

# Mindfulness as a moderator of the effect of implicit motivational self-concept on day-to-day behavioral motivation

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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 and Ryan, *J Pers Soc Psychol*, 84, 822–848, 2003) would act to modify the expression of implicit autonomy orientation in daily behavioral motivation. Using the Implicit Association Test (Greenwald et al. *J Pers Soc Psychol*, 74, 1464–1480, 1998), Study 1 provided evidence for the reliability and validity of a new measure of implicit autonomy orientation. Using an experience-sampling strategy, Study 2 showed the hypothesized moderating effect, such that implicit autonomy orientation predicted day-to-day motivation only for those lower in dispositional mindfulness. Those higher in mindfulness showed more autonomously motivated behavior regardless of implicit orientation toward autonomy or heteronomy. It also showed that this moderating effect of awareness was specific to mindfulness and was primarily manifest in spontaneous behavior. Discussion focuses on the implications of these findings for dual process theory and research.

**Keywords** Implicit motivation · Autonomy · Mindfulness · Self-determination theory · Implicit Association Test

## Introduction

For a number of contemporary motivation researchers, a common way to obtain a picture of individuals' prevailing motivations for their behavior is simply to ask them using self-report questionnaires. A primary theoretical assumption of this measurement approach is that motivation for behavior, like other self-related phenomena, is consciously known. However, 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, non-conscious motivations, attitudes and other self-related phenomena that can be activated automatically, without conscious intervention and guidance (e.g., Bargh 1997; Wilson et al. 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/or the environmental cues that activate it. Similarly, automatic thoughts have their greatest effect while they remain out of the field of awareness (Beck 1979; Segal et al. 2002).

Accumulating evidence supports the idea that non-conscious processes can be adaptive and quickly and appropriately responsive to contextual variations and situational demands (e.g., Aarts and Dijksterhuis 2000; Bargh et al. 2001; Dijksterhuis 2004; Mitchell et al. 2003). For example, automatically activated goals have been found to promote goal-directed action and produce behavioral persistence in the face of obstacles much like consciously

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regulated goals do (Bargh et al. 2001). However, certain behaviors arising from automatic processing can be maladaptive as well, as ample research on, for example, implicit racism, sexism and other forms of stereotyping and prejudice testifies (see Wilson 2002 for review). In the motivational domain, nonconscious guidance of behavior could lead people to act without awareness or knowledge of why they are acting (Wilson 2002). This is important because while a person may endorse some nonconscious behaviors if he or she were to reflect upon them, other automatic behaviors may, upon reflection, be experienced as unwanted or as alien to the self (Ryan and Deci 2004). In other circumstances, goal conflicts or other self-regulatory challenges may arise for which conscious guidance may be highly adaptive in obtaining desirable ends (Norman and Shallice 1986). In such cases, conscious monitoring of behavior may serve a valuable purpose in shaping or modifying automatic habits or reactions (Westen 1998).

Thus, while the activation of nonconscious motivations may be adaptive and lead to positive behavioral outcomes (e.g., Bargh et al. 2001), there are circumstances in which consciousness appears to play a valuable role in guiding behavior, including the modification or moderation of automatic behavioral tendencies. While research on such modulation is scarce, experimental research indicates that contextual cues for heightened attention and self-awareness can facilitate a conscious inhibition of automatic behaviors (Dijksterhuis and van Knippenberg 2000; Hefferline et al. 1959; Macrae and Johnston 1998). However, if behavior arising from implicit processes is to be consciously 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 of the effect of implicit motivation on the motivation behind day-to-day behaviors.

#### The role of conscious awareness in the manifestation of implicit motivation

Bargh and colleagues (Bargh 1997; Bargh and Barndollar 1996) theorized that whether implicit motivational and other automatic processes predict behavior depends 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. As such, consciousness may represent a moderating factor that determines the extent to which an implicit process translates into a psychological, perceptual, or overt behavioral outcome.

Consciousness directed toward psychological and behavioral processes is fundamental to a number of

theories of behavioral self-regulation (e.g., Carver and Scheier 1981; Deci and Ryan 1980, 1985; Zimmerman 2000). For example, Deci and Ryan (1985) argue that awareness facilitates self-regulated functioning because it allows a measure of 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—mindfulness—predicted higher levels of day-to-day self-regulated (autonomous) behavior. Awareness may also be important in determining whether an implicit motivation will manifest in self-endorsed behavior, since such endorsement may necessitate conscious attention to whether the motivation accords with one's sense of self.

Based on theory reviewed here, we predicted that awareness would play a moderating role in the relation between an implicit motivational disposition and day-to-day motivation for behavior. 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 the expression of their implicit motivational orientations when desired. This may be particularly adaptive for those whose implicit orientation tends toward low autonomy or heteronomy. Among those with less awareness, an implicit motivational orientation may be more likely to manifest in day-to-day motivation for behavior, because there is no conscious intervention to shape or modify 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; Bermúdez 1998), and include such phenomena as *private self-consciousness* (Fenigstein et al. 1975) and *reflection* (Trapnell and Campbell 1999). In contrast, the concept of *mindfulness* is “pre-reflexive.” It does not compare, categorize, or evaluate, nor does it contemplate, introspect, reflect, or ruminate upon events or experiences based on memory (Brown and Ryan 2003; Teasdale 1999). Instead, mindfulness concerns a non-interference with experience, by allowing inputs to enter awareness in a simple noticing of what is taking place. In fact, research shows that this construct bears little or no relation to reflexive forms of consciousness (Brown and 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. That is, when mindful, one can be aware of thoughts, impulses, and so on

as *simply thoughts or impulses*, and their accompanying emotions as simply reactions to them. In this way, the activity of the mind can be engaged and disengaged more choicefully. Support for this reasoning comes from Gill and Brenman (1959), who suggested 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 perception over cognition by reinvesting behavior and psychological experience with conscious attention. It is this perception that mindfulness provides (Brown and Ryan 2003). In the present research, this theorizing was tested by examining the self-regulatory potential of both reflexive and pre-reflexive (mindfulness) consciousness.

#### The implicit nature of autonomous motivation

In the present study of the role of conscious awareness 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 and 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 self-endorsed, or as having an internal locus of causality (deCharms 1968).<sup>1</sup> When heteronomous, the locus of causality of behavior is perceived as external to one's self. The autonomy–heteronomy dimension, for which we will interchangeably use the terms dispositional autonomy, autonomy orientation, or autonomy self-concept, forms a motivational spectrum anchored by intrinsic motivation at one end, and extrinsic motivation at the other.

Extensive research in SDT and related theoretical traditions over the past 30 years has demonstrated the importance of an autonomy orientation for positive behavioral and psychological outcomes, as measured by explicit self-reports of motivational self-concept (Amabile 1996; Deci and Ryan 1991; Ryan and Deci 2000). But both theory and research also suggest that motivation may also have an implicit or automatic aspect (e.g., Bargh et al. 2001).

<sup>1</sup> It is important to distinguish this use of the term “autonomy” from that used in the social cognition literature, in which autonomy is equated with automatic processing without conscious guidance (e.g., Bargh et al. 2001; Wegner and Bargh 1998).

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 et al. 2001; Levesque and Pelletier 2003) 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 motivational dispositions, and use of the TAT is limited to a relatively small set of motives for which reliable coding schemes are available. More importantly, such motives cannot easily be considered knowledge representations, as implicit attitudes, stereotypes, and (motivational) self-concept can (Asendorpf et al. 2002; Schnabel et al. 2006). 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 implicit trait and other social and personality phenomena. Among current measures of implicit processes, the IAT is one of the most psychometrically sound (Bosson et al. 2000; Cunningham et al. 2001).

#### The present research

The central thesis of this research is that whether implicit motivational orientations manifest in motivation for 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, implicit motivational orientation will show a greater tendency to “drive” behavior; specifically, those higher in implicit autonomy should show more autonomously guided behavior, while those lower in implicit autonomy should show less autonomous day-to-day behavior. Conversely, we hypothesized that when higher in mindfulness, implicit motivational orientation will have less effect on individuals' day-to-day motivation.

In line with theory and past research (Levesque and Pelletier 2003; McClelland et al. 1989), we further hypothesized that any effect of implicit motivation would more likely be upon a spontaneous (e.g., day-to-day) outcome rather than on a one-occasion self-report where self-presentation concerns and perceived social demands may be more salient (Asendorpf et al. 2002; Bosson et al. 2000; Greenwald and Farnham 2000; McClelland et al. 1989; see also Wilson et al. 2000 for a general discussion).

In the first study, an IAT measure of implicit autonomy self-concept is described, along with evidence for its reliability and validity. In the second study, the moderating role of mindfulness in the predictive relation between implicit autonomy self-concept and day-to-day motivation for behavior is tested. Further evidence for the reliability of

the IAT measure of implicit autonomy is also presented. To provide more evidence for the specific regulatory power of mindfulness, this study also tested the moderating capacity of two reflexive forms of consciousness. Finally, to assess the differential role of implicit autonomy in motivation for spontaneous versus one-occasion reported behavior, this second study examined the predictive role of implicit autonomy upon day-to-day motivation for behavior relative to a 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 (or motivational self-concept). Second, in its focus on day-to-day motivational 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 day-to-day behavioral and motivational outcomes. Finally, this research seeks to further specify the conditions under which implicit processes manifest in everyday 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 independence from self-presentation biases, and convergence of implicit autonomy with other, related constructs. Specifically, we expected that *self-report* ratings on the stimulus words to be used in the IAT to assess the autonomy–heteronomy dimension would be correlated with validated measures of explicit (self-reported) dispositional autonomy. We also expected that IAT-assessed implicit autonomy would show some convergence with IAT-assessed implicit attitude toward autonomy, under the assumption that individuals with a more positive implicit attitude toward autonomy would be more likely to implicitly associate themselves with autonomy.

SDT (Deci and 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 their self-concept with autonomy rather than heteronomy; that is, they would generally show an implicitly more autonomous self-concept or disposition. This study also examined the relation between the implicit 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 and

Farnham 2000) led us to expect that the implicit 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. Of those who began the study, data from 9 additional participants were excluded because of poor compliance on the dispositional IAT ( $n = 5$ ) and the attitudinal IAT ( $n = 4$ ).

### Explicit measures

*Dispositional autonomy.* The 5-item Choice subscale of the Self-Determination Scale (SDS; Sheldon and Deci 1996, Unpublished manuscript) 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 .73. The 14-item Autonomy scale (part of the Scales of Psychological Well-Being [PWB]; Ryff 1989) assessed self-direction, ability to resist social pressures, self-reliance, 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 0–100 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 et al. 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 me (*I, me, myself, mine, and the participant’s first name*) and 5 to refer to the target concept of not-me (*they, them, their, it, and other*; cf. Greenwald and 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 and 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*.

Two preliminary studies provided further evidence for the validity of these IAT stimuli. First, using a modified Q-sort methodology, evidence indicated that the 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.

Initial evidence for the convergent validity of the IAT stimuli was obtained in a second, independent sample of 136 undergraduates. Participants rated the extent to which each stimulus word was personally descriptive using a 7-pt scale (“very unlike me” to “very like me”). A difference

score formed by subtracting the mean of the heteronomy words ( $\alpha = .73$ ) from the mean of the autonomy words ( $\alpha = .70$ ) was then correlated with scores from the two validated measures of dispositional autonomy also used in Study 1 (see the *Explicit Measures* section): the SDS (Sheldon and Deci 1996, Unpublished manuscript) and the PWB Autonomy scale (Ryff 1989). The IAT stimulus score was strongly correlated with the SDS ( $r = .64, p < .0001$ ) and moderately correlated with PWB Autonomy ( $r = .42, p < .0001$ ). In the IAT tasks, the categories into which the 10 autonomy and heteronomy stimulus 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 et al. (1999). The categories into which these words were to be placed were labeled “pleasant” and “unpleasant” on the computer screen. The autonomy and 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 autonomy orientation 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 dispositional 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.<sup>2</sup> 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

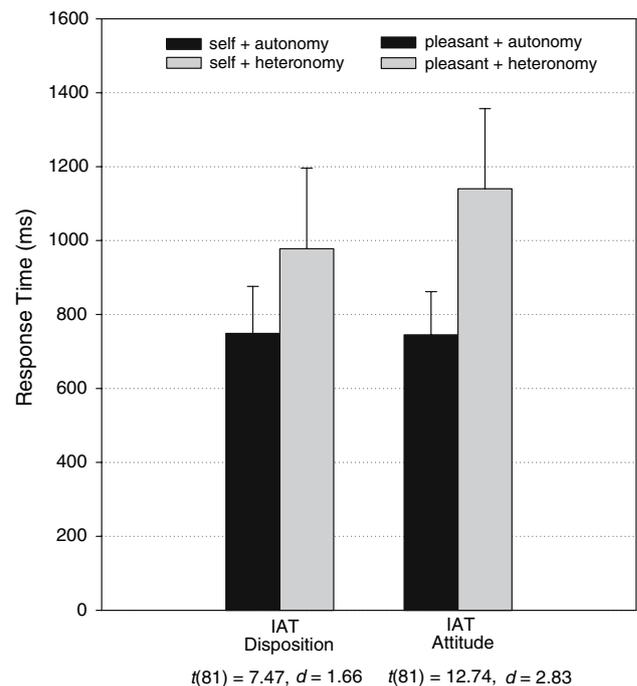
For each participant and each task, a single IAT score based on a measure termed *D* (Greenwald, Nosek, and Banaji, 2003) was computed by calculating the difference between the mean response latencies for the two critical, double categorization blocks (Blocks 4 and 7) and dividing that difference by its associated pooled standard deviation (*SD*). In accord with the specific IAT procedure used in this study, the *SD* was calculated from all trials in each block (Greenwald et al. 2003). The motivational self-concept IAT *D* score was calculated such that positive scores reflected a stronger association of the self with autonomy, while negative scores reflected a stronger association of the self with heteronomy. For the attitudinal task, positive *D* scores reflected a positive association with autonomy and negative scores reflected a positive association with heteronomy.

## 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 reaction time to each of the 20 stimulus words in the self + heteronomy block from the reaction time to each of the same words in the self + autonomy block. Cronbach's alpha based on these 20 difference scores was .67. The IAT effect for autonomy

<sup>2</sup> One of these IAT tasks was of interest to other, unpublished research.



**Fig. 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 + heteronomy condition minus that for the self + autonomy condition (dispositional IAT) and the mean for the pleasant + heteronomy condition minus that for the pleasant + autonomy condition (attitudinal IAT)

self-concept (mean latency for the me + not free block minus mean latency for the me + free block) was strong; across all counterbalancing conditions ( $D = .53$ ,  $SD = .32$ , Cohen's  $d = 1.66$ ,  $t(81) = 7.47$ ,  $p < .0001$ ). Participants classified stimulus words 250 ms faster, on average, in the self + autonomy conditions than in the self + heteronomy conditions (see Fig. 1).<sup>3</sup>

The internal consistency for IAT-assessed implicit attitude was .95. The IAT effect for attitude (mean latency for the pleasant + not free block minus mean latency for the pleasant + free block) was also strong; across all conditions,  $D = .81$ ,  $SD = .29$ ,  $d = 2.83$ ,  $t(81) = 12.74$ ,  $p < .0001$  (see Fig. 1). Participants responded much more quickly when associating autonomy items with pleasantness. The dispositional and attitudinal IAT measures were marginally correlated,  $r = .21$ ,  $p < .06$ . The size of this correlation suggests that while modestly convergent, these measures are tapping different constructs; that is, while an individual may implicitly value or prefer autonomy, it

<sup>3</sup> Because the stimulus words *me* and *free* were used as category labels in the dispositional autonomy IAT in both Study 1 and 2, we deleted all trials using these words before calculating the IAT effect. Inclusion of these trials did not meaningfully alter the results in either study.

**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	–	.21	–.15	–.04	–.08	–.06	.09	–.17
2. IAT attitude		–	.08	.16	–.13	–.10	.10	.27**
Explicit autonomy								
3. SDS choice			–	.40***	–.09	–.12	.02	.31**
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	250	408	2.88	4.02	4.66	73.34	4.66	4.40
SD	185	203	0.56	0.72	1.16	21.68	2.92	2.80
Min	–182	–263	1.00	2.43	–0.60	–15.00	0.00	0.00
Max	672	897	3.90	5.36	6.00	100.00	11.00	12.00

\*\*  $p < .01$ , \*\*\*  $p < .001$ , \*\*\*\*  $p < .0001$

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

appears to be another question whether s/he is dispositionally autonomous. No gender effects were found on either IAT measure, nor on any of the explicit measures, all  $ps$  ns.<sup>4</sup>

#### 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 impression management was uncorrelated with both implicit trait autonomy and attitude. Self deception was uncorrelated with IAT-assessed motivational self-concept and modestly correlated with IAT-assessed attitude,  $r = .27$ ,  $p < .01$ . These results suggest that IAT-assessed implicit autonomy measures are not (unduly) affected by self-presentation biases.<sup>5</sup> Table 1 shows, however, that both measures of explicit autonomy were moderately correlated with BIDR social desirability. The IAT-assessed implicit and explicit dispositional autonomy measures were unrelated, using both the SDS choice ( $r = -.15$ , ns) and the PWB Autonomy scale ( $r = -.04$ , ns). Such low correlations are consistent with

<sup>4</sup> Similarly, no gender effects were found on these measures in Study 2.

<sup>5</sup> Other, unpublished research from our laboratories has shown no relation between either implicit measure and BIDR-assessed self-presentation biases, suggesting that the correlation found here may be unreliable.

other, motive research (e.g., Spangler 1992). In sum, this study provides initial evidence for the reliability and convergent validity of IAT-assessed implicit dispositional autonomy. We turn now to our primary research questions, and also conduct a further test of the psychometric soundness of the IAT measure.

#### Study 2

This study had three 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 hypothesized that implicit motivational self-concept would predict behavioral motivation; that is, we expected a positive relation between implicit autonomy self-concept 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 autonomy self-concept would be unrelated to the autonomy of everyday behavior. For example, an individual who is implicitly low in autonomy but is highly mindful should show autonomous behavior because the implicit tendency can be modulated by conscious awareness. A person who is high in implicit autonomy and is highly mindful should also show high levels of behavioral autonomy. The predictive role of explicit, or self-reported autonomy was controlled in this investigation.

Like other aspects of implicit self-concept, such as dispositional shyness (Asendorpf et al. 2002) and anxiety (Egloff and Schmukle 2002), the impact of implicit motivational self-concept may be strongest in predicting spontaneous outcomes. One way to obtain such an outcome is through the recording of day-to-day behavior using sampling strategies. This study used one such strategy. Specifically, ratings on day-to-day motivation were collected three times per day over 2 weeks using a sophisticated, experience-sampling methodology. This permitted a close examination of day-to-day motivation that did not require cognitive retrospection.

To further test the specificity of the claim that implicit motivational self-concept will be strongest in predicting spontaneous outcomes rather than specific, controlled behaviors (cf., Asendorpf et al. 2002; Bosson et al. 2000; Greenwald and Farnham 2000; Levesque and Pelletier 2003; McClelland et al. 1989; Wilson et al. 2000), participants retrospectively reported on their behavioral motivation over the same period that experience sampling was conducted. Our second hypothesis was that implicit autonomy self-concept would more strongly predict the experience-sampled, spontaneous motivational outcome than the one-occasion retrospective report.

Finally, in the Introduction, we argued that mindfulness will be more likely than such reflexive forms of consciousness as private self-consciousness and reflection to modulate automatic motivational processes—that is, to shape the effects of nonconscious motivational orientation on everyday behavioral motivation. This study tested the moderating potential of all three awareness constructs. We predicted that only mindfulness would moderate the effect of implicit motivational self-concept on day-to-day motivation for behavior.

## 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 poor compliance 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 1, the Choice subscale of the Self-Determination Scale (SDS; sample  $\alpha = .82$ ) was completed. Because the

PWB Autonomy scale used in Study 1 appears to tap both autonomy and independence, a different measure of explicit dispositional autonomy was used in this study, namely an adaptation of the Perceived Locus of Causality scale (PLOC; Ryan and Connell 1989). The PLOC measure, derived from SDT, has been used extensively to examine self-regulated activity (e.g., Reis et al. 2000). In five behavioral domains—academics, 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”). An index 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. PLOC scores could range from –18 to +18 with higher scores reflecting greater autonomy.

To assess awareness, three measures were completed. To assess dispositional mindfulness, the Mindful Attention Awareness Scale (MAAS; Brown and 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  $\alpha = .88$ ). The 15-item MAAS includes items such as “I find it difficult to stay focused on what’s happening in the present” and “It seems I’m running on automatic without much awareness of what I’m doing”. Respondents indicate how frequently they have the experience described in each statement using a 1 (*almost always*) to 6 (*almost never*) scale, where higher scores reflect more mindfulness.

Two scales assessing reflexive awareness were also completed: 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 and 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 (described below). It assessed the same 5 behavioral domains, and used the same Likert scaling, as the dispositional PLOC measure.

### *Implicit measure, procedure, and data reduction*

The IAT autonomy measure, procedures, and data reduction were identical to those described in Study 1.

### *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 that assessed the perceived autonomy of daily activities. This PLOC measure was similar (but framed in past tense) to that used to measure dispositional autonomy (see *Explicit Measures* section above). Using a similar measure to assess both explicit dispositional autonomy and day-to-day autonomy permitted a stringent test of the role of implicit dispositional autonomy, and its interaction with awareness, in the prediction of everyday motivation. As with the dispositional PLOC, participants rated 5 reasons for engaging in each experience-sampled activity using a 1–7 scale. These reasons represented 4 different types of motivation, ranging from highly heteronomous (*external*) to highly autonomous (*intrinsic*). A score was formed in the same way as was done with the dispositional PLOC.

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 a.m. and 1 p.m. (10 a.m. and 1 p.m. 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 h 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. Compliance with sampling protocol was continuously assessed. A log was kept of returned forms for each participant throughout the diary portion of the study to check compliance on a) the return of forms each day, b) the completion of forms close to the time of each signal, and c) 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.

Participants received two booster contacts during the sampling period—at the 2- or 3-day point and at the 10-day point. 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 et al. 1998). 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  $\times$  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 min of the pager signal. Three percent of forms were completed after 60 min; 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 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 h 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 dispositional autonomy was .78. The IAT effect was large; across the two counterbalancing conditions, participants were quicker (by 294 ms) to associate self with autonomy words ( $D = .54$ ,  $SD = .35$ ,  $d = 1.52$ ,  $t(76) = 6.63$ ,  $p < .0001$ ). Because this effect is very similar to that found in Study 1, the phenomenon appears to be reliable.

### *Relations between implicit, explicit, experience-sampled, and retrospective measures*

The bottom portion of Table 2 presents descriptive information on all relevant variables. Participants self-reported fairly high mean levels of autonomy on both the SDS and the

**Table 2** Descriptive statistics and intercorrelations among all variables (Study 2)

Measure	1.	2.	3.	4.	5.	6.	7.	8.
Implicit autonomy								
1. IAT disposition	–	–.01	.04	.04	.08	.02	.04	–.08
Explicit autonomy								
2. SDS choice		–	.39****	–.10	.15	.55****	.19	.16
3. PLOC			–	–.16	–.03	.47****	.46****	.35**
Awareness								
4. PrSC				–	.79****	–.12	–.15	–.16
5. Reflection					–	.01	–.05	.02
6. Mindfulness						–	.30**	.07
Experience sampling								
7. PLOC							–	.63****
8. Retrospective PLOC								–
Mean	294	2.88	8.22	3.66	3.53	3.89	4.86	3.71
SD	284	0.57	3.36	0.51	0.77	0.77	7.48	6.66
Min	–223	1.20	–1.25	2.30	1.83	2.20	–18.00	–10.67
Max	1,732	4.00	15.80	4.90	5.00	6.00	18.00	15.00

\*\*  $p < .01$ , \*\*\*  $p < .001$ , \*\*\*\*  $p < .0001$

Note.  $N = 78$ . IAT = Implicit Association Test; SDS Choice = Self-Determination Scale, Choice subscale; PLOC = Perceived Locus of Causality Scale; PrSC = Private Self-Consciousness Scale. Experience-sampling descriptive statistics are based on non-aggregated values

PLOC. Experience-sampled behavior was generally autonomous, though not highly so. There was a wide range of autonomy scores within persons across time. The main portion of Table 2 presents the intercorrelations between all measures. The experience-sampled data were averaged within subjects for these analyses. As in Study 1, implicit and explicit dispositional autonomy were unrelated. Explicit dispositional autonomy orientation, as measured by the PLOC, was correlated with day-to-day autonomy,  $r = .46$ ,  $p < .0001$ . SDS dispositional autonomy was not related to experience-sampled autonomy,  $r = .19$ , *ns*. Also, 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 autonomy (latter  $r = .30$ ,  $p < .01$ ).

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 (experience-sampled) measure than with the dispositional PLOC, it provides a suitable dependent measure of behavioral motivation over the sampling period.

*Prediction of day-to-day and retrospectively reported perceptions of autonomy*

To predict experience-sampled motivation, we conducted multilevel random coefficient modeling (MRCM; e.g.,

Raudenbush and Bryk 2002) using the SAS MIXED procedure (SAS Institute 1997). 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 autonomy were included in separate models. To enhance interpretability of the model intercept parameters, the psychological predictor variables were centered around their sample means (Raudenbush and Bryk 2002), while the linear trend (day-of-study) and day-of-week variables were coded to include zero. 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 cyclicality),<sup>6</sup> and time of momentary report completion (to test for

<sup>6</sup> Cyclicality is typically tested using either a dummy variable approach or the trigonometric function approach used here (see Bowerman and 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 cyclicality because this is the most common interval over which cyclical effects have been reported in autonomy (Reis et al. 2000).

first-order autocorrelation in day-to-day motivation).<sup>7</sup> In none of the models was day of study a significant predictor; all other variables were retained for further analyses. The psychological predictor variables were centered around their sample means, while the day of study and time of day variables were scaled to include zero.

**Main effects and moderation effects analyses.** Preliminary analyses examined only the main effects of implicit and explicit autonomy disposition (along with time series variables as controls) on day-to-day autonomy. SDS explicit autonomy marginally predicted day-to-day autonomy,  $t(75) = 1.71, p < .10$ , while a significant explicit—day-to-day autonomy prediction 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 *ps* ns.

To examine moderation of implicit autonomy by the awareness constructs, models were constructed to test the direct and moderating effects of each awareness variable assessed in this study, along with dispositional autonomy. Interaction terms were first constructed between implicit autonomy and each awareness variable (cf. Aiken and West 1991). To provide a clear test of the predictive value of each awareness variable and to preserve a satisfactory cases:predictors ratio, models 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 3, Model 1 (left side) displays the results of the analysis 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,  $t(73) = -2.87, p < .01$ . Table 3, Model 2 (right side) shows the results of the analysis incorporating PLOC-assessed explicit autonomy and mindfulness. Dispositional PLOC was a significant predictor,  $t(73) = 2.70, p < .01$ . Neither implicit autonomy nor mindfulness were predictive, but the interaction between them was again significant ( $t(73) = -1.98, p < .05$ ) and was of the same form as in the SDS model.

Figure 2 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

**Table 3** Predicting day-to-day autonomy from implicit dispositional autonomy, Two measures of explicit dispositional autonomy, mindfulness, and time series variables (Study 2)

Predictor	Model 1		Model 2	
	Estimate	<i>t</i>	Estimate	<i>t</i>
IAT implicit autonomy	0.27	0.81	0.19	0.59
Explicit autonomy	0.02	0.06	1.01	2.70**
Mindfulness	0.80	2.05*	0.37	1.03
IAT × Mindfulness	-1.09	-2.87**	-0.76	-1.98*
Time of day	0.70	4.44****	0.70	4.45****
Weekly cyclicality	-0.60	-3.26***	-0.60	-3.27***
Autocorrelation	0.91	5.81****	0.91	6.59****

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

*Note.*  $N = 78$ . Model 1 uses the Choice subscale of the Self-determination Scale (SDS) as a measure of explicit dispositional autonomy; model 2 uses the Perceived Locus of Causality Scale (PLOC) as an explicit dispositional autonomy measure. IAT = Implicit Association Test. Values are unstandardized parameter estimates

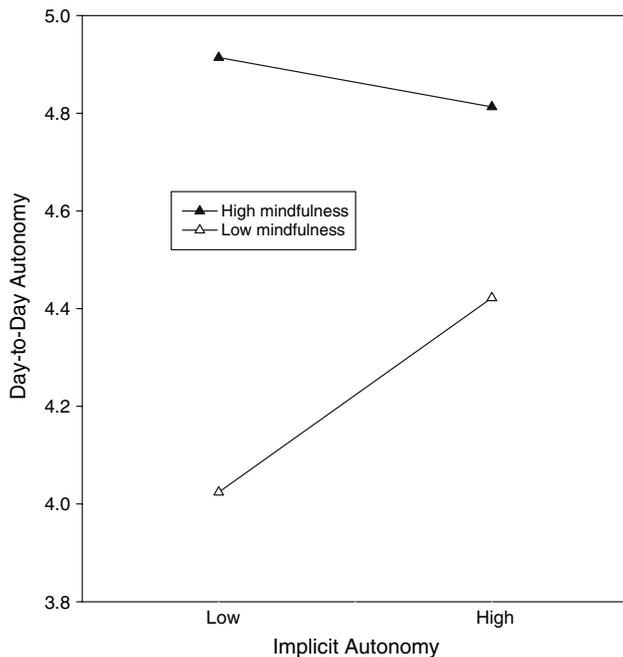
autonomy. Verifying this statistically (Aiken and West 1991), the slope for high mindfulness was nonsignificant,  $t(70) = -1.34$ , ns. In contrast, for those low in mindfulness, the relationship between implicit autonomy and day-to-day autonomy was positive,  $t(70) = 2.28, p < .05$ . Specifically, those low in both mindfulness and implicit autonomy showed the lowest levels of daily autonomy, while those low in mindfulness but high in implicit autonomy appeared to benefit from this implicit motivational orientation in that they experienced their daily behaviors as more autonomous.<sup>8</sup>

These results suggest that among those less mindful, implicit autonomy orientation tended to manifest in day-to-day level of autonomy. That is, for these individuals higher implicit autonomy was associated with higher levels of daily autonomy, while low levels of implicit autonomy orientation were associated with low levels of daily autonomy. For those with higher mindfulness, degree of day-to-day autonomy was comparatively high, regardless of implicit autonomy level.

In the two models incorporating the effects of private self-consciousness, neither the implicit autonomy and PrSC main effects, nor their interaction, were significant predictors of momentary autonomy, all *ps* ns. Similar results were found in models incorporating RRQ Reflection:

<sup>7</sup> 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 and 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.

<sup>8</sup> In this study, the absence of a significant relation between implicit dispositional autonomy and day-to-day motivation for behavior among more mindful individuals was not due to a restriction of range in the levels of day-to-day autonomy for these individuals. The correlation between mean level of mindfulness and the standard deviation of day-to-day autonomy scores was  $r = .06, p = .62$ . We thank an anonymous reviewer for suggesting a test of this alternative interpretation of the results.



**Fig. 2** Day-to-day level of autonomy as a function of implicit dispositional autonomy and mindfulness (Study 2,  $N = 78$ ). High and low values are one standard deviation above and below the mean, respectively

Neither implicit autonomy, reflection, nor their interaction predicted day-to-day autonomy, all  $ps$  ns.

*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  $\times$  mindfulness interaction term. In the SDS model, the implicit autonomy  $\times$  mindfulness interaction term was significant,  $t(1, 77) = -2.11, p < .05$ . In the dispositional PLOC model, this variable predicted retrospectively assessed autonomy,  $t(1, 77) = 2.84, p < .01$ . Neither the implicit autonomy main effect nor the implicit autonomy  $\times$  mindfulness interaction approached significance.<sup>9, 10</sup>

## General discussion

Despite an accumulation of research on implicit motivational and other processes, little work has examined their

<sup>9</sup> This study also included the same explicit and implicit attitude measures used in Study 1. Results replicated those of Study 1. Neither set of attitude measures predicted daily nor retrospectively assessed behavioral motivation.

<sup>10</sup> Preliminary analyses on the data from Study 2 also tested whether the effects of explicit autonomy on day-to-day and retrospective motivation were moderated by mindfulness. No significant interaction effects were found.

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., Bargh et al. 2001). But the predictive relation between implicit processes and behavioral perceptions may not necessarily be direct, and thus not readily detectable. In this article, we have shown that one form of conscious awareness, namely mindfulness, moderates the effect of implicit motivational dispositions on day-to-day motivation for behavior.

Using Self-determination Theory (SDT; e.g., Deci and 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-behavioral motivation relation. After first providing evidence of the reliability and validity of a new IAT measure of implicit autonomy orientation, results from a second sample 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. Those results suggest that mindfulness served to modulate the expression of implicit autonomy orientation.

These results do not indicate that mindfulness is essential for high levels of day-to-day autonomy. Individuals higher in explicitly measured autonomy orientation generally showed higher levels of autonomous motivation in everyday life (cf., Reis et al. 2000). Those who implicitly associated themselves with autonomy—regardless of level of mindfulness—also showed higher levels of day-to-day autonomous motivation. This latter finding provides some support for the predictive utility of the implicit autonomy orientation construct. In terms of practical significance, mindfulness was most beneficial to those with lower levels of implicit autonomy orientation, or implicit heteronomy; for such people, the tendency to be attentive and aware of ongoing events and experience that defines mindfulness modulated the nonconscious tendency to associate the self with a relative lack of choicefulness and volition. In contrast, those low in both mindfulness and implicit autonomy orientation reported comparatively low levels of autonomous motivation in their daily lives. Neither private self-consciousness nor reflection, both reflexive forms of consciousness (e.g., Baumeister 1999), moderated the effect of implicit autonomy orientation upon motivation for day-to-day behavior. This suggests that the pre-reflexive,

bare attention to and awareness of inner states and behavior that defines mindfulness may be essential to the moderating effect found here.

Finally, as predicted, implicit autonomy orientation was more relevant to the prediction of spontaneous (day-to-day) motivational outcomes than to a retrospective self-report of motivation. Neither main effects, nor consistent interaction effects with mindfulness were found when the outcome was a retrospective report of motivation over the same time period as the diary recording. These findings accord with past research on the dissociation between explicit and implicit modes of self-concept in predicting outcomes (e.g., Asendorpf et al. 2002; Bosson et al. 2000; Greenwald and Farnham 2000; McClelland et al. 1989; Wilson et al. 2000).

This research suggests that mindfulness may serve a de-automatization function, a term used to denote an “undoing” of automatized processes (Gill and Brenman 1959). Although the present research supports SDT’s contention that mindfulness can play an intervening role between implicit motivational orientation and behavioral motivation outcomes (Deci and Ryan 1980), the research does not disclose the process by which this self-regulation happens. While people can become aware of implicit processes (Wilson et al. 2000), and may thereby modify them before being expressed in behavior, mindfulness may also promote an awareness of day-to-day behavioral choices in specific situations (Deci and Ryan 1980). Further research is necessary to determine the point at which mindfulness intervenes in the implicit disposition-behavior relation.

The present research adds to a small but growing literature showing that mindful awareness may facilitate self-regulation, reflected in a moderation of the strength and predictive effects of implicit processes. Brown and Ryan (2003) argued that key to the self-regulatory nature of mindfulness is self-awareness or self-insight, and this argument was supported by evidence showing that among more mindful individuals, responses on an explicit measure of emotional self-concept were more concordant with those of the implicit self-concept counterpart. This suggested that more mindful individuals may be more attuned to their implicit emotions and reflect that awareness in their explicit self-descriptions.

Self-awareness is one form of self-regulation, and the present study examined another form, namely the capacity to behave in adaptive ways, which may mean modulating or overriding maladaptive tendencies (e.g., Baumeister et al. 1994). Mindful attention may have particular adaptive value when individuals face challenging tasks or new behavioral choices, or when they seek to alter nonconscious tendencies toward heteronomy that may manifest in behavior, given the positive task performance and

well-being outcomes associated with autonomous functioning (Ryan and Deci 2000).

The present study found evidence that mindfulness helped to modulate the motivational tendency toward heteronomy (and low autonomy). While these results indicated that mindfulness was related to a stronger dissociation between implicit motivational orientation and motivation for everyday behavior, they do not contradict the findings of Brown and Ryan (2003) because the two studies focused on different forms of self-regulation. Indeed, in light of this discussion on mindful self-regulation it would be counter-theoretical to suppose that mindfulness would be related to stronger concordance between an implicit tendency and behavioral motivation when that implicit tendency is toward heteronomy, a maladaptive form of motivation. With the differing interests in self-awareness and motivation for day-to-day behavior, the Brown and Ryan (2003) study and the present research together help to provide a broader base of support for the role of mindfulness in fostering different forms of self-regulation. However, the nascent stage of this research demands deeper investigation of the role of mindfulness in self-regulation, including its boundary conditions. On this latter point, it is worth noting that for individuals whose nonconscious motivational tendency is toward autonomous functioning, higher levels of mindfulness may not be necessary for autonomous functioning and the positive outcomes following from it.

Interestingly, this research found that mindfulness, in and of itself, was not a consistent predictor of day-to-day autonomous motivation for behavior, as past research has shown (Brown and Ryan 2003). Although mindfulness showed a moderate zero-order correlation with day-to-day motivation (see Table 2) and was a significant predictor in the multilevel model that also included the SDS measure of dispositional autonomy, it was not a significant predictor in the multilevel model that included the PLOC measure of autonomy. However, mindfulness shared variance with explicit dispositional autonomy and, as could be expected, the latter, especially as assessed by PLOC, was more strongly associated with daily motivation (also assessed with a PLOC measure). Thus, the inconsistent predictive value of mindfulness in this investigation was likely due to statistical competition with another variable bearing a considerable degree of conceptual and statistical overlap with the dependent variable.

#### The dual nature of dispositional autonomy

The present research is the first known to us to assess an implicit motivational process using the IAT. The results of both studies showed that, on average, individuals had a

more autonomous orientation or self-concept. In fact, inspection of the data showed that few individuals associated themselves with heteronomy on the dispositional IAT. In both studies, evidence was found for the conceptual independence of self-attributed and implicit forms of autonomy. This is consistent with motive research using TAT and other projective tests (e.g., Spangler 1992). But the lack of relations between these measures may have been due to a self-presentation bias in the explicit measures (e.g., Nosek and Banaji 2002). Since this series of studies are the first known to us to assess implicit motivation using the IAT, more research using well-validated implicit and explicit measures of motivation is needed to clarify this issue.

Further research is also needed to address the question of why most individuals showed an autonomous, rather than heteronomous implicit motivational orientation, especially in light of the claim that social controls on motivation are ubiquitous (Ryan and Deci 2002). Although behavior can vary in level of autonomy according to the presence of such controls, it may be that implicit self-concept was generally oriented toward autonomy in these studies because the self is naturally oriented toward autonomy (Deci and Ryan 1985). It is also possible that motivational orientation may vary according to sociodemographic or other characteristics. For example, college students, who participated in these studies, may show a more autonomous implicit orientation than those whose choices in life have been more limited. It is noteworthy that this research found that motivational orientation could not be understood as mere motivational preference. Further research on the basis of implicit motivational self-concept is needed.

#### Limitations and future research

The present results supported the psychometric soundness of IAT-assessed autonomy orientation, in that it showed acceptable levels of internal consistency, showed moderate stability of response over time, and showed some evidence of convergent validity. Further evidence for the convergent (and discriminant) validity of the IAT measure introduced here is needed, however, and with the recent advent of other reliable implicit reaction-time measures (Cunningham et al. 2001; Nosek and Banaji 2001), research using the IAT may more easily address such validity questions.

Future research using other implicit process measures may also help to uncover the exact nature of the automatic associations that individuals make between target concepts and motivational attributes. A potential limitation of the IAT is that it is structured as a relative measure of association strength between two attributes on the one hand

(e.g., autonomy vs. heteronomy) and two targets on the other (e.g., self vs. others). As such, the IAT only provides a relative comparison between two pairings that cannot be dissociated (Nosek et al. 2005). It would be desirable to examine the association strength for one target—attribute pairing (e.g., self and autonomy) separate from the association strength for another pairing (e.g., others and heteronomy).

Another issue concerns the predictive validity of the IAT measure of autonomy orientation. We hypothesized, and found that this implicit motivational orientation had a significant effect on everyday motivation for behavior when dispositional mindfulness was low, but not when mindfulness was high. While not hypothesized, we found no evidence for a direct (main) effect of implicit motivational orientation on motivation for day-to-day behavior. While we have argued that mindfulness should limit the predictive effect of implicit autonomy orientation, it is possible that the lack of a main effect had a methodological basis. For example, a restriction of range in the dependent variable could limit the ability to uncover main effects. However, the wide range of scores found on the daily- and experience-sampled motivation outcomes in the present studies makes this possibility untenable. It is also possible that the lack of a direct effect for IAT-assessed autonomy was due to the self-report nature of the outcome measures. While experience- and daily-sampling measurement of motivation for day-to-day behavior represent suitable outcomes for implicit process research, and do not bear the reactivity burdens of one-occasion self-reports (Schwartz and Stone 1998), the use of such measures does not supplant the need for assessment of objectively measured behavioral indicators of motivation 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 autonomy. Research is also needed to examine the means by 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 (cf., Hofmann et al. 2005). Research is also needed to specifically test whether mindfulness is more likely to moderate the expression of implicit autonomy in challenging or novel situations where conscious self-regulation is most adaptive.

Finally, 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 (e.g., Kabat-Zinn 1990)

facilitates the modulating or overriding of implicit tendencies such as heteronomy, low self-esteem, and stereotyping that can have negative psychological, interpersonal, and other consequences.

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