal priming techniques. Mindfulness is a construct that in part is concerned with the ways individuals attend to and react to stimuli, and was thus hypothesized to influence the way individuals were affected by subliminal priming. A brief overview of hypothesized effects and results is presented first, followed by a thorough exploration of the results.

Mindfulness is a construct composed of different facets, with the most basic facets being those of nonjudgmental acceptance and present-moment awareness. Individuals may experience varying degrees of each of these facets, and one may imagine someone who is generally aware, but unaccepting, and vice-versa. This study had two hypotheses concerning different aspects of mindfulness, and a hypothesis concerning implicit affect. It was predicted that the moods of individuals high in acceptance would be less influenced by the primes, whereas those high in awareness would report affect more in line with the priming condition. Finally, I suggested that mindfulness levels would not have an effect on implicit affect; however, I did predict that implicit affect would be influenced by the priming condition. Overall, this study did find an interaction effect with specific components of mindfulness and priming condition predicting Affect ratings – i.e., levels of specific mindfulness facets influenced the way individuals were affected by the primes.

The first hypothesis was concerned with acceptance: It was hypothesized that participants who reported higher levels of acceptance and nonjudgment would be less affected by the subliminal primes than those with lower levels. This hypothesis was not supported. The data did not reveal any interactions of acceptance and priming condition predicting subsequent affect.

High levels of acceptance were expected to 'buffer' against the effects of the primes. This was anticipated because mindful individuals (i.e., more accepting and less judgmental) tend to be more grounded and less affected by external stimuli. Individuals high in acceptance may be able to accept certain emotions without getting 'caught up' in the feelings or thoughts, which is contrary to the effects of thought suppression –where individuals often experience a 'rebound effect,' (i.e., experience a surge in target thoughts after attempts to suppress); see Abramowitz, Tolin, & Street (2001) for a meta-analytic review. An accepting and nonjudgmental attitude would allow individuals to experience the emotions with less intensity and return to their baseline moods (which I predicted would be reflected in smaller discrepancies of explicit affect between positive and negative primes).

Several explanations for the lack of interaction are possible. First, it is possible that the effect does exist, but is not an immediate one. In other words, perhaps accepting individuals do experience their emotions with less intensity and are able to return to baseline moods within a certain amount of time, but our procedures may have assessed affect too quickly after the prime to capture this effect. There may be cognitive processes that take place prior to accepting attitudes emerging in these individuals. This could be tested in the future by allowing more time to elapse between the manipulation and the measurement of affect. Identification of cognitive processes may be possible in other mood manipulation experiments, in which the participant is aware of the mood induction; experimenters may then ask participants to speak openly about their thoughts following the mood induction as they rate their moods.

Alternately, perhaps subliminal priming is not an appropriate method for examining the effects of acceptance on the intensity of mood experience and expression. In other words, it may be true that acceptance may moderate the effect of external stimuli on affect, but this effect may

only exist (or may be more pronounced) when individuals are able to identify the source of potentially mood-altering situations or events. For example, we may imagine an individual who receives a bad grade on an exam. Perhaps this individual begins to feel poorly, but upon noticing certain thoughts about the exam and related emotions, acceptance begins to emerge and the individual's mood returns to baseline. This type of identifiable event, of which one is conscious, may be necessary for the effects of acceptance to emerge.

The second hypothesis was concerned with awareness: It was hypothesized that participants with higher levels of awareness would report more negative moods (when primed with negative words) and more positive moods (when primed with positive words) on explicit mood scales than participants with lower levels of awareness. Results showed an interaction between awareness and priming condition, but in the opposite direction than was predicted. Specifically, I found a relationship between awareness and affect only in the negative priming condition. Contrary to my hypothesis, individuals with higher levels of awareness were less affected by negative primes (i.e., in the negative priming condition, the higher one's level of awareness, the higher one's self reported explicit affect ratings after exposure to the prime). This pattern was found with both awareness subscales from the two mindfulness measures.

My original hypothesis was based on my prediction that individuals who are highly aware would be more aware of and able to accurately describe their feelings. My results, however, do not necessarily mean that the opposite is true (i.e., that these individuals are not aware and not accurately describing their feelings). It is possible that highly aware individuals are not automatically/passively taking in external stimuli (whereas low-in-awareness individuals may be automatically affected by the external environment, including priming manipulations). Among the highly aware, they may not be aware of the actual subliminal stimuli, but perhaps

they are more aware of their feelings and moods. Thus, small shifts in mood (due to external stimuli) may not affect these individuals as much, as they may be able to quickly 'reset' their moods. Because they may have been more in tune with how they were feeling prior to the manipulation, it is possible that they were able to observe and let go of their emotions. These findings are similar to the ones obtained in a study by Nielsen and Kaszniak (2006) (previously discussed in the introduction), in which nonmeditators rated masked unpleasant pictures as significantly more unpleasant than did meditators. The authors suggested that meditation practice "influences how emotionally ambiguous information is processed, regulated, and represented in conscious awareness" (Nielsen & Kaszniak (2006), abstract). Although my study was different in a number of ways (I measured levels of mindfulness among nonmeditators and used subliminal words rather than subliminal pictures), our studies produced similar findings: those who are more aware/experienced meditators (which presumably have cultivated a mindful attitude) may be less affected by their external environments. Although I had originally predicted that acceptance would be the key component for such an effect, my results suggest that awareness may in fact be a more important facet when utilizing subliminal priming techniques to induce affect. As noted in the introduction, Radel el al. (2009) found a similar result when subliminally priming students with controlled vs. autonomous motivation: the more mindful students were immune to the manipulation. Mindfulness in this study was measured using the Mindful Attention Awareness Scale (MAAS), which taps into the construct of awareness. None of the questions assess accepting attitudes. Thus, the Radel et al. (2009) finding was similar to mine in that those who were more aware were less affected by subliminal primes. However, it must be noted that all items on the MAAS loaded on the Act with Awareness subscale of the

FFMQ. I did not find a significant interaction effect with the Act with Awareness subscale in my study (although there was a trend toward significance, p=.08; see Results.)

The third hypothesis of this study focused on the impact of priming condition on implicit mood. Specifically, it was predicted that those participants primed with negative mood would score higher on a measure of implicit negative affect (than those in the positive prime condition), and those primed with positive mood would score higher on a measure of implicit positive affect (than those in the negative prime condition). It was hypothesized that all participants, regardless of how mindful they were, would have the same initial experience (implicit affect) in response to the primes. Given the unexpected strong correlation between implicit positive and negative affect, data from the implicit mood scale was deemed invalid and was thus not analyzed.

As noted, implicit PA and implicit NA were positively correlated (i.e., participants who scored high on the measure of their (implicit) positive affect also tended to score high on a measure of their (implicit) negative affect. While I did not necessarily expect the two measures to be negatively correlated (see Watson et al., 1988, for a discussion of the independent structure of positive and negative affect), the fact that they are positively correlated was unexpected. It should be noted that the IPANAT – the measure I used to assess implicit PA and NA – has not been extensively used in research publications. A review of published studies that used the IPANAT showed that among other samples, implicit PA and NA were not correlated (Quirin, Kazen, & Kuhl, 2009a; Quirin, Kazén, Rohrmann, & Kuhl, 2009b), did not report correlations between the scales (Quirin, Bode, & Kul, 2011), or only used one subscale (Hicks & King, 2011).

As previously mentioned, the IPANAT has only been validated with a German-speaking sample. Although the same artificial words used for the German language version of the

IPANAT were used for this study, it is possible that the nonsense words may convey a meaning that has both positive and negative qualities in English. Participants were asked to rate how well each word expresses different moods (e.g., to what extent does the sound of the artificial word FILNU convey each of the following mods: happy, helpless, energetic, tense, cheerful, inhibited). It is possible that participants provided their ratings based on an overall emotional sense of the word, rather than focusing on what the specific emotional tone was (e.g., the word FILNU may have struck some participants as having an emotional undertone, but the specific emotion was not identified; thus, participants may have rated all adjectives as fitting FILNU rather well). It is also possible that a response bias was present among individuals, such as rating all adjectives (both positive and negative valenced) as a good (or bad) match for the nonsense word. Indeed, for two subjects responses for all items were nearly identical. When excluding these outliers, the correlation between implicit positive and implicit negative affect decreased from r=.445 to r=.369, though it remained statistically significant. Thus, the response bias of these individuals may explain part but not all of the unexpected correlation.

Perhaps this response bias would have arisen on later trials as participants became fatigued. To investigate this possibility, I computed participants' mean implicit positive and negative affect scores for the first half of the items (average score of 9 positive adjectives and 9 negative adjectives), as well as for the second half of the items. Excluding the outliers that I mentioned above, I then examined the correlations among mean implicit positive and negative affect scores in the first half (and then again with the second half). Implicit positive and negative affect scores were correlated for neither the first half of items, r=.12, p=.26, nor the second half, r=-.02, p=.90. How could noncorrelations on each half turn into a positive correlation overall? Inspection of scatterplots showed that only 5 participants had extreme scores (less than 1.3 or

greater than 3.7) on the first half of implicit positive or negative affect items, but 24 did for the second half. This suggests that individuals were more extreme in their responding in the second half of the measure than in the first half. Further, individuals who tended to have lower average scores on the first half of the items (on either the positive or negative affect scales), also tended to score lower on the second half of the items. Taken together, this suggests that those who were more extreme in their responding on the second half of items were also those individuals whose initial (first half) average scores were lower (i.e., their ratings started lower). This polarization may well account for the overall correlation of the total implicit positive and implicit negative affect scales. Perhaps the measure does not require 6 fake words to assess implicit mood. The more extreme responding on the second half of the measure may reflect decreased focus of the participants, and thus a shorter measure may prevent this. Additionally, this measure should be validated among an English-speaking sample to ensure that it is valid and reliable.

Overall, this unexpected positive correlation between positive and negative implicit affect measures suggests that among my sample, the IPANAT was likely not a valid measurement of implicit positive and negative affect; thus, it was deemed inappropriate to examine them as dependent variables.

My study was designed to assess the moderating role of mindfulness on the effects of subliminal mood priming. Indeed, awareness was shown to be a moderator. In thinking about clinical applications, one question that arises is whether this effect would hold true if the mood-inducing stimuli were presented above the threshold of conscious awareness – that is, if the participants were aware of the stimuli. Such procedures may include having a subject watch an affect-laden film clip, or imagine an emotion-inducing situation, and have been shown to induce

mood (e.g., Westermann, Spies, Stahl, & Hesse, 1996). These may be similar to experiences individuals encounter in everyday life.

Would acceptance and awareness moderate the effects of these mood induction techniques? It is possible that awareness may continue to buffer against negative mood priming, as it did within my study using subliminal priming. Additionally, perhaps acceptance would begin to exert its effects if individuals were conscious of the stimuli affecting their moods. For example, we might imagine a scenario where individuals were asked to think about a distressing event, and then rate their mood. Those who are not accepting and are judgmental of their internal experiences and the distressing event itself may report more negative moods because their judgmental reaction becomes entangled with the basic emotion, thus bringing their moods down more. In this way, acceptance may moderate the effect of supraliminal mood priming. Individuals' conscious awareness of mood-inducing stimuli may be necessary in order for individuals to put accepting attitudes into practice.

Although not central to the main hypotheses of this study regarding interactions of mindfulness and priming condition, it is important to note the main effects of mindfulness that were found. The traits of acting with awareness and nonjudgment of experience predicted explicit affect ratings, regardless of priming condition. In all cases, the relationships were positive, such that increasing levels of higher mindfulness traits were related to more positive moods. This relationship was expected, given the large body of research showing the mental health benefits of mindfulness (see Giluk (2009) for a meta-analytic review of mindfulness and positive and negative affect). Interestingly, acceptance also predicted higher levels of arousal. Of note, the mean Arousal score was -1.47, which is below the midpoint of 0 (possible range of responses = -5 to 5). The actual range of mean arousal scores was -5 to 2.75. Examination of the

data revealed a normal distribution, within this range. Independent-samples t-tests revealed that the mean arousal scores for both high and low accepting individuals (when split at the mean acceptance score) were both still below the midpoint of 0. (Low acceptance, mean= -1.77; high acceptance, mean= -1.13.). This suggests that all individuals were identifying their current experiences as more aligned with 'calm,' 'tired,' 'down,' and 'sedate' (rather than 'excited,' 'energetic,' 'elated,' and 'aroused.') More accepting individuals were only slightly more aroused than those who were less accepting. Some research has suggested a link between mindfulness and energy levels and vitality (Allen & Kiburz, 2012; Smith et al., 2008), although this research measured mindfulness using the MAAS (Brown & Ryan, 2003), a scale that focuses more on the awareness (as opposed the acceptance) aspect of mindfulness.

Additional exploratory analyses tested whether mindfulness moderated the relation of implicit and explicit affect. Namely, I was interested in whether Brown and Ryan's (2003) findings of higher mindfulness relating to greater implicit/explicit congruence could be replicated. As already discussed, the validity of the IPANAT within my sample is questionable, and deemed not appropriate for analyses of my main (third) hypothesis. However, I ran exploratory analyses using scales from the IPANAT, with the understanding that results should be interpreted cautiously. Indeed, I found that among those higher in self-reported awareness as measured by the PHLMS, there was greater congruence between their implicit positive affect and their self-reported explicit affect. This finding is consistent with Brown and Ryan's (2003) results. They used the MAAS, a measure primarily concerned with an individual's awareness. Similarly, the only significant result of the exploratory analyses I ran was with regard to awareness (as opposed to acceptance or a composite mindfulness score). This finding provides some support to the idea that those who are more aware may be more in touch with their internal

experiences, and this self-awareness may be manifest through accurate reporting on explicit measures, although future research using properly validated implicit affect measures will be needed to provide further support.

Although my results showed an interaction of priming condition and mindfulness facets on affect, it is important to acknowledge that there was no main effect of priming on affect in this study (i.e., no differences in affect scores were found between those in the positive and negative priming condition). This lack of a main effect was surprising, given that many studies have demonstrated the effects of priming on mood (see the introduction of this paper for a review of those studies). Some consideration of how my procedure for inducing and measuring affect differed from other research may be useful for understanding the lack of main effects. I will provide a brief synopsis of what other studies have done that produced priming effects, and then explore my own procedures and perhaps why mine did not produce main effects.

As previously discussed in the introduction, research has shown that subliminal priming has been effective for inducing affect and mood. One area of research on this topic focuses on the way in which primes affect subsequent behaviors and decisional styles through the induction of moods. Some of the studies assume the moods were induced, while others explicitly measure changes in mood (as well as the noted outcome variables).

Some research has used pictures of happy or angry faces as subliminal stimuli. Outcomes of such studies include ratings or preferences (Murphy & Zajonc, 1993) and behaviors (Winkielman et al., 2009). Researchers interpret the results of such studies as indicating basic affective reactions, although affect is often not directly assessed.

With regard to studies that explicitly evaluated affect following a subliminal priming manipulation with positive/negative words, Chartrand and colleagues (2006) conducted a series

of studies using a subliminal priming task (similar to the one used in this study) with positive, negative, and neutral stimulus words. The main objective was to link mood with information processing style; in 2 of the studies mood was again not directly assessed, but assumed to have been manipulated by the effects found on information processing. In the 2 studies that did include mood scales, the authors did find differences in state affect between positive and negative prime conditions as assessed with a variety of measures. Similar to my findings, no differences of arousal levels were found by priming condition. The studies from this article provided support to the idea that affect can be induced through subliminal priming of positive or negative words, and that such effects can be captured in explicit reports.

Additional support for the subliminal presentation of positive/negative to induce affect was provided by Ruys and Stapel in their 2008 publication, which was reviewed in the introduction. My study drew heavily from their methods. It is important to note that in September 2011, after conclusion of data collection for this study, the scientific integrity of D.A. Stapel's work was called into question. Stapel has since been fired from his position of professor at Tilburg University in the Netherlands, after an investigation revealed, and Stapel himself admitted, that he manipulated and fabricated data for a number of published studies. A recent investigation into the extent of deception revealed evidence of fraud in the aforementioned article. Mr. Stapel himself acknowledged fraud with regard to this specific article.

The extent of the fraud within this article is unclear; an investigation noted that there was, "evidence of copying data: one mean and standard deviation in table 3 and table 4 are exactly the same" (Stapel Investigation, 2012). It is possible a substantial portion of data from this publication were falsified, which could help explain the lack of a main effect of the priming manipulation in my study. A study by Dijksterhuis and Smith (2002) found that subliminal

presentation of extremely positive or extremely negative words were subsequently rated as less extreme (compared to similarly valenced, non-primed words). The authors suggest an affective habituation process to explain this finding. Although the study did not directly measure mood effects, the theory itself contradicts Ruys and Stapel's (2008) findings. On the whole, there is support in the field for the idea that positive and negative material, presented subliminally, can affect one's mood. However, there is not as much support for one specific methodological technique to accomplish this. Perhaps the method I used was not the most effective option, which in part may explain the lack of priming effects in my study.

Although most priming studies do not assess mood prior to the mood induction (including my present study), it is worth mentioning a quick mood measure prior to the induction would allow for a more in depth analysis of the effect of the priming. Changes in mood pre- to post- prime would be a more accurate way to determine if the prime worked for individual participants. Further, an understanding of the change in mood (or lack of change) following a prime would provide greater clarity as to whether mindfulness was buffering (or enhancing) the effect of the prime for each individual.

Limitations

There are several methodological issues that may have also contributed to the lack of significant hypothesized effects. First, it is possible that such effects do exist, but the effect is a very small one. Thus, my final sample size of 87 participants may not have provided enough power to detect such a small effect. In my priming manipulation, I used the same exposure times for each individual. Some priming research has suggested that the use of individually-set exposure times is a more appropriate method (e.g., Holender, 1986). Some research has shown

that when primes are supraliminal, priming effects diminish or disappear (e.g., Murphy & Zajonc, 1993). Other research has suggested that obtaining the desired effects of priming does not depend on whether the prime is subliminal or supraliminal, but rather whether the individual is aware that a prime is influencing them, and whether they have the ability to resist its influence (Bargh, 1992; Wilson & Brekke, 1994; Strahan, Spencer, & Zanna, 2002). Specifically, if an individual believes a prime is exerting a persuasive influence– regardless of whether it is subliminal or supraliminal – and the individual resists the persuasion, then the desired priming effect may not occur. It is possible that the priming manipulation did not produce the desired main effects because I utilized pre-specified exposure times, rather than individually-set exposure times, or because some participants were aware that the "flashes" (subliminal primes) were influencing them. Indeed, although no participants actually guessed that the primes were meant to influence their mood specifically, 25 participants did report that they thought the primes were designed to affect their later answers. The majority of participants in my sample were undergraduates drawn from psychology classes; thus, they may have learned about subliminal priming techniques in classes and resisted the influence of the primes, despite not being able to identify the primes themselves or the hypotheses.

Some researchers (Bem & Allen, 1974) have suggested that certain individuals may be untraited on particular psychological dimensions. That is, some individuals may be more consistent across situations (traited), and others may vary widely (untraited). Thus, self-reports on these dimensions are not as meaningful (or valid) for the untraited individuals. Somewhat related, Cervone and Shoda (1999) suggested that individuals may display predictable patterns of behavior that vary across contexts, which trait measures of personality (or, in this case, mindfulness) may not capture. I might imagine an individual who is very mindful in his

relationships with other people (very aware of their feelings, his actions, and accepting of them and his own feelings in regard to relationships), yet when it comes to his work, he is less aware and more critical of himself. It is possible that for some of my subjects, mindfulness is one such dimension on which individuals vary across situations. Thus, responses on self-report measures of trait mindfulness may not capture the complexity of attitudes and experiences for these individuals, potentially masking any possible effects. Other limitations include, as previously noted, the possibility that subjects were careless/haphazard in their responses and did not pay attention to the content of questions. Additionally, the issues inherent in any self-report measure (recall bias, social desirability, etc.) can affect the reliability and validity of my data (specifically the mindfulness measures).

It must be noted that one item was omitted from data collection forms due to experimental error. The original explicit affect questionnaire (drawn from Salovey & Birnbaum, 1989; and Chartrand et al. 2006), contained eight bipolar items in which participants were to rate each dimension based on how they felt at the moment with a response scale of -5 to 5. The emotion/affect dimensions are bad-good, disappointed-satisfied, sad-happy, and displeased-pleased. Due to an experimental error, the affect rating from the "bad-good" scale was omitted from the questionnaire. Thus, the final affect rating consisted of the mean of 3 items. However, alpha was .91, suggesting excellent internal consistency of these 3 items. The error of omitting the 'bad-good' rating may not have detracted from the overall reliability of the measurement of affect.

Finally, I was not blind to the condition. It is possible that because I knew of the participant's condition (positive or negative mood prime), I may have unconsciously acted differently to participants in different conditions, thereby affecting data quality and outcomes.

Future Research and Implications

While there are several limitations to my study – most notably the lack of priming main effects – the significant interaction of priming and mindful awareness on affect is promising. This is the first known study to examine mindfulness as a moderator of the effects of priming on mood. Future research may improve on my design by utilizing other techniques, as previously noted (e.g., different subliminal priming techniques). Researchers may also wish to assess mindfulness in alternate ways. For example, prior to priming, researchers may have a group of participants complete a mindfulness induction. Following the primes, researchers may then assess mood. This would eliminate some of the issues surrounding self-report measures of mindfulness.

As previously noted, a brief mood measure before and after priming would allow researchers to assess change in mood (rather than simply looking at mood post-prime), which would allow for a richer analysis of the interaction effect of priming and mindfulness on mood.

Much research has focused on the benefits of mindfulness in general, and acceptance more specifically, for well-being. My results from this study suggest that awareness may be an important facet in helping to prevent changes in mood from ambiguous, negative stimuli. Individuals may be served by cultivating greater awareness of their internal processes and external stimuli, which may help them be more aware of their own moods prior to changes in the external environment, and thus allow them to identify with their baseline moods, rather than have their moods be influenced by the environment.

APPENDIX A

GLOSSARY OF TERMS

CES-D – Center for Epidemiological Studies Depression Scale

FFMQ – Five Facet Mindfulness Questionnaire

PHLMS – Philadelphia Mindfulness Scale

NA – Negative Affect

PA – Positive Affect

IPANAT – Implicit Positive and Negative Affect Test

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