

Hypnosis, Suggestion, and Suggestibility: An Integrative Model

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This article elucidates an integrative model of hypnosis that integrates social, cultural, cognitive, and neurophysiological variables at play both in and out of hypnosis and considers their dynamic interaction as determinants of the multifaceted experience of hypnosis. The roles of these variables are examined in the induction and suggestion stages of hypnosis, including how they are related to the experience of involuntariness, one of the hallmarks of hypnosis. It is suggested that studies of the modification of hypnotic suggestibility; cognitive flexibility; response sets and expectancies; the default-mode network; and the search for the neurophysiological correlates of hypnosis, more broadly, in conjunction with research on social psychological variables, hold much promise to further understanding of hypnosis.

Keywords: attention, cognitive, core and process variables in hypnosis, expectancy, hypnosis, hypnotic suggestibility, induction, response set theory, socio-cognitive models, suggestion

Stretching back to the time of Mesmer, hypnosis has provoked the curiosity of scientists and the lay public. After all, any intervention that produces hallucinations on command, amnesia for events, and a blunting of response to ordinarily painful stimuli would call for an explanation (Pintar & Lynn, 2008). How can we account for the fascinating and perplexing alterations in consciousness that occur during hypnosis? Is the participant in hypnosis somehow experiencing a trance state, radically different from waking life, as the dominant view of hypnosis for more than 200 years proclaims? Or can the apparent shifts in consciousness be readily explained in the same terms as more mundane phenomena?

In this article, we favor the latter view and present an integrative model of hypnosis and hypnotic phenomena that acknowledges the interaction of social, cultural, and cognitive variables in producing the multifaceted experience of hypnosis (for earlier versions of integrative/synergistic models, see Lynn & Rhue, 1991; Nadon, Laurence, & Perry, 1991). These variables include, but are not limited to, participants' attitudes, beliefs, and expectancies about hypnosis; their motivation to respond to the hypnotist and his or her suggestions; their interpretation of how to respond to suggestions and willingness and ability to imagine experiences consistent with the requirements of diverse suggestions; and their ability to form response sets in keeping with suggested activities and respond to nonhypnotic imaginative suggestions. We believe that a truly comprehensive account of hypnosis must consider the neurophysiological roots or correlates of what transpires during hypnosis. We keep an open mind with regard to the possible operation of unique attentional and neurocognitive capabilities that may prove to distinguish highly responsive from non-responsive participants in and out of hypnosis (Laurence, Slako, & Le Beau, 1998), and we suggest lines of future research to examine such differences among participants.

We contend—with most mainstream hypnosis researchers—that hypnosis produces genuine changes in consciousness, and we wholeheartedly agree with Bloom (2004) who observed that “words change physiology” a claim that is not in dispute among proponents of competing theories of hypnosis. In fact, hypnotic experiences can be so compelling that impressive changes in brain activation can be observed as a product of suggestion (e.g., visual hallucinations) that are akin to those produced by real perceptual experiences (Szechtman, Woody, Bowers, & Nahmias, 1998; Woody & Szechtman, 2000).

Is Hypnosis an Altered or Special State of Consciousness?

To be clear from the outset, we eschew the culturally received belief that hypnosis is best construed as a special state or “trance,” somehow divorced from the operations of day-to-day consciousness. Whether one must be in an altered or special state of consciousness to experience hypnosis becomes a moot issue to the extent that “hypnotic” and ordinary experiences are not static and instead reflect constant and often transient changes in our awareness, emotions, thoughts, sensations, and action tendencies that are typically difficult, if not impossible, to parse into discrete states (Lynn, Green, Elinoff, Baltman, & Maxwell, *in press*).

The experience of hypnosis differs both within and among individuals on a moment-to-moment basis. Differences in what people are told about hypnosis; their attitudes, beliefs, and expectancies about hypnosis; the suggestions they receive; how they construe particular suggestions; and their feeling of comfort and security with the hypnotist and the situation overall will ensure the uniqueness and idiosyncratic nature of their experiences during hypnosis (see Sheehan & McConkey, 1982).

Accordingly, we agree with Kihlstrom (2003) that the neurophysiological correlates of hypnosis will vary with the suggestions received and that cognitive activities during hypnosis—much like waking consciousness—do not represent a steady or uniform “state.” As Kihlstrom observed, different responses to suggestions or hypnotic activities (e.g., responding to suggestions for hallucinations, amnesia, motor suggestions) are likely to be associated with different brain modules or systems (p. 118). The modulating effects of different suggestions on physiology are evident in terms of analgesia suggestions (De Pascalis, Magurano, & Bellusci, 1999), hypnotic blindness (Barabasz, Barabasz, Jensen, Calvin, Trevison, & Wagner, 1999), and pain (Hofbauer, Rainville, Duncan, & Bushnell, 2001; Rainville, Duncan, Price, Carrier, & Bushnell, 1997). Neurophysiological variables may therefore provide important indicators of the multifarious effects of suggestion on cognition, affect, and behavior.

Given the shifting nature of hypnotic experience, we suggest that there is no singular brain state, physiological signature, or state of consciousness that invariably follows a hypnotic induction. That said, we are optimistic that research efforts to identify physiological concomitants of both a general receptiveness and readiness to respond to suggestions and cognitive flexibility may yield valuable findings. Moreover, as we will illustrate, there are already indications that this is the case.

We define hypnosis as a situation in which imaginative suggestions for changes in thoughts, feelings, and actions are provided to a person in a context defined as “hypnosis,” with the expectation that the participant will respond to them in a compelling manner consistent with his or her beliefs about hypnosis, often derived from the broader sociocultural context. Imaginative suggestions are requests to experience an imaginary state of affairs as if it were real (Kirsch & Braffman, 2001). They differ from various other types of suggestion (e.g., the placebo effect, sensory suggestions, and the misinformation effect), as indicated by relatively low correlations between responsiveness to these various types of suggestion. Imaginative suggestions can be given with or without the induction of hypnosis. When given in a hypnotic context, they can be administered by a person designated or perceived to be in the role of a “hypnotist” or self-administered, in which case the situation is construed as “self-hypnosis.”

It can be said that someone is “hypnotized” when he or she responds to imaginative suggestions that are presented following a hypnotic induction ritual, which may be elaborate or as simple as merely defining the situation as “hypnosis.” People who are able to respond to the imaginative suggestions that are characteristic of hypnosis are often termed highly hypnotizable or susceptible to hypnosis. However, the very high correlation between responsiveness to these suggestions in hypnosis, and the same suggestions without the induction of hypnosis ($r = .67$ for behavioral scores; $r = .82$ for subjective scores; Braffman & Kirsch, 1999), indicates that the term highly suggestible is a more accurate description of these individuals. We propose that the ability to respond to imaginative suggestions depends on the ability to experience or translate the suggested sensations and imaginings into credible and compelling subjective experiences and actions.

Hypnotic Induction

To flesh out our perspective, we discuss the two stages in which hypnosis typically unfolds: induction and suggestion. Historically, hypnosis has been associated with inductions as varied as eye closure, focusing on an internal stimulus (such as breathing) or an external stimulus (such as the proverbial “dangling watch” popularized in fiction and the movies), and perhaps most commonly with instructions to relax and feel at ease. Regardless of what induction method is used, it is crucial to clearly define the events as “hypnotic” in nature, to distinguish the social interaction from everyday communications, and to mark the special occasion as one in which consciousness or capabilities will be optimally and radically expanded beyond the mundane. That is, what is paramount is that the hypnotist presents communications in such a way that they are deemed to be “hypnotic,” as defined by the socio-cultural context.

The induction includes implicit (e.g., enter a deeper state of relaxation) and often explicit suggestions to experience or “enter hypnosis,” which are typically delivered by an individual who assumes the culturally prescribed role of “hypnotist.” The hypnotist may intone suggestions in such a way as to accentuate their specialness and transformative nature regarding the experiences that will follow the induction. For example, he or she may speak quietly, slowly, and deliberately, modifying the pacing of speech to enhance the salience and impact of particular words and demarcate specific suggestions or response directives (e.g., your *hand will rise* off the resting surface). Many inductions (and suggestions) implicitly inform participants that they will experience the effects of hypnosis as “happening” to them (e.g., “Your hand is rising by itself”; Spanos, 1971), which contributes to the experience of involuntariness that is one of the hallmarks of hypnosis.

The physical setting in which hypnosis occurs is typically quiet to limit distractions, and the participant is encouraged to pay attention to both the hypnotist’s voice and to the effects of suggestions as they unfold. Not surprisingly, eye closure is often one of the first suggestions delivered to facilitate concentrated focus on imagery and the gamut of internal experiences as they arise.

Inductions often include words and phrases that are commonly associated with passive or receptive mental states (e.g., sleep, relaxation), encouraging openness to experience and readiness to respond to suggestions that focus attention. Additionally, inductions that suggest relaxation and sleepiness discourage an analytical attitude and searching for causes of behavior outside the framework of hypnosis (Lynn, Kirsch, & Hallquist, 2008; Lynn, Rhue, & Weekes, 1990). In short, hypnotic inductions invite absorption in internal and external experiences, while they discourage focusing attention on stimuli that compete with immersion in suggestion-related experiences (Lynn et al., *in press*).

We suggest that these functions of the induction facilitate the seeming automatic unfolding of hypnotic responses and decrease the sense of conscious deliberation that sometimes accompanies actions in more mundane situations. Brain structures that are

associated with the executive system, which in everyday life are associated with focused imagination, absorption, focused attention, and reduced analytical thought, also come on-line during hypnosis (Oakley & Halligan, 2010).

Defining the situation as hypnosis activates sociocultural schemas and expectancies regarding hypnosis, including the idea that hypnosis produces an altered state of consciousness that enhances suggestibility. Accordingly, it is not surprising that many participants experience alterations in consciousness, particularly when the suggestions provided explicitly call for such alterations in consciousness. Still, most individuals do not, in fact, experience hypnosis as a “trance,” and virtually all of the effects participants’ experience during hypnosis can be experienced with motivating instructions in the absence of defining the situation as hypnosis (Braffman & Kirsch, 1999; McConkey, 1986).

The broad skein of cultural beliefs and expectations in which hypnosis is embedded coalesces into a loosely woven script that specifies how events will unfold and what is expected from the participant during hypnosis (Lynn & Green, 2011). In this initial stage, the hypnotist may define hypnosis in various ways, ranging from a state of absorption in suggestions, much like being absorbed in a movie; to an altered state of consciousness; a state of dissociation; and thinking and imagining with suggestions. The particular way in which hypnosis is defined is less important than casting the situation as “hypnotic,” boosting response expectancies (i.e., anticipations of automatic subjective and behavioral responses to particular situational cues) for successful responding and providing a rationale for administering suggestions that are delivered in the next phase. According to Kirsch, hypnotic inductions produce hypnotic responses, much like placebos, by the power of the expectancies they induce and produce alterations in a wide variety of responses, including sexual arousal, anxiety, depression, and pain (Kirsch, 1985, 1991, 1994). When hypnosis is described as a trance, participants are not as responsive and experience diminished subjective effects compared to when hypnosis is defined as merely involving cooperation (Lynn, Vanderhoff, Shindler, & Stafford, 2002). This finding is not particularly surprising, given that many participants experience trepidations regarding what they (mistakenly) believe to be succumbing to a radically altered state of consciousness in which they relinquish control to the hypnotist. Indeed, this widely prevalent belief may predictably engender uneasiness and even outright anxiety and reluctance or resistance to participate fully. Accordingly, early on, the hypnotist often confronts cultural myths and misconceptions head on, informing individuals that they will not lose control, that they can resist suggestions if they choose to do so, and that they will not lose touch with their surroundings.

In this initial information-giving or “preinduction” stage of the hypnotic proceedings, rapport and positive response expectations about hypnosis are established, participant fears are minimized as myths about hypnosis are debunked, and an unspoken “contract” is established that the hypnotist will facilitate the responses of the participant who is willing, motivated, and hopefully able to experience whatever is suggested. This first

stage also often involves setting an agenda for hypnosis and removing barriers to optimal responding in which (a) suggestions are tied to goals of research or therapy; (b) motivation is enhanced by emphasizing the appealing features of hypnosis (e.g., relaxation, calm); and (c) expectancies about hypnosis are clarified, often by way of discussion that reveals and addresses lingering concerns about full immersion in the experience of hypnosis.

Hypnotic Suggestions

In the suggestion stage, suggestions serve to organize mental contents, while the hypnotic context facilitates motivation to get absorbed in imaginative suggestions and respond in keeping with the sensations, imaginings, and implicit and explicit directives of the suggestions. Suggestions vary in terms of their generality (e.g., full-body relaxation) versus specificity (e.g., rehearse in imagination a specific future event) and in their wording (e.g., permissive versus authoritative tone). Typically, the way suggestions are worded exerts little or no effect on participants' subjective or behavioral responses, beyond whether the suggestions are experienced as involuntary. For example, (a) permissive suggestions are experienced as more involuntary than authoritative suggestions (Lynn, Neufeld, & Matyi, 1987) and (b) suggestions that contain imagery (so-called goal-directed fantasies [GDFs]; Spanos, 1971) that would be expected to lead to the involuntary occurrence of a motor response (e.g., imagining a helium balloon as part of a hand levitation suggestion) produce more involuntary responses than suggestions that contain no GDFs. What matters more than minor variations in suggestion wording is that the suggestions convey the expected response clearly. Indeed, as noted earlier, the identical suggestions delivered in a nonhypnotic context are highly correlated with the response to the same suggestions delivered in a hypnotic context (Braffman & Kirsch, 1999; Hilgard & Tart, 1966). Further, the addition of a hypnotic induction appears to add little to suggestibility (approximately 1.5 suggestions on a 12-point scale; Kirsch & Lynn, 1995), as the imaginative suggestions themselves provide clear direction for responding and establish expectancies regarding how to respond (Kirsch, Mazzoni, & Montgomery, 2007; Meyer & Lynn, 2011; Polito, Barnier, Woody, & Connors, 2014). The small difference between hypnotic and identical nonhypnotic suggestions, and the small increment in hypnotic responsiveness that follows an induction, imply that an altered state is not necessary to explain hypnotic responses. The small advantage for hypnosis in increasing suggestibility may be a function of enhanced motivation and expectancies that often accompany the induction of hypnosis (Lynn et al., 2008).

Popular depictions aside, people do not respond to suggestions robotically. In fact, one of the most striking features of hypnosis is that there are pronounced individual differences in responsiveness to suggestions. For the past 50 years or so, researchers have struggled, largely in vain, to identify meaningful personality correlates and markers

of hypnotic responsiveness. Absorption, openness to experience, and thin boundaries between conscious and unconscious experiences show some small correlations with hypnotic responsiveness (Cardeña & Terhune, 2014; Laurence, Beaulieu-Prevost, & Duchene, 2008). Nevertheless, individual differences in expectancies, along with motivation to respond and imaginative suggestions, appear to be some of the most stable correlates of both subjective and behavioral responses to hypnosis (Kirsch & Braffman, 2001). For example, expectancies often—but not always—determine both when responses will occur and the nature of those responses, and altered expectancies account for more variability in hypnotic responding than trait hypnotic suggestibility (Kirsch, Mobayed, Council, & Kenny, 1992).

Response Sets and the Experience of Involuntariness

The experience of hypnotic suggestions occurs not so much by a process of dissociation (i.e., hypnotic suggestibility and dissociation correlate on average only at $r = .14$; Kirsch & Lynn, 1998) or via a radically altered state of consciousness, but by active engagement with suggestions. Such experiential involvement accompanies a response set to embrace a suggested thought or idea—a so-called “preparedness to respond” (Sheehan & McConkey, 1982)—in which experiences have an effortless or involuntary quality, “as if they happened by themselves” (Tellegen, 1981, p. 222). Researchers have found that this response set is associated with decreased brain activity in the anterior parts of the default mode network (Mazzoni, Venneri, McGeown, & Kirsch, 2013; McGeown, Mazzoni, Venneri, & Kirsch, 2009). The experiential set is itself prepared or primed by positive attitudes, beliefs, and expectancies regarding hypnosis and facilitated by rapport with the hypnotist (Lynn, Snodgrass, Rhue, Nash, & Frauman, 1987). Rapport may motivate participants to please the hypnotist, encourage behavioral compliance, and minimize task-irrelevant or distracting thoughts that affect the involuntary quality of experience (Sheehan, 1991).

During hypnosis, participants often attribute the sense of involuntariness or automaticity to the hypnotist or to the effects of suggestion. Culturally based ideas about hypnosis as involving automatic or involuntary responses promote the inference that goal-directed occurrences are involuntary happenings (Lynn et al., 1990). According to response set theory (Kirsch & Lynn, 1997, 1998, 1999; Lynn, 1997; Lynn & Hallquist, 2004), many actions apart from the hypnotic context, like those that emerge during hypnosis, flow effortlessly from response expectancies. Response expectancies elicit automatic responses in the form of self-fulfilling prophecies that are carried out efficiently with little conscious awareness. Lynn, Nash, Rhue, Frauman, and Sweeney (1984) showed that prehypnotic expectancies were associated with the reports of involuntariness that accompany suggestions. Participants led to believe that highly hypnotizable individuals typically experienced involuntariness were much more likely

to experience suggestion-related involuntariness than participants informed that many individuals do not experience suggestion-related involuntariness. Even though responses to hypnotic suggestions are often described as having an involuntary quality (Hoyt & Kihlstrom, 1987), hypnotic responses consume attentional resources and, as with many everyday actions, are goal-directed (Lynn et al., 1990).

The goal-directed nature of hypnotic responding may occur outside conscious awareness and represent strategic activity, such as focusing on distracting thoughts and sensations to facilitate responsiveness to a suggestion for amnesia for events that transpired during hypnosis. Indeed, in everyday life, actions are often initiated and executed with little or no awareness of their goal-directed nature (Custers & Aarts, 2010). In hypnosis, the goals and strategies that people adopt are shaped and primed by suggestions (e.g., to hallucinate an object), and the key response set—to respond like an excellent participant—may operate outside of immediate awareness. Moreover, the activation of a suggested idea and accompanying elaborated imagings and sensations may prompt action programs to responses that are executed with seeming automaticity. Because people are often unaware of the automatic nature of their responding and the stimuli that control their behaviors under ordinary circumstances, they tend to attribute the automatic or involuntary nature of their responses during hypnosis to an altered state of consciousness, a trance, or the power of the hypnotist (Lynn & Green, 2011). Accordingly, perceptions of involuntariness may represent a “post hoc self-attribution of causality over actions that are compatible with an individual’s thoughts” regarding the nature of hypnosis (e.g., hypnosis is associated with involuntary responses; Polito et al., 2014, p. 14).

Neurophysiology and Hypnosis: Mental Flexibility and the Default Network

The current account represents our most concerted attempt to integrate social-psychological, cognitive, and neurophysiological variables associated with hypnotic responding. Accordingly, in this section we present a selective review of studies that provide support for the neurophysiological underpinnings of cognitive flexibility, attention, and the activation of response sets during hypnosis, with important caveats noted as we proceed.

At this point, we may say, quite accurately, that there is no one “hypnosis,” no one “state of hypnosis,” and no one or essential “ability” necessary to respond to hypnosis. Rather than representing a fixed capacity to experience a special state of consciousness, the experience of hypnosis may require a modicum of mental flexibility and the ability to regulate attention and emotion in keeping with a variety of suggestions and their attendant demands (Davidson & Goleman, 1977; Gruzelier, Gray, & Horn, 2002; MacLeod, 2011). As Erickson, Rossi, and Rossi (1976) stated so cogently, therapeutic hypnosis occurs when “the limitations of one’s usual conscious sets and belief systems are temporarily altered so that one can be receptive to an experience of other patterns

of association and modes of mental functioning . . . that are usually experienced as involuntary by the patient” (p. 20). To accomplish this set shifting, a certain degree of mental flexibility is required.

Horton and Crawford (2004) interpreted greater hemispheric asymmetries and hemispheric specificity for tasks during hypnosis for high- compared with low-suggestible subjects in terms of greater cognitive flexibility on the part of highly suggestible subjects. Nevertheless, these differences in asymmetries and specificity may be related to differences across high- and low-suggestible subjects in terms of motivation, expectancies, fantasy-proneness, and other variables (see Lynn, Kirsch, Knox, & Lilienfeld, 2006).

Research suggests that activation of the anterior cingulate cortex (ACC) plays a role in state-like changes in response to a hypnotic induction (see Barabasz & Barabasz, 2009; Oakley & Halligan, 2010; Raz, Shapiro, Fan, & Posner, 2002). Nevertheless, additional studies are needed that control for imagery use, relaxation, motivation, and expectancy across both hypnotic and nonhypnotic inductions and suggestions before firm conclusions can be drawn regarding the specificity of involvement of the ACC in hypnotic responding. Indeed, the ACC has been associated with many cognitive functions outside the context of hypnosis (e.g., monitoring the degree of response conflict, over-riding prepotent response tendencies, and reappraising the relation between internal states and events, see Lynn et al., 2006).

McGeown et al.’s (2009) research implicates the default network in hypnotic responding. This network refers to cortical areas active when goal-directed mental activity is absent in states such as mind wandering and daydreaming. Conversely, decreases in the default mode signal goal-directed activity. McGeown and colleagues (2009) found evidence for decreases in the default network among highly hypnotizable individuals—but not low hypnotizables—following a hypnotic induction. Decreases in default-mode activity are associated with increased goal-directed activity in everyday life and are therefore also consistent with our hypothesis that goal-directed, strategic, and possibly nonconscious mental activity can play a role in hypnotic responding, much as it does on a day-to-day basis. We contend that (a) readiness to respond, (b) the propensity to focus attention as directed—engendered by the hypnotic context, (c) the properties of the hypnotic induction described earlier, and (d) physical and mental changes experienced during the induction create a situation in which response sets can form readily with little awareness and bolster a positive response set in a recursive, feed-forward manner.

Research on the modification of hypnotic responsiveness holds a key to expand the integrative model, examine the role of the default mode in hypnotic responding, and identify potentially unique abilities or capabilities of highly responsive hypnotic participants. Nearly three decades ago, Gorassini and Spanos (1986) developed the Carleton Skills Training Program (CSTP) to enhance hypnotic responsiveness. The CSTP includes the following components: (a) information to instill positive attitudes about hypnosis and motivation to respond, (b) instructions regarding how to use imaginal strategies to promote successful responding and instructions regarding how to interpret

suggestions (e.g., one must actually lift the hand while imagining that it is rising by itself), (c) exposure to a video-taped model who enacts successful responses to suggestions and verbalizes imagery-based strategies to facilitate subjective response, and (d) practice in responding to test suggestions.

Researchers have documented impressive increases on behavioral and subjective measures of suggestibility following hypnotic suggestibility modification training. In more than 15 studies, researchers (Gorassini & Spanos, 1999; Spanos, 1986) determined that more than 50% of initially low hypnotizable subjects who participated in the CSTP scored as high hypnotizables at posttesting. Importantly, large magnitude CSTP treatment gains endure for 2.5 years (Spanos, Cross, Menary, & Smith, 1988), and research in Spain (Cangas & Pérez, 1998), Poland (Niedzwieńska, 2000), and England (Fellows & Ragg, 1992) has provided cross-cultural support for the effectiveness of the CSTP.

Although this research indicates that hypnotic suggestibility is modifiable for many participants via the manipulation of social and cognitive variables, it is still the case that a sizable minority of individuals does not show increases in responsiveness post-intervention. We hypothesize that one reason for the failure of the CSTP to produce hypnotic suggestibility gains is that low-suggestible individuals lack key hard-wired abilities compared with highly suggestible participants, pertinent to automatic information processing and attentional abilities. Notably, this contention represents an expansion of previous sociocognitive models of hypnosis to better represent the possible influence of trait-like attributes on hypnotic responding.

Generally speaking, highly suggestible individuals exhibit greater Stroop conflict than low-suggestible individuals, regardless of whether or not they are hypnotized (Blum & Graef, 1971; Dixon, Brunet, & Laurence, 1990; Dixon & Laurence, 1992; for a contradictory finding, see Rubichi, Ricci, Padovani, & Scaglietti, 2005). Researchers have interpreted the suggestibility findings alternately as indications that highly suggestible individuals process information more automatically (Dixon & Laurence, 1992) or that their executive attention networks are more efficient (Raz et al., 2002) than their low-suggestible counterparts. Both explanations imply that trait-like attributes (neuro-cognitive factors) can modulate Stroop performance. Further evidence for specific neuro-cognitive factors comes from a neurophysiological investigation of evoked potentials during a Stroop-like task (Baribeau, Le Beau, Roth, & Laurence, 1994; Laurence et al., 1998) in which highs displayed significantly shorter latencies of a pre-300 negativity at the frontal site for the word and neutral conditions.

These results provide further support for the automaticity hypothesis and suggest that the greater automaticity exhibited by highly hypnotizable subjects is not exclusively verbal but rather perceptual in nature. In a recent case study of brain oscillations during an electroencephalogram (EEG) procedure, Fingelkurts, Fingelkurts, Kallio, and Revonsuo (2007) suggested that neutral hypnosis was characterized by an increase in alertness and heightened attention, reflected as neuronal activation in the pre-frontal cortex. Their results, although based on a case study, provide support for the hypothesis that in very

highly hypnotizable subjects, hypnosis may be accompanied by a changed pattern of neural activity (see also Oakley & Halligan, 2010).

In a study of Stroop performance as a marker of high suggestibility, Raz et al. (2002) demonstrated that highly suggestible individuals are able to completely eliminate Stroop interference following a post-hypnotic suggestion to see the words in a foreign language. In contrast, low-suggestible individuals displayed no such ability. In a second study in Kirsch's laboratory (Raz, Kirsch, Pollard, & Nitkin-Kaner, 2006), the same suggestions Raz et al. (2002) used, when not presented in the context of hypnosis, also significantly reduced Stroop conflict.

Other studies have indicated that the Stroop effect can be reduced, if not eliminated, in highly suggestible participants when experimenters provide attention-focusing instructions (e.g., Nordby, Jasiukaitis, & Spiegel, 1999; Sheehan, Donovan, & MacLeod, 1988). MacLeod and Sheehan (2003) reported a case study in which a highly suggestible participant succeeded in eliminating the Stroop interference effect. Laurence et al. (2008) concluded that the preponderance of the evidence suggests that "Hypnotic inductions increase interference in highs but not in lows. . . . However, when given suggestions to reduce interference either in hypnosis or post-hypnotically, highs can reduce interference more than lows" (p. 242). The authors conclude that this implies that "highs attentional capacities are more 'flexible' or at least more responsive to hypnotic demands/suggestions than those of lows" (p. 242). We suggest that the combination of a propensity to highly automatized cognition, which facilitates the seamless operation of response sets and the recruitment of suggestion-related imaginings, combined with cognitive flexibility and the use of cognitive strategies deployed in response to a variety of suggestions, may be essential to optimal hypnotic responsiveness.

Default mode and other neural activity and responses to attentional measures may be assessed in low-hypnotizable individuals who do not respond to the CSTP to determine whether these individuals can be distinguished on measures of such activity and attentional processes from individuals who are highly suggestible with and without benefit of CSTP intervention. If reliable differences can be demonstrated, suggesting that those individuals who fail to show gains post-CSTP show unique patterns of neurocortical functioning, it would strongly implicate some role for identified unique hypnotic abilities or capacities in determining hypnotic responsiveness, in addition to social and cognitive variables.

Still, even if reliable neurological correlations of hypnosis (measured pre- and post-induction) can be identified, they may well be produced by the social and cognitive variables we have discussed. Moreover, it will also be important to determine whether any neurocognitive differences identified with this research paradigm stand in a causal relation with hypnotic responsiveness, or whether hypnotic responsiveness produces neurocognitive changes. In either case, our model is open to the inclusion or exclusion of variables that future research will—we are confident—demonstrate to interact in interesting, complex, and highly individualized ways among participants.

This brief overview of our model points to a number of important issues for future research. When it comes to investigating hypnosis, cognitively and neuro-physiologically, social-psychological variables are continuously at play modulating the hypnotic response. The extrinsic and intrinsic influences of these variables are part and parcel of what the experience of hypnosis is. It thus becomes quite important to compare what happens during hypnosis to what happens in contexts removed from hypnosis. As far as suggestibility is concerned, either high suggestibles process information differently out of hypnosis and bring these differences to the hypnotic context (as the relation between imaginative suggestibility and hypnotic suggestibility suggests) or the demands of the hypnotic situation triggers in them cognitive processes that may or may not interact apart from this specific context.

We are confident that hypnosis research, driven by competing theories, will reveal much about human consciousness. After all, hypnosis will continue to captivate the attention of the psychological community, as hypnosis and hypnotic phenomena provide a potent demonstration of the impressive plasticity of human consciousness; the powerful impact of mere words on thoughts, feelings, and actions; and how suggestions can be used to structure or restructure our imaginings, experiences, and narratives of the world and ourselves.

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