Meditation and Hypnosis at the Intersection Between Phenomenology and Cognitive Science

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Abstract Cognitive scientists increasingly turn to contemplative practices such as hypnosis and meditation to shed light on consciousness and cognition. By their very nature, such practices call scientists to address the qualitative, lived experience of the subject. Yet, while the rise of contemplative techniques in neuroscience research has highlighted the importance of incorporating subjective experience within the empirical sciences of mind, the practical reality of marrying first- and third-person methods remains largely unactualised. Given that hypnosis and meditation exert powerful influence on subjective experience, we propose that they can serve as potent instruments for elucidating the structures and mechanisms of conscious experience in cognitive science settings. Here we discuss the motivation for a so-called 'neurophenomonological' approach and outline recent findings from the domains of hypnosis and meditation. Concrete examples illustrate how such contemplative practices can go beyond their place as objects of investigation to emerge as complementary experimental tools, thereby advancing the synthesis of scientific and phenomenological studies of mind (This article draws on ideas and expositions that ML and AR authored in the introduction of a 2012 special issue on hypnosis and meditation in *The Journal of Mind-Body Regulation* (see volume 2, issue 1)).

Neurophenomenology and the Gesture of Awareness

Following a few early studies that highlighted the inaccuracy of introspection (e.g., Nisbett and Wilson 1977), throughout much of the twentieth century cognitive scientists largely eschewed subjective reports. Efforts shifted instead toward

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understanding the workings of the brain, leading to major progress in regard to neuroimaging technology and brain models (Bandettini 2012). Alongside the emergence of the neuroimaging era, however, some cognitive researchers began to reflect on the value of refining scientific accounts of conscious experience. They realised that if they were to elucidate how and why experiences emerged from biological processes in the brain, they needed careful descriptions of those very experiences they sought to explain (Lutz 2004). However, while we are now equipped with a plethora of advanced methods for imaging and modelling the brain, first-person methods for describing and theorizing about phenomenal experience continue to lag behind.

In response to this practical discrepancy, in the 1990s Francisco Varela notably proposed "a quest to marry modern cognitive science and a disciplined approach to human experience" (Varela 1996). He coined this approach 'neurophenomenology,' a mission to establish a method within the cognitive sciences for acquiring descriptions of conscious experience such that they could be integrated with third-person cognitive and biological accounts. Neurophenomenology is based on the notion that with appropriate training, participants can reliably generate and sustain specific experiential states and provide accurate reports on those states (Lutz and Thompson 2003). Researchers can then analyse such reports alongside behavioural and neurobiological data, eventually establishing "strong reciprocal constraints between phenomenological accounts of experience and cognitive-scientific accounts of mental processes" (Lutz and Thompson 2003, p. 48).

Importantly, neurophenomenology does not propose a return to the introspective techniques of early twentieth-century psychology. Such "naïve" introspection assumes that we have the ability to observe our experience as we might uncritically observe an "inner visual field" (Varela 1998, p. 32). Instead, neurophenomenology situates itself as an extension of various contemplative lineages including Husserlian Continental Phenomenology and Eastern meditative traditions such as Buddhism. In contrast to the inwardly reflective, meta-cognitive turn of psychological introspection, these contemplative traditions aim to study subjective life by putting aside the presuppositions that suffuse our ordinary encounters with experience and engaging in a more reflexive and embodied meta-awareness of the experiential field. Although the terms designating such awareness and the subtleties of its application differ between traditions, for the purposes of this paper we refer to the overarching concept of meta-awareness (for a detailed comparison between Buddhist notions of mindfulness and Continental descriptions of phenomenological reduction, please see (Varela et al. 1992)). In a recent account, phenomenologist Daniel Schmicking sketches this gesture of meta-awareness as a practice of setting aside commonsensical and scientific beliefs about experience, metaphysical realities, and an extended narrative self (2010). Although Schmicking says that the function of this practice is "to step back from the situation" (p. 42), clearly we can never step wholly outside of our experience to some impartial position. Instead, the movement of awareness must involve stepping back from our usual *absorption* in the mental contents under investigation. The difficult task of phenomenology, therefore, is to observe and describe experiences impartially, without cognitive bias, whilst living through them

subjectively. For the scientist advancing a neurophenomenological approach, moreover, the crucial challenge is to enable the research participant to foster this gesture of awareness.

While traditional Continental Phenomenology hardly addressed the critical issue of how to actually practice and achieve meta-awareness, recent accounts have begun to outline an embodied method of phenomenological awareness, often drawing on contemplative accounts of Buddhist mindfulness practices (Depraz et al. 2000, 2003; Steinbock 2004; Thompson 2006). Inspired by these recent integrative efforts, here we characterise the practice of meta-awareness as the reflexive skill of bringing experiential *processes* into focus without being swept up by absorption in particular experiential *contents*. Contents include perceptual phenomena such as sights and sounds, as well as conceptual items such as discursive thoughts and internal imagery, and perhaps also more vague and pervasive embodied experiences such as moods and affective states. Processes, on the other hand, refer to the structural and temporal relationships that determine the mode of appearance of these different contents – i.e., more fundamental experiential structures such as selfhood, intersubjectivity, temporality, and spatiality. The gesture of meta-awareness involves adjusting the aperture of attention to reframe experiential contents in the wider focus of the structural and temporal relationships that hold between them.

The crucial question, then, is how do researchers actually go about incorporating meta-awareness practices into their experimental paradigms? Meta-awareness involves an experiential shift more radical than simply trying to think impartial thoughts, because this latter strategy would merely lead to absorption in new conceptual contents rather than a holistic observation of the process of experience. For example, when we try to think about how a thought appears, we become engrossed in a thought about our thinking and therefore miss *how* this new thought gives itself to us. Rather than rearranging our conceptual content, therefore, meta-awareness likely requires a profound shift in our mode of attention: withholding the habitual propagation of discursive elaboration and opening a bare attentional space in which the relationships between phenomena can reveal themselves as they are. Opening such an attentional space presents a formidable challenge, however, because our patterns of discursive overlay and absorption in experiential contents are overlearned and highly automatic. Genuine meta-awareness, therefore, would require powerful first-person tools for overriding habitual preoccupation with phenomenal contents and holding attention open to the process of experience.

Here, we will argue that hypnosis and meditation are strong candidates for such phenomenological tools. Historical accounts as well as recent scientific investigations have documented the power of these practices to radically influence how people experience themselves and their environments. We propose that cognitive scientists can harness hypnosis and meditation to enable experimental subjects to suspend presuppositions, loosen deep-seated patterns of absorption, and sustain unencumbered meta-awareness in an experimental setting. These practices may allow researchers to generate specific and reliable alterations in consciousness, and perhaps achieve more fine-grained and unbiased phenomenological reports. Thus, meditation and hypnosis offer practical avenues for actualizing the neurophenomonological project.

Meditation and Hypnosis as Empirical and Experiential Tools

While there are many ways to envision the gesture of meta-awareness in practice, hypnosis and meditation may have much to offer, not least of all because they come along with a broad and growing body of psychological and neuroscientific literature exploring their mechanisms and effects. As research tools, hypnosis and meditation have already made important contributions to cognitive neuroscience (for reviews see Oakley and Halligan 2009; Slagter et al. 2011). Although hypnosis and meditation represent distinct domains of practice, they appear to overlap in phenomenology, cognitive mechanisms, neural substrates, and potential therapeutic merits. We recently published a special issue addressing the merits of juxtaposing hypnosis and meditation to advance our understanding of their underlying mechanisms and help elucidate salient topics in cognitive neuroscience (Lifshitz and Raz 2012). Here we expound on how these powerful practices can incorporate and illuminate a neurophenomenological approach.

Cognitive scientists typically distinguish between mental processes that are controlled and those that are automatic. Whereas controlled processes are voluntary, slow, and effortful, automatic processes are involuntary, fast, and effortless (Schneider and Shiffrin 1977). Achieving literacy, for example, is a controlled and deliberate process requiring attention. Once learned and sufficiently practiced, however, reading becomes an automatic process, proceeding quickly and without effort (MacLeod 1991). A common view posits that extensive practice can render effortful processes more automatic. Once automatised, these processes become resistant to control and largely imperturbable (MacLeod and Dunbar 1988). Modifying such ballistic processes is central to the neurophenomenological project for at least two reasons: (i) These automatic processes often reflect the profound experiential structures that phenomenological investigation seeks to elucidate, and (ii) Overriding specific overlearned patterns of discursive conceptual thinking may allow participants to achieve more open and refined states of meta-awareness and provide more accurate and sensitive phenomenological reports. With this framework in mind, we will now explore how hypnosis and meditation can modulate deep-seated cognitive structures and occupy an important place in the broader landscape of neurophenomenology.

Meditation

Meditative practices may provide a potent means of overriding habitual assumptions and adopting a radical meta-awareness toward experience. Largely originating in Buddhist traditions, mindfulness meditation refers to a broad range of mental practices geared at training attention to disengage from undesirable patterns of mental absorption. Although the aims of these practices range from mundane relaxation to spiritual enlightenment, most forms of meditation emphasize non-discursive

meta-awareness of moment-to-moment experience (Lutz et al. 2006). Whereas some techniques involve focused attention on a particular experiential object such as the breath or a mantra, other practices involve non-discriminatory widening of attention to include the whole field of present-moment experience (Lutz et al. 2008). Both of these overarching meditative styles train the flexible skills of (i) noticing the tendency to become lost in thoughts and feelings, (ii) disengaging such habitual patterns of absorption, and (iii) shifting attention to lived experience unmediated by conceptualization. Although the specific instructions for achieving such receptive states of attention differ between traditions, formal meditation generally involves sitting silently with an upright, alert, and yet relaxed posture. The eyes may be open or closed, and traditions place varying degrees of emphasis on bodily stillness. The point of adopting a quiet and motionless posture is not to escape the usual tossing and turning of the mind, but rather to create an experiential space free from distraction wherein one can observe the full activity of the mind – tossing, turning, and all.

Newcomers to meditation are often surprised to find that sitting quietly in meditation is hardly relaxing. At first, practitioners can observe only coarse mental processes such as fully formed thoughts and overwhelming affective states. With practice, however, attention becomes refined such that seasoned meditators report observing subtle experiential processes including the arising, dwelling and decaying of mental phenomena and the constitution of the apparent duality of self and other. Although such accounts are difficult to corroborate scientifically, numerous empirical reports have demonstrated the impact of meditation on a wide range of attention processes and associated brain functions, including sustained attention (MacLean et al. 2010; Brefczynski-Lewis et al. 2007) and executive control (Tang et al. 2007; Moore et al. 2012). Furthermore, meditation seems to render attention more flexible. When presented with two visual stimuli in rapid succession, people commonly demonstrate an "attentional blink" and fail to attend to the second stimulus. Following a three month meditation retreat, however, practitioners readily detected the second stimulus (Slagter et al. 2007). Moreover, electroencephalography (EEG) recordings showed that meditation participants allocated less attention to processing the first target and thus had more neural resources left over to perceive the second stimulus. These findings suggest that meditation promotes heightened temporal sensitivity to experience by improving the flexibility and efficiency of attention. A recent study extended this notion using a local–global competition task (van Leeuwen et al. 2012). When viewing large font digits (global level) visually composed of smaller font digits (local level), participants typically give precedence to the global level and show delayed reaction times when reporting the number at the local level. Compared to controls, long-term meditators and newly trained novices responded more easily and quickly to the local digits. Among long-term practitioners, moreover, EEG data revealed deeper information processing of both local and global target information. Thus, by cultivating the ability to disengage, reorient, and sustain attention, meditative practices appear to improve the flexibility, sensitivity, and stability of awareness.

Traditional contemplative accounts suggest that the refined attention developed through meditative training provides a powerful means of gaining control over

automatic cognitive processes. Moreover, in contrast to the rapid and transient alterations induced by hypnotic suggestion, the cognitive changes brought about through meditative training typically manifest more gradually over several sessions, and in some cases reflect enduring transformations (see Slagter et al. 2011). Crucial to the goal of developing meta-awareness, meditation appears to alter habits of spontaneous mind-wandering (Mrazek et al. 2012; Brewer et al. 2011) and involuntary reactivity in response to strong emotions (Allen et al. 2012; Taylor et al. 2011) and pain (Grant et al. 2011, 2012; Zeidan et al. 2011). One study showed that long-term Zen practitioners demonstrate reduced activation in neural structures related to spontaneous thought (Pagnoni et al. 2008). While lying in a functional magnetic resonance imaging (fMRI) scanner, subjects were instructed to pay attention to their breathing and return to it whenever they noticed distracting thoughts, memories, or sensations. Throughout this meditative condition, they performed a lexical decision task, wherein they pushed a button to indicate whether letters on a screen constituted real English words (e.g., "apple") or strings of letters with plausible readings but no semantic content (e.g., "nabol"). When presented with real words, long-term meditators, compared to controls, demonstrated a "reduced duration of neural response linked to conceptual processing … suggesting that meditative training may foster the ability to control the automatic cascade of semantic associations and, by extension, to voluntarily regulate the flow of spontaneous mentation" (Pagnoni et al. 2008). Certain meditative practices, therefore, appear to allow individuals to spend less time dwelling on conceptual content, perhaps opening a pre-reflective space for observing processes of experience in a more embodied, reflexive mode of meta-awareness.

While empirical research on meditation is still relatively young, cognitive scientists have already amassed a broad evidence base highlighting the power of meditative training to refine attention and override automatic conceptual and affective processes. These findings indicate that meditative practices may lead to more receptive and sensitive observation of experiential structures and to more accurate introspective reports. While such claims are hardly new, few empirical accounts have directly addressed the question of whether meditation actually improves phenomenological awareness. One study showed that meditators performed comparably to non-meditators when asked to estimate the rate of their heartbeat (Khalsa et al. 2008). Ironically, despite their equivalent performance, meditators reported greater confidence in their judgments than controls, intimating that meditation may bias participants to inflate their introspective abilities. While these findings warrant careful consideration, the authors of the study note that the heart rate counting task may not properly reflect the embodied meta-awareness cultivated in most forms of meditation. On the flip side of the coin, another recent study found that meditators compared to non-meditating controls showed greater introspective accuracy following a body-scan meditation and that the amount of meditation experience predicted introspective aptitude (Fox et al. 2012). Thus, whereas direct evidence that meditative training improves meta-awareness remains scarce and inconsistent, traditional claims and recent findings from cognitive neuroscience indicate that meditation will likely make a strong ally for neurophenomenology.

Hypnosis

Whereas meditation has long occupied a central space in discussions surrounding neurophenomenology, hypnosis has received relatively little attention in this domain. Yet, hypnosis and other forms of suggestion hold great promise for advancing the synthesis of phenomenology and cognitive neuroscience. In recent decades, a mounting body of scientific evidence has demonstrated that, among responsive individuals, hypnotic suggestions can produce remarkable alterations in subjective experience as well as cognitive and brain function. One fruitful empirical approach employs specific hypnotic suggestions to produce "virtual patients" with transient syndromes nearly identical to genuine clinical psychopathologies in terms of experiential substrates and in some cases also neurobiological correlates (Woody and Szechtman 2011; Oakley and Halligan 2009). For example, a recent study used hypnotic suggestion to produce compelling experiences of mirrored-self misidentification – a clinical condition wherein patients no longer recognize their own reflection in a mirror. Following a suggestion that "the person you see in the mirror will not be you, it will be a stranger", highly hypnotizable subjects failed to recognize their own reflection and retained their delusional beliefs in the face of verbal challenges (e.g., "How is it possible that the person in the mirror looks just like you?") as well as behavioural demands (e.g., being asked to touch their nose whilst staring in the mirror) (Barnier et al. 2008). We speculate that closer phenomenological investigation of such hypnotically induced distortions of self-perception could reveal nuances concerning the relation between embodied subjectivity and the self viewed as external object (cf Rochat and Zahavi 2011). Beyond delusions of mirrored-self recognition, cognitive scientists have employed hypnotic suggestion to generate a wide range of virtual syndromes including obsessive-compulsive disorder (Woody and Szechtman 2011), synaesthesia (Cohen Kadosh et al. 2009), alien-hand syndrome (Blakemore et al. 2003), and visuospatial neglect (Priftis et al. 2011). In addition to the obvious practical advantages of studying virtual rather than genuine clinical patients, hypnotic analogues have the added benefit of allowing researchers to generate subtle nuances in symptomology, as well as design and implement novel delusions and psychopathologies that suit their specific research questions. Hypnotic clinical analogues, therefore, constitute an important untapped resource for neurophenomenology. More broadly, this approach points to the great flexibility afforded by hypnosis to modulate deep-rooted structures of experience with just a few brief words of suggestion.

Suggestion can derail processes previously considered ballistic and impervious to wilful intervention (Lifshitz et al. 2013). For example, a suggestion to view coloured images in black and white produced the experience of greyscale vision among highly responsive individuals, with concomitant dampening of low-level brain regions associated with colour processing (Kosslyn et al. 2000). Another example involves the classic Stroop paradigm, wherein participants typically demonstrate a lag when asked to report the ink colour of incongruent colour words (e.g., the word "blue" printed in red) (Stroop 1935). Based on the robustness of this

Stroop interference effect, most cognitive scientists consider processing printed linguistic stimuli inevitable for skilled readers (MacLeod 1991); however, a string of reports from multiple independent laboratories demonstrate that a suggestion to view the stimulus words as meaningless symbols of a foreign language allows participants to override the automaticity of reading and substantially reduce, or in some cases even eliminate, the Stroop interference effect (Raz and Campbell 2011; Raz et al. 2002, 2003, 2006, 2007; Augustinova and Ferrand 2012; Parris et al. 2012). Neuroimaging assays have begun to unravel the mechanisms of de-automatization as a function of suggestion (Casiglia et al. 2010; Raz et al. 2005; Terhune et al. 2010), while behavioural accounts have extended these effects to related cognitive paradigms probing automatic visual attention (Iani et al. 2006, 2009) as well as ballistic multimodal perceptual integration (Lifshitz et al. 2013).

At first glance, such striking cognitive-perceptual changes may seem more like enthralling curiosities than demonstrations of useful phenomenological tools. Yet, in addition to advancing our understanding of controlled and automatic processes as well as their interactions, such subjective alterations can be adapted to derail habitual patterns of conceptual judgment and support non-judgmental meta-awareness of the present moment. Investigators have already started experimenting with using suggestion-based approaches to foster mindful states of awareness for therapeutic purposes (Lynn et al. 2006, 2010). To be sure, however, efforts to induce mindfulness via targeted suggestion are still new and the precise wording of such suggestions would require fine-tuning based on the specific goals of the investigator. Classical descriptions of phenomenological awareness as well as traditional meditation instructions may provide a rich point of departure. Suggestions could be as simple as, for example, noting without judgment the arising and passing of thoughts, emotions, and sensations on a moment-to-moment basis (Lynn et al. 2012).

A subjective sense of effortlessness commonly accompanies hypnotic response, rendering suggestion particularly relevant for promoting meta-awareness. Phenomenologists have often remarked that while one can consciously cultivate a ground ripe for phenomenological insight, the moment of awareness itself involves releasing effortful strategies that would otherwise obscure the phenomena under investigation (Depraz et al. 2000). Acting in accordance with hypnotic suggestions, subjects generally report experiencing their actions and cognitions as effortless and involuntary, as though "the cognitive module that executes the suggestion does so outside of phenomenal awareness" (Kihlstrom 2008). Thus, working below the level of conscious effort, a suggestion for improved phenomenological awareness may allow practitioners to notice their experience while minimizing interference from the wilful act of observation.

One may object, however, that because hypnotic procedures generally involve deep relaxation and mental absorption (Rainville and Price 2003), phenomenological reports following suggestion would conflate the abnormal processes inherent in hypnotic states with the structures of usual waking consciousness. Atypical conscious planes, however, need not accompany response to suggestion; relaxation and fixed attention, although common, are unnecessary for instigating responses typically associated with hypnotic suggestion (Oakley and Halligan 2010). Hypnotic phenomena

usually follow even in the absence of an induction ritual or explicit mention of the context of hypnosis (McGeown et al. 2012; Mazzoni et al. 2009; Raz et al. 2006) and responses to suggestions during hypnosis correlate strongly with responses to the same suggestions outside of hypnosis (Kirsch and Braffman 2001). In addition, potential confounding factors associated with the hypnotic ritual can be avoided by means of posthypnotic suggestion – a condition following termination of the hypnotic experience, wherein a subject remains compliant to a suggestion made during hypnosis (Raz and Buhle 2006). Because posthypnotic suggestions function during common wakefulness, they may allow participants to view and describe their experience untarnished by abnormalities surrounding the hypnotic procedure. Hypnotic and posthypnotic suggestion, therefore, constitute potentially fruitful methods of achieving states of receptive observation of experiential processes. Whether hypnosis can really improve meta-awareness and the accuracy of subjective reports, however, remains largely untested. In the following section, we will discuss how meditation and hypnosis can concretely advance a neurophenomenological approach to the mind.

Meditation and Hypnosis: Neurophenomenology in Action

Some cognitive researchers have already begun to use hypnosis and meditation as phenomenological tools to inform their studies, placing phenomenology and neuroscience in direct contact with one another. Over the past decade, approaches to studying brain function have shifted dramatically from purely task-based paradigms toward methods of investigating the subject at rest, in the absence of external stimulation or goal-directed behaviour (Kelly et al. 2012; Raichle 2010; Callard et al. 2012). In line with this resting-state approach, new paradigms have begun to exploit the benefits of manipulating the attention of participants rather than external task parameters (Raz and Buhle 2006). By allowing researchers to generate profound and highly specific alterations in attention and consciousness without altering the external stimuli, hypnosis and meditation are emerging as valuable tools for investigating spontaneous cognitive activity and the default-mode – a network of brain regions that show increased activity at rest. Default-mode network (DMN) activity correlates with a wide range of internally directed cognitive processes, including mind-wandering, self-oriented thinking, moral reasoning, and episodic memory (Buckner et al. 2008); yet, it is difficult to experimentally manipulate the DMN alongside these processes because the defining feature of the DMN is that it activates spontaneously, in the absence of external task demands. Accordingly, in the past few years, researchers have begun employing contemplative practices in concert with intrinsic connectivity imaging methods to elucidate the psychological correlates of resting-state brain networks such as the DMN (e.g., Brewer et al. 2011; Deeley et al. 2012; Hasenkamp et al. 2012; McGeown et al. 2009; Pagnoni 2012; Pyka et al. 2011; Tang et al. 2012; Taylor et al. 2012).

Harnessing hypnosis together with experiential reports and brain imaging, a recent study showed that hypnotic induction increased subjective ratings of attentional absorption and decreased ratings of mind-wandering, and that these changes

were associated with decreased DMN activity and increased activity in prefrontal attention networks (Deeley et al. 2012). Another recent account leveraged a similar neurophenomenological approach to show that subjective ratings of hypnotic depth following an induction were associated with changes in global functional connectivity in the electroencephalography signal. Furthermore, differences in subjective experiential dimensions such as "imagery", "everyday concerns", and "vestibular and other bodily experiences" were associated with distinct patterns of connectivity (Cardeña et al. 2012). These hypnosis studies illustrate how manipulating the experiential state of the subject while collecting subjective reports can enrich and even guide the investigation of intrinsic brain networks and their psychological correlates.

Meditators have extensive practice monitoring and regulating fluctuations of complex cognitive states such as focused attention, distraction, and meta-awareness – states that are tightly linked with intrinsic connectivity networks in the brain. A recent account capitalised on this contemplative ability to better understand the fine-grained temporal vacillations of key attention systems including the DMN, salience network, and executive control network (Hasenkamp et al. 2012). Long-term meditation practitioners performed a simple breath-awareness meditation in an fMRI scanner and pressed a button each time they noticed their mind had wandered from the meditation. By parsing the data surrounding the button press, the researchers were able to distinguish between periods of distraction (in the few seconds prior to the button press), awareness (in the moments immediately surrounding the button press), reorienting of attention (immediately after the press), and finally sustained attention (several seconds after the press). Consistent with their naturalistic model of mind wandering and attention, the researchers found that the cognitive-experiential states inferred via the buttons press reports clearly delineated temporal periods associated with distinct attentional sub-networks. Again, this study underscores the value of yoking phenomenological methods and cutting-edge neuroimaging techniques to arrive at a more complete and, in this case, temporally nuanced view of cognitive and experiential processes.

Let us consider one more example to see how contemplative practice can bring a neurophenomenological approach to bear on one of the most complex and long-standing issues in the sciences of mind: the nature of the self. Contemporary cognitive scientists and phenomenologists often draw a distinction between embodied, pre-reflective subjectivity (the "I" or "minimal self") and higher-order, representational senses of self (the "me" or "narrative self") (Gallagher 2000; Christoff et al. 2011). At first glance, these categories seem to accord with classical Buddhist descriptions of subjectivity, including the tenet of *anatman* or 'no-self,' which refers to the false perception of a permanent self unchanging over time (cf. Siderits et al. 2011). Buddhist sources often describe the goal of meditation as uprooting this illusory sense of an extended self – perhaps similar to the phenomenological notion of narrative self – and uncovering a profoundly embodied, intimate relationship with experience – perhaps akin to the contemporary concept of minimal self. Such phenomenological descriptions can be "front-loaded" into experimental design and explored neuroscientifically (Gallagher and Brøsted Sørensen 2006). One landmark

study used functional magnetic resonance imaging to probe the neural correlates of these distinct yet interdependent modes of self-experience in trained meditators (Farb et al. 2007). Participants with 8 weeks of mindfulness training were asked to read personal trait adjectives while engaging in either a "narrative" self-focus, i.e., thinking about how the adjectives related to them as a person, or an "experiential" self-focus, i.e., openly and non-reactively monitoring their moment-to-moment sensory, cognitive, and affective experience.

Consistent with contemplative descriptions, during narrative-focus all participants demonstrated increased activation in neural regions commonly associated with higher-order self-reference and linguistic-semantic processing (medial prefrontal and left lateralized cortices, respectively). During experiential focus, however, only participants trained in meditation demonstrated a pronounced reduction in activity among these higher-order self-reference networks, and a corresponding increase in activity among brain regions associated with internal and external sensory perception as well as body schema (somatosensory cortex, insula, and inferior parietal lobule, respectively). The authors conclude that "these results support distinct, but habitually integrated, aspects of self-reference: (i) higher order self-reference characterised by neural processes supporting awareness of a self that extends across time and (ii) more basic momentary self-reference characterised by neural changes supporting awareness of the psychological present" (Farb et al. 2007). Beyond physiologically corroborating the widespread phenomenological distinction between minimal and narrative selves, these empirical findings expand this understanding by revealing that training can allow people to de-couple these distinct modes of self-reference. Furthermore, the meditative ability to uncouple these usually tightly conjoined self-referential modes was crucial for gaining a better scientific grasp on the nature of the self. The study by Farb et al., therefore, elegantly demonstrates the central thesis of the present paper: that braiding together the strands of contemplative practice, phenomenological description and cognitive neuroscience can lead to a more complete understanding of behaviour, cognition, and the spectrum of human experience.

Conclusion

Here we explore how contemplative practices such as hypnosis and meditation can advance the emerging interdisciplinary dialogue between cognitive science and phenomenology. We propose that hypnosis and meditation offer powerful tools for instantiating meta-awareness – allowing participants to step back from habitual absorption in experiential contents and attend more openly to fundamental experiential processes. Furthermore, we show how these practices can allow researchers to generate atypical experiential states that may illuminate cognitive structures underlying usual mental life. Although a small number of reports from both the phenomenological and empirical domains have begun to foster the kind of collaborative exchange envisioned here, many basic yet critical questions remain unanswered.

For example, do hypnotic suggestion and mindfulness meditation really improve the accuracy of phenomenological reports, and, if so, to what extent? In addition, how can we meaningfully distil first-person data for analysis alongside behavioural and physiological measurements, and what subjective dimensions do we flatten in the process? We hope that this largely theoretical paper will inspire concrete investigations to answer such crucial questions and help diffuse the boundaries between meditation, hypnosis, cognitive science, and phenomenology.

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