

# Contemplative Cognition: A More Integrative Framework for Advancing Mindfulness and Meditation Research

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**Abstract** Mindfulness, whether distinguished as a state, trait, or training, is central to a growing wave of interest in meditation. Theoretical development has been called for in order to clarify confusion about mindfulness from a scientific perspective. Ideally, such development will allow ingress for more traditional perspectives and guide inclusive research on the wider range of meditation practices. To address this call, we outline a new approach for understanding mindfulness and related meditative experience that accommodates diverse perspectives. In accord with other integrative approaches, we employ foundational psychological constructs (namely, attention, intention, and awareness) to understand mindfulness. In contrast to other theoretical perspectives, however, we utilize this foundation to derive novel psychological constructs needed to better explain mindfulness and important features of meditative experience more widely. The *contemplative cognition framework* integrates three attention-related processes entailed by a variety of contemplative practices: *intended attention*, *attention to intention*, and *awareness of transient information*. After delineating this set of three processes, we explain how they can cooperate to promote a contemplative range of metacognition about attention, intention, and awareness, as well as enhanced regulation of cognition, emotion, and behavior. The contemplative cognition framework (a) overcomes discrepancies in mindfulness research; (b) accounts for contextual and motivational aspects of training; (c) supports investigation from phenomenological, information processing, neurophysiological, and clinical perspectives;

and (d) enables investigations on various contemplative states, traits, and practices to inform one another. This new approach has potential for advancing a more inclusive, productive, and theory-driven science of mindfulness and meditation.

**Keywords** Attention · Contemplative practice · Intention · Metacognition · Mindfulness · Present-moment awareness

## Introduction

A recent explosion of research has investigated mindfulness as a state, trait, or type of training, as well as numerous other styles of meditation practice. Rather than yielding falsifiable theories or deep understanding, this research has achieved little integration. For example, a meta-analysis of over 800 studies concluded that “scientific research on meditation practices does not appear to have a common theoretical perspective” (Ospina et al. 2007, p. v). Nevertheless, another recent meta-analysis indicated that meditation produces numerous positive psychological outcomes (Sedlmeier et al. 2012). This verification of measurable outcomes encourages a response to a growing call to build productive theories: “real progress in understanding the effects of meditation cannot be made if future empirical studies are not guided by better theories” (Sedlmeier et al. 2012, p. 1139). Central to this call is the need to clarify terminological and definitional confusion about key topics such as mindfulness, meditation, and contemplative practice. Challenges stemming from this central confusion include diffusely characterizing states, traits, and types of training under the same umbrella term “mindfulness”; lack of precise terms delineating distinctive features of diverse meditation styles; and difficulty reconciling scientific and traditional accounts. The present article addresses these challenges by depicting the psychological processing associated

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with mindfulness and meditation in terms of new theoretical constructs derived from the foundational processes of attention, intention, and awareness (James 1890).

### Confusion Regarding Mindfulness States, Traits, and Trainings

The term *mindfulness* has been applied to temporary meditative states, longer-lasting dispositional traits, practices that can be learned, and interventions that incorporate a meditative component, producing confusion in the research literature (Davidson 2010; Lutz et al. 2007). A traditional Buddhist understanding of mindfulness characterizes specific aspects of psychological processing that contribute to living a wholesome life with care (Dreyfus 2011). Indeed, the term mindfulness is one of many terms traditionally used to describe distinct meditation practices (e.g., shamatha, vipashyana, zazen) and varieties of meditation experience (e.g., jhāna, kenshō, nondual awareness). Yet much of this diversity has become obscured as mindfulness developed into a broadly employed umbrella term (Chiesa and Malinowski 2011) that extends beyond its Buddhist origins. Indeed, Kabat-Zinn (2011), long after introducing the term mindfulness into scientific discourse, explained its role as a placeholder “meant to carry multiple meanings and traditions simultaneously” (p. 290).

Despite its multiplicity of specific meanings (Dreyfus 2011), mindfulness cannot account for some meditative practices, even Buddhist ones, such as loving-kindness, compassion, or visualization practices (Hofmann et al. 2011; Kozhevnikov et al. 2009). In contrast, the term *contemplative* has been applied to diverse meditative experience (not limited to Buddhist contexts), to accommodate an even wider set of practices from various traditions (e.g., Christian centering prayer). An integrative psychological framework could help to guide and facilitate investigation across the broad spectrum of contemplative experience. A highly integrative theory should more precisely differentiate various practices involving mindfulness (Tang and Posner 2013), as well as address commonalities across the wider diversity of contemplative interventions and experience.

### Disconnected Depictions of Diverse Meditation Practices

A large and heterogeneous family of meditation practices originates from various contemplative traditions, and empirical studies have investigated a growing diversity of these practices. Most scientific efforts to characterize meditation have narrowly focused on a single practice drawn from a particular contemplative tradition, as defining meditation more generally appears difficult (Lutz et al. 2008). The resulting segregation of studies by practice style has led to disconnected, discrete areas of research. Differentiating among the aims and techniques of specific practices remains important (Lutz et al.

2007; Slagter et al. 2011); without a theoretical basis for integrating findings, however, idiosyncratic approaches to investigating distinct practices impede empirical investigations from informing one another and prospects for building psychological theories about the processes involved in meditation remain distant. Fortunately, it may be possible to identify commonalities among different kinds of meditation that could form a basis for an integrative scientific approach (Lutz et al. 2007; Slagter et al. 2011).

### Difficulty Reconciling Scientific and Traditional Accounts

To enable dialogue between distinct stakeholder groups, researchers require constructs that enable mutual engagement between a wide range of empirical findings and traditional meditation perspectives (cf. Goleman 2003). Current theoretical approaches vary in degree of contiguity with contemplative traditions—some derive from ancient sources or modern versions of traditional texts (e.g., Grabovac et al. 2011), while others emphasize knowledge available within cognitive neuroscience (Tang and Posner 2009). Approaches that can effectively leverage traditional understanding of meditation for rigorous investigation are needed, in part so that ancient traditions’ descriptive precision may enhance clarity and accuracy in scientific terminology and theorizing (Lutz et al. 2007).

Several integrative theories have taken important steps toward such reconciliation. The Buddhist Psychological Model was derived from an ancient source (the Abhidhamma Pitaka), and applies Buddhist understanding to how mindfulness training produces moment-by-moment awareness of impermanence, relation to suffering, and lack of fixed self considered inherent to mental events (Grabovac et al. 2011). A different model of mindfulness meditation focuses on four components informed by traditional perspectives but specified with regard to existing psychological constructs: attention regulation, body awareness, emotion regulation, and change in perspective of self (Hölzel et al. 2011). Similarly, traditional and neurobiological accounts were combined to posit three components pertaining to self-related processing: self-awareness, self-regulation, and self-transcendence (S-ART; Vago and Silbersweig 2012). S-ART explains mindfulness meditation in terms of several long-standing cognitive constructs (intention, motivation, attention regulation, emotion regulation, memory extinction and reconsolidation) as well as decentering (Vago and Silbersweig 2012).

Each of these approaches to integrating scientific and traditional perspectives reveals important insights about mindfulness meditation not readily achieved through either perspective alone, and they characterize mindfulness primarily in terms of existing psychological constructs. Although focus on understanding mindfulness is warranted by its prominence in recent scientific literature, theoretical development focused exclusively on mindfulness risks

further confusion as the field broadens the scope of practices under investigation. Faced with many viable perspectives, from traditional wisdom to modern neuroscience, an even more integrative framework can further advance contemplative science. Rather than rely exclusively on existing psychological constructs, further integration can be achieved through novel psychological constructs tailored specifically to account for unique features of meditative experience, including those beyond mindfulness.

### Toward a More Integrative Framework

In describing a primary challenge to the field of meditation research, Ospina et al. (2007) exhort, “we must attempt to identify the components that are common to the many practices that are claimed to be meditation or that incorporate a meditative component” (p. 10). As a step toward determining some of meditation’s central psychological components, we utilize the foundational psychological processes of attention, intention, and awareness to gain a new vantage regarding the cognitive functions most centrally involved in meditation.

**Attention in Meditation** Since its highlighting by William James (1890), investigation of attention has yielded a psychological understanding that spans multiple levels of analysis, from physiological to social (Posner and Rothbart 2007). We define attention, in regard to human information processing, as *a process that modulates the efficiency of processes as they are happening through facilitation and/or inhibition*. For a given process, attention can selectively increase (or decrease) the timeliness, quality, and subjective salience (engagement with awareness) of its output. For example, a meditation practitioner attending to auditory sensations may process environmental sounds rather quickly and fully. While psychological science has long focused on attention, it has been explicitly addressed within ancient meditative traditions for much longer (Anālayo 2003; Davidson et al. 1976). In categorizing meditation practices, Lutz et al. (2008) draw from both scientific and traditional perspectives to distinguish *focused attention* practices, involving sustained selective attention to a chosen object, from *open monitoring* practices, in which attention monitors internal and external domains of experience moment-by-moment.

Meditation entails a diversity of attentional modes not easily described with existing psychological constructs, such as intentional *bare attention*, distinguished from a more habitual style of attention infused with self-interest (Gethin 2011), *attentional balance*, voluntarily sustaining attention so that the mind is neither too excited nor too lax (Wallace and Shapiro 2006; Tang and Posner 2009), *effortless attention and concentration* (Lutz et al. 2008, p. 164; Posner et al. 2010), and *non-attention* (Dunne 2011, p. 7). Even the most influential scientific definition of mindfulness offers a nuanced

depiction of attention: “paying attention in a particular way: on purpose, in the present moment, and non-judgmentally” (Kabat-Zinn 1994, p. 4). Another definition characterizes mindfulness as “*open or receptive* attention to and awareness of ongoing events and experience” (Brown and Ryan 2004, p. 245), with attention understood as a process that “continually pulls ‘figures’ out of the ‘ground’ of awareness” (Brown and Ryan 2003, p. 822). These portrayals exceed customary scientific descriptions of attention, as is evident in the need to qualify extant psychological constructs with more elaborated phenomenological descriptions. Clearly, existing constructs do not suffice for a parsimonious and integrative psychological framework of mindfulness. The challenge to explain such phenomenological aspects in terms better suited for scientific analysis motivates the innovation of new constructs. In order to develop a parsimonious and integrative theoretical framework that reconciles phenomenological and scientific accounts, we next examine intention and present-moment awareness, and then employ these familiar constructs in new ways especially suited for understanding meditation.

**Intention in Meditation** The psychological investigation of decision-making and behavior has long been informed by the construct of intention (James 1890; Ouellette and Wood 1998). Though folk psychology may limit the scope of intentional behavior to only those actions that are consciously controlled, even automatic behaviors can be driven by intentions (cf. Saling and Phillips 2007). Though theorized to play a critical role in both mindfulness (Shapiro et al. 2006) and meditation (Wallace and Shapiro 2006), that literature typically treats intention as a theoretical primitive. For example, intention has recently been characterized as a basis for motivation, inhibition of distraction, and executive monitoring during meditation (Vago and Silbersweig 2012). Consistent with these perspectives, we recognize intention as central to developing an integrative framework of meditative cognition, given its several functional roles in meditation.

First, intention can guide attending—disparate meditation instructions engender distinct intentions to attend, and so styles of meditation can be distinguished according to intentions about attending, such as whether to focus attention on a particular meditation object versus distributing attention more broadly in open monitoring (Lutz et al. 2008). Second, some meditation styles employ intentions that are not primarily about attention, such as compassion or loving-kindness meditations (Hofmann et al. 2011) that focus on heartfelt, well-wishing intentions. Third, intention provides a means for meditation to incorporate practitioners’ goals, values, and beliefs more generally. Wallace and Shapiro (2006) posit that intentional (conative) balance regarding goals and priorities in contemplative practice precedes balance in attention, emotion, and other aspects of mental functioning. Neurophysiological evidence indicates that such intentions can be effective, e.g.,

advanced practitioners during compassion meditation exhibit neural activation patterns indicative of enhanced emotional responses to sounds of human distress relative to meditating novices (Lutz et al. 2008).

Despite its pivotal role in meditation, few clear definitions of intention have been provided. One perspective considers intention “an explicit plan for one’s actions” (Farb 2012, p. 28), while another equates intention to “personal vision” (Shapiro et al. 2006, p. 345). These initial renderings of intention reflect its importance, though greater specificity would facilitate productive theories. A thorough account needs to fit the findings that a person can hold a large number of personally motivated intentions concurrently and implicitly (Bargh and Gollwitzer 1994), and that intentions can guide complex processes, such as voluntarily attending to a meditation object.

To equip meditation researchers with a definition well-suited for creating falsifiable theories, we define an intention as a process that (a) *carries motivational impetus*, (b) *specifies a future goal*, and (c) *increases the likelihood of subsequent information processing that serves that goal*. The degree of increased likelihood may depend on parameters such as motivational intensity, duration of being operative, and engagement with awareness (e.g., explicit or implicit). Numerous intentions may be operative at the same time and mutually interact. Allied intentions, such as wanting to reduce suffering and to increase happiness, have the potential to augment the influence of any single intention. In contrast, disparate intentions may compete for influence, such as during mind wandering, when attention shifts automatically toward personally salient intentions other than one’s explicit, immediate intention (Smallwood and Schooler 2006). Thus understood, intention provides a foundational construct for explaining many processes important to meditation, including motivation, emotion regulation, goal pursuit, inhibition of distraction, executive functions, prospective memory, and mind wandering.

**Awareness in Meditation** Though engagement with awareness may depend on the boosting of processing provided by attention, not all attention leads to awareness. It is therefore helpful to distinguish awareness from attention, which modulates the activity level of various processes, whether implicit or explicit. To clearly distinguish awareness from attention, we define awareness as a process that (a) *entails conscious experience* and (b) *makes information widely available for further processing* (Baars 2002; Grossenbacher 2001). Because attentional functions (e.g., alerting, selecting, and sustaining) can make information available to awareness, changes in attention with meditation are apt to influence conscious experience. Consistent with traditional meditation accounts (Thurman and Jamspal 2004), meditative cognition entails more awareness of that which occurs in present-moment experience (Dunne 2011; Farb et al. 2007; Sauer et al. 2012). Numerous empirical findings corroborate this,

such as reduced disruption of detection awareness by continued processing of a recent event (in an Attentional Blink paradigm; Slagter et al. 2007). Additionally, multiple findings link a particular style of focused attention meditation (shamatha) with greater visual discrimination awareness (MacLean et al. 2010) and greater conscious discrimination of emotional intensity (Sze et al. 2010). Despite widespread agreement about the importance of present-moment awareness to mindful attention, scientific depictions typically treat this awareness in a broad and nonspecific way (e.g., Bishop et al. 2004; Hölzel et al. 2011).

Reconciling phenomenological and scientific accounts of present-moment awareness poses challenges for both definition (e.g., what constitutes the present moment) and measurement. Scientific studies tend to overlook the subjective qualities of present-moment engagement, such as clarity or depth (though see Baijal and Srinivasan 2009; Francken et al. 2011), that characterize awareness in meditative or mindful cognition (Bodhi 2011; Brown and Ryan 2003). In addition, the breadth of immediate occurrence that may engage with awareness needs accounting for, as each moment entails a wide expanse of sensory and mental events that can potentially stream through awareness. Prior theoretical work indicates important nuances in present-moment awareness, including variation in depth (i.e., degree of vividness, attunement to moment-by-moment sensory experience; Lutz et al. 2007) as well as breadth (e.g., engaging multiple sense modalities concurrently or encompassing both sensory and cognitive processing; Brown et al. 2007b; Grabovac et al. 2011). Present-moment awareness also influences other psychological processes (Brown et al. 2007b; Grabovac et al. 2011; Lutz et al. 2008; Teper et al. 2013), such as curtailing habitual, affective reactions to sensations and thoughts (Grabovac et al. 2011). The current challenge to a parsimonious account of meditative cognition concerns appropriately treating present-moment awareness, as well as attention and intention.

## Contemplative Cognition Framework

The processes of attention, intention, and awareness have been treated largely as theoretical primitives for understanding mindfulness and meditation. To create a more integrative framework, we have precisely defined these processes, and will now configure them into new psychological constructs. The resulting framework risks appearing deceptively simple, yet the three attention-related constructs introduced below (intended attention, attention to intention, and awareness of transient information) provide a parsimonious basis for psychologically delineating complex and nuanced contemplative experience. This novel rendering of meditative processing helps to reconcile phenomenologically guided theorizing

about embodied mind during meditation with the growing corpus of empirical work (see Abbott 2008).

### Intended Attention

We define *intended attention* (IA) as *attending that has been specified by an intention primarily about attention*. IA can combine multiple attentional operations, including disengaging, shifting, engaging, sustaining, monitoring, modulating scope of focus (e.g., distributing narrowly or broadly), and the manner of attending. IA comprises all attending that has been made more likely by virtue of intentions that specifically invoke attention, even when attending has been subject to additional influences. While IA also includes attending driven by intentions about awareness, which necessarily requires attention, it does not include attending that has been facilitated by intentions that focus solely on specific objects or events, which only instrumentally involve attention (e.g., intention to relax, which facilitates attention to breathing). Though not previously delineated in this particular way, IA has already been implicated in meditative experience (Shapiro and Schwartz 2000; Wallace and Shapiro 2006). IA accommodates several varieties of volitional influence on attention: in comparison to particularly effortful control, IA can entail less effortful attending “with a light touch”—gently guided, invited, or even aspired. As depicted in Table 1, the new theoretical construct of IA parsimoniously accounts for meditation’s effects on attention in comparison to extant constructs created in research contexts that were not concerned with mindfulness or meditation.

Thus understood, IA can account for the voluntary control of various attention parameters and functions. For example, a single intention (e.g., to sustain unwavering attention on a candle flame or other meditation object) may encourage both monitoring to detect any attention drifts away from the object and if so, modulation of attention back toward the meditation object. IA can also readily account for a diversity of attentional modes, whether between and within practice styles (e.g., bare attention, effortless concentration), due to the wide variety of intentions that may specify parameters of attention. A set of intentions to focus but also “rest” attention on the meditation object could support decreasing effort while improving attentional stability. Just as both explicit and implicit motivations can drive attentional effort (Sarter et al. 2006), so too IA, whether the intention is conscious or not, can foster mental stability in which attention is less drawn toward distraction. From a practitioner’s perspective, the subjective aspect of robust IA may entail a sense of stable focus. If a particular process of IA becomes automatic through repetition, e.g., consequent to sufficient practice, automatization need not imply lack of intention (Saling and Phillips 2007). For example, an experienced Zen archer may automatically and effortlessly disengage from distracting noises as she tightens the bow string,

**Table 1** Contemplative cognition predictions with related extant constructs and tasks

Contemplative cognition construct	Predicted effect of enhancement	Related extant constructs	Related extant tasks <sup>a</sup>
Intended attention (IA)	Improved intentional modulation of diverse parameters of attentional function	Selective attention, sustained attention, voluntary attention	Attention Network Test (orienting subtest), d2 Concentration and Endurance Test, Continuous Performance Test, Sustained Attention to Response Task
Attention to intention (A→I)	Increased facility in monitoring and/or modulating the efficiency of intending	Inhibitory control, prospective memory, task switching	Go/No-Go, Prospective memory tasks, Stroop task, Trail Making Test
Awareness of transient information (ATI)	Increased temporal fidelity of awareness	Detection sensitivity, discrimination	Attentional Blink Task, Critical Flicker Fusion Task
Contemplative cognition <sup>b</sup>	Greater readiness to intentionally engage current context	Executive control, working memory	Attention Network Test (executive subtest), Operation Span Task, Symbol Digit Modalities Test

<sup>a</sup> The extant tasks listed relate most directly to assessing the extant constructs, and new tasks may better and more comprehensively assess variation in contemplative cognition and its three components. This depiction focuses on tasks because they are amenable to both phenomenological and/neurophysiological approaches

<sup>b</sup> Since contemplative cognition entails integrative functioning of IA, A→I, and ATI, it also relates to the extant constructs and tasks listed for each component.

without consciously intending how to attend—enjoying the fruit of many hours of purposeful concentration during practice of contemplative kyudo (meditative archery).

### Attention to Intention

As defined earlier, intentions increase the likelihood of subsequent information processing serving a specified goal, and the strength of influence on processing engendered from a given intention may vary over time, which indicates the possible role of modulatory mechanisms. Indeed, people can attend to a specific, presently-held intention, as evidenced by differential patterns of brain activity during attention focused on an intention to act, compared to attention directed to the intended action (Lau et al. 2004). So too, the strength of a presently held intention can be diminished, as marked by brain activity

during (attentional) inhibition of an intended action versus acting upon the intended behavior (Brass and Haggard 2007). These studies show, through neuroscientific evidence, that a person can attend to (or away from) an intention. Additional support for attentional modulation of intentions comes from research suggesting that attention accounts for early selection and maintenance of goal-relevant information during proactive cognitive control, as well as re-selection and dynamic weighting of goal-relevant information according to task demands (reactive cognitive control; Braver 2012; Abrahamse et al. 2013). Such findings suggest that attentional modulation of intentions enable regulation of behavior (Lau et al. 2004), including whether and when behavior occurs (Brass and Haggard 2008).

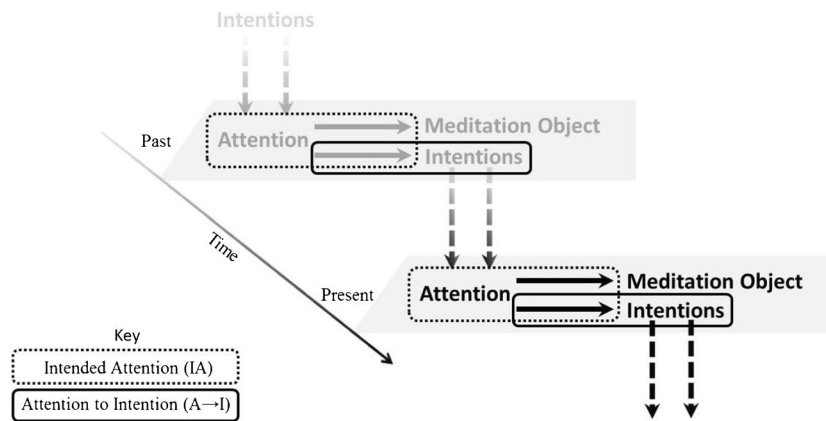
Recognizing a rather sophisticated metacognitive process in meditation, we define *attention to intention* (A→I) as *attentional modulation and/or monitoring of an intention*. Note that both IA (intended attention) and A→I (attention to intention) combine attention and intention, are closely interrelated, and could be confusable. To reinforce their distinction, an arrow indicates the present-moment operation of attention on intention in (A→I), distinguished from the temporally extended influence of previous intention on current attending in (IA). In A→I, attention regulates the efficiency of current intending, whether through facilitation of a selected intention, inhibition of competing intentions, sustaining an already operative intention, and/or re-engaging one that has waned. For example, an intention to meditate for 30 min without stopping can be supported via inhibiting a countervailing intention to mentally plan one's day. In addition, A→I can also *monitor* an intention's activation level. Remaining mindful as one enjoys a cup of tea can be supported by tracking the intention to do so, monitoring that allows noticing if the intention wanes. In order to uphold an intention, attention may modulate various aspects such as intensity, duration, and engagement with awareness (i.e., explicit vs. implicit). Though A→I does not require consciously holding an intention, its selective aspect does have the potential to keep an operative intention highly activated, perhaps in working memory, consistent with evidence that the fulfillment of previously established activity-based intentions depends on attention during the activity (Brewer et al. 2011). As depicted in Table 1, the new theoretical construct of A→I efficiently accounts for meditation's effects on attitudes, feelings, and thoughts that can be intentionally held or discounted, in comparison to extant constructs not originally pertaining to mindfulness or meditation.

Though attention to a meditation object captures something important about meditation, overlooking the role of intention disregards the conative context that gives rise to that attention (IA), along with any real-time regulating of relevant intentions (A→I). From a practitioner's perspective, intentional engagement of attention can benefit from recurrently sustaining one's

meditative intentions. Practices that emphasize IA may be facilitated by A→I, e.g., by cultivating intentions regarding attention, but there are also practices that target A→I more directly. The intentions that get modulated though A→I vary greatly across different practice styles, and can include intentions that are about attention as well as intentions that are not. For example, both compassion meditation (Lutz et al. 2009) and loving-kindness meditation (Fredrickson et al. 2008; Salzberg 2011) encourage selecting, sustaining, and monitoring intentions concerned with others' wellbeing. More generally, the so-called *form meditation* practices that focus on intention-laden emotions, mantras, sounds, visualizations, etc. (Sedlmeier et al. 2012) rely heavily on A→I. Because of the abundance of intentions that an individual may hold, including intentions that pertain to contemplative states, A→I helps to account for the influence of conceptual and cultural contexts on meditative cognition. For example, some Buddhist practitioners formally vow to devote themselves to benefitting others (Williams 2008), a relatively general intention that could interact dynamically with more specific intentions during meditation (e.g., aspiration to remain attentive to one's distressing thoughts and emotions to better understand the pain of others; cf. Feldman and Kuyken 2011; Lutz et al. 2008). In daily life, such training in A→I could support more skillful modulation of the presence, timing, and expression of intentions (and derivatively, the thought, emotion, and behavior engendered by intentions) in a manner consistent with one's values and beliefs.

### Cooperation of Intention and Attention

Some of the subtleties of mindful attending have been characterized as interplay between voluntary and stimulus-driven control of attention, e.g., while meditators perform vigilance tasks (MacLean et al. 2009). Precise description of such interplay appears critical for understanding attention regulation in meditation, and the new constructs of IA and A→I serve to clarify this attentional equilibrium. (To review, in IA, previous operation of an intention has increased the likelihood of particular attentional processing; in A→I, attention monitors and/or modulates the process of intending in real-time.) Over time, *mutual engagement between IA and A→I* (see Fig. 1) enables coherent mental governance through their reciprocal influence. When IA and A→I mutually engage, both intention and attention can dynamically adjust according to the monitored workings of IA and A→I, thereby optimizing attentional control. More specifically, the reciprocation between mutually engaged IA and A→I affords ongoing monitoring and modulation of their own functioning. For *monitoring*, IA can guide A→I to select intentions that pertain to monitoring IA; likewise A→I can select intentions that guide IA toward monitoring A→I. To *modulate* intending in response to this monitoring, IA can guide A→I to select



**Fig. 1** Mutually engaged intended attention and attention to intention in meditation. As depicted by *dashed arrows*, intentions (which need not be conscious) increase the likelihood of subsequent attentional processing, whereas attention monitors and modulates current processes (*solid arrows*). At the earlier (*Past*) point in time, previous intentions to attend (e.g., to focus on the meditation object “with a light touch”) influence attentional selection. At the same time, a related intention to sustain this intended attention over time will influence subsequent attentional selection, including at the next point in time (*Present*). At this second

point in time, this same process is reiterated, with the potential for fine-tuning attention and intention to optimize meditation experience over time. Note that attention can be governed by multiple intentions, e.g., attending to the meditation object as intended, and sustaining intended attention. When IA and A→I are mutually engaged, intention guides attention, and the same intention(s) that regard attention can themselves be monitored and sustained by attention. (Though IA appears first in this illustration, either component could initiate a period of reciprocal influence.)

intentions that will bolster its performance, and A→I can select intentions that strengthen the performance of A→I via IA. Thus, IA and A→I cooperating together can dynamically tune their respective operation.

For example, suppose that a meditator intends to keep attention distributed across sounds occurring anywhere in the immediate environment. If the meditator’s attending to environmental sounds (IA) becomes distracted by a strong and compelling train of thought, then selectively boosting meditative intentions (A→I), whether implicitly or explicitly, could help the meditator to disengage from thoughts and again stabilize attention on auditory sensations. When aligned in this way, cooperating attention and intention may range from tight control to calm fluidity: one might concentrate on a meditation object so intently as to preclude awareness of anything else, or one could attend with sensitivity to novel information that might crop up, in a fluid balance between top-down and bottom-up influences (MacCoon et al. 2005).

This mutual engagement of IA and A→I can help address outstanding theoretical issues in the scientific study of meditation. For example, meditative attention might either involve *reduced effort* (cf. Lutz et al. 2008; Dunne 2011) or *increased attentional effort* (based on the finding that mindfulness-trained participants scored no better on some attention measures than did controls offered a monetary incentive; Jensen et al. 2012). However, the same psychological process need not underlie each group’s improvement—mindfulness trainees may have *improved because of an enhanced regulatory efficiency provided by mutually engaged IA and A→I*, rather than the increased attentional effort that was presumably driven by monetary incentive in the comparison group (cf. Zanesco et al. 2013).

### Present-Moment Awareness

Without present-moment awareness, even the most skillful shepherding of intention and attention could miss the mark. Indeed, a new behavioral measure operationalizes mindfulness according to sustained present-moment awareness (Levinson et al. 2014). As a step toward creating a new theoretical construct to specifically reflect “being in the present moment,” we first *define transient information as information in mind about present-moment experience as it happens*, arising freshly each moment—the ephemera of moment-to-moment experience. Here the noun *information* does not imply anything lasting, because present-moment occurrence is ever shifting from one unique, time-specific instance to another. While determining the precise temporal aspects of transient information falls outside the scope of this paper, prior research has suggested various durations for the lived present (Varela 1999). Whatever the brief duration of an experiential present moment, transient information comprises a constantly refreshing cusp of immediacy in a recurring opportunity for engaging with awareness. Indeed, many practices use objects of meditation that repeatedly shift across moments (e.g., breathing sensations, candle flame), thereby keeping readily noticeable (supra-threshold) transient information available to awareness. From a practitioner’s perspective, staying present with, and coming back to, awareness of this information enables one to stay in touch with “the now.”

We thus consider *awareness of transient information (ATI)* an important component of meditation and related states in which *awareness engages information in mind about present-moment experience as it happens*. ATI specifies, in

precise terms amenable to scientific investigation, the present-moment emphasis widely attributed to meditation (e.g., Dunne 2011; Farb et al. 2007; Levinson et al. 2014; Sauer et al. 2012). ATI includes awareness of transient *sensory* information (e.g., subtle shifts in throbbing pain), as well as transient *mental* events (e.g., the flow of thought). Thus, ATI has the potential to include much of the mind's information processing hierarchy, from cognizance of moment-by-moment shifts in early, pre-conceptual sensory afference, to witnessing the highest levels of abstract thinking. Indeed, awareness of transient information about a cognitive process provides the key to recognizing conceptualizations as transient processes that arise and pass away, which appears in several depictions of mindfulness (e.g., Grabovac et al. 2011) and meditation (e.g., Mejer 1991; Teasdale et al. 2002) and is reflected in the common meditation instruction to observe one's thoughts as though they were clouds passing through the sky (Gyatso 2000). As depicted in Table 1, the new theoretical construct of ATI efficiently accounts for meditation's effects on awareness in comparison to constructs that were previously created in research contexts not originally concerned with mindfulness or meditation.

ATI consciously engages the occurrence of one's immediate (and relentlessly transitory) experience and provides a means for describing variation in awareness. For example, just as the scope of attention varies, ATI may also vary in scope of content, from narrow engagement with a sensation to wider awareness of the entire experiential field. In addition, ATI may vary in the extent to which transient information in awareness is made available for input to further processes, a functional parameter of awareness which could underlie the subjective dimensions of clarity, vividness, or salience reported by meditators. ATI parsimoniously accounts for both traditionally reported range in vividness and depth of meditative processing (Trungpa 2008), and neurophysiological observations of enhanced early representation of stimuli (Cahn et al. 2013).

### **Integrative Functioning of Three Attention-Related Processes**

Reciprocation between IA and A→I already offers explanatory power, but something important happens when cooperating intention and attention connect with the present moment (ATI). These three processes, each reflecting a distinct role that attention serves in the meditating mind, can function together in various configurations that enable differing forms of coherent metacognition (cf. Jankowski and Holas 2014). We distinguish this as *contemplative cognition, defined broadly as integrated functioning of IA, A→I, and ATI*.

The integrative functioning of IA, A→I, and ATI may be supported by the involvement of attention in each component, facilitating metacognition about attention, intention, and

awareness. Attention can be guided, afforded, or constrained by intention (IA), attention can select, monitor, and sustain intentions (A→I), and attention supports awareness of transient sensory information as well as mental events as they occur (ATI). Each component can be bolstered by the others. For example, the selectivity of IA can increase through real-time feedback and calibration supported via ATI, along with the monitoring and boosting of intentions to attend by A→I. Also, the regulatory influence of A→I can be bolstered by intentional guidance (IA), or by ATI's effect of quelling distracting conceptual elaborations and contradictory intentions by foregrounding information about the here-and-now. Further, ATI itself can be facilitated by the stability of focus achieved by meditative IA, or by intentions pertaining to ATI that may be boosted by A→I. Finally, the dynamic interrelations between any two of these three components can be supported by the third, and vice versa. In one such instance, awareness of the real-time functioning (ATI) of intention and attention can enable mutual access and availability of information helpful for fine-tuning the cooperation between IA and A→I. For example, a contemplative practitioner might notice that the striving quality of intending to effortfully concentrate increases mind wandering, and she may subsequently adopt the intention to reduce her effort and discern whether doing so lessens distractibility. As depicted in Table 1, the new theoretical construct of contemplative cognition provides a parsimonious way to account for meditation's effects on the configuration of interrelated processes that influence a wide range of mental activity.

Let us examine some of these intercomponent dynamics using a specific type of meditation as an example. During focused attention practices such as shamatha, practitioners intend to attend to the meditation object (e.g., sensations of breathing), thereby increasing the likelihood of so attending (IA). Because respiratory sensations dynamically update, they provide a renewing source of transient sensory information. Practitioners can thereby recurrently utilize ATI (e.g., maintained or diminishing awareness of respiratory sensations) as input that can inform the intentional tuning of attention so as to better ensure that sensations of breathing are foregrounded in consciousness. Along with IA to breathing, a practitioner may also (perhaps unconsciously) select and monitor the intention to attend to the breath (A→I), promoting ongoing focus on sensations of breathing, e.g., by inhibiting meditation-irrelevant intentions. Other intentions affiliated with IA to breathing (e.g., the long-term goal of stabilizing one's mind) may support disengaging attention from objects other than the breath, and attention may also select these allied intentions (A→I). Mutual engagement of IA and A→I thus accounts for dynamic aspects of maintaining and returning attention to the breath, while real-time monitoring of this mutual engagement (ATI) could contribute to refining meditative attention.



## Contemplative Cognition, Emotion, and Enhanced Regulatory Processing

An important critique of a largely cognitive approach to describing meditation concerns limitations in its ability to account for so-called “hot” features of affective information processing (Pessoa 2008). Mindfulness is most often delineated according to differences in cognitive processes, primarily attention and awareness (Quaglia et al. 2015). Thus, the focus on these processes, together with intention, is consistent with theoretical precedents in the investigation of meditation, yet broader consideration of diverse styles of contemplative practice warrants fresh consideration of emotion-related aspects of meditation. Indeed, numerous forms of meditation explicitly induce positive emotions such as compassion or loving-kindness (Hofmann et al. 2011), while others foster equanimity, an even-handed approach to experience that refrains from favoring experience having either positive or negative emotional value (Wallace 1999). In both cases, intentional working with emotion involves emotion regulation, broadly construed.

Despite moderate empirical support for the beneficial effects of meditation on emotion regulation (Sedlmeier et al. 2012), and notwithstanding theories that posit emotion regulation as an important component of mindfulness meditation (Hölzel et al. 2011; Vago and Silbersweig 2012), the relation between emotion regulation and intrinsic meditation processes remains unclear. Specifically, emotion regulation has been construed as both active component (Hölzel et al. 2011) and outcome (Chambers et al. 2009) of meditation. This lack of clarity may stem in part from the basic problem of differentiating emotion from its regulation (Todd et al. 2012), but it could also reflect the challenge of trying to disaggregate cognitive and affective aspects of meditation.

By affording greater theoretical specificity about cognitive-affective processes intrinsic to mindfulness and meditation, the contemplative cognition framework can help clarify contemplative emotion regulation. For example, according to an account of mindful emotion regulation (see Teper et al. 2013), enhanced present-moment awareness may facilitate executive control of emotion by heightening sensitivity to events that signal the need for regulation. In the context of the contemplative cognition framework, ATI describes heightened awareness of present-moment events, both internal and external, that can inform about the need for regulation moment-by-moment. Regarding the facilitation of executive control, IA can function together with A→I to support stability of attending-as-intended and quelling of emotion-related interference in current task performance. Though consistent with Teper et al.’s (2013) account of mindful emotion regulation, the contemplative cognition framework extends to enhanced emotion regulation beyond mindfulness meditation. For example, a practitioner of compassion meditation focused on sustaining a heartfelt intention to reduce the suffering of all

beings may efficiently notice, via ATI, the onset of a judgmental thought about oneself that could, if left unregulated, trigger strong emotion incongruent with sustaining attention on their compassionate intention. Consequently, the meditator may boost activation of their heartfelt intention through A→I, along with an allied intention to include oneself in the scope of loving-kindness, decreasing any interference of the judgmental thought on the stability of their IA. In addition to these more top-down influences of intending on emotion, emotional processing can facilitate or hinder cognitive control mechanisms to varying degrees (cf. Pessoa 2009), such as how ATI regarding sensations of warmth in one’s chest could facilitate congruent intention and attention. Thus, emotion may reciprocally support the integrative functioning of IA and A→I, and greater sensitivity to emotion-relevant information (ATI) may help guide this integration.

Meditation-related improvements in emotion regulation may also be driven by monitoring emotion’s visceral aspects, without altering the subjective affective experience (in contrast to reappraisal accounts of emotion in which affective distress is perceived as problematic and in need of alteration; Farb et al. 2010). This suggests that not all contemplative states necessitate emotion regulation; indeed, contemplative cognition may be employed so to *not* actively inhibit or otherwise regulate emotion. In the context of contemplative cognition, improving the regulation of attention (through cooperating IA and A→I) and present-moment awareness (ATI) constitutes both a means and a goal of meditation training, with ramifications for emotion regulation both during and post-training. This may help to explain why emotion regulation has likewise been construed as both active component and outcome of meditation. Further consideration of relations between the contemplative cognition framework and affective processing could aid in clarifying emotion-related concomitants and consequences of meditation. More broadly, contemplative cognition could support enhanced regulatory processing beyond emotion to the extent it involves more conscious interplay of attention, intention, and awareness.

## Advancing Theory-Driven Mindfulness and Meditation Research

A broad and integrative approach to understanding mindfulness and meditation is called for because research progress has been fundamentally hindered by confusion about their definition (Davidson 2010; Ospina et al. 2007). The *contemplative cognition framework* comprises IA, A→I, and ATI, as well as *their integration*, and provides a general structure suited for not only theorizing about mindfulness and other types of contemplative practice (including those originating outside of Buddhist contexts), but also relations among trainings, states, and traits (e.g., role of training in development from states to traits, cf. Cahn and Polich 2006).

## Mindfulness through the Lens of Contemplative Cognition

How might introducing such a framework help to clarify debates within mindfulness research? While millennia of experience in many languages and cultures indicate that the term *mindfulness* is useful for teaching and learning meditation, its utility as a scientific construct is compromised by ambiguity, vagueness, and definitional confusion. The contemplative cognition framework helps to overcome terminological and definitional discrepancies in mindfulness research (cf. Davidson 2010) through analyzing meditation practices and allied states and traits in terms of shared underlying processes. In so doing, contemplative cognition may serve to discourage reliance of the term *mindfulness* to designate commonalities of diverse practices and experience. As noted, mindfulness does not account for practices such as loving-kindness, compassion, or visualization (Hofmann et al. 2011; Kozhevnikov et al. 2009), whereas the term *contemplative* has already been applied in ways that accommodate these and other diverse kinds of meditative experience. Thus, contemplative cognition refers to what is shared across diverse practices and experience without serving the double duty of also naming a distinct practice style or experience in the way that *mindfulness meditation* or *mindful state* do.

With its parsimonious set of three innovative attention-related constructs, the contemplative cognition framework can also support a nuanced examination of the similarities and differences among distinct characterizations of mindfulness. Consider, for example, the debated role of *nonjudgment* in theories of mindfulness (Brown et al. 2007a), given mindfulness meditation instructions that specify not judging whatever arises. From the perspective of contemplative cognition, suspending judgment of immediate experience can be supported by an intention to do so, which itself can be bolstered via A→I. Nonjudging may also derive naturally from ATI keeping present-centered meditative cognition from disheveling into narrative proliferation. Thus understood, contemplative cognition clarifies how an experiential sense of nonjudgment (accessed phenomenologically) may be produced in meditation either via implementing an explicit meditation instruction through intention(s) that can be selected and sustained via A→I, or as a consequence of awareness of transient mental information monitoring for thoughts and feelings.

### Distinct Practices Share Processes

Beyond mindfulness, regarding contemplative practices and experience more broadly, it is important to note the risk of a general approach trivializing important distinctions between practices (Lutz et al. 2007). Yet the contemplative cognition framework accounts for the intentional use of attention to engage with awareness that is shared across diverse practices

and related states and traits, while also leaving plenty of room for considering the role of additional processes for specific practices. Given concern regarding overly general use of the term *meditation* (Lutz et al. 2007), we suggest the contemplative cognition framework can help specify boundary criteria of meditation as *an activity suited for effectively inducing contemplative cognition and its components*. From this perspective, meditation training and practice can increase the efficiency, potency, and integration of IA, A→I, and ATI, and thereby their ramifications across cognitive, emotional, and somatic domains.

This approach offers a theoretical basis for considering common aims and features of distinct meditation practices without glossing over their distinctions. Because IA, A→I, ATI, and contemplative cognition do not constrain contextual and other distinctions among individual practices, attempts at *comprehensively* accounting for cognition during specific practices and experience will need to involve additional processes. However, the foregrounding of intention in the contemplative cognition framework facilitates greater differentiation among practices according to distinct intentions. For example, differences between focused attention and open monitoring styles of meditation may primarily derive from different intentions for attention. Beyond differentiation by intentions, variation in emphasis, deployment, efficiency, potency, and integration of contemplative cognition components can help distinguish distinct types of meditation practice.

### Steps toward a Naturalized Science of Meditation

Effective meditation practice involves more than just sitting quietly for a specified period. Just as two people could spend the same amount of time at a gym but experience different results depending on exertion, type of exercise, individual characteristics, etc., so too they could practice meditation for equal time yet differ in results. The contemplative cognition framework helps to integrate the field of meditation research by delineating processes entailed by meditating; yet engaging in formal practice is neither sufficient nor necessary for causing contemplative cognition. Though meditative practices commonly involve training contemplative cognition components, practicing meditation is *not sufficient* for eliciting contemplative cognition, since a given practice session need not successfully elicit IA, A→I, or ATI. So too, meditation is *not necessary* for contemplative cognition because IA, A→I, ATI, or their integration may occur outside the context of formal practice and training, i.e., both “on and off the cushion.” Because applying meditation principles in everyday life may be as important as formal practice (Davidson 2010), occurrence of contemplative cognition or its components outside of planned sessions may be as efficacious as formally practicing meditation. Though neither strictly necessary nor sufficient, contemplative practice appears critical for cultivating contemplative cognition and its consequents. To the extent

that learning persists across activities, contemplative cognition during practice should facilitate its spontaneous occurrence outside of formal practice, and vice versa. Importantly, this broad-based approach can account for several complicated facets of training, such as variability in efficacy of practice, combination of multiple practices, and training that includes more than formal practice.

**Practice Quantity versus Quality** Research on the effects of diverse styles of meditation has quantified “dose” as time spent practicing (e.g., Davidson 2010; Hasenkamp et al. 2012). However, experience during a practice session can vary greatly, both between and within individuals, and could be influenced by various factors. A review of mindfulness meditation studies found only equivocal support for a direct relationship between compliance for assigned meditation practice and outcome variables, and admonished researchers “to determine the extent to which ‘mindful’ states actually comprise periods of home practice” (Vettese et al. 2009, p. 222). A comprehensive report from the National Institutes of Health recommended that “Greater importance should be placed ... on reporting the criteria and methods used to determine a successful meditation practice” (Ospina et al. 2007, p. 210). One kind of criterion for successful meditation is performance of the requisite technique as instructed (Ospina et al. 2007), and contemplative cognition offers an approach to understanding and, given appropriate measures, assessing variability in this performance.

How might the contemplative cognition framework facilitate quantification of the quality of meditative experience? First, unlike extant constructs created in research contexts not originally concerned with mindfulness or meditation, components of the proposed framework were developed to delineate core aspects of meditative mind. This will enable more targeted, theory-driven assessment of processes that matter for understanding meditation’s effects. Second, these core components employ terms familiar to scientists and contemplatives alike, providing more opportunity to connect variation in processes through self-report with other levels of analysis. Whether due to practice compliance or efficacy, variation in the frequency and intensity of contemplative cognition and its components could be assessed in a variety of ways (both during formal and informal practice) to qualify practice, an important step toward quantifying effective practice time. This approach to quantifying important aspects of meditation might account for and refine the predictive power of practice time. Disentangling actual occurrence of contemplative cognition, or its components, from overall time spent in training sessions is like distinguishing between duration of physical activity and total time spent at a gym (which might include inactive periods). Whether in meditation or physical exercise, the work accomplished both during the focused activity and throughout the day may contribute to the net result.

**Training Includes More Than Practice** Contemplative training can facilitate contemplative cognition and its consequences through instruction, formal and informal practice, and also reading, lecture, study, etc., which is customary in many traditions and modern interventions. Also, to the extent that contemplative cognition may be evident in behavior (e.g., Choi et al. 2012; Michalak et al. 2011), exposure to role models who embody contemplative cognition could facilitate training through observational learning. Traditional contexts provide teachings, including many regarding attention, intention, or awareness, that influence practitioners’ experience during practice and beyond. The initialization of a person’s first intention to attend meditatively appears critical for learning new ways of engaging one’s mind: instruction can introduce previously unbeknownst intentions regarding attention and awareness, transmitting contemplative forms of IA to new practitioners—once a meditative intention is held in mind, then subsequent attention and awareness may be influenced accordingly. Intention is also important for staying motivated to continue practicing, and A→I helps to explain the maintenance of such intentions over time. For example, to the extent that traditional vows, rituals, artwork, etc. can reinforce such intentions, contextual factors could facilitate A→I and thus enhance meditation training.

## Conclusion

While millennia of experience reflects the usefulness of the term *mindfulness* for teaching and learning meditation, its utility as a scientific construct is compromised by polysemy, vagueness, and definitional confusion. Against this backdrop, meditation research has proceeded without guidance from highly integrative theory, driven primarily by developments pertaining to a single practice or intervention. Identifying the processes intrinsic to mindfulness and meditation is needed (Kabat-Zinn 2011; Walsh and Shapiro 2006) to scaffold the development of falsifiable and productive theories (Ospina et al. 2007; Sedlmeier et al. 2012). Prior theoretical work has motivated the innovation of three attention-related processes: intended attention (IA), attention to intention (A→I), and awareness of transient information (ATI). Their integrative orchestration in contemplative cognition offers a parsimonious, coherent and integrative approach to understanding not only mindfulness, but also various other contemplative states, traits, and trainings. The contemplative cognition framework supports theorizing about the role of emotion, embodiment, worldview, and contextual factors in distinct contemplative practices. Though additional investigation is needed, this parsimonious psychological framework can readily promote theory-driven research on diverse meditative experience from both first- and third-person perspectives. In addition to specific predictions outlined for

contemplative cognition and its components (see Table 1), the potential for the three components introduced to be central to diverse contemplative training and experience is itself a falsifiable prediction. By delineating integrative psychological processes specifically targeted by meditation training, this innovative framework charts a course for the development of self-report, behavioral and physiological measures of IA, A→I, ATI, and their interaction in various modes of contemplative cognition. Aiming to carve meditative mind at its joints, the contemplative cognition framework takes an important step toward a more incisive, widely representative, and theory-driven field of meditation research.

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#### Compliance with Ethical Standards

**Conflict of Interest** The authors declare that they have no conflict of interest.

**Ethical Approval** This article does not contain any studies with human participants or animals performed by any of the authors.

**Informed Consent** This article does not contain any studies with human participants performed by any of the authors.

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