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Mindfulness and De-Automatization

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Abstract

Some maladaptive thought processes are characterized by reflexive and habitual patterns of cognitive and emotional reactivity. We review theoretical and empirical work suggesting that mindfulness -- a state of nonjudgmental awareness of the present moment -- can facilitate the discontinuation of such automatic mental operations. We propose a framework that suggests a series of more specific mechanisms supporting the de-automatizing function of mindfulness. Four related but distinct elements of mindfulness (awareness, attention, focus on the present, and acceptance) can each contribute to de-automatization through subsequent processes, including discontinuing automatic inference, enhancing cognitive control capacity, facilitating metacognitive insight, and preventing suppression or thought distortion. De-automatizing can, in turn, allow enhancement of adaptive self-control ability and increased well-being.

Keywords: Mindfulness, Emotion, Automaticity, Attention, Cognitive Control

Mindfulness and the De-Automatization of Emotional Life

Mindfulness, or a state of nonjudgmental awareness of the present moment, is generally thought to be psychologically adaptive. Mindfulness-based psychological interventions are effective in alleviating distress and enhancing well-being (cf. Chambers, Gullone, & Allen, 2009). However, the underlying mechanisms of mindfulness remain largely unknown. In this paper, we review empirical and theoretical work on mindfulness in relation to automaticity, the ability to effortlessly and unconsciously engage in behaviors. We then propose a framework that describes the mechanisms underlying mindfulness that lead to the discontinuation of maladaptive automatic reactivity.

Mindfulness has at least two distinct meanings in psychology, which we refer here as ‘meditation-oriented’ and ‘mindset-oriented.’ In work based on or derived from Eastern Buddhist meditation traditions, mindfulness refers to a quality of mind that is practiced or cultivated during meditation (e.g., Kabat-Zinn, 1982). Meditation-oriented mindfulness involves bringing one’s attention and awareness to the present moment with an attitude of nonjudgmental acceptance (Kabat-Zinn, Lipworth, & Burney, 1985). Meditation-oriented mindfulness has demonstrated efficacy first in the treatment of chronic pain (Kabat-Zinn, 1982), and subsequently in various clinical disorders, including major depression (Teasdale et al., 2000), anxiety (Kabat-Zinn et al., 1992), and substance abuse (e.g., Bowen et al., 2006; Brewer et al., 2009). By contrast, mindset-oriented mindfulness (Langer, 1989; 1997) refers to openness to novel information in the present moment, while having awareness of multiple perspectives. This understanding in turn enables less judgmental evaluation of others’ behavior (Langer, 1975; Langer & Abelson, 1972). Research on mindset-oriented mindfulness demonstrated that subtle changes in environmental cues can elicit different reactions in similar situations when people are

not thoughtfully aware of their behaviors. Langer argues that much of human behavior is based on mindless and unconscious processing, even in ostensibly “thoughtful” actions (Langer, Blank, & Chanowitz, 1978).

Tasks designed to induce mindset-oriented mindfulness include goal-oriented cognitive problem solving that requires consideration of information or situations from multiple perspectives to increase learning or creativity (e.g., Langer & Moldoveanu, 2000). In contrast, meditation instructions often include a non goal-directed and nonjudgmental observation of internal and external events (e.g., Kabat-Zinn, 1990). Despite differences, both approaches to mindfulness share a common ingredient of automaticity, or the ability to effortlessly and unconsciously engage in behaviors. Both also involve the process of increasing awareness of automatic behavior patterns and then learning to disengage from them by attending to internal and external stimuli with flexible awareness in the present (Kabat-Zinn, 1990; Langer, 1989). This shared ingredient of both conceptualizations of mindfulness is de-automatization. Through the process of de-automatization, mindfulness can help to discontinue emotional and cognitive reactions that have become automatic and spontaneous. In the current review, we primarily focus on mechanisms underlying meditation-oriented mindfulness. We chose to do this because our systemization of de-automatization involves all components pertaining to meditation-oriented mindfulness, but does not include all the components of mindset-oriented mindfulness. However, we also discuss elements of mindset-oriented mindfulness, and thus operationalize mindfulness as a general construct that encompasses both meditation and mindset-oriented modes of mindfulness.

We define automaticity as the ability to effortlessly engage in behaviors without paying conscious attention to their operational details (e.g., LaBerge & Samuels, 1974). Automaticity is

usually a desired result of learning that reflects a degree of habit or mastery, but automatized cognitive or emotional reactivity can lead to a wide range of detrimental consequences. In particular, highly automatized cognitive or emotional reactivity is associated with negative societal and individual outcomes, such as stereotyping that can lead to prejudice, and negative thought patterns prevalent in mental disorders. Many investigators suggested that de-automatization may be one of the central benefits or mechanisms of mindfulness (e.g., Langer, 1989; Moore & Malinowski, 2009). However, the de-automatizing function of mindfulness has not been adequately elaborated in the mindfulness literature. Instead, the focus has been on testing whether mindfulness decreases symptom severity and increases well-being over time. Although examining outcomes of mindfulness is important, establishing a mechanistic model of the actions underlying mindfulness is essential to understanding the steps required to achieve mindfulness.

We propose a framework that describes the way mindfulness facilitates de-automatization in terms of four more specific processes, thereby leading to desirable outcomes. We first elaborate the concepts of mindfulness and automaticity as we use these terms. Four components of mindfulness (awareness, attention, present focus, acceptance) can each bring forth the necessary environment for de-automatization to occur, as schematized in Figure 1. Mindfulness can instigate four broad subsequent mental processes, including reduction of automatic inference processing, enhancement of cognitive control, facilitation of metacognitive insight, and prevention of thought suppression and distortion. This de-automatizing function of mindfulness promotes adaptive self-regulatory strategies and desirable health outcomes.

INSERT FIGURE 1 HERE

Four Elements of Mindfulness

Mindfulness meditation practice is a form of cognitive training aimed at learning how and where to guide one's attention. This involves maintaining awareness of attention from one moment to the next, and gently but firmly escorting it back to the initial target object when the mind becomes distracted. The point of such practice is to train the mind to be stable, letting it disengage from usual and automatized thought processes. Most discussions of mindfulness include the following four elements: (1) awareness, (2) sustained attention, (3) focus on present moment, and (4) nonjudgmental acceptance (e.g., Kabat-Zinn et al., 1985; Teasdale, Segal, & Williams, 1995). These four elements will now be briefly defined and discussed in turn.

Awareness. Awareness is having conscious knowledge of one's experience, including bodily sensations, thoughts and emotions, and external events such as sights and sounds (e.g., Brown & Ryan, 2003). Awareness is contrasted with automatized mental reactions that often occur without the conscious awareness. Implicit stereotyping, for example, is a phenomenon in which automatized reactions occur outside of one's awareness. Mere exposure to a representative of social categories or aspects of a group stereotypes can automatically activate stereotypic associations, and often so without the perceivers' knowledge (Todorov & Uleman, 2003). A mindful individual may be more likely to notice when implicit stereotyping takes place, having accurate awareness of the nature of the bias.

Sustained Attention. Sustained attention involves placing one's attention on the ongoing stream of internal and external stimuli. When mindful, individuals bring their attention to the target of observation. When the mind drifts away or is distracted, attention is gently but firmly

brought back to the original target of focus. This component of sustained attention has been associated with positive mental health outcomes, including reduction in ruminative processes (Chambers, Lo, & Allen, 2008) and anxiety (Wells, 2002).

Focus on the Present Moment. Focusing on the present moment involves directing one's attention, with or without effort, to the internal and external phenomena occurring at each moment of awareness (e.g., Baer, 2003). It is contrasted with states in which the mind is preoccupied with thoughts about the past or the future, such as memories, plans, or fantasies. Rumination, which is associated with increased depressive symptom severity, is an example where perceivers lack focus on the present moment, preoccupied with automatically recurring thoughts from the past such as the causes and consequences of their feelings (e.g., Nolen-Hoeksema, 1991).

Nonjudgmental Acceptance. Nonjudgmental acceptance involves experiencing thoughts, sensations, and events as they are at the moment they enter one's consciousness, without judging them as being good or bad, desirable or undesirable, important or petty (Germer, Siegel, & Fulton, 2005). Acceptance is allowing all experiences -- whether pleasurable, neutral, or painful -- to arise without trying to change, control, or avoid them. Acceptance applies to both concrete (e.g., sensory pain) and abstract (e.g., feelings of rejection) experiences. Acceptance allows individuals to appreciate the experience even when condemnatory self-evaluations occur (e.g., "I am a failure"). When these evaluations do occur, acceptance allows individuals to embrace them as they are, without suppression or distortion (e.g., "I am currently feeling as though I am a failure").

All four elements of mindfulness are important in order for a moment of full mindfulness to occur. For example, mindfulness cannot be achieved when attention and awareness are not

accompanied by focus on present moment, such as when one dwells on past memories or worries about the future. Attention and awareness may also be present without acceptance, such as in feeling angry for a previous mistake, where clear awareness of anger is present without being able to accept past blunders and related emotions. Similarly, focusing on the present moment without awareness may occur in the state of inebriation, accompanied by gaps in awareness against intentions. Missing one or more components of mindfulness can result in ‘mindless behavior’ (Langer & Piper, 1987). A mindless person would have little awareness of the present experiences, blindly following daily routines and impulses. When the mind is not in active control, it is more likely to be determined by unconscious processes. For example when we are mindless, it is more likely that our perceptions and judgments about a person will be influenced by superficial labels associated with that person (e.g., job title, political orientation). By contrast, a mindful person relies on conscious and deliberate thought processing by having open and flexible attitude, which can lead to nonjudgmental acceptance of multiple context-dependent perspectives. Acceptance further allows individuals to distinguish events from the thoughts or emotions evoked by them. Therefore, a mindful individual can further notice that some events are uncontrollable, whereas the responses can be controlled with practice. Mindfulness does not necessarily give control, but enables individuals to better notice the presence of control by providing more awareness of what is controllable and what is not.

Automaticity and De-Automatization

Much of our mental life is supported by processes that are unconscious, spontaneous, and seemingly instantaneous -- that is, automatic (Bargh & Chartrand, 1999). People are often on “autopilot” in their behavior and decision-making, following habits or heuristic routines while their minds are occupied with other thoughts (e.g., Langer & Abelson, 1974). Automaticity is

adaptive in that it conserves limited attentional resources and lessens the self-regulatory burden by freeing up one's limited conscious attention from tasks in which they are no longer needed (e.g., Bargh & Chartrand, 1999). However, automatized mental reactions can also lead to negative health outcomes. For example, when an external event is followed by unconscious and automatic reactions, it may become difficult to separate the event itself from thoughts or emotions that it arouses. The automatic and quick reactions may lead to lack of perceived control. Helplessness, or lack of perceived control is commonly associated with a host of mental problems, such as anxiety disorders (Chorpita & Barlow, 1998), depression (Abramson, Seligman, & Teasdale, 1978), and addiction (Forsyth, Parker, & Finlay, 2003).

Whether automaticity is innate or acquired through learning, the field's consensus has been that automatic reactions are difficult or even impossible to control (e.g., Devine, 1989). However, some recent findings suggest that de-automatization is possible. A highly automatic and unconscious process of stereotyping was de-automatized when counter-stereotyping egalitarian goals were preemptively activated (Moskowitz & Li, 2011). In this study, when prompted to contemplate a time when they were unfair to a black person in the past (egalitarian goals activated) participants showed less implicit stereotyping. Hypnosis can also be used to initiate de-automatization. In a series of experiments, participants who were given hypnotic suggestion for alexia, the inability to read, showed a reduction or elimination of Stroop interference (Raz, Moreno-Iniguez, Martin, & Zhu, 2007). However, de-automatization through priming or hypnosis has problems with durability and real-world application, because the effects of priming and hypnosis tend to be short-lived (e.g., Dasgupta & Greenwald, 2001). Another way to instigate de-automatization while allowing perceivers' introspection and control is through mindfulness. A mindful mental set can weaken previously established associative

categories and other routine modes of behavior. A growing body of empirical findings suggests that mindfulness practice can lead to de-automatization.

Mindfulness and De-Automatization

In this section, we discuss how the four integral elements of mindfulness -- awareness, attention, focus on the present moment, and acceptance -- can enable de-automatization by creating different layers of changes in human behavior. In doing so, we emphasize that these components of mindfulness often operate in a mutually dependent and reciprocal relationship to produce related outcomes, and the outcomes often partially overlap. In the current paper, however, we intentionally separate the outcomes of each component of mindfulness for the sake of distinctness.

Awareness and De-Automatization

Automaticity can conserve our limited cognitive resources by utilizing information processing strategies that are not taxing (Bargh, 1992). When our mind relies on automaticity, increased susceptibility to priming effects or reliance on simplifying tactics such as stereotyping may result. Mindfulness, on the other hand, promotes awareness of the automatic ebb and flow of mental events (Wells, 2006). This awareness can be an initial step to discontinue automatic inference processing.

Priming. The priming effect occurs when a preceding stimulus, or prime, influences the perception of or response to a later stimulus (e.g., Salancik & Pfeffer, 1977). Priming research often requires that participants are not aware of the prime itself or that the prime can affect their subsequent behaviors. For example, brief exposure to words related to elderly stereotypes led people to walk more slowly down the hallway when leaving the experiment than did control participants (Bargh, Chen, & Burrows, 1996). In this study, the words were presented for an

extremely brief duration so that they were inaccessible to participants' awareness. In another study, incidental contact with a hot (versus iced) cup of coffee led people to perceive more (versus less) interpersonal warmth in a stranger (Williams & Bargh, 2008). Participants in this study were exposed to a temperature prime for a longer period of time but were not aware of the way it could affect their subsequent social behavior.

Awareness of a prime and its effects on behavior can eliminate the priming effect. The magnitude of the priming effect is inversely related to the length of exposure to the prime (Fazio, Sanbonmatsu, Powell, & Kardes, 1986), suggesting that priming information is most potent when presented so briefly that it is inaccessible to the perceiver's conscious awareness. In particular, Murphy and Zajonc (1993) showed that awareness eliminates the priming effect by presenting priming stimuli in the form of smiling or scowling faces either for an extremely brief duration or a longer duration followed by novel Chinese ideographs. Participants preferred the Chinese ideographs that were presented immediately after smiling faces only when the smiling faces were presented for a very brief time and thus inaccessible to their conscious awareness. A very short exposure to affective priming information did not allow individuals' awareness to recognize that the affective information (faces) were unrelated to the later stimuli (Chinese ideographs). On the other hand, when the faces were presented for a longer duration, increased awareness allowed individuals to be capable of separating the affective information of the faces from their preference for Chinese ideographs.

A mindful person, who attends to the changing fields of sensations, thoughts, and feelings from moment to moment, may be less influenced by the priming effect, given an increased alertness to the here-and-now. This may result in heightened vigilance and clarity of awareness regarding internal and external processing of information. With increased awareness,

mindful individuals may be more likely to notice the priming trigger or its psychological effect, bypassing automatic priming reactions. In support of this view, Radel and colleagues (2009) showed that individuals with higher levels of dispositional mindfulness as measured by the Mindful Attention Awareness Scale (Brown & Ryan, 2003) were less susceptible to a priming manipulation designed to activate goal motivations, compared to those with low mindfulness. Participants who were exposed to subliminal words related to autonomy (e.g., willing) performed better in a subsequent exam than those presented with non goal-related words. Importantly, this effect occurred only among those with low self-reported dispositional mindfulness. The authors conclude that mindful awareness can increase immunity against automatic guidance.

Stereotyping. Stereotyping refers to a cognitive response that is based upon automatic categorization, formed by a perceiver's knowledge, beliefs, and expectations about a human group (e.g., Hamilton & Troler, 1986). The cognitive processes that initiate stereotyping occur automatically and unconsciously (Devine, 1989; Pratto & Bargh, 1992), and stereotyping is often considered to be an inescapable and necessary byproduct of the categorization process (Bargh, 1989). However, current models of stereotype reduction argue that decreasing stereotyping is possible when people are aware of their own bias. Simply being aware of one's mental states or processes-- a key ingredient of mindfulness -- can reduce these automatized categorizations of feature-related interpretations, such as "I am perceiving this female student to be math-incompetent because there exists a stereotype that women are incompetent at math." (e.g., Bargh, 1999) This suggests that mindfulness can facilitate de-automatization by fostering awareness of one's present thoughts and feelings. Mindfulness training based on acceptance and commitment decreased racial stereotyping in a naturalistic classroom setting across two sessions and at one-week follow-up (Lillis & Hayes, 2007).

Langer and Moldoveanu (2000) further argue that active awareness permits appreciation of new perspectives and promotes context sensitivity, revealing that behaviors can be understood in multiple ways. For example, mindset-oriented mindful individuals are more likely to understand views other than their own, recognizing that there are as many different perspectives as there are different observers (Langer, 1989). This observation can lead to a less judgmental attitude, and thus a reduction in stereotyping. For example, experimentally inducing mindfulness in children reduced discrimination against physically handicapped individuals (Langer, Bashner, & Chanowitz, 1985). In another study, greater mindfulness induced by examining multiple (versus single) aspects of a person reduced automatic stereotype-activated behaviors, such as slow walking speed activated by age-related stereotyping (Djikic, Langer, & Stapleton, 2008). Whether increased multiple perspective taking or context sensitivity mediated the demonstrated efficacy of mindfulness on stereotype reduction, however, was not directly tested in these studies.

Collectively, the theoretical rationale and empirical results support the notion that awareness can deter automatic inference processing shown in priming and stereotyping. We further suggest that awareness in the state of mindfulness is made possible by active control of attention. Mindfulness can promote de-automatization and help control automaticity by training one's attentional control capacity, which is further illustrated in the following section.

Attention and De-Automatization

We now discuss the way mindfulness training can facilitate de-automatization by enhancing attentional control and cognitive flexibility. Mindfulness practice that involves focusing on a goal object while reducing distraction can enhance the ability to sustain attention on a target object (e.g., Chambers et al., 2009; Shapiro & Schwartz, 2000). Although one's own breath is the

most commonly used object of attention in mindfulness practice, the target can be anything, including objects in the environment, bodily sensations, mental imagery, felt emotions, or even cognitive concepts. Practitioners can eventually cultivate the ability to direct their attention to any target of their choice with increased cognitive control, the ability to sustain attention without intentionally choosing the focus of awareness (allowing the specific focus to change from moment to moment, while maintaining an alert state). We review the effect of mindfulness on facets of cognitive control, including attentional control and cognitive flexibility.

Attentional control. Attention is an information-processing capacity that enables selective focus on a particular feature of the environment while inhibiting other competing information. In a state of mindfulness, attention is placed on one specific aspect of goal-relevant information while inhibiting the array of other competing stimuli. Therefore, one critical change during mindfulness training is the enhancement of attentional capacities, indexed by improved performance on tasks that require attentional control. Mindfulness practice was shown to improve the attentional control capacity needed to sustain and inhibit attention and allocate attentional resource as intended. In particular, Chambers and colleagues (2008) found that mindfulness cultivates an ability to sustain and control the attentional focus. In this study, participants who underwent a 10-day intensive mindfulness retreat showed increased ability to maintain and shift their focus of attention. Another brief five-day integrative daily meditation program that used mindfulness-based approaches also improved inhibitory attentional control (Tang et al., 2007). Furthermore, a three-month intensive mindfulness retreat increased the capacity to better allocate attentional resource to task-relevant stimuli (Slagter et al., 2007).

Converging evidence strongly suggests that mindfulness may be one effective way to train the ability to redirect one's attention in the face of previously established automatic reactions. In

support of this view, there are some important similarities between mindfulness training and other attention interventions. For example, both meditation-oriented mindfulness and other attention training programs emphasize the importance of repetition (e.g., Sohlberg & Raskin, 1996). Attention training and mindfulness both can involve difficulties associated with attempts to control one's internal experience against the mind's strong tendency to habitually wander, often unaware of its own lack of awareness (Langer, 1989). The emphasis of mindfulness on repetition is thus necessary in order to overcome mindlessness and achieve fluency at a task that was initially challenging (e.g., Sohlberg & Mateer, 1987). Mindfulness training has other elements that are also characteristics of an effective attention intervention, such as sufficiently gratifying reinforcement (Sohlberg & Raskin, 1996), as the reward of successful mindfulness training can be extensive with wide-ranging improvements of well-being (for a review, Germer et al., 2005). In addition, successful attention training should use target stimuli that are common to both the training environment and the real world (Sohlberg & Raskin, 1996). Target stimuli commonly used in mindfulness training are one's breathing and related bodily sensations, and this readily available nature of target stimuli makes it easy to generalize what was learned during practice in a real environment.

Cognitive flexibility. Cognitive flexibility is the ability to adapt information processing strategies to deal with novel and unpredicted information, allowing individuals to switch behavioral responses according to the changing context of the situation (Cañas, Quesada, Antolí, & Fajardo, 2003). Mindfulness allows flexible allocation of attention on the ever-changing landscape of moment-to-moment information (Langer, 1989). Thus, mindfulness training can increase cognitive flexibility and the ability to discontinue habitual patterns of automatic information processing. The ability to recognize multiple aspects of a target object and choose a

task-relevant attentional set is often measured using the Stroop task, where attention has to be withdrawn from processing the overlearned and automatic information (word reading) and placed onto processing novel and relatively less practiced information (naming the ink color), a process of de-automatization. Some evidence indicates that mindfulness reduces Stroop interference. For example, Moore and Malinowski (2009) report that cognitive flexibility is positively related to meditation practice and self-reported levels of mindfulness. In this study, mindfulness meditators who completed at least six weeks of meditation sessions showed better performance on the Stroop task than those who had no previous mindfulness experience. When a highly automatic reaction has become task-irrelevant, mindfulness meditators could override it and redirect their attention to the new task-relevant information. Furthermore, Alexander and colleagues (1989) found that performing 20 minutes of daily mindfulness practice twice a day over three months was associated with decreased Stroop interference among residents in nursing homes.

We reviewed literature suggesting that mindfulness meditation can increase attentional control and cognitive flexibility, thereby enabling discontinuation of automatic cognitive processing. We suggested that the repeated training of directing attention in mindfulness meditation can enhance cognitive control, indexed by increased attention control and cognitive flexibility, which then can provide a basis for the de-automatization to occur.

Focus on the Present Moment and De-Automatization

We now discuss the nature of target stimuli to which mindful attention is directed, namely, the present moment. Mindful practice of repeatedly bringing attention back to the present moment can lead to realization that thoughts are simply patterns of the mind rather than accurate reflections of truth or reality. This process is called “metacognitive insight” (Teasdale, 1999), a

transition toward realizing thoughts as ephemeral mental events, rather than as direct representations of reality. Metacognitive insight is the basis for de-centering and non-elaborative processing, which are discussed next.

De-centering. De-centering involves stepping back from mental experiences and observing that thoughts are transient mental events which do not necessarily represent facts based in reality (Segal, Williams, & Teasdale, 2002). De-centering can allow individuals to have mental distance from their problematic thoughts and emotions, allowing an opportunity to observe their habitual tendency to automatically react. This observation can further offer a sense of choice to respond consciously instead of reacting unconsciously.

The process and outcomes of de-centering have strong implications in psychological disorders that are characterized by problematic automatized thought patterns. For example, Teasdale (1999) highlights that ruminative and negative self-focused thought patterns can perpetuate depressive episodes. A de-centered view can help reduce rumination by helping individuals to notice recurrent depressogenic thought patterns and address them within a different processing configuration. Specifically, negative thoughts are simply regarded as risings and wanings of mental patterns, rather than reflections of reality. In support of Teasdale's view, mindfulness based interventions has shown efficacy in treating major depression (Ma & Teasdale, 2004; Teasdale et al., 2000) and bipolar disorder (Williams et al., 2008). De-centering is a process of changing an individual's relationship to thoughts and feelings, rather than focusing on their details in an attempt to modify them. This changed relationship can free the mind from secondary elaborative processing (Bishop et al., 2004), which will be discussed next.

Non-elaborative processing. A de-centered perspective, by enabling a suspension of conceptual meaning-based processing, can lead to cessation of elaborative thoughts (Wells,

2006). Non-elaborative processing of information related to physical and psychological pain is of particular importance in mindfulness. The expectation or experience of pain can lead to elaborative patterns of worries and aversion responses that are often unconscious and automatic, making it difficult to separate pain from suffering in the overall experience. With respect to physical pain, the Buddhist tradition observes that pain is not the same as suffering and that suffering occurs when negative thoughts and fear are projected onto pain sensations (Germer et al., 2005). Of particular relevance, studies on pain perception suggest that the expectation of pain can influence the subsequent amplitude of an actual pain experience. For example, expectation of a painful stimulus, a secondary information processing that is purely based on psychological factors, amplified the actual experience of unpleasantness in response to an innocuous stimulus as indexed by increased brain responses within areas implicated in pain processing (Sawamoto et al., 2000). Siegel and colleagues (2001) also illustrate the way physical pain can be exacerbated by secondary subjective evaluations that often arise automatically upon encountering the pain experience, such as worrying about losing one's job or not being able to carry out normal activities. Affected individuals may in turn avoid physical activities altogether for the fear of worsening the symptoms, which can aggravate psychological stress and muscle deterioration. Mindfulness may provide the initial impetus to put a stop to this automatized chronic pain cycle by allowing individuals to recognize that a certain portion of the pain experience is self-generated and identify the source of pain that can be changed.

Rumination is another example of elaborative thought processing that involves a highly automatized and repetitive cycle of negative thought patterns and self-focused attention, where negative thoughts about a present problem further compound the condition (Nolen-Hoeksema, 1991). Metacognitive insight, brought about by mindful observation of ever-changing current

thoughts, allows relocation of attention from habitual passive thought fixation back to the intended primary focus of attention (Teasdale, 1999). Furthermore, paying attention to one's thought patterns can provide a sense of control over possible courses of actions. Instead of unconsciously following pre-established automatic thought patterns, a mindful person can consciously monitor emotional experiences, thereby preventing further emotional reactivity in rumination (Teasdale et al., 1995). Mindfulness practice was shown to reduce self-reported rumination, as measured by a trait rumination scale (Ramel, Goldin, Carmona, & McQuaid, 2004).

De-centering and non-elaborative thinking are different from thought suppression, in which an individual attempts to inhibit ideas that are unacceptable or unpleasant (Wegner, Schneider, Carter, & White, 1987), or cognitive reappraisal, in which individuals reconstrue a situation in a different way than how it was originally experienced (Gross, 1998). Mindfulness training does not involve systematic evaluations and cognitive alterations of irrational thoughts. Instead, individuals learn to observe the impermanence of their thoughts and notice that thoughts are not factual threats that call for escape or avoidance behavior. This in turn may allow a more accepting and less judgmental stance towards all thoughts, including ruminative thoughts. In the next section, we further discuss the concept of mindful acceptance, and how it prevents suppression or thought distortion thereby facilitating benefits of exposure.

Acceptance and De-Automatization

In the state of mindfulness, the mind is attending to the ongoing stream of ever-changing present experiences with clear awareness. Resulting from these processes may be an enhanced level of acceptance (Chambers et al., 2008). Understanding the futility of trying to achieve certainty in the present moment, which is in a perpetual state of fluctuation, can lead to the

fundamental insight of acceptance. In the state of nonjudgmental acceptance, all phenomena that enter awareness are observed carefully but not evaluated as good or bad. Instead, all events are experienced without threat or defense.

Acceptance is one of the primary facets of acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 1999), although ACT does not describe its treatment approach in terms of mindfulness (Baer, 2003). Clients in ACT are encouraged to accept and observe all thoughts without evaluating, judging, or trying to control them. Based on this observation, they recognize patterns of maladaptive behaviors that are to be modified. In this sense, acceptance is not the same as endorsing cognitive avoidance. Rather, acceptance involves recognizing and embracing the content and automatic nature of one's fear-related thoughts or behaviors without avoiding them. Only after this acceptance can constructive behavioral modification follow. Acknowledging one's avoidance of a fearful stimulus does not equate to endorsing avoidant behavior. Instead, mindfulness involves observing one's own reactive desire to avoid the fear-inducing stimuli without regarding them as harmful or undesirable. This detached stance helps individuals to actually experience fear, which in turn may make the object of fear less threatening. This process is very similar to that of interoceptive exposure.

Exposure. Mindfulness encourages a gradual orientation of attention toward fear as it arises, while exploring it with nonjudgmental acceptance. Mindfulness thus involves exposure to fearful stimuli without avoidance, which is a key ingredient in effective therapy that aims to change undesirable reactivity to fearful stimuli (Samoilov & Goldfried, 2000). Exposure reduces reactivity that would otherwise engender maladaptive automatic cognitive defenses (Baer, 2003). The nonjudgmental acceptance toward internal experience may function as an implicit element of exposure (Hayes & Feldman, 2004). For example, it can introduce exposure and reduce

anxiety severity by encouraging the experience of anxiety symptoms without attempts to control them (Kabat-Zinn et al., 1992). Kabat-Zinn (1982) also explains that undistorted exposure to the sensations of chronic pain in the absence of catastrophic consequences may lead to desensitization and eventual extinction of the emotional reactivity elicited by the pain sensations.

Despite the similarities, mindfulness practice and exposure-based therapy differ in some major ways. First, individuals in mindfulness practice do not adopt a specific goal, even if they intended to reduce distress by seeking treatment in the first place. While the desire to feel better may motivate one to practice mindfulness meditation, the meditation itself is practiced with the attitude of non-striving, where participants do not strive to reduce their pain or feel better (Baer, 2003). Second, mindfulness training does not include the deliberate induction of panic symptoms with an aim of practicing tolerance to these sensations until they subside, but involves observing these sensations when they naturally arise.

Acceptance enables individuals to observe their automatic reactivity to mental events without judging, which can open a gateway to discontinued undesirable automatized behaviors. No longer subjected to formerly over-learned reactive thought patterns as much, one gains opportunity to better regulate thoughts and feelings, which can result in improved health outcomes. Indeed, Alexander and colleagues (1989) showed that mindfulness practice can promote mental health and even predict longevity. Residents in nursing homes who engaged in 20-minute mindfulness meditation twice a day for three months exhibited improved mental health outcomes, measured by a question probing general improvement of mental health (rated by nurses blind to experimental condition) compared to a control group. Furthermore, those who practiced mindfulness were more likely to be alive than controls three years after treatment

ended. We suggest that acceptance can help regulate thoughts and feelings, contributing to the potentially powerful effect of mindfulness on health outcomes.

Conclusions and Future Directions

Many authors have discussed the de-automatizing function of mindfulness. We provide further elaboration on this model and propose that four core elements of mindfulness -- awareness, attention, focus on present moment, and acceptance -- dampen automaticity. Mindful de-automatization can further cultivate adaptive self-regulation strategies, which has implications for psychophysical well-being. Thus, the demonstrated efficacy of mindfulness may be underpinned by an amplified potential for self-regulation.

Mental life is often a succession of automatic and habituated reactions to a constant flow of external and internal stimuli. Automaticity is essential in dealing with more information than our limited attentional capacity can handle, but there are tradeoffs. This paper reviewed the potential effect of mindfulness in reducing automatic cognitive and emotional reactions. The proposed mechanistic approach can be used to analyze mindfulness and its de-automatizing function into deconstructed algorithmic steps. Understanding essential components required to achieve the desired state of mindfulness can provide a functional model to test the construct of mindfulness, while preventing potentially misguided applications of mindfulness that result in limited or undesired outcomes. We further suggest directions for future research that we hope will flow from this de-automatization model of mindfulness. First, researchers can test whether mindfulness can de-automatize other highly automatic responses, even those shown at a sensory-level such as visual illusions or face recognition. Second, other mechanisms of de-automatization can be tested, such as increased positive emotions and decreased negative emotions. Mindfulness has been shown to increase daily experiences of positive emotions such as joy and gratitude

(Tang et al., 2007) and decrease negative affect (Chambers et al., 2008). Increased experience of positive emotion as a result of mindfulness may in turn enhance de-automatization. According to Fredrickson's (1998) "broaden-and-build" model, positive emotions broaden the possible thought-action repertoire by unlatching the rigid processing of automatic operations. Unlike negative emotions that require preparation for a narrow range of specific actions, positive emotions sans threat do not call for quick reactions. Positive emotions thus may open up a mental space, a state where individuals can savor the moment-to-moment experience without mindlessly reacting to incoming stimuli.

Utilization of mindfulness practice in clinical or daily life settings presents vast possibilities as a new avenue of effective and non-invasive treatment or health-beneficial instrument. Both mindset-oriented and meditation-oriented perspectives on the efficacy of mindfulness have been investigated in recent studies, yet their specific underlying properties still remain underexplored. Using modern scientific techniques to uncover mindfulness' potential de-automatizing function can help shed light on better understanding and application of a more advanced contemporary utilization of the 2,500 year-old ancient practice of meditation.

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Figure Caption

Figure 1. A model describing the mechanism of de-automatization facilitated by mindfulness.