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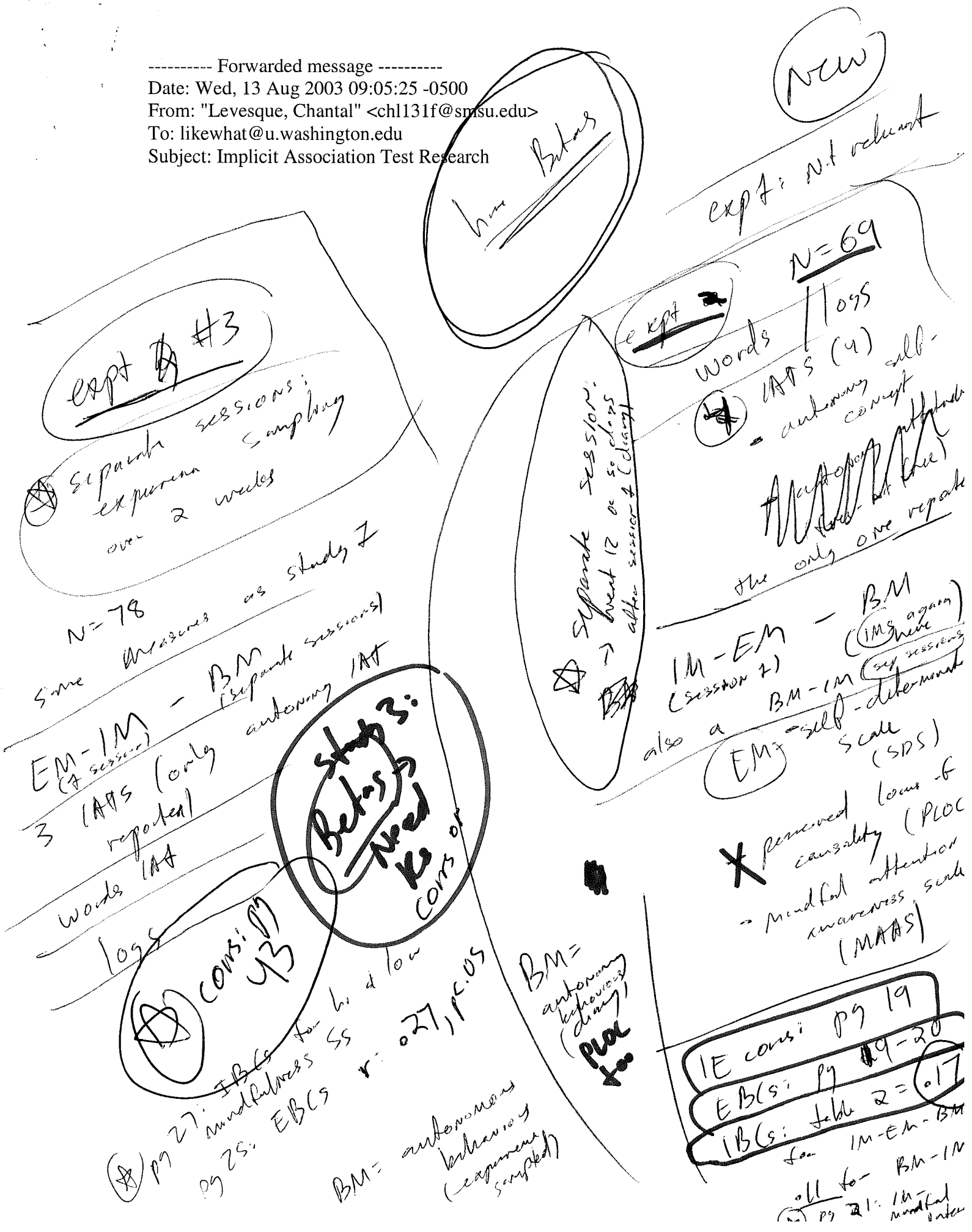

Overriding Motivational Automaticity: Mindfulness as a Moderator of the Influence of Implicit Motivation on Day-to-Day Behavior

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Abstract

Drawing from theories regarding the role of awareness in behavioral self-regulation, this research was designed to examine the role of mindfulness as a moderator between implicit motivation and the motivation for day-to-day behavior. We hypothesized that dispositional mindfulness (Brown & Ryan, 2003) would act to modify the expression of implicit autonomy orientation in daily behavior. Using the Implicit Association Test (Greenwald, McGhee & Schwartz, 1998), Study 1 provided evidence for the reliability and validity of a new measure of implicit relative autonomy. Using a time-sampling strategy, Study 2 showed that implicit relative autonomy predicted day-to-day motivation, but only when dispositional mindfulness was low. Study 3 replicated this finding using a more sophisticated experience-sampling approach, and showed that this moderating effect of consciousness was specific to mindfulness and to spontaneous behavior. Discussion focuses on the implications of these findings for dual process theory and research.

Keywords: implicit process, autonomy, mindfulness, Self-determination Theory, Implicit Association Test

Overriding Motivational Automaticity:

Mindfulness as a Moderator of the Influence of Implicit Motivation on Day-to-Day Behavior

Most contemporary motivation researchers assume, either implicitly or explicitly, that the best way to obtain a picture of individuals' prevailing motivations for their behavior is simply to ask them. A primary theoretical assumption of this measurement approach is that motivation for behavior, like other self-related phenomena, is consciously known (e.g., Deci & Ryan, 1985). But there has been a long-standing recognition among students of social cognition that motivational and other psychological processes also have an implicit aspect. Implicit processes represent the habitual, nonconscious motivations, attitudes and other self-related phenomena that can be activated automatically from memory, without conscious intervention and guidance (e.g., Bargh, 1997; Wilson, Lindsey, & Schooler, 2000). In fact, there is now ample evidence to indicate that the potentiation and enactment of automatic, habitual behavior depends on a lack of conscious attention to and awareness of the behavior and the environmental cues that activate it. As Macrae and Johnston (1998) note, habitual action can unfold when the "lights are off and nobody's home." Similarly, automatic thought patterns thrive while they remain out of the field of awareness (Segal, Williams, & Teasdale, 2002).

While automatized behavior conserves attentional energy for maximal efficiency in achieving goals, consciousness serves a valuable shaping or overriding function when psychological and behavioral monitoring is desired (Westen, 1998), such as when goal conflicts or other challenges arise. In this way, conscious intervention provides greater flexibility in shaping, or adapting to, circumstances. As McClelland, Koestner, and Weinberger (1989) note, "the automatic motivational system is not well equipped to make plans or to set specific goals that can take into account contextual circumstances" (p. 699). And indeed, research has shown

how contextual cues for heightened attention and self-awareness can facilitate conscious overriding of automatic behaviors (Dijksterhuis & van Knippenberg, 2000; Hefferline, Keenan & Harford, 1959; Macrae & Johnston, 1998). However, if automatic behavior is to be regulated in a self-directed manner on an ongoing basis, a dispositionally elevated level of attention and awareness would seem essential. The present research was designed to examine the role of one such disposition – namely, mindfulness – as a moderator between implicit motivation and day-to-day motivated behavior.

The Role of Conscious Awareness in Prediction by Implicit Motivation

Whether implicit motivational and other processes predict behavior is theorized to depend on the degree to which individuals exercise awareness of and attention to a) the stimuli that impinge upon their psychological states, and b) their psychological and behavioral responses to those stimuli (Bargh,1997; Bargh & Barndollar, 1996). As such, consciousness may represent a moderating factor that determines whether an implicit process translates into a psychological or overt behavioral outcome. To illustrate, imagine a person seeking to alter an implicit tendency to be controlled by others or environmental circumstances. This person could be said to be implicitly heteronomous, automatically associating him/herself with choicelessness and a lack of freedom. As Bargh (1997) notes, a first step in gaining control over such an automatic process is to become aware of the automatic cognitions that intervene between a triggering event (say, a demand to conform to some standard of behavior) and a psychological or behavioral response. Bringing the motivational tendency into the realm of conscious processing, the individual could mentally entertain self-endorsed responses to the event, potentially leading to more autonomous behavioral outcomes.

Consciousness directed toward psychological and behavioral processes is fundamental to a number of theories of behavioral self-regulation (e.g., Carver & Scheier, 1981; Deci & Ryan, 1980; 1985). Deci and Ryan (1985) argue that awareness facilitates self-regulated functioning because it permits introspective access into one's needs and desires in any given situation, and thereby facilitates the expression of behavior that accords with those promptings. Indeed, Brown and Ryan (2003) showed that one awareness construct, namely mindfulness, predicted higher levels of day-to-day self-regulated (autonomous) behavior. Awareness is also theorized to be important in determining whether an implicit motivation will manifest in self-endorsed behavior, since such endorsement may necessitate conscious reflection on whether the motivation accords with one's sense of self.

Based on theory reviewed here, we predicted that attention and awareness would play a moderating role in the relation between an implicit motivational disposition and day-to-day behavioral motivation. It could be expected that those with higher levels of awareness would show self-regulated functioning, regardless of implicit motivational orientation. Such individuals may be more likely to consciously modify or override the expression of their implicit motivational orientations when desired, while among those with less awareness, an implicit motivational orientation is more likely to translate into behavior, because there is no conscious intervention to shape or override the implicit tendency.

Research has uncovered two primary classes of dispositional awareness that may serve the self-regulatory function discussed here. "Reflexive" forms of consciousness involve cognitive activity directed toward the self (Baumeister, 1999), and include such phenomena as *private self-consciousness* (Fenigstein, Scheier, & Buss, 1975) and *reflection* (Trapnell & Campbell, 1999). The concept of *mindfulness* is "pre-reflexive", rooted in bare attention to and

awareness of psychological experience and behavior (Brown & Ryan, 2003). Of the two forms of consciousness discussed here, mindfulness may best serve the "de-automatization" function that Bargh (e.g., 1997) and Westen (1998) describe, because unlike reflexive forms of consciousness, mindfulness operates upon, rather than within thought, feeling, and other contents of consciousness. Gill and Brenman (1959) suggest that attention directed toward behavior and percepts is necessary for de-automatization to occur. Deikman (1966) further notes that automatization normally transfers attention from a percept or action to cognition, suggesting that reflexive consciousness can operate automatically and thus fail to provide a clear perception of automatic psychological and behavioral patterns. De-automatization favors receptive perception over cognition by reinvesting behavior and percepts with conscious attention. It is this receptive perception that mindfulness provides (Brown & Ryan, 2003). This theorizing was tested by examining the self-regulatory potential of both reflexive and pre-reflexive (mindfulness) consciousness.

The Implicit Nature of Motivation

To study the role of conscious awareness and attention as a moderator of the expression of implicit motivation, we chose a motivational dimension that is theorized to have widespread and enduring behavioral consequences, namely autonomy versus heteronomy. According to Self-determination Theory (SDT; Deci & Ryan, 1985), autonomy refers to the extent to which behavior is performed out of a sense of choicefulness or volition versus driven by forces that are experienced as external or alien to the self. When autonomous, behavior is perceived as having an internal locus of causality (deCharms, 1968); when heteronomous, the locus of causality of behavior is perceived as external to one's self. The autonomy/heteronomy dimension – which for short-hand purposes we will call relative autonomy or autonomy orientation – is a primary

component of intrinsic/extrinsic motivation, which has long held an important place in motivation research (Heckhausen, 1991). Extensive research in SDT over the past 30 years has demonstrated the importance of this motivational orientation for positive behavioral and psychological outcomes like creativity (Amabile, 1996), task performance (Deci & Ryan, 1991), and well-being (Ryan & Deci, 2000).

While research supports the explicit, self-attributed nature of dispositional relative autonomy, both theory and research also suggest that it may also have an implicit or automatic aspect. McClelland et al.'s (1989) dual motive theory posits that implicit motivational orientations form through natural incentives and emotional experiences (see also Woike, 1995). These motivations can then be activated automatically and guide behavior without conscious oversight. Thus, implicit relative autonomy refers to a motivational style – either toward being choiceful or controlled – to which individuals have come to implicitly associate themselves. Levesque and Pelletier (in press) provided evidence for the implicit aspect of intrinsic motivational orientations like relative autonomy. Importantly, this motivational style may prompt either autonomous or controlled behavior, and may be regulated by means that are nonconscious (e.g., environmental stimuli) or conscious (e.g., mindfulness; Ryan & Deci, in press).

To date, empirical research on the implicit aspect of motivation has been focused on either short-term goal states activated through priming (e.g., Bargh, Gollwitzer, Lee-Chai, Barndollar & Trotschel, 2001) or dispositional motives assessed using projective techniques like the Thematic Apperception Test (TAT; e.g., King, 1995). As implicit measures, priming methodologies are not well-suited to the study of individual differences, and use of the TAT is limited to a relatively small set of motives for which reliable coding schemes are available. The advent of response-latency approaches like the Implicit Association Test (IAT; Greenwald et al.,

1998) has created opportunities to test hypotheses regarding a wide range of trait and other social and personality phenomena. Like the TAT, the IAT is believed to measure implicit associations, but unlike the TAT, it does so without recourse to narrative report. Among current measures of implicit processes, the IAT is one of the most psychometrically sound (Bosson, Swann, & Pennebaker, 2000; Cunningham, Preacher, & Banaji, 2001).

The Present Research

The central thesis of this research is that whether implicit motivational orientations manifest in day-to-day behavior depends on the degree to which individuals have conscious awareness of their inner states and behavior. We hypothesized that when individuals are low in dispositional mindfulness, the predictive relation between implicit relative autonomy and motivation for day-to-day behavior will be positive. Conversely, we hypothesized that when high in mindfulness, individuals will show little or no relation between their implicit and day-to-day motivation. In line with theory and past research (e.g., Levesque & Pelletier; in press; McClelland et al., 1989), we further hypothesized that any effect of implicit motivation would be upon a spontaneous (e.g., day-to-day) behavioral outcome rather than a controlled outcome where external demands may be salient, such as a one-occasion self-report.

In the first of three studies, an IAT measure of implicit relative autonomy is described, along with evidence for its reliability and validity. In Study 2, the moderating role of mindfulness in the predictive relation between implicit relative autonomy and experience-sampled motivation for behavior is tested. Further evidence for the reliability of the IAT measure of implicit relative autonomy is also presented. Study 3 was designed to replicate the moderational findings of Study 2 in an independent sample, and using a more sophisticated experience-sampling methodology. To provide more evidence for the specific regulatory power

of mindfulness, this study also tested the moderational capacity of two reflexive forms of consciousness. Finally, this third study examined the predictive role of implicit motivation upon day-to-day behavior relative to a one-occasion retrospective measure of behavioral motivation.

This research serves as an extension of, and bridge between, several areas of research on dual processes. First, it carries work with the IAT into a new domain of investigation, that of dispositional motivation. In its focus on day-to-day behavioral outcomes, this research acts as a bridge between research using sophisticated methodologies like the IAT to tap implicit processes and research traditions (e.g., McClelland et al., 1989) that recognize the value in assessing everyday behavioral outcomes. Finally, this research seeks to further specify the conditions under which implicit processes manifest in day-to-day life.

Study 1

We first developed an implicit measure of dispositional autonomy using the IAT. Demonstrating the psychometric soundness of new implicit measures is essential, and this study examined the internal consistency, degree of freedom from self-presentation biases, and discriminability of the implicit autonomy construct from the implicit attitude toward autonomy. On this last point, while an individual may implicitly value autonomy, it is another question whether he/she is dispositionally autonomous.

SDT (Deci & Ryan, 1985) posits that individuals find natural incentives for behaving autonomously, given the inherent interest, enjoyment and value in choiceful, self-endorsed action. Thus, we expected that in general individuals would implicitly associate themselves with autonomy rather than heteronomy; that is, they would generally show an implicitly autonomous disposition. This study also examined the relation between the implicit relative autonomy measure and validated measures of explicit (self-reported) autonomy. Prior dual process research

on motives (e.g., Spangler, 1992) and other trait phenomena (e.g., Bosson et al., 2000; Greenwald & Farnham, 2000) led us to expect that the implicit relative autonomy construct would be relatively independent of its explicit counterpart.

Method

Participants

Eighty-three University of Rochester undergraduates (58 women and 25 men) participated in exchange for extra course credit. All participants had begun to speak English before age 5. Data for 5 additional participants were excluded due to high error rates (greater than 20% of trials) on the combined task blocks of the dispositional IAT (see below), while data from 4 participants were not used due to high error rates on the attitude IAT.[1]

Explicit Measures

Dispositional autonomy. The 10-item Self-Determination Scale (SDS; Sheldon & Deci, 1996) presented participants with statement pairs and, using a 1-5 scale, asks which of each pair feels more true (e.g., "I always feel like I choose the things I do" versus "I sometimes feel that it's not really me choosing the things I do"). Higher scores reflect greater autonomy. In the present sample, Cronbach's alpha was .79. The 14-item Autonomy scale (part of the Scales of Psychological Well-Being [PWB]; Ryff, 1989) assessed self-determination, ability to resist social pressures, self-regulation of behavior, and self-evaluation with personal, rather than others' standards using a 1-6 scale (sample $\alpha = .86$).

Attitude toward autonomy. A semantic differential scale assessed attitude towards "being free" and "being not free". Using 7-point scales (-3 to +3), respondents described their attitudes towards each on 5 bipolar adjective pairs: good/bad, pleasant/unpleasant, nice/awful, desirable/undesirable, and success/failure. Mean "not free" ratings were subtracted from mean

"free" ratings to obtain a relative attitude score. A thermometer scale with two parts (as above) also assessed attitude; for each, respondents marked a horizontal box ranging from 0 to 100 with anchors at 0 ("cold or unfavorable"), 50 ("neutral") and 100 ("warm or favorable"). Relative attitude toward autonomy was calculated by subtracting the "not free" from the "free" marked values. Past IAT-based research has used similar attitude measures (e.g., Greenwald et al., 1998).

Social desirability. The Balanced Inventory of Desirable Responding (BIDR; Paulhus, 1991) assessed self-deception (sample $\alpha = .73$) and impression management (sample $\alpha = .78$).

Implicit Measures and Procedure

The IAT procedure closely followed that described by Greenwald et al. (1998) and Greenwald and Farnham (2000). The IAT was administered on a PC-type computer using E-Prime software (Schneider, Eschman, & Zuccolotto, 2002). Participants were instructed to categorize words that appeared in the center of a computer screen (classification stimuli) into one of two continuously visible categories at the top right and top left sides of the screen. Stimuli were placed into the right category with the right forefinger using the '5' key on the right side of the computer keyboard; words were placed into the left category with the left forefinger using the 'A' key. Participants were instructed to make each classification "fast" and to expect to make a few mistakes because of going fast. An incorrect response prompted a red "X" to appear in the center of the screen, and remained until the correct response was made. At the end of each trial block, the number of correct responses out of the total was displayed.

The dispositional IAT used 5 classification stimuli to refer to the target concept of self (*I, me, myself, mine,* and the *participant's first name*) and 5 to refer to the target concept of non-self, or other (*they, them, their, it,* and *other*; cf. Greenwald & Farnham, 2000). The categories into which these words were placed were labeled "me" and "not me" on the computer screen.

Stimulus words to assess the associated attributes of autonomy/heteronomy were chosen through pilot testing. Judges (7 psychology faculty and graduate students conducting SDT-related research) independently rated the adequacy of 27 autonomy words and 21 heteronomy words as representative of the constructs of autonomy and heteronomy using a 5-point scale. Using the "V" statistic (e.g., Aiken, 1996), which is a content validity coefficient designed for a small number of ordinal validity ratings, only highly and consistently rated items ($p < .05$) were retained. The 5 selected autonomy stimuli were: *choice, free, spontaneous, willing,* and *authentic*; the 5 selected heteronomy stimuli were: *forced, pressured, restricted, controlled,* and *should.*

Using a modified Q-sort methodology, further evidence indicated that these stimuli could be meaningfully grouped into two distinct categories. In a sample of 86 undergraduates, 9 of the 10 words were classified as predicted by over 94% of participants; the word "should" was correctly classified by 80.2% of participants. In the IAT tasks, the categories into which these words were to be placed were labeled "free" and "not free" on the computer screen.

The classification task for the attitudinal IAT used 5 stimuli to refer to the target concept of pleasantness (*joy, peace, sunrise, warmth,* and *gold*) and 5 to refer to the target concept of unpleasantness (*vomit, agony, death, corpse,* and *slime*). These were drawn from stimulus sets used by Rudman, Greenwald, Mellott, and Schwartz (1999). The categories into which these words were to be placed were labeled "pleasant" and "unpleasant" on the computer screen. The autonomy/heteronomy stimuli to be associated with these categories were the same as for the dispositional IAT.

Each IAT task comprised 7 blocks of speeded classification trials. The trial block sequence for the dispositional IAT was as follows: 1) self discrimination ("me" versus "not me" categorization; 20 trials); 2) motivation discrimination ("free" versus "not free" categorization;

20 trials); 3) practice of combined category classification ("free or me" words versus "not free or not me"); in counterbalanced order, half the participants received the opposite combination first: "free or not me" versus "not free or me" (20 trials); 4) critical, data collection block of the combined category classification practiced in block 3 (40 trials); 5) repeat of motivation discrimination (see block 2) with category labels now on the opposite side of the screen (20 trials); 6) practice of reverse combined category classification ("free or not me" versus "not free or me"; 20 trials); and 7) critical, data collection block of the reverse combined category categorization (40 trials). In blocks 6 and 7, each person completed the combined category task opposite to the one in blocks 3 and 4. The order of blocks 3+4, and blocks 6+7 were counterbalanced across participants.

In each trial block, all stimulus items were drawn randomly until all words had been presented before re-use. The intertrial interval was 250 milliseconds (ms). The IAT effect for implicit trait autonomy was computed by subtracting the mean latency for the me+free combined trial block from that for the me+not free block (block 7 – block 4, as presented here). The attitudinal IAT task followed the same procedure as the trait IAT, except that the target concept was "pleasant" versus "unpleasant" rather than "me" versus "not me" in the single concept and combined concept trial blocks.

General Procedure and Design

Participants completed the self-report measures and three IAT tasks individually in a single session. One of these IAT tasks was of interest to other research. Except for preliminary instructions by the experimenter, the IAT tasks were completed by following instructions on the computer screen. Three procedural variables were counterbalanced: Order of the IAT and self-report tasks (with approximately half the participants completing the self-report measures before

the IAT tasks and half after the IATs), order of the three IAT tasks, and combined block order within IATs. These variables did not produce any effects that qualified interpretation of the results.

Data Reduction

IAT data reduction followed the procedures established by Greenwald and colleagues (e.g., Greenwald et al., 1998). Only the critical trial blocks (4 and 7) were used for analysis. In each block, responses to the first two trials were dropped given their typically long response latencies. To correct for anticipatory responding and momentary inattention, latencies shorter than 300 ms or longer than 3000 ms were recoded to 300 ms and 3000 ms, respectively. The response latency data was logarithm transformed to normalize distributions. Consistent with past research, the average error rate on the combined tasks was low (5% or less).

Results and Discussion

Implicit Autonomy Orientation

Internal consistency of IAT-assessed trait autonomy orientation was computed using a variation of the approach taken by Bosson et al. (2000). A mean response latency score was derived by subtracting the (log-transformed) reaction time to each stimulus word in the self+heteronomy block from the reaction time to the same word in the self+autonomy block. Cronbach's alpha based on these 20 difference scores was .75. The IAT effect for dispositional autonomy (mean latency for the self+heteronomy block minus mean latency for the self+autonomy block) was strong; across all counterbalancing conditions, Cohen's $d = 1.73$, $t(81) = 7.79$, $p < .0001$. Participants classified stimulus words 230 ms faster, on average, in the self+autonomy conditions than in the self+heteronomy conditions.[2]

The internal consistency for IAT-assessed implicit attitude was .67. The IAT effect for attitude (mean latency for the pleasant+heteronomy block minus mean latency for the pleasant+autonomy block) was also strong; across all conditions, $d = 2.79$, $t(81) = 12.55$, $p < .0001$. Participants responded much more quickly when associating autonomy items with pleasantness. The dispositional and attitudinal IAT measures were correlated, $r = .33$, $p < .01$. This modest relation indicates that these measures are conceptually discriminable. No gender effects were found on either IAT measure, nor on any of the explicit measures, all *p*s ns.[3]

Relations between Implicit and Explicit Measures of Autonomy

Table 1 presents descriptive statistics on the raw (untransformed) IAT response latencies and the explicit measures, as well as correlations between all measures. The BIDR measure of self-deception was uncorrelated with both implicit trait autonomy and attitude. Impression management was uncorrelated with IAT-assessed attitude and modestly correlated with IAT-assessed dispositional autonomy, $r = .21$, $p < .05$. However, other, unpublished research from our laboratories has shown no relation between these two measures. These results suggest that IAT-assessed implicit autonomy measures are not (unduly) affected by self-presentation biases. The IAT-assessed implicit and explicit dispositional autonomy measures were unrelated, using both the SDS ($r = -.06$, ns) and the PWB Autonomy scale ($r = -.08$, ns). This result is consistent with other, motive research (e.g., Spangler, 1992). Given evidence for the reliability and validity of IAT-assessed implicit dispositional autonomy and for its conceptual independence from other constructs, we turn to our primary research questions.

Study 2

This study had two primary hypotheses: First, we predicted that the extent to which implicit motivation would predict day-to-day motivation would depend on levels of dispositional

mindfulness. Specifically, among those less mindful, we predicted that implicit motivation would "drive" behavioral motivation; that is, we expected a positive relation between implicit relative autonomy and behavioral motivation. Among those more mindful, whose greater self-regulatory capacity may allow them to act as "gatekeeper" between implicit motivational processes and behavior, we predicted that implicit relative autonomy would be unrelated to the relative autonomy of everyday behavior. For example, an individual who has low implicit autonomy but is highly mindful should show autonomous behavior because the implicit tendency can be overruled by conscious awareness. A person who is both implicitly autonomous and mindful should also show high levels of behavioral autonomy. The predictive role of explicit, or self-reported autonomy was controlled in this investigation.

The impact of implicit motivation has been strongest in predicting spontaneous motivational trends, which can be observed in day-to-day behavior using a sampling strategy (McClelland et al., 1989). This study used such a strategy and also sought more evidence for the psychometric soundness of the implicit autonomy orientation measure developed in Study 1 by examining its test-retest reliability.

Method

Participants

Undergraduate students at Southwest Missouri State University participated for extra course credit. Of those who began the study, data from 7 participants were excluded from analyses because of high error rates on the dispositional IAT (greater than 20% of trials on the combined category task) at time 1 and/or time 2. One individual did not complete the diary portion of the study and 6 participants did not complete the time 2 IAT. This left 69 participants for analysis (36 women, 33 men). All were English speakers before age 5.

Explicit Measures

As in Study 1, the Self-Determination Scale (SDS) was completed (sample $\alpha = .73$). An adaptation of the Perceived Locus of Causality scale (PLOC; Ryan & Connell, 1989) was also completed as a second measure of dispositional relative autonomy. The PLOC measure, derived from SDT, has been used extensively to examine self-regulated activity (e.g., Reis, Sheldon, Gable, Roscoe, & Ryan, 2000). In five behavioral domains – college, friendships, leisure/personal pursuits, work (if applicable), and sports/exercise (if applicable) – participants rated 5 reasons for engaging in the behavior using a 1-7 scale. These reasons, which varied on a continuum from highly heteronomous to highly autonomous, were defined as *external* ("Because other(s) want me to, or pressure me to"); *introjected* ("To help me look good to other(s)" and "To help me feel good about myself"); *identified* ("Because I truly value it"); and *intrinsic* ("Because it is fun or interesting to do it"). A relative autonomy index (RAI) was formed by weighting each statement within each domain of activity (-2 and +2 for external and intrinsic scores, respectively; -1 for the mean introjected scores; +1 for identified scores) and then summing across statements. The domain totals were then averaged across the 5 domains of behavior. RAI scores could range from –18 to +18 with higher scores reflecting greater autonomy.

To assess awareness, the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) was used to measure the frequency with which individuals are openly attentive to and aware of current experience, including both internal states and behavior (sample $\alpha = .90$).

Implicit Measures, Procedure, and Data Reduction

Four counterbalanced IAT tasks were completed, of which only one, the dispositional relative autonomy measure, was relevant to this research. The measure and procedures were

identical to those described in Study 1. The average error rate on the combined tasks was less than 5% at both time 1 and time 2.

Daily Sampling Measure and Procedure

To assess the relative autonomy of daily activities, a PLOC measure was used that was similar (but framed in past tense) to that used to measure dispositional autonomy. Using a similar measure to assess both dispositional and day-to-day autonomy permitted a stringent test of the role of implicit autonomy orientation, and its interaction with awareness, in the prediction of everyday motivation. PLOC ratings were completed at the end of each day, for one week, on daily behavior within each of the 5 domains outlined earlier.

All participants began daily recordings the day following completion of the time 1 measures. Completed diary forms were returned in person each day subsequent to recording. A log was kept of returned forms for each participant throughout the diary portion of the study to check compliance on: The return of one form each day, the completion of forms at the end of the day, and the completion of all items on each form. Deviations from this protocol prompted an immediate e-mail to the participant in question to clarify understanding of the study procedure and to rectify any difficulties.

All participants received one "booster" e-mail approximately 2 days after the start of the diary recordings. This was designed to check for problems with form completion and to encourage ongoing adherence to the diary protocol. Booster contacts have been shown to increase compliance rates (Litt, Cooney, & Morse, 1998). In this study, 479 (99.2%) of 483 possible forms (69 Ps x 7 days) were completed correctly and returned.

General Procedure and Design

The first series of implicit measures, and all explicit measures, were completed in a single laboratory session. Since explicit-implicit task order did not influence the results of Study 1, the IAT tasks were completed before the self-report measures (cf. Greenwald & Farnham, 2000). At time 2, which followed the diary recording (M = 12.4 days after time 1, SD = 6.36 days), the same IAT tasks were completed, followed by study debriefing. Neither IAT task order nor trial block order produced significant effects at time 1 and time 2.

Results and Discussion

Implicit Autonomy Orientation

The internal consistency of IAT-assessed relative autonomy was .78. The IAT effect was large across the two counterbalanced conditions at time 1: IAT effect = 265 ms; d = 1.27, t(68) = 10.58, $p < .0001$, and at time 2: IAT effect = 203 ms; d = 1.30, t(68) = 10.81, $p < .0001$. As in Study 1, participants were quicker to associate self with autonomy words. The test-retest reliability of the IAT was .51 which, though moderate in size, compares favorably to that found elsewhere (Cunningham et al., 2001).

Relations between Implicit, Explicit, and Daily-Sampled Measures

The bottom portion of Table 2 presents descriptive information on all study variables. One-occasion explicit and daily-sampled data showed that participant behavior was generally autonomously oriented. Table 2 also presents intercorrelations between all measures. The daily-sampled motivation data were averaged within subjects for these analyses. As in Study 1, the correlations between implicit and explicit dispositional autonomy were low and nonsignificant (based on time 1 data, r = .19 for SDS; r = .11 for PLOC). IAT-assessed autonomy orientation was uncorrelated with day-to-day autonomy, but both measures of explicit autonomy orientation

were correlated with this outcome ($r = .44$, $p < .0001$ for the SDS, and $r = .66$, $p < .0001$ for the PLOC. Mindfulness was related to both measures of explicit autonomy orientation, and to day-to-day autonomy, $r = .32$, $p < .01$ (cf. Brown & Ryan, 2003).

Prediction of Day-to-day Relative Autonomy

Using HLM 5 software (Raudenbush, Bryk, & Congdon, 2000), multilevel random coefficient modeling was used for prediction of daily motivation (MRCM; e.g., Raudenbush & Bryk, 2002). MRCM is well suited to hierarchically nested data structures in which a lower level unit of analysis (e.g., daily reports) is nested within a higher level of analysis (e.g., persons). Such models can control for the effects of several characteristics that often appear in diary data, including linear trend over time and day-of-week effects (cf. Reis et al., 2000).

The main effects of explicit and implicit autonomy orientation upon daily autonomy were first tested, and then the moderating effect of mindfulness. PLOC-assessed and SDS-assessed explicit relative autonomy were included in separate models. To enhance interpretability of the model intercept parameters (Raudenbush & Bryk, 2002), the psychological variables were centered around their sample means, while the linear trend (day-of-study) and day-of-week variables were coded to include zero.

Main effects analyses. The left side of Table 3 ("Set 1") displays results of the analyses including implicit and explicit (PLOC) relative autonomy disposition. Only explicit autonomy predicted day-to-day autonomy using the PLOC, $t(66) = 9.18$, $p < .001$, and the SDS, $t(66) = 4.86$, $p < .001$.

Moderating effects analyses. To test for moderation, an interaction term was constructed between the IAT and MAAS mindfulness scores (cf. Aiken & West, 1991). In the SDS explicit autonomy model, this variable remained a significant predictor, $t(64) = 3.38$, $p < .01$. Neither

implicit autonomy nor the MAAS were predictive. The moderator variable was nonsignificant, $t(64) = -.78$, ns, although the effect was in the predicted direction. The right side of Table 3 ("Set 2") displays results of the analyses incorporating PLOC-assessed explicit autonomy. This variable remained significant in this model, $t(64) = 8.14$, $p < .001$. Neither the implicit trait autonomy nor the MAAS main effects were significant predictors. However, their interaction was predictive, $t(64) = -2.09$, $p < .05$.

Figure 2 (left panel) displays this moderation effect. Significance tests (Aiken & West, 1991) revealed that neither slope differed significantly from zero, but the positive slope for low mindfulness was stronger than the almost-null slope for high mindfulness, $t(64) = 1.57$ versus $t(64) = -.66$, respectively. This suggests that among those less mindful, implicit autonomy orientation tended to manifest in day-to-day level of autonomy. For those with higher mindfulness, degree of day-to-day autonomy was comparatively high, regardless of implicit autonomy level. This study provides initial evidence that mindfulness acts to "overrule" the effects of implicit motivational orientation on day-to-day motivation for behavior.

Study 3

Study 3 had three purposes: First, we sought to replicate and extend the primary, moderation results of Study 2 using a more sophisticated, experience-sampling methodology to assess day-to-day motivation. Specifically, ratings on day-to-day motivation were collected three times per day over a longer time interval (two weeks). This permitted a closer examination of day-to-day motivation that did not require cognitive retrospection. Marco and Suls (1993) showed that memory and other cognitive biases may be introduced when individuals are asked to make retrospect reports on behavior over as brief an interval as a single day.

Second, this study tested whether the moderating effects of conscious awareness on implicit motivation were specific to mindfulness. Earlier, we argued that mindfulness will be more likely than such reflexive forms of consciousness as private self-consciousness and reflection to serve a "de-automatization" function – that is, to shape or override the (sometimes detrimental) effects of nonconscious motivational orientation on everyday behavioral motivation. This study tested the moderating potential of all three awareness constructs.

Dual process theory and research suggest that the effect (direct or indirect) of an implicit motivational process on behavior should be limited to spontaneous (e.g., experience-sampled) behavioral outcomes rather than specific, controlled behaviors, such as one-occasion self-reports (e.g., Levesque & Pelletier, in press; McClelland et al., 1989). A third purpose of this study was to test this claim. At the end of the sampling period, participants retrospectively reported on their behavioral motivation over the same period that experience sampling was conducted. We predicted that the effect of implicit relative autonomy would be limited to the experience-sampled, spontaneous motivational outcome.

Method

Participants

Introductory Personality psychology students at the University of Rochester participated for extra course credit. Of those who began the study, data from 7 participants were excluded because of high error rates on the dispositional IAT. An additional 7 individuals did not complete the experience sampling portion of the study. This left 78 participants (59 women, 19 men) for analysis. All were speaking English before age 5.

Explicit Measures

As in Study 2, the Self-Determination Scale (SDS; sample $\alpha = .82$), the Perceived Locus of Causality scale (PLOC), and the Mindful Attention Awareness Scale (MAAS; sample $\alpha = .88$) were completed. Two scales assessed reflexive awareness: The Private Self-Consciousness (PrSC) portion of the Self-Consciousness Scale (Fenigstein et al., 1975) measures the tendency to reflect upon oneself, fantasize, and attend to one's moods, motives, and cognitive processes (sample $\alpha = .73$). The 12-item Reflection subscale of the Rumination-Reflection Questionnaire (Trapnell & Campbell, 1999) assesses "intellectual self-attentiveness" through items tapping the tendency to explore, analyze, and contemplate the self (sample $\alpha = .93$).

The retrospective report on motivation for behavior over the experience-sampling portion of the study was a PLOC measure that included the same 5 statements used on the experience sampling forms (see Study 2 and below). It assessed the same 5 behavioral domains, and used the same Likert scaling, as the dispositional PLOC measure.

Implicit Measures, Procedure, and Data Reduction

The IAT relative autonomy measure and procedures were identical to those described in Studies 1 and 2. The average error rate on the combined tasks was less than 5%.

Experience Sampling Measure and Procedure

After being asked to briefly describe the activity engaged in at the time of a pager signal, the sampling form asked, "Why were you engaged in this activity?" Five statements followed, identical to those used in Study 2 to assess relative autonomy. All participants began 14 consecutive days of recordings on a Wednesday, one or two days after a training session on the use of the electronic pager and sampling forms. Keeping the start day constant helps to control for day-of-week effects (Reis et al., 2000). Pager signals were sent three times per day on a

quasi-random schedule: one between 9 am and 1 p.m. (10 am and 1 pm on weekends); one between 1 p.m. and 5 p.m.; and the last between 5 p.m. and 9 p.m. Within these timeframes, the signal was sent randomly, under the constraint that signals not be sent within 2 hours of each other. This was done to minimize any irritation participants might feel if signals were received in close proximity (cf., Shiffman, 2000). Pager signal schedules were generated by randomizing software (Random 2.1; Wild, 1999).

Forms were returned in stamped, self-addressed envelopes each day subsequent to recording. As in Study 2, compliance with sampling protocol was continuously assessed. Participants received two booster contacts during the sampling period – at the 2 or 3 day point and at the 10 day point. Participants were asked to complete forms as close as possible to the pager signal but were also told that circumstances may prevent them from completing a form immediately (e.g., in a meeting), and that the actual number of minutes between signal and form completion should be recorded. Thus, participants were not pressured to complete forms immediately, a factor designed to encourage honesty in recording the "time since signal" item.

Compliance with the form return procedure and timely completion of each form was good: 3114 (95.1%) of 3276 possible forms (78 Ps x 42 signals) were completed and returned. The number of minutes from signal to form completion was $M = 8.36$, $SD = 23.55$. Most forms (88.7%) were reported as completed within 15 minutes of the pager signal. Three percent of forms were completed after 60 minutes; these were excluded, leaving 3021 records for analysis (M number of forms per participant = 39, range = 24 to 42).

General Procedure and Design

In a single laboratory session, the self-report measures, and then the IAT tasks were completed. Three counterbalanced IAT tasks were completed, of which the relative autonomy

task was relevant here. Neither procedural variable (IAT task order and IAT combined block order) produced effects that qualified interpretation of the results. Experience sampling began three to 14 days following the laboratory session. Within 48 hours of the end of the sampling phase, participants returned to the laboratory to complete the retrospective PLOC and for debriefing.

Results and Discussion

Implicit Autonomy Orientation

The internal consistency of IAT-assessed relative autonomy was .80. The IAT effect was large; across the two counterbalancing conditions, IAT effect = 256 ms; $d = 1.59$, $t(76) = 6.93$, $p < .0001$. As in Studies 1 and 2, participants were quicker to associate self with autonomy words. This effect is very similar to that found in the other studies, suggesting that the phenomenon is reliable.

Relations between Implicit, Explicit, Experience-Sampled, and Retrospective Measures

The bottom portion of Table 4 presents descriptive information on all relevant variables. Participants self-reported fairly high mean levels of relative autonomy on both the SDS and the PLOC. Experience-sampled behavior was generally autonomous, though not highly so. The main portion of Table 4 presents the intercorrelations between all measures. The experience-sampled data were averaged within subjects for these analyses. Implicit and explicit dispositional autonomy were again unrelated. Both measures of explicit dispositional autonomy orientation were correlated with day-to-day autonomy, SDS $r = .27$, $p < .05$; PLOC $r = .46$, $p < .0001$. Implicit autonomy orientation was uncorrelated with average day-to-day autonomy.

Among the awareness constructs, only mindfulness was related to explicit motivational orientation and to day-to-day motivation, $r = .30$, $p < .01$. The dispositional PLOC was

moderately correlated with the retrospective measure ($r = .35, p < .01$), which was itself strongly correlated with the experience-sampled PLOC ($r = .63, p < .0001$). Since the retrospective report was more strongly correlated with an aggregated state measure than with the trait PLOC, it provides a suitable dependent measure of behavioral motivation over the sampling period.

Prediction of Day-to-day and Retrospectively Reported Relative Autonomy

Multilevel modeling was used to predict experience-sampled motivation using the SAS MIXED procedure (SAS Institute, 1997). As in Study 2, the main effects of explicit and implicit autonomy orientation upon daily autonomy were tested first, and then the mindfulness moderation effect. Separate models tested the predictive effects of each explicit relative autonomy variable. Four time series control variables were included in preliminary models: day of study and time of day (both testing for linear trend), a cosine term (to model weekly cyclicity),[4] and time of momentary report completion (to test for first-order autocorrelation in day-to-day motivation).[5] In none of the models was day of study a significant predictor; all other variables were retained for further analyses. The psychological variables were centered around their sample means, while the day of study and time of day variables were scaled to include zero.

Main effects analyses. Table 5, Set 1 shows that only SDS explicit autonomy was predictive of day-to-day autonomy, $t(75) = 2.48, p < .05$. The same result was found in the model using the PLOC, $t(75) = 4.42, p < .0001$. In neither model was implicit autonomy orientation a significant predictor, both *p*s ns.

Moderating effects analyses. These models incorporated the dispositional autonomy predictors and the direct and moderating effects of each of the awareness variables. To test for moderation, interaction terms were constructed between implicit autonomy and each awareness variable (cf. Aiken & West, 1991). To provide a clear test of the predictive value of each

awareness variable and to preserve a satisfactory cases:predictors ratio, model tested the effects of each of the two explicit dispositional autonomy variables separately, and each of the three awareness variables separately. In all six models, the three time series variables were significant predictors, all $ps < .0001$.

Table 5, Set 2 displays the results of the analyses incorporating SDS-assessed explicit autonomy and MAAS-measured mindfulness. The main effects were not predictive in this model. However, the interaction between implicit autonomy and mindfulness was predictive, $t(73) = -2.62, p < .01$. In a second model, the dispositional PLOC was a significant predictor, $t(73) = 3.06, p < .01$. Neither implicit autonomy nor the MAAS were predictive, but the interaction between them was again significant, $t(73) = -2.01, p < .05$.

Figure 2 (right panel) displays the moderating effect of mindfulness, using data from the SDS model. For individuals higher in mindfulness, degree of autonomy in day-to-day behavior was comparatively high, across levels of implicit autonomy. Verifying this statistically (Aiken & West, 1991), the slope for high mindfulness was nonsignificant, $t(70) = -0.27$, ns. In contrast, for those low in mindfulness, the relationship between implicit relative autonomy and day-to-day autonomy was positive, $t(70) = 2.36, p < .05$. Those low in both implicit autonomy and mindfulness showed the lowest levels of daily autonomy. In the models incorporating private self-consciousness, this variable was not predictive, neither as a main effect nor interaction. There were also no significant effects for Reflection.

Retrospective report analyses. A final pair of analyses tested the role of implicit autonomy in predicting the retrospective report on behavioral motivation. An ordinary least squares multiple regression model regressed the retrospective PLOC measure onto explicit and implicit dispositional autonomy and the implicit autonomy x mindfulness interaction term. In the

SDS model, this variable marginally predicted retrospective autonomy, $t(1, 77) = 1.89, p < .06$. The implicit autonomy x mindfulness interaction term also showed a trend toward significance, $t(1, 77) = -1.68, p < .10$. In the dispositional PLOC model, this variable predicted retrospectively assessed autonomy, $t(1, 77) = 3.13, p < .01$. No other predictors approached significance.[6]

General Discussion

Despite an accumulation of research on implicit motivational and other processes, little work has examined their role in predicting everyday psychological and behavioral outcomes, and most of these "first generation" studies have naturally been focused on uncovering direct relations (e.g, Levesque & Pelletier, in press). But the predictive relation between implicit processes and behavior may not necessarily be direct, and thus not readily detectable. In this article, we have argued that one form of conscious awareness, namely mindfulness, moderates the behavioral manifestations of implicit motivational dispositions.

Using Self-determination Theory (SDT; e.g., Deci & Ryan, 1985) and other (e.g., Bargh, 1997) approaches to the role of awareness in self-regulation as conceptual starting points, the present research supported the theorized role of awareness in the implicit process-behavior relation. After first providing evidence of the reliability and validity of a new IAT measure of implicit autonomy orientation, the research showed that the manifestation of this orientation in day-to-day behavioral motivation was moderated by awareness, and specifically dispositional mindfulness. Among those less mindful, a positive relation between implicit and everyday autonomy was found, such that low implicit autonomy orientation predicted the lowest levels of day-to-day autonomy while high implicit autonomy orientation predicted higher levels of everyday autonomy. Among those with higher levels of mindfulness, implicit autonomy was inconsequential to everyday autonomy, which was comparatively high. As expected, the

predictive role of implicit autonomy orientation was limited to spontaneous motivational outcomes. Neither private self-consciousness nor reflection, both reflexive, rather than pre-reflexive forms of consciousness, showed a moderating effect between implicit autonomy orientation and motivation for behavior.

This research suggests that mindfulness may serve a de-automatization function, a term used to denote an "undoing" of automatized goal, and other, structures (Gill & Brenman, 1959). The present research supports SDT's contention that mindfulness (Deci & Ryan, 1980) can play an intervening role between implicit trait motivation and behavioral motivation outcomes. The research does not reveal what the focus of attention is in this de-automatization process. While people can be aware of implicit processes (Wilson et al., 2000), and may thereby modify or override them before being expressed in behavior, mindfulness may also promote an awareness of day-to-day behavioral choices in specific situations (Deci & Ryan, 1980). Further research is necessary to determine the point at which mindfulness intervenes in the implicit disposition-behavior relation.

The role of mindfulness as a moderator between implicit motivation and behavior bears some similarity to the self-observation process that takes place in psychotherapy, wherein implicit motives may be brought into awareness, where cognition can be brought to bear on them (Weinberger & McClelland, 1990). The present findings also contribute to the literature demonstrating that conscious awareness facilitates self-knowledge, reflected in a stronger concordance between implicit and explicit processes (Brown & Ryan, 2003; Thrash & Elliot, 2002). It also supports research showing that enhanced attention and awareness can interfere with the development and unfoldment of automatic responses (e.g., Dijksterhuis & van Knippenberg, 2000; Macrae & Johnston, 1998). There are a variety of circumstances where

conscious attention serves an important self-regulatory function (e.g., Baumeister, Heatherton, & Tice, 1994). The present research indicates that mindful attention may have adaptive value when individuals face behavioral choices, given the positive task performance and well-being outcomes associated with autonomous functioning (Ryan & Deci, 2000).

The Dual Nature of Trait Autonomy

The present research is the first known to us to assess an implicit motivational process using the IAT. The results of all three studies showed that, on average, individuals had an implicitly autonomous orientation. In fact, inspection of the data showed that few individuals associated themselves with heteronomy on the dispositional IAT. In all studies, evidence was found for the conceptual independence of self-attributed and implicit forms of relative autonomy. This finding accords with McClelland's dual motive theory (McClelland et al., 1989), and with research using the TAT to assess motives (e.g., King, 1995) and the IAT to assess attitudes, self-esteem, and self-concept (e.g., Greenwald & Farnham, 2000; Wilson et al., 2000).

Limitations and Future Research

While the present results support the psychometric soundness of IAT-assessed motivation, they may qualify the predictive utility of such measures, given that this may depend on other individual difference constructs (see also Bornstein, 1998). Also, while these studies used sampling measures to assess motivation for spontaneous behavior, and thus represent suitable outcomes for implicit process research, they still relied on self-report. Sampling measures do not bear the reactivity burdens of one-occasion self-reports (Schwartz & Stone, 1998), but assessment of objectively measured behavioral outcomes would be useful in future research.

Further research on mindfulness is needed to determine whether this disposition moderates the behavioral expression of implicit motivational and other processes besides relative autonomy. Research is also needed to examine the way in which awareness modifies the expression of implicit processes. Such intervention is likely to have, minimally, one or two components: awareness of the implicit process and/or alignment of behavior in accord with conscious intentions or goals. Additionally, evidence suggests that the intentional enhancement of attention and awareness can intervene between the initial activation of an implicit cognitive response and the consequences that would otherwise follow from that activation (Gollwitzer, 1999). Both basic and applied questions could be addressed by examining whether the enhancement of mindfulness through training (Kabat-Zinn, 1990) facilitates the shaping or overriding of implicit tendencies that may have negative psychological, interpersonal, and other consequences.

Footnotes

1. Data were also subject to exclusion if the average response latency across either of the combined task blocks of the IAT was greater that 2 seconds (cf. Greenwald & Farnham, 2000). None of the participants' data exceeded this cut-off in these studies.
2. Because the stimulus words *me* and *free* were also used as category labels in the dispositional autonomy IAT, we conducted analyses to determine whether the IAT effect was dependent on the use of these stimulus words. After deleting all trials using these words, the IAT effect remained very large in all three studies.
3. Similarly, no gender effects were found on these measures in Studies 2 and 3.
4. Cyclicity is typically tested using either a dummy variable approach or the trigonometric function approach used here (see Bowerman & O'Connell, 1993). The fit of a sine function was also examined here, but across analyses, a cosine function consistently provided a better fit. We tested for septurnal, or 7-day weekly cyclicity because this is the most common interval over which cyclical effects have been reported in autonomy (Reis et al., 2000).
5. The day and time that each record form was completed was used to create a continuous time variable which started at day 1, record 1, and ran linearly upward to day 14, record 3 (see Schwartz & Stone, 1998). For each sampling record, the number of minutes after the pager signal that the form was completed was subtracted from the actual time of record completion to derive the actual time that each record's data referred to.
6. This study also included the same explicit and implicit attitude measures used in Study 1. Results replicated those of Study 1. Neither set of measures predicted daily nor retrospectively-assessed behavioral motivation.

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Table 1. Descriptive Statistics and Intercorrelations Among All Variables (Study 1).

Measure	1.	2.	3.	4.	5.	6.	7.	8.
Implicit Autonomy								
1. IAT disposition	--	.33**	-.06	-.08	-.12	-.09	.21*	-.21
2. IAT attitude		--	.05	.12	-.11	.00	.15	.18
Explicit Autonomy								
3. SDS			--	.48****	-.02	-.09	.09	.40***
4. PWB Autonomy				--	.11	-.05	.17	.53****
5. Semantic differential					--	.76****	-.08	.00
6. Thermometer						--	-.04	.09
BIDR								
7. Impression management							--	.16
8. Self-deception								--
Mean	230	396	2.88	4.02	4.66	73.34	4.66	4.40
SD	157	170	0.56	0.72	1.16	21.54	2.92	2.80

* $p < .05$ ** $p < .01$ *** $p < .001$ **** $p < .0001$

Note. N = 83. IAT = Implicit Association Test; SDS = Self-Determination Scale; PWB Autonomy = Psychological Well-Being Autonomy Scale; BIDR = Balanced Inventory of Desirable Responding.

Table 2. Descriptive Statistics and Intercorrelations Among All Variables (Study 2).

Measure	1.	2.	3.	4.	5.	6.
Implicit Autonomy Orientation						
1. IAT disposition, Time 1	--	.51****	.19	.11	.07	.17
2. IAT disposition, Time 2		--	-.03	.03	.05	.11
Explicit Autonomy Orientation						
3. SDS			--	.40****	.48****	.44****
4. PLOC				--	.35**	.66****
5. Mindfulness					--	.32**
6. Daily sampling (PLOC)						--
Mean	265	203	3.84	7.92	3.87	6.64
SD	208	156	0.59	3.93	0.69	3.30

IE

Daily sampling version of the explicit scale

* $p < .05$ ** $p < .01$ *** $p < .001$ **** $p < .0001$

Note. $N = 69$. IAT = Implicit Association Test; SDS = Self-Determination Scale; PLOC = Perceived Locus of Causality Scale.

Table 3. Predicting Day-to-Day Autonomy from Implicit and Explicit Autonomy Orientation, Mindfulness, and Time Series Variables (Study 2).

	Set 1		Set 2	
Predictor	Estimate	t	Estimate	t
IAT Autonomy	2.32	0.64	1.52	0.45
PLOC Autonomy	0.61	9.18***	0.58	8.14***
Mindfulness	--	--	0.63	1.59
IAT x Mindfulness	--	--	-6.22	-2.09*
Day of Study	-0.02	-0.71	-0.20	-0.72
Day of Week	-0.19	-0.43	-0.03	-0.45

* $p < .05$ ** $p < .01$ *** $p < .001$ **** $p < .0001$

Note. $N = 69$. IAT = Implicit Association Test; PLOC = Perceived Locus of Causality Scale. Values are unstandardized parameter estimates.

Table 4. Descriptive Statistics and Intercorrelations Among All Variables (Study 3).

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Implicit Autonomy										
1. IAT disposition	--	-.02	.04	.18	.04	-.16	-.12	.01	.06	-.06
Explicit Autonomy										
2. SDS		--	.41***	.19	.22*	-.22*	.02	.59****	.27*	.21
3. PLOC			--	.33**	.32**	-.16	-.03	.47****	.46****	.35**
4. Semantic differential				--	.88****	.03	.05	.13	.22*	.19
5. Thermometer					--	.05	.01	.13	.17	.12
Awareness										
6. PrSC						--	.79****	-.12	-.15	-.16
7. Reflection							--	.01	-.05	.02
8. Mindfulness								--	.30**	.07
Experience sampling										
9. PLOC									--	.63****
10. Retrospective PLOC										--
Mean	256	2.90	8.22	4.76	75.39	3.66	3.53	3.86	4.79	3.71
SD	215	0.58	3.36	1.08	19.83	0.51	0.77	0.73	3.10	6.66

* $p < .05$ ** $p < .01$ *** $p < .001$ **** $p < .0001$

Note: N = 78. IAT = Implicit Association Test; SDS = Self-Determination Scale; PLOC = Perceived Locus of Causality Scale; PrSC = Private Self-Consciousness Scale.

Table 5. Predicting Day-to-Day Autonomy from Implicit and Explicit Autonomy Orientation, Mindfulness, and Time Series Variables (Study 3).

	Set 1		Set 2	
Predictor	Estimate	t	Estimate	t
IAT Autonomy	0.23	0.69	0.40	1.22
SDS Autonomy	0.87	2.48*	0.54	1.29
Mindfulness	--	--	0.44	1.08
IAT x Mindfulness	--	--	-0.91	-2.62**
Time of day	0.70	4.45****	0.70	4.44****
Weekly cyclicity	-0.60	-3.27***	-0.60	-3.26***
Autocorrelation	0.91	5.51****	0.91	5.66****

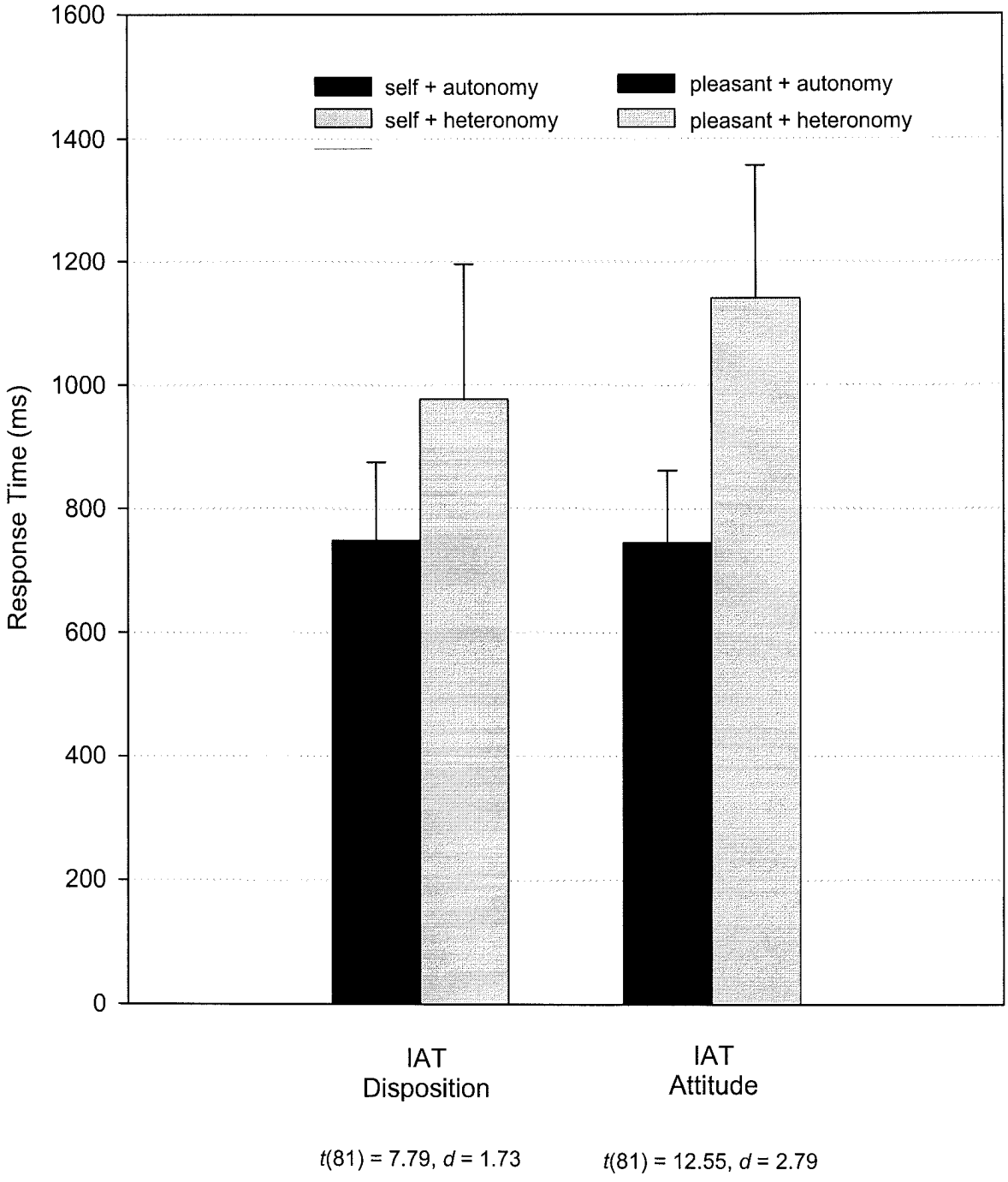
* $p < .05$ ** $p < .01$ *** $p < .001$ **** $p < .0001$

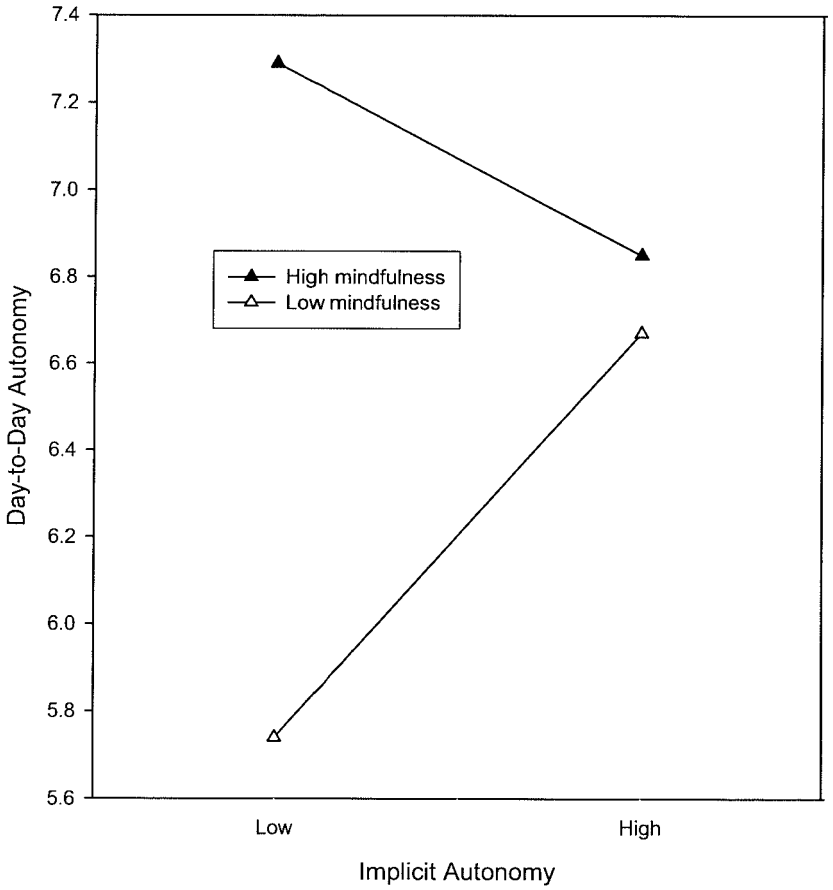
Note. $N = 78$. IAT = Implicit Association Test; SDS = Self-Determination Scale. Values are unstandardized parameter estimates.

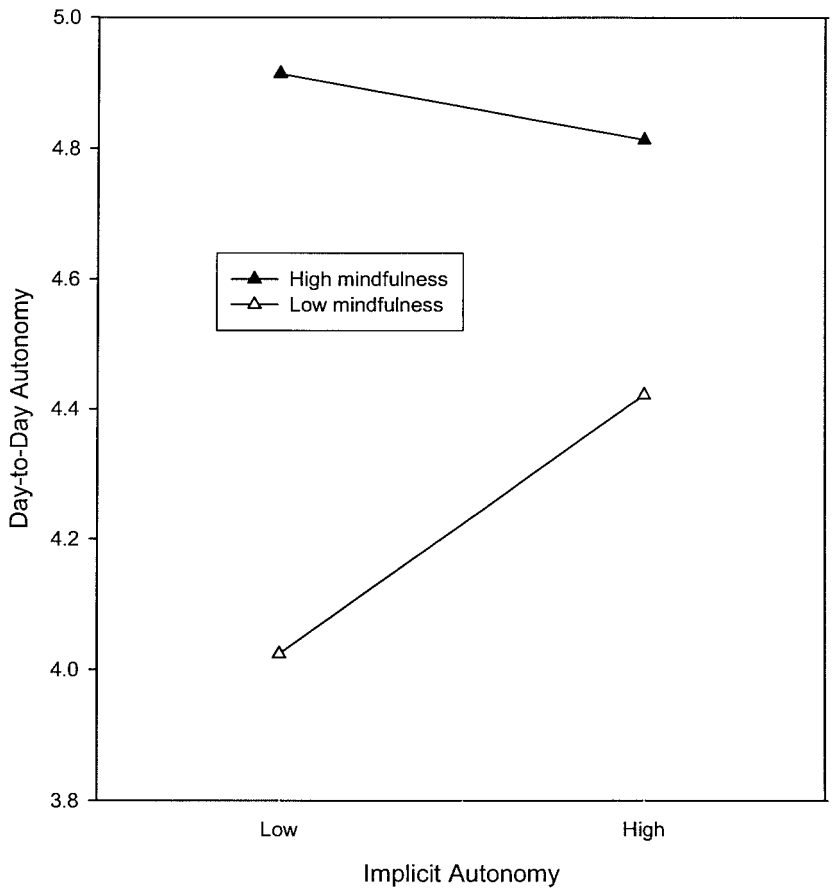
Figure Captions

Figure 1. Response times for critical blocks of the dispositional (left side) and attitudinal (right side) Implicit Association Tests (IATs; Study 1, N = 83). The mean IAT effect is the mean for the self+autonomy condition minus that for the self+negative condition (dispositional IAT) and the mean for the pleasant+autonomy condition minus that for the pleasant+heteronomy condition (attitudinal IAT).

Figure 2. Day-to-day level of autonomy as a function of implicit dispositional autonomy orientation and mindfulness (Left panel: Study 2, $N = 69$; Right panel: Study 3, $N = 78$). High and low values are one standard deviation above and below the mean, respectively.


1600
1400
1200
1000
800
600
400
200
0
Response Time (ms)
self + autonomy
self + heteronomy
pleasant + autonomy
pleasant + heteronomy
IAT
Disposition
IAT
Attitude
t(81) = 7.79, d = 1.73
t(81) = 12.55, d = 2.79


7.4
7.2
7.0
6.8
6.6
6.4
6.2
6.0
5.8
5.6
Day-to-Day Autonomy
High mindfulness
Low mindfulness
Low
High
Implicit Autonomy


5.0
4.8
4.6
4.4
4.2
4.0
3.8
Day-to-Day Autonomy
High mindfulness
Low mindfulness
Low
High
Implicit Autonomy

Authors' Notes

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