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How does mindfulness training improve moral cognition: A theoretical and experimental framework for the study of embodied ethics

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Abstract

Mindfulness meditation has been primarily studied within the context of individual's psychological well being and/or in relation to its potential to enhance cognitive skills such as attention and working memory[1]. However, in Buddhism, mindfulness is a means to cultivate wholesome actions, and to promote virtuous, prosocial qualities[2]. Here, we postulate that a mindful state, with heightened attention to and awareness of the sensory and contextual features, may transform the individual's ability to detect morally relevant information and result in improvements in moral behavior. In this framework, morality is not only a system of explicit rules and principles, but also is enacted through the dynamic interaction between the organism and its environment. Accordingly, individuals are equipped with an ethical know-how rooted in the immediacy of perception and action[3,4]. A mindful state, then, favors an awareness of morally relevant internal and external cues and may thereby foster the emergence of moral behaviors. In support of our proposition, we briefly summarize neuroscientific investigations into moral cognition, and then provide a theoretical and an experimental framework for the investigation of embodied ethics, i.e., ethical action that depends upon and is constituted not only by cognitive processes but also by the physical body.

Psychological and Neuroscientific Investigations Into Moral Cognition

Morality and the moral nature of human beings have been in the center of philosophical discussions for millennia. In recent years, the complex psychological and neurobiological mechanisms underlying human morality have also been a quest for psychology and modern neuroscience. Rooted in the cognitive-developmental approach of Piaget and Kohlberg, morality was initially regarded as a trait-like ability that depended predominantly upon one's level of reasoning[5]. As such, in the field of psychology the main line of research has focused on explicit moral reasoning and deliberative decision-making. More recently, however, the role of implicit processes and/or moral emotions has also captured

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attention[6,7]. Consequently, the discipline has witnessed a burgeoning of models that amalgamate affective and cognitive components into a unified model for moral action[8–10].

From a neurocognitive perspective, morality relies on several domain general processes including the control of impulses and urges, representation of mental states, imagining the future, and other higher level cognitive processes such as reasoning and decision making[11,12]. It has been examined using a variety of experimental paradigms ranging from tasks that isolate perceptual and attentional influences on the processing of morally-laden information (e.g. tasks that involve passive viewing of immoral actions[13,14]), to highly evocative moral dilemmas (e.g. would you sacrifice one person to save the life of five others[15]). Moral intuitions, as emotion-laden responses to issues concerning harm, fairness, purity, authority, and in-group favoritism has also been investigated[16].

Although the role of emotions in guiding moral behavior is now established, it is still unclear how these affective and cognitive components interact to influence moral action. While some researchers suggest a conflict between responses driven by affective and cognitive processes[15], whereby each process favors a certain outcome (e.g. deontological vs. utilitarian inclinations), others argue that these judgments are predominantly driven by automatic, intuitive process, with deliberative reasoning only providing a post hoc justification of the decision[16]. While the debate on the complex interaction between affective and cognitive processes still continues, multiple dynamic models that attempt to capture the variety of situations that reflect real life moral encounters have also been introduced.

Moving beyond the dichotomy of affect versus reason, these dynamic models have incorporated contextual modulations. According to these models, moral processes depend largely on the situational demands and range from quick affect laden reactions to deliberative reasoning (e.g. responding to a moral dilemma scenario)[17]. The different component processes including sensory perception[18] or other perceptual [18–20] and attentional[21,22] processes are utilized depending on these contextual demands [12,23,24]. Providing support to this dynamic view of moral action, a recent meta-analysis of functional neuroimaging studies demonstrated dissociable patterns of brain activity associated with different contextual demands (passive viewing of morally laden stimuli versus active moral decision making)[25]. These dynamic models bear significance to the framework of embodied ethics as they take the complex interaction between the environment and the organism into account, and therefore may provide clues into how mindfulness may improve moral cognition.

For instance, relying on the view that domain-general, large-scale intrinsic brain networks constitute the neural substrates of emotional, social, and cognitive phenomena[26], Sevinc and colleagues demonstrated salience/ventral attention network engagement associated with the initial detection of moral content (automatic detection of moral content and modulation of activity in downstream brain regions [27]). According to the results of this study salience network was active during the initial detection of the moral relevance and this activation was succeeded by the engagement of default and frontoparietal control networks, potentially reflecting associative, elaborative processes required for the further processing of morally-

relevant information[28–30]. This initial detection by the salience network is critical for moral action, especially in initiating a more context-specific and goal-directed processing of the moral content[31]. Therefore, we postulate that heightened awareness of physiological and mental phenomena, attained through mindfulness meditation, may lead to enhanced detection of morally relevant stimuli, and thereby promote moral action in response to the stimuli that would otherwise go unnoticed.

A neuroscientific framework for the investigation embodied ethics

Mindfulness meditation has primarily been studied within the context of psychological outcomes and/or in relation to its potential to enhance cognitive abilities[32,33]. Several researchers and Buddhist scholars, however, have underlined the joint nature of mindfulness and ethics; and mindfulness meditation's potential role in enhancing wholesome behaviors[34,35]. In line with these assertions, preliminary investigations into the relationship between mindfulness and ethics have demonstrated mindfulness training dependent improvements in moral reasoning ability[36,37], as well as an association between trait levels of mindfulness and ethical behaviors[38].

Before we introduce a neuroscientific framework for the investigation of the relation between mindfulness training and ethics, it is important to make a distinction between moral cognition and prosociality. Prosocial behaviors include behaviors that are beneficial to others such as helping and sharing[39–41]. The cognitive processes that are studied under the umbrella term 'moral cognition', such as the ability to tag a situation as morally relevant, are potentially fundamental to prosocial behaviors as well, however, many additional trait level factors may also influence to prosociality, and more work is needed to define the relative contribution of the meditation practices to prosocial actions. Moreover, although a recent systematic review indicates an association between mindfulness and prosocial behaviors[42], others have found null effects and questioned the impact of mindfulness training on prosociality[43]. Here, we limit our framework to 'moral awareness' and focus on the link between mindfulness training and enhanced awareness of morally relevant stimuli.

Given the range of cognitive components that constitute moral cognition and the multiplicity of proposed mechanisms of action associated with mindfulness meditation[44,45], it is reasonable to hypothesize that multiple mechanisms including enhanced attentional capacity, interoceptive awareness, emotion regulation, and a change in perspective of the self synergistically contribute to enhanced moral action. Here, we postulate that the dynamic model of moral cognition together with a distributed brain network perspective of mindfulness may provide a framework for the investigation of these multiple mechanisms through which enhanced awareness following mindfulness training may impact ethical behaviors.

This distributed brain network perspective has already been adopted to investigate neural correlates of mindfulness meditation. Researchers have successfully demonstrated default network engagement during mind wandering periods; salience network engagement during the awareness of mind-wandering, and frontoparietal executive network engagement when

disengaging from mind wandering and redirecting attention, with dorsolateral prefrontal cortex activity persisting into focused attention meditation[46,47]. It has been argued that the repeated engagement of these networks during meditation give way to lasting adaptations and modulate cognition via alterations in network functioning beyond meditative periods. In line with this proposition, long-term meditators exhibit increased resting state connectivity within the default network[48,49] as well as in attentional networks, and between the attentional networks and medial frontal regions[50,51]. Our model hinges on these findings and posits that functional changes in these distributed brain networks associated with meditation practice may mediate alterations in moral processing, leading to enhanced ethical action[4].

Mindfulness training has previously been associated with heightened awareness of physiological and mental phenomena, including an ‘awareness of awareness’ and attention to intention[52,53]. The dynamic view of moral cognition[24], as well as psychological models of moral behavior[54] regard these aspects as integral to moral action (e.g. noticing the presence of a person in pain). For social animals, morally-relevant situations are salient events that potentially require regulation of behavior as well as one’s homeostatic state. Here, we propose that mindfulness training influences moral processing in part through alterations in this initial step, i.e. the detection of morally-relevant stimuli, mediated by enhanced activity in the salience network[55].

Central structures of this network include the dorsal anterior cingulate and frontoinsula, which have been associated with interoceptive awareness, an awareness of bodily signals. Lying at the interface of the cognitive, homeostatic, and affective systems, the anterior insula – a major node of the salience network, processes sensory and limbic inputs from the body, and detects salient events[28]. Critically, in a recent systematic review, increased activity in the insular cortex was found to be one convergent outcome of mindfulness-based interventions[56]. Relying on mindfulness meditation’s emphasis on awareness as well as this overlap, we postulate that enhanced activity in the salience network following mindfulness training [57,58] may be one mechanism through which mindfulness training enhances the detection of moral salience and improves ethical behaviors.

In line with our assertion, the salience network has been associated with initiation of appropriate control signals to regulate behavior and the homeostatic state through inputs to the default and/or frontoparietal control networks[58,59]. These associative, integrative processes are required for further processing of morally relevant information. Therefore, mindfulness-meditation dependent changes in the salience network may impact moral behaviors through changes in the salience network, as well as through salience network’s influence on these networks [48–50,60, 61]. In addition to increased awareness of morally relevant stimuli, mindfulness-training related decreases in rumination and mind-wandering[63] could also conceivably impact awareness by increasing available cognitive resources- both for the initial detection of moral salience as well as for subsequent deliberative cognitive processing. Mindfulness-training related changes in meta-awareness and perspective of the self may influence one’s moral identity over time[64–66], and may further influence the processing of morally-relevant stimuli.

It is important to note that the quest for domain-specific morality has been challenged and the neural mechanisms, mentioned here, are by no means unique to moral cognition[11]. Our model aims at providing an experimental and theoretical framework for the investigation of the association between mindfulness and ethical action and needs to be experimentally evaluated. While enhanced awareness of morally-relevant information may not necessarily guarantee moral action, or other-focused decision-making, such an awareness and the ability to tag otherwise insignificant situations as morally-relevant is a necessary step for this quest and therefore holds the potential to provide a means to examine the mechanisms through which mindfulness training may promote moral action.

Finally, it is important to distinguish between brief secular training programs that incorporate compassion or mindfulness meditation and long-term practitioners obtaining training from traditional Buddhist teachers. Since ethics are a very prominent component of Buddhism, studies with long-term practitioners must take into account those practitioners' explicit efforts to become more ethical. Furthermore, while there is some overlap between the proposed mechanisms of compassion and mindfulness meditation, each has been associated with different neural mechanisms of action[57]. Thus, a randomized controlled investigation of secular mindfulness training is essential to investigate how mindfulness in and of itself may contribute to enhanced ethics. Such an investigation may illuminate the association between awareness and ethics[34], validate the use of contemplative practices for catalyzing change at the interpersonal level, and ultimately contribute to the development of better intervention programs to enhance moral and prosocial behaviors, while also introducing a method that can alter a process that has long been overlooked as unchangeable.

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