

## Chapter 10

# **Toward a science of internal experience**

## Conceptual and methodological issues in hypnosis and meditation research

Vince Polito and Michael H. Connors

### **Abstract**

Hypnosis and meditation both involve private, subjective experiences. As a result, they can be difficult to investigate in empirical studies. This chapter discusses some of the theoretical and methodological challenges in conducting such research, and ways of addressing these. It focuses, in particular, on four conceptual issues in hypnosis research that the authors believe might also be useful in studying meditation. These are: distinguishing the procedures participants follow from their reported effects; separating participants' trait capacities and contextual influences; considering the interplay between cognitive and social processes; and controlling for demand characteristics. The chapter notes how awareness of these issues may enrich understanding of meditation and help guide research into subjective experience more broadly.

### **Introduction**

Both hypnosis and meditation are complex practices with rich and diverse histories. Although it is not yet clear the degree to which the domains of these two techniques overlap, a key common strand is that both involve internal subjective experiences. This chapter explores theoretical and methodological challenges in investigating what are essentially private mental events and suggests conceptual distinctions that may facilitate a more rigorous empirical science of hypnosis and meditation. In particular, we discuss how a number of conceptual issues in hypnosis research might enrich the study of meditation.

Hypnosis has been a topic of investigation in Western science since the eighteenth century and has been a controversial field since its inception (Gauld, 1995). The history of hypnosis research has been characterized by vigorous debate as to the veracity, causes, effects, and practical applications of the phenomenon (Hilgard, 1977; Hull, 1933; McConkey, 2008; Sheehan & Perry, 1976). Despite considerable theoretical differences, broad agreement has emerged among researchers as to the elements of hypnotic phenomena that need to be explained (Hilgard, 1965, 1975; Kihlstrom, 1985, 2008), and commonly accepted best practices for conducting research and clinical work have developed (Lynn, Rhue, & Kirsch, 2010; Nash & Barnier, 2008). That is not to

say that all researchers agree on definitional questions; however, there does exist within the field a shared scientific language to describe the phenomena of hypnosis and a general understanding of the range of positions that various theorists hold (Cox & Bryant, 2008; Lynn & Rhue, 1991; Woody & McConkey, 2003).

Meditation has followed a somewhat different trajectory. Meditative techniques were practiced for millennia prior to engagement with Western scientific frameworks (Lutz, Dunne, & Davidson, 2007). During that time, highly detailed accounts, instructions, and traditions developed around meditative practices. It is only in the last five decades that this field has been intensively investigated from the perspective of Western, empirical, psychological science. A considerable focus in the meditation research literature has been the influence that meditation has on psychological, neurophysiological, and individual difference variables. In a meta-analysis of the effects of meditation on a wide range of psychological outcome variables, Sedlmeier et al. (2012) found that meditation had a positive impact on emotionality, relationships, attention, and cognitive capacities. In addition, a growing body of evidence now suggests that meditation (like hypnosis) can be an effective adjunct to therapeutic interventions for conditions such as anxiety, depression, and pain (Baer, 2003; Goyal et al., 2014; Hofmann, Sawyer, Witt, & Oh, 2010; Smith, Richardson, Hoffman, & Pilkington, 2005). Meditation may also induce neurophysiological changes: a review by Fox et al. (2014) found evidence of significant neural changes in brain areas associated with meta-awareness, body awareness, memory consolidation, and emotion regulation.

In recent years, however, several researchers have provided thoughtful, reflective critiques of the meditation literature, highlighting potential confounds in empirical research due to inconsistencies in the ways that meditation is defined, operationalized, and measured (Davidson, 2010; Grossman, 2008, 2011; Sauer et al., 2013; Sedlmeier et al., 2012; Van Dam, Earleywine, & Borders, 2010). Similar challenges have been faced by hypnosis researchers, and it may be that some of the conceptual distinctions that have emerged in the hypnosis literature can also help clarify and refine research on meditation.

## Useful concepts from hypnosis research

The complexity of these domains, multiplicity of techniques, individual differences, and varying timescales for effects present many potential confounds and confusions. A challenge for any science of hypnosis and meditation is to conceptualize the domain of these phenomena in a way that allows detailed, consistent empirical investigation. We discuss four concepts that we believe are important in hypnosis research and reflect on how they might also apply to meditation research.

### Procedure and product

The first concept that we consider useful has been to make a clear distinction between two different ways that the term hypnosis can be understood: hypnosis-as-procedure and hypnosis-as-product (Barnier & Nash, 2008; Nash, 2005; Polito, Barnier, & McConkey, 2014). Hypnosis-as-procedure refers to the practical aspects of the hypnotic interaction—primarily what the hypnotist does. In a research setting, this usually consists of four phases: an introduction to the process that is about to occur, a hypnotic induction, a series of hypnotic suggestions, and then a deinduction. Hypnosis-as-product, in contrast, refers to the subjective, behavioral, and neurophysiological alterations in participants that result from this procedure—that is, the effects of hypnosis. Whereas hypnosis-as-procedure is what the hypnotist does in the hypnotic context, hypnosis-as-product is what the participant experiences (Barnier & Oakley, 2009).

The specific details of a hypnotic procedure can vary immensely (Woody & Barnier, 2008). Typically, an induction involves instructions for relaxation and focused attention, but inductions can also feature vigorous physical activity (Bányai & Hilgard, 1976), or can be entirely self-directed by the participant themselves (Shor & Easton, 1973). The hypnotic suggestions administered also vary considerably. For example, these can range from simple suggestions for ideomotor movements in the context of research on motor control (e.g., Galea, Woody, Szechtman, & Pierrynowski, 2010), to detailed suggestions for cognitive-perceptual restructuring oriented toward specific therapeutic goals in a clinical context (e.g., Nash, 2008; Oakley & Halligan, 2002).

A given hypnotic procedure will not necessarily lead to hypnosis-as-product, so it is important to assess the effects of hypnosis empirically. Researchers and practitioners pay a great deal of attention to assessing hypnosis-as-product (Barnier & McConkey, 2004; Sheehan & McConkey, 1982) and have developed a wide range of methodologies and assessment tools to understand and quantify participants' experiences. Here, we outline three ways this has been achieved.

First, hypnosis-as-product can be analyzed in terms of behavioral responses. The effects of hypnosis are essentially private subjective experiences but researchers often use behavior as an indirect indication of these subjective changes. Typically, specific criteria are established for passing each suggestion (Woody & Barnier, 2008). In the case of a suggestion for arm levitation, for example, this could be whether or not the participant raises their arm at least 30 centimeters. This approach is exemplified in standard measures of hypnotizability such as the Harvard Group Scale of Hypnotic Suggestibility, Form A (HGSHS:A; Shor & Orne, 1962; Weitzenhoffer & Hilgard, 1962) and the Stanford Scale of Hypnotic Suggestibility, Form C (SHSS:C; Weitzenhoffer & Hilgard, 1962).

Second, hypnosis-as-product can be assessed through direct reports of participants' subjective experiences. This can take a variety of forms. For example, some researchers have asked participants to give moment-to-moment, verbal ratings of the degree to which they feel they are experiencing the effects of suggestions (Laurence & Nadon, 1986). McConkey, Wende, and Barnier (1999) employed a more sophisticated methodology to assess moment-to-moment experience: they tracked participants' fluctuating experiences during a hypnosis session using a handheld dial device that participants continually updated. They found that, rather than hypnotic effects being "switched on" immediately in response to a hypnotic suggestion, phenomenal changes arose gradually and then faded away as each suggestion was administered, tested, and then cancelled.

Subjective experiences can also be assessed through retrospective ratings, after a hypnosis session has concluded. For example, Kirsch, Council, and Wickless (1990) and Kihlstrom (2002a) added additional items in the HGSHS:A, asking participants to rate the subjective involuntariness of their responses to the hypnotic suggestions; Bowers (1981) likewise included similar items with the SHSS:C. Researchers also have developed independent scales that can be used to retrospectively assess subjective experiences in hypnosis. One example is the Phenomenology of Consciousness Inventory (Pekala & Kumar, 1986), which surveys multiple dimensions of conscious experience and has shown that hypnotic responding is frequently associated with a subjective sense of dissociated control and attention to internal processes (Kumar, Pekala, & McCloskey, 1999). Another example is the recently developed Sense of Agency Rating Scale (Polito, Barnier, & Woody, 2013), which specifically assesses changes in agency during hypnosis. Findings with this latter scale have shown that the feeling of involuntariness typically associated with hypnotic responding is a multidimensional construct that varies over the time course of a hypnotic session (Polito, Barnier, Woody, & Connors, 2014).

More formal interviews after the hypnosis session provide another way of assessing subjective experience retrospectively. In contrast to quantitative measures, which necessarily tap a limited

range of experiences, qualitative interviews allow for richer and more detailed accounts of hypnotic effects. A specific methodology for qualitative hypnosis research is the Experiential Analysis Technique (EAT; Sheehan & McConkey, 1982). The EAT is a semi-structured interview whereby, at the conclusion of a hypnosis experiment, participants watch video recordings of their responses during the session, with an independent experimenter. This experimenter stops the video at specific points and asks participants questions about their experiences during each segment of the recording. This can provide additional contextual information for quantitative data and highlight hypnotic effects that might otherwise have been missed (Barnier, Cox, Connors, Langdon, & Coltheart, 2011; Connors, Cox, Barnier, Langdon, & Coltheart, 2012).

Third, hypnosis-as-product can be inferred through neurophysiological measures. In recent years, there has been increasing interest in the neural correlates of hypnotic effects (Oakley & Halligan, 2013; Oakley, 2008; see also Chapter 18). Various changes in neural functioning have been shown to occur both in neutral hypnosis—that is, in the hypnotic context in the absence of any suggestions (Deeley et al., 2012; Rainville, Hofbauer, Bushnell, Duncan, & Price, 2002)—and in response to specific suggestions (e.g., Cojan, Archimi, Cheseaux, Waber, & Vuilleumier, 2013; Kosslyn, 2000). For example, research has identified distinct neural correlates of hypnotically suggested pain (Derbyshire, Whalley, & Oakley, 2009), hypnotic hallucinations (Szechtman, Kalogeras, Bowers, & Nahmias, 1998), and hypnotic paralysis (Halligan, Athwal, Oakley, & Frackowiak, 2000; for reviews, see Oakley, 2008; Oakley & Halligan, 2009).

Together, these various methods provide converging data on hypnosis-as-product (Cox & Bryant, 2008; Sheehan & Perry, 1976). By making a distinction between procedure and product, and recognizing that the former does not necessarily imply the latter (Kirsch, Mazzoni, & Montgomery, 2007), hypnosis researchers have developed a nuanced view of the elements that contribute to hypnosis. This perspective allows for a multiplicity of very different types of suggestions to be considered part of hypnosis-as-procedure. It also provides a range of tools for assessing the effects of these procedures in constructive ways.

Meditation research can be conceptualized in very similar terms: meditation-as-procedure can be thought of as the physical and cognitive practices that individuals perform, whereas meditation-as-product can be thought of as the phenomenological experiences, behavioral changes, and neurophysiological correlates that occur as a result of these meditation practices. In meditation research, this distinction, although recognized by some investigators (e.g., Rao, 2011), is generally less explicit than in hypnosis research. In fact, many meditation studies conflate procedure and product by simply reporting that participants performed some meditation procedure as evidence of product, without independently verifying whether or not the procedure actually led to any change in meditation-as-product (Nash & Newberg, 2013). Here, we briefly consider procedure and product in meditation separately and provide some suggestions for how clearer boundaries between these two elements might facilitate future meditation research.

There is unquestionably an enormous variety of practices that could be considered meditation-as-procedure (Walsh & Shapiro, 2006) and a great deal of effort in the meditation literature has been spent developing various categorization schemas to group different meditation traditions according to their features. For example, Shear (2006) distinguished techniques based on the specific mental faculties used (attention, feeling, reasoning, visualization, memory, bodily awareness); the manner in which those faculties were used (actively, passively, effortlessly, forcefully); and the objects to which these faculties were directed (thoughts, images, concepts, internal energy, aspect of the body, love, god). Walsh and Shapiro (2006) similarly categorized practices according to the type of attention involved, the relationship between the practice and other cognitive processes, and the goal of the practice. Whereas these taxonomies allow fine-grained analysis of differences

across various techniques, probably the most popular schema has been a much simpler proposal by Lutz, Slagter, Dunne, and Davidson (2008). Inspired by traditional Buddhist meditation texts, Lutz et al. categorize practices into two broad categories: focused attention and open monitoring. These two categories may involve distinct psychological and neurological processes that account for much of the variation between techniques.

Meditation-as-product has received mixed attention. On the one hand, there has been considerable interest in identifying the neural correlates of various forms of meditation (e.g., Barnhofer, Chittka, Nightingale, Visser, & Crane, 2010; Manna et al., 2010; Vago & Silbersweig, 2012; Wang et al., 2011). Findings among these studies have varied; however, there is growing evidence that many forms of meditation are associated with power increases in theta and alpha bands, and increased activity in frontal and prefrontal areas (Cahn & Polich, 2006). In contrast, research into phenomenological experiences and behavioral changes associated with meditation have received much less attention. Although numerous studies have looked at the long-term effects of meditation (see Sedlmeier et al., 2012 for a comprehensive review), only a relatively small number of studies have investigated the direct subjective experience of meditation in a systematic way. In fact, very few non-neurophysiological methods have been developed for the assessment of meditation-as-product (notable exceptions include Lau et al., 2006; Levinson, Stoll, Kindy, Merry, & Davidson, 2014; Nash & Newberg, 2013). Because of the emphasis on long-term outcomes, the measures that have been developed have tended towards operationalizing the effects of meditation in terms of influences on other psychological constructs and characteristics, such as anxiety and stress, rather than in terms of the immediate phenomenological experience of meditation (Grossman & Van Dam, 2011). This lack of focus on the intrinsic features of meditative experience has meant that this aspect of meditation and mindfulness has remained poorly defined.

A common feature throughout the meditation research literature is for authors to offer a tentative interpretation of key terms and to call for increased specificity and convergence of definitions in the field (e.g., Awasthi, 2013; Bishop et al., 2004; Nash & Newberg, 2013). To progress beyond this definitional impasse, it may be useful for meditation research to incorporate similar methods to those used in hypnosis research.

Members of our research team (Polito et al., 2013) faced a similar set of challenges in developing the Sense of Agency Rating Scale (SOARS), a psychometric scale that assesses subjective sense of agency in hypnosis. Prior to the creation of this measure, there were many published accounts of altered agency associated with hypnosis but no agreed terminology or method for describing and assessing this construct. We compiled a comprehensive set of terms used in the literature to describe agency, constructed scale items based on these terms, and then asked participants to rate the degree to which each item matched their experiences in hypnosis. We performed factor analysis on participants' responses and refined this measure across multiple studies. This ultimately resulted in a validated, multifactorial measure of sense of agency that has informed a new theoretical account of subjective control in hypnosis (Polito, Barnier, Woody, & Connors, 2014).

A similar research strategy might be useful in developing a clearer account of meditation-as-product. This would likely involve a combination of self-report measures, qualitative interviews, and custom-designed scales to better characterize changes in subjective experience during meditation. In fact, there have been promising moves in this direction with calls for multimethod approaches and the emergence of new techniques such as neurophenomenology, which promises to systematically integrate phenomenological and neurophysiological data in meditation research (Garland & Gaylord, 2009; Mikulas, 2011; Sauer et al., 2013; see also Chapters 6 and 15).

## Trait and state

The second concept that we consider useful has been to distinguish between individuals' capacities (i.e., trait effects) and contextual influences (i.e., state effects) in hypnosis. In the section "Procedure and product," we highlighted that a given hypnosis procedure should not be assumed to create any particular corresponding product (i.e., changes in subjective experience). Rather, hypnotic effects are strongly influenced by the interaction of state and trait variables.

One of the foundational findings of hypnosis research has been that individuals differ markedly in their capacity to experience hypnosis (Barnier, Cox, & McConkey, 2014). This capacity to respond to suggestions in the context of hypnosis is referred to as "hypnotizability", and is a stable trait that seems, for the most part, only very modestly related to other personality characteristics or cognitive capacities (Laurence, Beaulieu-Prévost, & du Chênè, 2008). In hypnosis research, hypnotizability is assessed through standardized measures. These are almost exclusively "work-sample" scales that score participants' responses to hypnotic suggestions in terms of predefined behavioral criteria (Woody & Barnier, 2008). Whereas a variety of measures have been developed, the two most commonly used in a research setting are the HGSHS:A (Shor & Orne, 1962) and the SHSS:C (Weitzenhoffer & Hilgard, 1962). These have been described as the "gold standard" in hypnotizability research (Barnier & Oakley, 2009). Considerable data from studies conducted across multiple populations and cultures have reliably shown that approximately 15% of people are "high hypnotizable" (i.e., able to respond to all or most suggestions), 70–80% are "medium hypnotizable" (i.e., able to respond to some but not all suggestions), and 10–15% are "low hypnotizable" (i.e., able to respond to only a few suggestions) (Barnier & Oakley, 2009).

To control for the trait effects of hypnotizability, researchers sometimes pre-screen participants and then compare experimental groups of individuals with differing levels of hypnotic ability—for example, comparing the experiences of low and high hypnotizable participants (Woody & Barnier, 2008). In such a design, only high hypnotizable participants would be expected to respond hypnotically. The importance of controlling for individual differences has long been recognized as a key consideration in hypnosis research, with Bowers claiming that "an effect is not a classic suggestion effect unless it is correlated with hypnotic ability as standardly assessed" (as quoted in Woody & Barnier, 2008; see also Bowers, 1976). The importance of trait influences on hypnosis cannot be over-emphasized. Although some participants may comply with the perceived demands of the hypnotic context (as discussed in the "Demand characteristics" section), an individual can only be expected to experience genuine hypnotic effects if they have the personal capacity to do so.

In hypnosis, "state" variables refer to influences related to the hypnotic context and other factors that may vary over time. Important state variables in research include the nature of the hypnotic induction administered, environmental features (such as the location in which the hypnosis session is being conducted), and the tone of the hypnotist's voice. Many of these features mark the interaction as hypnotic, as opposed to being some other kind of social interaction. Systematically controlling for state influences in the context of research can be difficult as participants, particularly those who are experienced with hypnosis, may interpret suggestions as hypnotic cues regardless of any other situational factors (Cox & Bryant, 2008). One strategy has been to consider the hypnotic induction as a ritual marker of the hypnotic "state." This is problematic, as evidence suggests that some participants can experience marked changes in cognitive, perceptual, and physiological processes even in the absence of an induction (Bowers & Kelly, 1979; Polito, Barnier, Woody, & Connors, 2014; Raz, Kirsch, Pollard, & Nitkin-Kaner, 2006).

Nevertheless, a number of designs in hypnosis research attempt to (at least partially) control for state influences by testing participants of a similar level of hypnotizability and manipulating the impact of the induction. One commonly employed design has simply been to test high hypnotizable participants with and without a hypnotic induction (Orne, 1979). The assumption of such a design is that the induction interacts with other variables (e.g., traits, social cues, cognitive factors) to facilitate hypnosis. In response to questions around the specific importance of an induction for hypnosis to occur, alternative designs have compared a traditional induction to instructions for increased imagination (McConkey, Bryant, Bibb, & Kihlstrom, 1991), an obviously non-hypnotic task (mathematical puzzles; Connors et al., 2013; Nogrady, McConkey, & Perry, 1985), and task motivational instructions (Barber & Calverley, 1962). Variation in participants' responses and experiences across these different manipulations, although not perfectly isolating the role of the hypnotic "state," do highlight the impact of contextual factors on hypnotic effects.

Distinguishing between trait and state effects in hypnosis has allowed researchers to better understand how hypnotic phenomena relate to one another. Rather than simply viewing everything that happens in the hypnotic context as occurring due to a broad and monolithic concept of "hypnosis," recognizing the simultaneous influence of trait and state effects (and their interaction with other variables) has allowed a more nuanced view of the domain of hypnosis (Kihlstrom, 2003a). This clarity has encouraged research that integrates hypnosis with other fields, for example, guiding research into the relationship between hypnotizability and memory (Barnier, 2002; Kihlstrom, 2003b). It has also enabled researchers to form and investigate sophisticated research questions, for example, distinguishing between the neural correlates of hypnotizability, neutral hypnosis, and specific hypnotic suggestions (Oakley, 2008; Oakley & Halligan, 2013).

In meditation research, a similar distinction can be made between the influence of specific personal characteristics that are relatively stable over time—for example, an individual's inherent capacity for focused attention (trait)—and the influence of the specific meditative context and other variables that can fluctuate over time (state). Historically, throughout the meditation literature these two elements have often been confounded with one another and with other variables. Recently, however, a number of researchers have started to explicitly address these confounds. Awasthi (2013) reviewed a number of neurophysiological studies that did not properly account for trait or state effects and recommended clearer operational definitions of meditative effects as a way of improving future research. Similarly, Nash and Newberg (2013), Rao (2011), and Lutz et al. (2008) have emphasized the gradual development of meditative abilities (traits) and their impact on meditative states. These are important issues for future research in meditation.

Trait differences related to meditation have been most commonly conceptualized as "mindfulness" (Baer, 2003) and a number of measures have been developed to assess this construct. The most cited measure (according to Sauer et al., 2013) has been the Mindfulness Attention Awareness Scale (MAAS; Brown & Ryan, 2003). Other measures that have been used in meditation research include the Kentucky Inventory of Mindfulness Skills (KIMS; Baer, Smith, & Allen, 2004), the Freiburg Mindfulness Inventory (FMI; Walach, Buchheld, Buttenmüller, Kleinknecht, & Schmidt, 2006), and the Five Factors Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). Whereas each of these measures claims to measure mindfulness, Grossman (2008) has argued that they are based on distinct theoretical concepts and noted that correlations between the measures are low. Inconsistencies between these various trait measures are necessarily related to the broader definitional difficulties across the domain of meditation outlined in the "Procedure and product" section.

An additional concern regarding the use of mindfulness measures is that trait effects have often been confounded with state effects. This is particularly the case, for example, in some early

studies that compared the neural activity of inexperienced participants at rest with the neural activity of experienced practitioners during mediation (e.g., Banquet, 1973; Deepak, Manchanda, & Maheshwari, 1994; Khare & Nigam, 2000; for a review see Awasthi, 2013). Even in research designs without such an obvious confound, it is not always clear if differences between experts and novices reflect trait differences, such as pre-existing characteristics and acquired characteristics from long-term meditation, or state differences, such as the effect of the meditative context or experiential changes associated with a particular episode of meditation.

This issue could be addressed by adopting designs similar to those used in hypnosis; for example, by testing participants high in trait mindfulness inside and outside of the meditative context. A complication, however, is establishing how to define the meditative context. Although both hypnosis and meditation can take the form of either a social interaction (i.e., one person administers a procedure to another person) or a solitary exercise (i.e., an individual self-directs a procedure), meditation is most commonly self-directed. Meditation also tends not to follow a specific script and can take place in many different settings. A consequence of this is that, unlike hypnosis (which typically involves an observable induction procedure), there is often no obvious observable marker of the meditative context. This poses challenges for separating state and trait. One way of meeting these challenges might be to assess participants' moment-to-moment subjective experiences in different experimental conditions—for example, by repeatedly recording ratings of attention during a normal meditation procedure and during a relaxation control condition (Davidson, 2010).

A further issue relevant to the distinction between trait and state effects in meditation is the role of training. In hypnosis, although various attempts have been made to train low hypnotizable participants to respond to hypnosis, the results have been largely unconvincing. Although it is possible to train participants to emulate the outward physical behaviors of high hypnotizable participants (Gorassini & Spanos, 1986, 1999), there is little evidence that the training promotes genuine changes in subjective experience or that the effects of the training persist in other contexts or across time (Bates, 1992; Bowers & Davidson, 1991; for a review, see Barnier & McConkey, 2004). Hypnosis thus seems to reflect a relatively stable trait that is not easily modifiable. In contrast, the ability to meditate seems to implicitly require some level of practice and training (Tang et al., 2007). There is, for example, some evidence that meditative training can result in relatively stable changes to attention and mind wandering (Brewer et al., 2011).

Despite this, the nature of the relationship between meditation training and trait mindfulness is somewhat unclear, and there are a number of unresolved questions. For example, it is not clear if people have an inherent capacity for mindfulness or if this is an entirely learned skill (Grant, 2012). Likewise, it is not clear if the social and contextual cues of meditation training have a facilitatory effect on participants' practice, independent of trait mindfulness (Tang, Rothbart, & Posner, 2012). Even more critically, it is not clear if trait mindfulness is a single capacity or involves multiple distinct components (e.g., perhaps particular levels of training might correspond to specific meditative capacities; Grossman, 2011). Woody, Barnier, and McConkey (2005) have proposed a similar idea regarding hypnosis, arguing for a componential model of hypnotizability, whereby a generalized capacity for hypnosis explains much of the variation across participants, while additional specialized component abilities are required for specific hypnotic effects. Similarly, Terhune, Cardeña, and Lindgren (2011) have found evidence that there are distinct subtypes of high hypnotizable individuals capable of responding to different types of suggestions. A possible future direction for meditation research might be to investigate whether there are comparable general and specific mindfulness capabilities that vary across individuals, meditative practices, and levels of expertise.

Recent methodological and conceptual reviews of meditation research (e.g., Awasthi, 2013; Grossman, 2008; Mikulas, 2011; Sauer et al., 2013; see also Chapters 13 and 15) suggest growing awareness of these issues. The increasing focus on methodologies for quantifying trait mindfulness is particularly encouraging. Distinguishing between trait and state effects in meditation has the potential to improve our understanding of the way that different meditation phenomena relate to one another, and we suggest that the conceptual frameworks used in hypnosis research may be instructive in this goal. Improved conceptual clarity would likely lead to new and refined measures, which would in turn facilitate new research questions and hypotheses within the broader science of subjective experience.

### Cognitive and social influences

The third concept that we consider useful has been an awareness of the interplay between cognitive and social processes. Hypnosis, by definition, involves cognitive changes in the context of a social interaction between the hypnotist and person being hypnotized (in the case of self-hypnosis, both roles are performed by the same person; Kihlstrom, 2008). As a result, hypnosis research has needed to examine both cognitive and social influences. An enduring debate is whether hypnosis can be understood as involving mainly social variables or cognitive changes. Although such a simple dichotomy is likely to be problematic (Kihlstrom, 2003a), various theorists have emphasized one over the other (e.g., Barnier, Dienes, & Mitchell, 2008; Lynn, Kirsch, & Hallquist, 2008).

In meditation research, much more focus has been placed on cognitive changes associated with meditation—either as state or trait—while largely ignoring the social context in which meditation occurs. Meditation, however, is traditionally engaged in for a particular spiritual purpose and within a particular cultural setting (Chiesa, 2013). It remains to be seen as to the extent to which meditation can be excised from this setting for the purposes of laboratory research or clinical intervention (Faure, 2012; MacCoon, MacLean, Davidson, Saron, & Lutz, 2014; Mitchell, 2002). It is likely, for example, that the particular beliefs a person holds, their motivations, and the social groups to which they belong influence their meditative practice (Sedlmeier et al., 2012). Neglecting this is likely to lead to an impoverished view of the phenomena.

This also has specific implications for research. Sedlmeier et al. (2012), for example, note that details about instructors, demographic background, participants' personality, and recruitment are often sparse in the literature. Research, instead, typically only reports the type of meditative practice undertaken and the duration of practice. Both these measures are problematic. Type of meditative practice is usually insufficient because of the heterogeneity within even simple meditative practices in terms of technique and the context in which it is engaged. A simple breath meditation, for example, can be done in many different ways and can be done simply to improve concentration or with a more soteriological goal (Gethin, 1998; Mitchell, 2002). Duration of practice is also problematic, showing only a very modest association ( $r = 0.05$ ) with the effects of meditation in Sedlmeier et al.'s (2012) meta-analysis. Furthermore, there is evidence from other domains of expertise showing that training is necessary but not sufficient for expertise (Campitelli & Gobet, 2011; Hambrick et al., 2014). In particular, there are considerable differences between individuals in terms of the amount of practice required to achieve levels of expertise (Campitelli & Gobet, 2008), and pre-existing individual differences greatly influence final attainment (Campitelli & Gobet, 2011; Hambrick & Meinz, 2011).

Other general social variables may also influence meditative outcomes. Some authors have explained hypnosis in terms of factors that describe other complex social behavior, such as expectancies, attributions, beliefs, and relationships (Lynn et al., 2008). Although there has been considerable debate as to whether hypnosis can be entirely reduced to these factors, it is clear that

these variables play an important role in hypnosis. There is evidence, for example, that increasing expectancy may lead to greater responsiveness from hypnotized participants (Lynn et al., 2008). It remains to be seen how these variables affect meditation. This is particularly relevant to the reliability of self-report measures of subjective experience in meditation, which might be especially affected by various socio-cognitive influences. This is an important area for future research.

### **Demand characteristics**

The fourth concept that we consider useful is controlling demand characteristics. Whereas many general social factors are important to both hypnosis and meditation, the particular social setting of a laboratory experiment may also influence participants' responses. In particular, demand characteristics—features of the experimental situation that invite particular responses from participants—are an inescapable part of laboratory research (Kihlstrom, 2002b; Orne, 1959, 1979). These have been studied perhaps most intensely in hypnosis, due to skepticism and debate about the nature of hypnotic effects. In a hypnosis session, participants may alter their behavior in response to subtle pressure from the hypnotist to comply, their preconceptions of what hypnosis involves, and particular cues in the experimental setting, such as the wording of the suggestion and how it is tested. More broadly, in the act of hypnosis, both the hypnotist and the participant enter into an implicit arrangement with predefined social roles (Kihlstrom, 2002b). This complicity encourages participants to adjust their behavior to what they believe is required, and so undermines the ecological validity of the experiment.

In hypnosis research, demand characteristics are traditionally investigated using the real-simulator design developed by Orne (1962, 1979). In this design, genuinely hypnotized, high hypnotizable participants (reals) are compared to a quasi-control group of low hypnotizable participants instructed to fake hypnosis (simulators). The hypnotist remains blind as to which participants are in each group and administers a hypnotic induction and hypnotic suggestions to all participants. The rationale of this design is that if reals respond in the same way as simulators, it is not possible to rule out the possibility that reals are merely responding to social cues. If, however, reals respond differently to simulators, it is likely that their behavior is not simply due to situational cues. This design thus allows experimenters to investigate what social cues are available to participants and the likely impact of these cues on behavior (Sheehan & Perry, 1976).

Although such a design may not be useful for ongoing meditation research, it could provide important insights into the experimental cues that influence behavior. Participants, for example, are typically aware that they are taking part in a study on meditation and this, by itself, is likely to cue certain responses and behaviors (Lifshitz & Raz, 2012). For example, meditators are likely to complete questionnaires or answer questions in the context of being a meditator—rather than in terms of their other social roles and identities—and may be inclined to emphasize the benefits of meditation to provide what they believe the experimenter is looking for (Sauer et al., 2013). It is even possible that some neurophysiological characteristics could be affected by the unique social context of the experiment, in which the participant's identity as a meditator is highly salient and the participant is scrutinized in great detail (see, e.g., Campbell-Meiklejohn, Bach, Roepstorff, Dolan, & Frith, 2010; Mason, Dyer, & Norton, 2009; Zaki, Schirmer, & Mitchell, 2011, for evidence that social influence can affect neurophysiology).

Even without deploying complicated designs such as real-simulator studies, meditation research might benefit from a more explicit focus on assessing demand characteristics. For example, at the conclusion of a study, participants could be asked, by an independent interviewer, what they thought the experimenter was looking for and the extent to which they felt pressure to provide particular responses. In addition, questionnaires could include items to detect impression

management and compliance—for example, including items that assess responses that one would not necessarily expect to change as a result of meditation (such as physical strength and abilities), as well as items that assess expectations around meditation and its effects on others. Research could also examine whether participants' responses vary depending upon the context in which they are assessed—whether in the laboratory or in other settings when other aspects of their identity are more salient—and in response to financial incentives (Jensen, Vangkilde, Frokjaer, & Hasselbalch, 2012).

## Conclusion

We acknowledge that hypnosis and meditation differ in many important ways. These differences include, in particular, the goals of practice, the contexts in which they typically occur, the techniques involved (procedure), their effects (product), the role of individual differences, and their social, cultural, and historical backgrounds. There is also considerable heterogeneity within each tradition, and differences in how these techniques are practiced both in everyday settings and in the laboratory. Nevertheless, we believe that the various distinctions we have identified in hypnosis research can help to inform meditation research.

Research into both hypnosis and meditation is challenging precisely because both primarily involve alterations in subjective experience. Since it is not possible to directly observe these alterations, researchers must infer what these alterations involve using various methodologies. Both hypnosis and meditation have developed different methods for addressing this challenge. Whereas hypnosis research has focused on the various subjective, behavioral, and neurophysiological alterations that occur within a particular social interaction, meditation research has focused on changes associated with specific training and the development of expertise. Dialogue between these traditions may thus help to enrich each other, as well as to guide investigation into the nature of subjective experience more broadly.

## References

- Awasthi, B. (2013). Issues and perspectives in meditation research: in search for a definition. *Frontiers in Consciousness Research*, 3, 613. doi:10.3389/fpsyg.2012.00613
- Baer, R. A. (2003). Mindfulness training as a clinical intervention: a conceptual and empirical review. *Clinical Psychology: Science and Practice*, 10(2), 125–143. doi:10.1093/clipsy.bpg015
- Baer, R. A., Smith, G. T., & Allen, K. B. (2004). Assessment of mindfulness by self-report: the Kentucky Inventory of Mindfulness Skills. *Assessment*, 11(3), 191–206. doi:10.1177/1073191104268029
- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, 13(1), 27–45.
- Banquet, J.-P. (1973). Spectral analysis of the EEG in meditation. *Electroencephalography and Clinical Neurophysiology*, 35(2), 143–151.
- Bányai, E. I., & Hilgard, E. R. (1976). A comparison of active-alert hypnotic induction with traditional relaxation induction. *Journal of Abnormal Psychology*, 85(2), 218–224. doi:10.1037/0021-843X.85.2.218
- Barber, T. X., & Calverley, D. S. (1962). "Hypnotic behavior" as a function of task motivation. *Journal of Psychology*, 54(2), 363–389.
- Barnhofer, T., Chittka, T., Nightingale, H., Visser, C., & Crane, C. (2010). State effects of two forms of meditation on prefrontal EEG asymmetry in previously depressed individuals. *Mindfulness*, 1(1), 21–27. doi:10.1007/s12671-010-0004-7
- Barnier, A. J. (2002). Remembering and forgetting autobiographical events: instrumental uses of hypnosis. *Contemporary Hypnosis*, 19(2), 51–61. doi:10.1002/ch.242

- Barnier, A. J., Cox, R. E., Connors, M., Langdon, R., & Coltheart, M. (2011). A stranger in the looking glass: developing and challenging a hypnotic mirrored-self misidentification delusion. *International Journal of Clinical and Experimental Hypnosis*, *59*(1), 1. doi:10.1080/00207144.2011.522863
- Barnier, A. J., Cox, R. E., & McConkey, K. M. (2014). The province of "highs": the high hypnotizable person in the science of hypnosis and in psychological science. *Psychology of Consciousness*, *1*(2), 168–183. doi:10.1037/cns0000018
- Barnier, A. J., Dienes, Z., & Mitchell, C. (2008). How hypnosis happens: new cognitive theories of hypnotic responding. In M. R. Nash & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis: theory, research and practice* (pp. 141–177). Oxford, UK: Oxford University Press.
- Barnier, A. J., & McConkey, K. M. (2004). Defining and identifying the highly hypnotisable person. In M. Heap, R. J. Brown, & D. A. Oakley (Eds.), *The highly hypnotizable person: theoretical, experimental and clinical issues* (pp. 30–60). New York: Routledge.
- Barnier, A. J., & Nash, M. R. (2008). Introduction: a roadmap for explanation, a working definition. In M. R. Nash & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis: theory, research and practice* (pp. 1–18). Oxford: Oxford University Press.
- Barnier, A. J., & Oakley, D. A. (2009). Hypnosis and suggestion. In W. P. Banks (Ed.), *Encyclopedia of consciousness* (pp. 351–368). Oxford, UK: Elsevier.
- Bates, B. L. (1992). The effect of demands for honesty on the efficacy of the Carleton Skills-Training Program. *International Journal of Clinical and Experimental Hypnosis*, *40*(2), 88–102.
- Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., . . . Devins, G. (2004). Mindfulness: a proposed operational definition. *Clinical Psychology*, *11*(3), 230–241. doi:10.1093/clipsy.bph077
- Bowers, K. S. (1976). *Hypnosis for the seriously curious*. Monterey, CA: Brooks/Cole.
- Bowers, K. S. (1981). Do the Stanford scales tap the "classic suggestion effect"? *International Journal of Clinical and Experimental Hypnosis*, *29*(1), 42. doi:10.1080/00207148108409142
- Bowers, K. S., & Davidson, T. M. (1991). A neodissociative critique of Spanos's social-psychological model of hypnosis. In S. J. Lynn & J. W. Rhue (Eds.), *Theories of hypnosis: current models and perspectives* (pp. 105–143). New York: Guilford Press. Retrieved from <http://psycnet.apa.org/psycinfo/1991-98913-004>
- Bowers, K. S., & Kelly, P. (1979). Stress, disease, psychotherapy, and hypnosis. *Journal of Abnormal Psychology*, *88*(5), 490–505. doi:10.1037/0021-843X.88.5.490
- Brewer, J. A., Worhunsky, P. D., Gray, J. R., Tang, Y.-Y., Weber, J., & Kober, H. (2011). Meditation experience is associated with differences in default mode network activity and connectivity. *Proceedings of the National Academy of Sciences*, *108*(50), 20254–20259. doi:10.1073/pnas.1112029108
- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*(4), 822.
- Cahn, B. R., & Polich, J. (2006). Meditation states and traits: EEG, ERP, and neuroimaging studies. *Psychological Bulletin*, *132*(2), 180.
- Campbell-Meiklejohn, D. K., Bach, D. R., Roepstorff, A., Dolan, R. J., & Frith, C. D. (2010). How the opinion of others affects our valuation of objects. *Current Biology*, *20*(13), 1165–1170.
- Campitelli, G., & Gobet, F. (2008). The role of practice in chess: a longitudinal study. *Learning and Individual Differences*, *18*(4), 446–458.
- Campitelli, G., & Gobet, F. (2011). Deliberate practice necessary but not sufficient. *Current Directions in Psychological Science*, *20*(5), 280–285. doi:10.1177/0963721411421922
- Chiesa, A. (2013). The difficulty of defining mindfulness: current thought and critical issues. *Mindfulness*, *4*(3), 255–268.
- Cojan, Y., Archimi, A., Cheseaux, N., Waber, L., & Vuilleumier, P. (2013). Time-course of motor inhibition during hypnotic paralysis: EEG topographical and source analysis. *Cortex*, *49*(2), 423–436. doi:10.1016/j.cortex.2012.09.013

- Connors, M. H., Barnier, A. J., Langdon, R., Cox, R. E., Polito, V., & Coltheart, M. (2013). A laboratory analogue of mirrored-self misidentification delusion: the role of hypnosis, suggestion, and demand characteristics. *Consciousness and Cognition*, *22*(4), 1510–1522. doi:10.1016/j.concog.2013.10.006
- Connors, M. H., Cox, R. E., Barnier, A. J., Langdon, R., & Coltheart, M. (2012). Mirror agnosia and the mirrored-self misidentification delusion: a hypnotic analogue. *Cognitive Neuropsychiatry*, *17*(3), 197–226. doi:10.1080/13546805.2011.582770
- Cox, R. E., & Bryant, R. A. (2008). Advances in hypnosis research: methods, designs and contributions of intrinsic and instrumental hypnosis. In M. R. Nash & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis: theory, research and practice* (pp. 311–336). Oxford: Oxford University Press.
- Davidson, R. J. (2010). Empirical explorations of mindfulness: conceptual and methodological conundrums. *Emotion*, *10*(1), 8–11. doi:10.1037/a0018480
- Deeley, Q., Oakley, D. A., Toone, B., Giampietro, V., Brammer, M. J., Williams, S. C. R., & Halligan, P. W. (2012). Modulating the default mode network using hypnosis. *International Journal of Clinical and Experimental Hypnosis*, *60*(2), 206–228. doi:10.1080/00207144.2012.648070
- Deepak, K. K., Manchanda, S. K., & Maheshwari, M. C. (1994). Meditation improves clinicoelectroencephalographic measures in drug-resistant epileptics. *Biofeedback and Self-regulation*, *19*(1), 25–40.
- Derbyshire, S. W. G., Whalley, M. G., & Oakley, D. A. (2009). Fibromyalgia pain and its modulation by hypnotic and non-hypnotic suggestion: an fMRI analysis. *European Journal of Pain*, *13*(5), 542–550. doi:10.1016/j.ejpain.2008.06.010
- Faure, B. (2012). A gray matter: another look at Buddhism and neuroscience. *Tricycle: The Buddhist Review*, *XXII*, 70–75.
- Fox, K. C. R., Nijeboer, S., Dixon, M. L., Floman, J. L., Ellamil, M., Rumak, S. P., . . . Christoff, K. (2014). Is meditation associated with altered brain structure? A systematic review and meta-analysis of morphometric neuroimaging in meditation practitioners. *Neuroscience and Biobehavioral Reviews*, *43*, 48–73. doi:10.1016/j.neubiorev.2014.03.016
- Galea, V., Woody, E. Z., Szechtman, H., & Pierrynowski, M. R. (2010). Motion in response to the hypnotic suggestion of arm rigidity: a window on underlying mechanisms. *International Journal of Clinical and Experimental Hypnosis*, *58*(3), 251–268.
- Garland, E., & Gaylord, S. (2009). Envisioning a future contemplative science of mindfulness: fruitful methods and new content for the next wave of research. *Complementary Health Practice Review*, *14*(1), 3–9. doi:10.1177/1533210109333718
- Gauld, A. (1995). *A history of hypnotism*. Cambridge, UK: Cambridge University Press.
- Gethin, R. (1998). *The foundations of Buddhism*. Oxford: Oxford University Press. Retrieved from [http://books.google.com/books?hl=en&lr=&id=al\\_Wlh2mwWIC&oi=fnd&pg=PA2&dq=The+foundations+of+Buddhism&ots=rwCaRbzM-x&sig=I5alDYGc7MAB092YuXmmpxY0bLs](http://books.google.com/books?hl=en&lr=&id=al_Wlh2mwWIC&oi=fnd&pg=PA2&dq=The+foundations+of+Buddhism&ots=rwCaRbzM-x&sig=I5alDYGc7MAB092YuXmmpxY0bLs)
- Gorassini, D. R., & Spanos, N. P. (1986). A social-cognitive skills approach to the successful modification of hypnotic susceptibility. *Journal of Personality and Social Psychology*, *50*(5), 1004.
- Gorassini, D. R., & Spanos, N. P. (1999). The Carleton Skill Training Program for modifying hypnotic suggestibility: original version and variations. In I. Kirsch, A. Capafons, E. Cardeña-Buelna, & S. Amigo (Eds.), *Clinical hypnosis and self-regulation: cognitive-behavioral perspectives* (pp. 141–177). Washington, DC: American Psychological Association.
- Goyal, M., Singh, S., Sibinga, E. M. S., Gould, N. F., Rowland-Seymour, A., Sharma, R., . . . Haythornthwaite, J. A. (2014). Meditation programs for psychological stress and well-being: a systematic review and meta-analysis. *JAMA Internal Medicine*, *174*(3), 357–368. doi:10.1001/jamainternmed.2013.13018
- Grant, J. A. (2012). Towards a more meaningful comparison of meditation and hypnosis. *Journal of Mind-Body Regulation*, *2*(1), 71–74.
- Grossman, P. (2008). On measuring mindfulness in psychosomatic and psychological research. *Journal of Psychosomatic Research*, *64*(4), 405–408. doi:10.1016/j.jpsychores.2008.02.001

- Grossman, P. (2011). Defining mindfulness by how poorly I think I pay attention during everyday awareness and other intractable problems for psychology's (re)invention of mindfulness: comment on Brown et al.(2011). *Psychological Assessment*, **23**(4), 1034–1040.
- Grossman, P., & Van Dam, N. T. (2011). Mindfulness, by any other name . . . : trials and tribulations of sati in Western psychology and science. *Contemporary Buddhism*, **12**(1), 219–239. doi:10.1080/14639947.2011.564841
- Halligan, P. W., Athwal, B. S., Oakley, D. A., & Frackowiak, R. S. (2000). Imaging hypnotic paralysis: implications for conversion hysteria. *The Lancet*, **355**(9208), 986–987. doi:10.1016/S0140-6736(00)99019-6
- Hambrick, D. Z., & Meinz, E. J. (2011). Limits on the predictive power of domain-specific experience and knowledge in skilled performance. *Current Directions in Psychological Science*, **20**(5), 275–279.
- Hambrick, D. Z., Oswald, F. L., Altmann, E. M., Meinz, E. J., Gobet, F., & Campitelli, G. (2014). Deliberate practice: is that all it takes to become an expert? *Intelligence*, **45**, 34–45. doi:10.1016/j.intell.2013.04.001
- Hilgard, E. R. (1965). *Hypnotic susceptibility*. New York: Harcourt, Brace & World.
- Hilgard, E. R. (1975). Hypnosis. *Annual Review of Psychology*, **26**(1), 19–44. doi:10.1146/annurev.ps.26.020175.000315
- Hilgard, E. R. (1977). *Divided consciousness: multiple controls in human thought and action*. New York: Wiley and Sons.
- Hofmann, S. G., Sawyer, A. T., Witt, A. A., & Oh, D. (2010). The effect of mindfulness-based therapy on anxiety and depression: a meta-analytic review. *Journal of Consulting and Clinical Psychology*, **78**(2), 169–183. doi:10.1037/a0018555
- Hull, C. L. (1933). *Hypnosis and suggestibility*. New York: Appleton-Century Crofts.
- Jensen, C. G., Vangkilde, S., Frokjaer, V., & Hasselbalch, S. G. (2012). Mindfulness training affects attention—or is it attentional effort? *Journal of Experimental Psychology*, **141**(1), 106.
- Khare, K. C., & Nigam, S. K. (2000). A study of electroencephalogram in meditators. *Indian Journal of Physiology and Pharmacology*, **44**(2), 173–178.
- Kihlstrom, J. F. (1985). Hypnosis. *Annual Review of Psychology*, **36**(1), 385–418. doi:10.1146/annurev.ps.36.020185.002125
- Kihlstrom, J. F. (2002a). Measurement of involuntariness in hypnotic response. Retrieved March 11, 2012, from <http://list-socrates.berkeley.edu/~kihlstrm/PDFfiles/Hypnotizability/HGSHSAResponse1002.pdf>
- Kihlstrom, J. F. (2002b). Demand characteristics in the laboratory and the clinic: conversations and collaborations with subjects and patients. *Prevention and Treatment*, **5**, Article 36c.
- Kihlstrom, J. F. (2003a). The fox, the hedgehog, and hypnosis. *International Journal of Clinical and Experimental Hypnosis*, **51**(2), 166–189. doi:10.1076/iceh.51.2.166.14611
- Kihlstrom, J. F. (2003b). Hypnosis and memory. *Learning and memory* (2nd edn.) (pp. 240–242). Farmington Hills, MI: Macmillan Reference.
- Kihlstrom, J. F. (2008). The domain of hypnosis, revisited. In M. R. Nash & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis: theory, research and practice* (pp. 21–52). Oxford: Oxford University Press.
- Kirsch, I., Council, J. R., & Wickless, C. (1990). Subjective scoring for the Harvard Group Scale of Hypnotic Susceptibility, Form A. *International Journal of Clinical and Experimental Hypnosis*, **38**(2), 112. doi:10.1080/00207149008414506
- Kirsch, I., Mazzoni, G., & Montgomery, G. H. (2007). Remembrance of hypnosis past. *American Journal of Clinical Hypnosis*, **49**(3), 171–178.
- Kosslyn, S. M. (2000). Hypnotic visual illusion alters color processing in the brain. *American Journal of Psychiatry*, **157**(8), 1279–1284. doi:10.1176/appi.ajp.157.8.1279
- Kumar, V. K., Pekala, R. J., & McCloskey, M. M. (1999). Phenomenological state effects during hypnosis: a cross-validation of findings. *Contemporary Hypnosis*, **16**(1), 9–21. doi:10.1002/ch.145

- Lau, M. A., Bishop, S. R., Segal, Z. V., Buis, T., Anderson, N. D., Carlson, L., . . . Devins, G. (2006). The Toronto Mindfulness Scale: development and validation. *Journal of Clinical Psychology*, *62*(12), 1445–1467. doi:10.1002/jclp.20326
- Laurence, J.-R., Beaulieu-Prévost, D., & du Chênè, T. (2008). Measuring and understanding individual differences in hypnotizability. In M. R. Nash & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis: theory, research and practice* (pp. 225–253). Oxford: Oxford University Press.
- Laurence, J.-R., & Nadon, R. (1986). Reports of hypnotic depth: are they more than mere words? *International Journal of Clinical and Experimental Hypnosis*, *34*(3), 215–233. doi:10.1080/00207148608406987
- Levinson, D. B., Stoll, E. L., Kindy, S. D., Merry, H. L., & Davidson, R. J. (2014). A mind you can count on: validating breath counting as a behavioral measure of mindfulness. *Frontiers in Psychology*, *5*, 1202. doi:10.3389/fpsyg.2014.01202
- Lifshitz, M., & Raz, A. (2012). Hypnosis and meditation: vehicles of attention and suggestion. *Journal of Mind–Body Regulation*, *2*(1), 3–11.
- Lutz, A., Dunne, J. D., & Davidson, R. J. (2007). Meditation and the neuroscience of consciousness: an introduction. In P. Zelazo, M. Moscovitch, & E. Thompson (Eds.), *The Cambridge handbook of consciousness* (pp. 499–554). Cambridge, UK: Cambridge University Press.
- Lutz, A., Slagter, H. A., Dunne, J. D., & Davidson, R. J. (2008). Attention regulation and monitoring in meditation. *Trends in Cognitive Sciences*, *12*(4), 163–169. doi:10.1016/j.tics.2008.01.005
- Lynn, S. J., Kirsch, I., & Hallquist, M. N. (2008). Sociocognitive theories of hypnosis. In M. R. Nash & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis: theory, research and practice*. Oxford: Oxford University Press.
- Lynn, S. J., & Rhue, J. W. (1991). Hypnosis theories: themes, variations, and research directions. In S. J. Lynn & J. W. Rhue (Eds.), *Theories of hypnosis: current models and perspectives* (pp. 601–626). New York: Guilford Press.
- Lynn, S. J., Rhue, J. W., & Kirsch, I. (Eds.). (2010). *Handbook of clinical hypnosis* (2nd revised edn.). Washington, DC: American Psychological Association.
- MacCoon, D. G., MacLean, K. A., Davidson, R. J., Saron, C. D., & Lutz, A. (2014). No sustained attention differences in a longitudinal randomized trial comparing mindfulness based stress reduction versus active control. *PLoS ONE*, *9*(6), e97551. doi:10.1371/journal.pone.0097551
- Manna, A., Raffone, A., Perrucci, M. G., Nardo, D., Ferretti, A., Tartaro, A., . . . Romani, G. L. (2010). Neural correlates of focused attention and cognitive monitoring in meditation. *Brain Research Bulletin*, *82*(1–2), 46–56. doi:10.1016/j.brainresbull.2010.03.001
- Mason, M. F., Dyer, R., & Norton, M. I. (2009). Neural mechanisms of social influence. *Organizational Behavior and Human Decision Processes*, *110*(2), 152–159.
- McConkey, K. M. (2008). Generations and landscape of hypnosis: questions we've asked, questions we should ask. In M. R. Nash & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis: theory, research and practice* (pp. 53–77). Oxford: Oxford University Press.
- McConkey, K. M., Bryant, R. A., Bibb, B. C., & Kihlstrom, J. F. (1991). Trance logic in hypnosis and imagination. *Journal of Abnormal Psychology*, *100*(4), 464.
- McConkey, K. M., Wende, V., & Barnier, A. J. (1999). Measuring change in the subjective experience of hypnosis. *International Journal of Clinical and Experimental Hypnosis*, *47*(1), 23. doi:10.1080/00207149908410020
- Mikulas, W. L. (2011). Mindfulness: significant common confusions. *Mindfulness*, *2*(1), 1–7. doi:10.1007/s12671-010-0036-z
- Mitchell, D. W. (2002). *Introducing the Buddhist experience*. New York, NY: Oxford University Press.
- Nash, M. R. (2005). The importance of being earnest when crafting definitions: science and scientism are not the same thing. *International Journal of Clinical and Experimental Hypnosis*, *53*(3), 265–280. doi:10.1080/00207140590961934

- Nash, M. R. (2008). Foundations of clinical hypnosis. In M. R. Nash & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis: theory, research and practice* (pp. 487–502). Oxford: Oxford University Press.
- Nash, M. R., & Barnier, A. J. (Eds.). (2008). *The Oxford handbook of hypnosis*. New York: Oxford University Press.
- Nash, J. D., & Newberg, A. (2013). Toward a unifying taxonomy and definition for meditation. *Consciousness Research*, 4, 806. doi:10.3389/fpsyg.2013.00806
- Nogrady, H., McConkey, K. M., & Perry, C. (1985). Enhancing visual memory: trying hypnosis, trying imagination, and trying again. *Journal of Abnormal Psychology*, 94(2), 195–204. doi:10.1037/0021-843X.94.2.195
- Oakley, D. A. (2008). Hypnosis, trance and suggestion: evidence from neuroimaging. In M. R. Nash & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis: theory, research and practice* (pp. 365–392). Oxford: Oxford University Press.
- Oakley, D. A., & Halligan, P. W. (2002). Hypnotic mirrors and phantom pain: a single case study. *Contemporary Hypnosis*, 19(2), 75–84. doi:10.1002/ch.244
- Oakley, D. A., & Halligan, P. W. (2009). Hypnotic suggestion and cognitive neuroscience. *Trends in Cognitive Sciences*, 13(6), 264–270. doi:10.1016/j.tics.2009.03.004
- Oakley, D. A., & Halligan, P. W. (2013). Hypnotic suggestion: opportunities for cognitive neuroscience. *Nature Reviews Neuroscience*, 14(8), 565–576. doi:10.1038/nrn3538
- Orne, M. T. (1959). The nature of hypnosis: artifact and essence. *Journal of Abnormal and Social Psychology*, 58(3), 277.
- Orne, M. T. (1962). On the social psychology of the psychological experiment: with particular reference to demand characteristics and their implications. *American Psychologist*, 17(11), 776.
- Orne, M. T. (1979). On the simulating subject as a quasi-control group in hypnosis research: what, why, and how. In E. Fromm & R. E. Shor (Eds.), *Hypnosis: developments in research and new perspectives* (pp. 399–444). New York: Aldine.
- Pekala, R. J., & Kumar, V. K. (1986). The differential organization of the structures of consciousness during hypnosis and a baseline condition. *Journal of Mind and Behavior*, 7(4), 515–539.
- Polito, V., Barnier, A. J., & McConkey, K. M. (2014). Defining hypnosis: process, product, and the value of tolerating ambiguity. *Journal of Mind-Body Regulation*, 2(2), 118–120.
- Polito, V., Barnier, A. J., & Woody, E. Z. (2013). Developing the Sense of Agency Rating Scale (SOARS): an empirical measure of agency disruption in hypnosis. *Consciousness and Cognition*, 22(3), 684–696. doi:10.1016/j.concog.2013.04.003
- Polito, V., Barnier, A. J., Woody, E. Z., & Connors, M. H. (2014). Measuring agency change across the domain of hypnosis. *Psychology of Consciousness*, 1(1), 3–19. doi:10.1037/cns0000010
- Rainville, P., Hofbauer, R. K., Bushnell, M. C., Duncan, G. H., & Price, D. D. (2002). Hypnosis modulates activity in brain structures involved in the regulation of consciousness. *Journal of Cognitive Neuroscience*, 14(6), 887–901. doi:10.1162/089892902760191117
- Rao, K. R. (2011). Applied yoga psychology studies of neurophysiology of meditation. *Journal of Consciousness Studies*, 18(11–12), 11–12.
- Raz, A., Kirsch, I., Pollard, J., & Nitkin-Kaner, Y. (2006). Suggestion reduces the Stroop effect. *Psychological Science*, 17(2), 91–95. doi:10.1111/j.1467-9280.2006.01669.x
- Sauer, S., Walach, H., Schmidt, S., Hinterberger, T., Lynch, S., Büssing, A., & Kohls, N. (2013). Assessment of mindfulness: review on state of the art. *Mindfulness*, 4(1), 3–17. doi:10.1007/s12671-012-0122-5
- Sedlmeier, P., Eberth, J., Schwarz, M., Zimmermann, D., Haarig, F., Jaeger, S., & Kunze, S. (2012). The psychological effects of meditation: a meta-analysis. *Psychological Bulletin*, 138(6), 1139–1171. doi:10.1037/a0028168
- Shear, J. (2006). Introduction. In J. Shear (Ed.), *The experience of meditation: experts introduce the major traditions* (pp. xiii–xxii). St. Paul, MN: Paragon House.

- Sheehan, P. W., & McConkey, K. M. (1982). *Hypnosis and experience: the exploration of phenomena and process*. Hillsdale, NJ: Lawrence Erlbaum.
- Sheehan, P. W., & Perry, C. (1976). *Methodologies of hypnosis: a critical appraisal of contemporary paradigms of hypnosis*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Shor, R. E., & Easton, R. D. (1973). A preliminary report on research comparing self- and hetero-hypnosis. *American Journal of Clinical Hypnosis*, *16*(1), 37–44.
- Shor, R. E., & Orne, E. C. (1962). *The Harvard Group Scale of Hypnotic Susceptibility, Form A*. Palo Alto, CA: Consulting Psychologists' Press.
- Smith, J. E., Richardson, J., Hoffman, C., & Pilkington, K. (2005). Mindfulness-based stress reduction as supportive therapy in cancer care: systematic review. *Journal of Advanced Nursing*, *52*(3), 315–327. doi:10.1111/j.1365-2648.2005.03592.x
- Szechtman, H., Kalogeras, J., Bowers, K. S., & Nahmias, C. (1998). Where the imaginal appears real: a positron emission tomography study of auditory hallucinations. *Proceedings of the National Academy of Sciences, USA*, *95*(4), 1956–1960.
- Tang, Y.-Y., Ma, Y., Wang, J., Fan, Y., Feng, S., Lu, Q., . . . Posner, M. I. (2007). Short-term meditation training improves attention and self-regulation. *Proceedings of the National Academy of Sciences*, *104*(43), 17152–17156. doi:10.1073/pnas.0707678104
- Tang, Y.-Y., Rothbart, M. K., & Posner, M. I. (2012). Neural correlates of establishing, maintaining, and switching brain states. *Trends in Cognitive Sciences*, *16*(6), 330–337. doi:10.1016/j.tics.2012.05.001
- Terhune, D. B., Cardeña, E., & Lindgren, M. (2011). Dissociated control as a signature of typological variability in high hypnotic suggestibility. *Consciousness and Cognition*, *20*(3), 727–736. doi:10.1016/j.concog.2010.11.005
- Vago, D. R., & Silbersweig, D. A. (2012). Self-awareness, self-regulation, and self-transcendence (S-ART): a framework for understanding the neurobiological mechanisms of mindfulness. *Frontiers in Human Neuroscience*, *6*, 296. doi:10.3389/fnhum.2012.00296
- Van Dam, N. T., Earleywine, M., & Borders, A. (2010). Measuring mindfulness? An item response theory analysis of the Mindful Attention Awareness Scale. *Personality and Individual Differences*, *49*(7), 805–810. doi:10.1016/j.paid.2010.07.020
- Walach, H., Buchheld, N., Buttenmüller, V., Kleinknecht, N., & Schmidt, S. (2006). Measuring mindfulness—the Freiburg Mindfulness Inventory (FMI). *Personality and Individual Differences*, *40*(8), 1543–1555.
- Walsh, R., & Shapiro, S. L. (2006). The meeting of meditative disciplines and Western psychology: a mutually enriching dialogue. *American Psychologist*, *61*(3), 227–239. doi:10.1037/0003-066X.61.3.227
- Wang, D. J. J., Rao, H., Korczykowski, M., Wintering, N., Pluta, J., Khalsa, D. S., & Newberg, A. B. (2011). Cerebral blood flow changes associated with different meditation practices and perceived depth of meditation. *Psychiatry Research: Neuroimaging*, *191*(1), 60–67. doi:10.1016/j.pscychresns.2010.09.011
- Weitzenhoffer, A. M., & Hilgard, E. R. (1962). *Stanford Hypnotic Susceptibility Scale, Form C*. Palo Alto, CA: Consulting Psychologists' Press.
- Woody, E. Z., & Barnier, A. J. (2008). Hypnosis scales for the twenty-first century: what do we need and how should we use them? In M. R. Nash & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis: theory, research and practice* (pp. 255–281). Oxford: Oxford University Press.
- Woody, E. Z., Barnier, A. J., & McConkey, K. M. (2005). Multiple hypnotizabilities: differentiating the building blocks of hypnotic response. *Psychological Assessment*, *17*(2), 200–211. doi:10.1037/1040-3590.17.2.200
- Woody, E. Z., & McConkey, K. M. (2003). What we don't know about the brain and hypnosis, but need to: a view from the buckhorn inn. *International Journal of Clinical and Experimental Hypnosis*, *51*(3), 309–338. doi:10.1076/iceh.51.3.309.15523
- Zaki, J., Schirmer, J., & Mitchell, J. P. (2011). Social influence modulates the neural computation of value. *Psychological Science*, *22*(7), 894–900.

