

## The Province of “Highs”: The High Hypnotizable Person in the Science of Hypnosis and in Psychological Science

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The ability to genuinely and completely respond to hypnotic suggestion is the province of high hypnotizable people (“highs”). The abilities and experiences of highs are fascinating and important to hypnosis researchers in particular and to psychological researchers generally. To illustrate, first we discuss the role of highs in the science of hypnosis. We introduce the high hypnotizable people who helped shape theoretical discussions about the nature of hypnosis. Second, we discuss the contributions of highs in psychological science. We focus on the relevance of hypnosis research to general scientific problems in psychology and the use of hypnosis to turn highs temporarily into virtual patients to understand a range of psychological phenomena. Finally, we consider why highs are so helpful in these enterprises. We consider the nature of hypnotic models, the correlates and components of high hypnotizability, and the best ways to tap potential overlaps between hypnotic ability and differences in or predictors of the specific psychological phenomena that highs help us study.

*Keywords:* hypnosis, hypnotisability, hypnotic analogues, delusions

It is a fundamental fact of hypnosis that people differ in their susceptibility to hypnotic suggestions. Across centuries, countries, and cultures, in the clinic or the laboratory, these individual differences were recognized from the earliest days of scientific investigation (Barnier

& McConkey, 2004; E. R. Hilgard, 1965a; Laurence, Beaulieu-Prévost, & du Chéné, 2008). Most importantly, the ability to genuinely respond to all or almost all of the hypnotist’s suggestions, even the most difficult, is the province of a relatively select group of *high hypnotizable people* (or *highs* as we also call them). In 1892, Schrenck-Notzing (1892; cited in Laurence et al., 2008) reported hypnotizability scores of 8,705 people hypnotized by 15 clinicians from different countries. Of these, 1,313 or 15.1% were identified as the most hypnotizable (or “somnambulistic,” in the language of the day). In 1996, McConkey, Barnier, MacCallum, and Bishop (1996) reported hypnotizability scores of 4,752 people hypnotized over a 10-year period at Macquarie University in Australia. Of these, 680 or 14.3% were identified as highs.

Just over 100 years apart, these and other hypnotizability distributions consistently identify a small group of talented hypnotic subjects (for other distributions, see Bongartz, 1985; De Pascalis, Russo, & Marruci, 2000; Kallio & Ihamuotila, 1999; Laurence & Perry, 1982). Some researchers conceptualize hypnotic ability as a normally distributed, stable individual difference dimension akin to intelligence (E. R.

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Hilgard, 1965a). When measured by the field's reliable, well normed, standardized measures of hypnotizability—such as the Harvard Group Scale of Hypnotic Susceptibility, Form A (Shor & Orne, 1962) or the Stanford Hypnotic Susceptibility Scale, Form C (Weitzenhoffer & Hilgard, 1962)—10–15% of people score as “low hypnotizable,” passing only a few or no hypnotic items on the scale; 70–80% score as “medium hypnotizable,” passing some but not other items, usually easier rather than harder items; and 10–15% score as “high hypnotizable,” passing all or most items (Barnier & McConkey, 2004; Laurence et al., 2008). In this conception, highs are at one end of the distribution.

Other researchers view hypnotizability as a typology where highs differ qualitatively as well as quantitatively from lows and mediums (Kallio & Revonsuo, 2003; or typological above a certain dimensional level; Balthazard & Woody, 1989; Oakman & Woody, 1996). Kallio and Revonsuo (2003), for instance, argued that hypnotic virtuosos<sup>1</sup> (the most hypnotizable of high hypnotizable people), who score perfectly on hypnotizability measures (just 1.3% in McConkey et al.'s 1996 norming data), are distinct from all other hypnotic subjects and represent the only “true” responders. Here, true hypnotic responding may be in terms of the way they approach suggestions or the compelling or compulsive characteristics of their hypnotic experiences (see Woody & Sadler, 2005). Still other researchers recognize heterogeneity within “superb hypnotic performance” and identify subtypes of the most talented subjects (Barber, 1999; see also Laurence et al., 2008; McConkey & Barnier, 2004; Sheehan & McConkey, 1982; Terhune, Cardeña, & Lindgren, 2011a, 2011b). In these typological conceptions, highs are a breed or breeds apart. These conceptions also have led to a range of significant questions about the developmental trajectory of hypnotic ability and its relationship to various personality characteristics such as imaginative involvement, absorption, and openness to experience (J. R. Hilgard, 1970; Tellegen & Atkinson, 1974; see also Barnier, Dienes, & Mitchell, 2008).

### Highs in the Science of Hypnosis

... theoretical debates about the nature of hypnosis are rooted in the behaviors and experiences of a few sub-

jects who seem to respond in an intriguing, sometimes surprising way to a hypnotic induction.—Laurence et al. (2008, p. 225)

Whether high hypnotizability is best thought of as the extreme end of a continuum or as a particular type or types, high hypnotizable people remain fascinating and important to hypnosis researchers. They are fascinating because “mere words” (White, 1941)—relatively straightforward verbal communications—from the hypnotist can have a dramatic impact on their experience and behavior (Barnier, Dienes et al., 2008; McConkey, 2008). Highs respond positively to suggestions, for instance, that their arms are moving, their limbs are paralyzed, they can or cannot communicate, taste, smell, hear, feel or see, and they cannot remember (E. R. Hilgard, 1965b, 1975; Kihlstrom, 1985). Highs respond to these suggestions with, as Kihlstrom (2008) put it, “experienced involuntariness bordering on compulsion” and “conviction bordering on delusion” (p. 21). In other words, highs report their hypnotic experiences feel surprisingly easy and exceptionally real (Barnier, Dienes et al., 2008). High hypnotizable people are important to hypnosis researchers because it is their compelling experiences that we strive to understand and explain. Naturally then, highs have played a key role in both the developing and contemporary science of hypnosis. A few selected examples of such theoretically pivotal highs must start with Victor Race.

### The Marquis de Puységur and Victor Race

The birth of hypnosis typically is dated to the work of Franz Anton Mesmer (1734–1815), a Viennese physician who practiced in Paris, France in the 1770s and 1780s. He introduced a therapeutic technique called “animal magnetism” or “mesmerism,” which he claimed could cure people's physical ills (Ellenberger, 1970; Laurence et al., 2008). This therapy involved in part making “magnetic passes” with his hands over the body of the patient. This led to a

<sup>1</sup> This use of “virtuoso” to refer to the most extreme high hypnotizable subjects, who respond to all hypnotic suggestions, overlaps with its more general meaning of a highly skilled person. However, virtuosos in other domains (e.g., music or other artistic pursuits) become outstanding via extensive training (as well as natural talent). True hypnotic virtuosos cannot be created by training (see Laurence et al., 2008).

convulsive fit or “crisis,” during which patients displayed some of the behaviors we now associate with hypnosis. According to Mesmer, and consistent with physical science views of the time, a magnetic force pervaded the universe, including inside and outside people’s bodies (Spanos & Chaves, 1991). A person experienced illness when this magnetic force was out of balance; Mesmer claimed his magnetic treatment returned the fluid to balance.

Mesmer’s physical explanation of magnetism was discredited in large part because of a famous investigation, *The Franklin Commission*, a commission of inquiry established by Louis XVI and presided over by Benjamin Franklin (McConkey & Barnier, 1991; McConkey & Perry, 2002). However, Mesmer’s disciple—the Marquis de Puységur (1751–1825)—offered an alternative, psychological explanation. Puységur’s interpretation of the behavior and experience of “magnetized” individuals was motivated mostly by his interactions with one highly susceptible man, Victor Race (Ellenberger, 1970; Sheehan & Perry, 1976).

Race was a young peasant living and working on Puységur’s estate. He was one of Puységur’s first patients and apparently could be “easily magnetized” (Ellenberger, 1970, p. 71; see also Gauld, 1992). While magnetized, Race showed quite different behavior compared with the rather notorious, convulsive crises of Mesmer’s patients. He instead appeared to enter “a strange kind of sleep in which he seemed to be more awake and aware than in his normal waking state” (Ellenberger, 1970, p. 71), although later he would have no memory for this (much like the modern hypnotic phenomenon of suggested posthypnotic amnesia; see Barnier, 2002; Kihlstrom, 1980). Puységur labeled this state “artificial somnambulism” and mapped its characteristics in his work with Race and other patients. For instance, Puységur recognized that the method of induction influenced people’s responses and that close rapport was important to, perhaps even diagnostic of, the magnetic relationship (Sheehan & Perry, 1976). As Ellenberger noted:

The role played by Victor Race in the history of magnetism deserves special attention. Not only was he one of Puységur’s first patients, and the very first to fall into the perfect crisis—of which he became the prototype—but it is from him that the Marquis

learned fundamental principles (Ellenberger, 1970, p. 72).

So Puységur’s work with Victor Race, who today we would recognize as a virtuoso high, played a crucial role in the earliest theoretical discussions of the nature of hypnosis (Sheehan & Perry, 1976).

### The Abbé de Faria and One in Five or Six

Both Mesmer and Puységur noted but did not fully understand why people such as Race responded extremely well to their techniques when others did not (Laurence et al., 2008; Sheehan & Perry, 1976). The Abbé de Faria (1756–1819) was the first to systematically document and try to explain such individual differences in susceptibility. On the basis of his work with over 5,000 people, Faria argued that only certain people were highly susceptible: “natural eptotes” (Ellenberger, 1970, p. 75). He estimated that hypnotic talent was reserved for “one in five or six of the population” (Sheehan & Perry, 1976, p. 21). Furthermore, whereas Mesmer, Puységur, and others attributed their success with mesmerism, artificial somnambulism, or lucid sleep (as Faria called it) to outside agents and/or forces, Faria attributed it firmly to the abilities of the highly susceptible person. According to Sheehan and Perry (1976), Faria’s views and methods were crucial turning points in the history of hypnosis given the central role that individual differences still play in modern accounts of hypnosis.

### Ernest Hilgard and the Hidden Observer

Like Victor Race before him, a highly hypnotizable young man was a catalyst in the theorizing and research of Ernest Hilgard, one of the most influential modern scholars across psychology, and in the field of hypnosis. As part of a broader explanation of the nature of mental life, Hilgard argued that hypnosis involves a temporary disunity in consciousness. Hypnotic responses feel as they do because impaired executive monitoring is isolated within a dissociated stream of consciousness from (mostly) spared executive control (E. R. Hilgard, 1991, 1992).

In a chapter reflecting on the development of these theoretical views, Hilgard described “the unanticipated appearance of a hidden observer”

(E. R. Hilgard, 1992, p. 74) in an early 1970s classroom demonstration of hypnotically suggested deafness (see also [Zimbardo, Andersen, & Kabat, 1981](#)). For this demonstration, Hilgard administered a hypnotic suggestion to a young, blind male student. Hilgard then suggested that the student would become deaf to all sounds until Hilgard placed his hand upon the student's right shoulder. Hilgard tested the suggestion by banging wooden blocks together close to the hypnotized student's head and his classmates tested the suggestion by asking questions and taunting him to get a reaction. The student did not respond, as if he were truly deaf. One classmate wondered whether some part of the hypnotized student was aware of the true state of affairs, so Hilgard used a finger signaling technique from clinical hypnosis to speak to "some part of you that is hearing my voice" (E. R. Hilgard, 1992, p. 75). The hypnotized subject promptly responded despite the suggestion for deafness. By placing his hand on and off the hypnotized subject's arm, Hilgard could speak with "the hidden part." Hilgard wrote of this experience:

This unplanned and hence unrehearsed demonstration indicated clearly that a hypnotized subject who is not aware of sensory information may nevertheless be registering the sensory experience in some manner and processing the information. Under appropriate circumstances, what was unknown to the subject while hypnotized can be uncovered and talked about . . . . Once the existence of the hidden-observer phenomenon was demonstrated with this highly responsive hypnotic subject, it became important to find out how prevalent it was and what its parameters were (E. R. Hilgard, 1992, p. 77).

Although only "a small fraction of the very highly responsive hypnotic subjects" that E. R. Hilgard (1992, p. 77) tested in his laboratory showed the hidden observer phenomenon, his discovery, mapping, and extension of it (especially to hidden observer reports of pain; e.g., E. R. Hilgard, Morgan, & McDonald, 1975) strongly influenced Hilgard's theorizing about the dissociative basis of hypnotic experience (E. R. Hilgard, 1979, 1991, 1992). It also motivated multiple series of experiments by Hilgard, his collaborators and others, which often focused on the most talented hypnotic subjects (e.g., Laurence, Nadon, Nogrady, & Perry, 1986; Nogrady, McConkey, Laurence, & Perry, 1983), as well as ongoing discussions about the validity of the phenomenon and its implication

for understanding hypnosis (e.g., [Kihlstrom & Barnier, 2005](#); [Lynn, 2005](#)).

### Martin Orne and Trance Logic

Another important theoretical concept in accounts of hypnosis is "trance logic," proposed and developed by Martin Orne in the 1950s and 1960s. Orne (1959, 1972) argued that deeply hypnotized subjects display without concern paradoxical or illogical reasoning during hypnosis. For instance, a high hypnotizable subject given a suggestion to see a (nonexistent) person sitting in a chair (i.e., a positive visual hallucination) sometimes will report that they see both the hallucinated person as well as the back of the chair; that is, they "mix freely . . . perceptions derived from reality with those that stem from . . . imagination and are perceived as hallucinations. These perceptions are fused in a manner that ignores everyday logic" (Orne, 1959, p. 295). Orne saw highs' comfort in tolerating logical incongruities as a diagnostic marker of a deep and genuine experience of hypnosis: as part of the essence (vs. artifact) of hypnosis (Orne, 1959). Although not all highs show trance logic (and other explanations have been proposed; [Spanos, 1986](#)), Orne argued that simulating or faking subjects never show it (Orne, 1959; but see [Spanos, 1986](#)).

Orne noticed highs' lack of concern for logical consistency in his work, for instance, on age regression. Age regression involves a suggestion from the hypnotist to go back in time to an earlier age or experience, such as back to a particular grade or year in school (as in the SHSS:C; [Weitzenhoffer & Hilgard, 1962](#); see also [Nash, 1987](#)). Orne (1972) described a dramatic example of trance logic from a hypnotic session with one high hypnotizable subject who he regressed to age six. As a 6-year-old, the young man spoke only German but as an adult spoke English. Orne wrote that while age regressed to this time, the subject:

. . . answered ["Nein"] when asked whether he [understood] English. . . . When this question was rephrased to him 10 times in English, he indicated each time in German that he was unable to comprehend English. . . . While professing his inability to comprehend English, he continued responding appropriately in German to the hypnotist's complex English questions (Orne, 1972, p. 427; see also [McConkey, Bryant, Bibb, & Kihlstrom, 1991](#)).



Although not all high hypnotizable people show the hidden observer and trance logic, their discovery in some highs fuelled new—albeit contested—ideas about the nature of hypnosis (e.g., Lynn, Weekes, Milano, Brentar, Johnson, & Condon, 2011). Theoretical debates about them also interacted with and influenced wider debates about the relative importance of internal, cognitive, and external, contextual features on human experience and behavior (e.g., Michel, 1973; Neisser, 1967).

### Sheehan and McConkey and the Subject's Point of View

One final example of theoretically important highs comes from the work of Peter Sheehan and Kevin McConkey in the 1980s and 1990s who emphasized the need to understand hypnosis from the subjects'—particularly high hypnotizables'—point of view. Sheehan and McConkey (1982) developed and used their Experiential Analysis Technique (EAT) to focus closely on the private experience, rather than only observable behavior, of hypnotized people, especially a handful of talented hypnotic subjects who worked in their laboratory at the time. Capitalizing on the then relatively new technology of videotapes, Sheehan and McConkey recorded subjects' hypnosis sessions and asked them to watch and comment on the video with an independent experimenter, an approach "highly sensitive to the measurement of the richness of subjects' experiences" (Sheehan & McConkey, 1982, p. xiii). In a series of case studies, they used the EAT to explore a range of hypnotic phenomena shown by highs who they argued "provide the most useful data for explaining the nature of hypnotic response" (Sheehan & McConkey, 1982, p. xiii).

For instance, Sheehan and McConkey (1982) presented three case illustrations of hypnotic age regression. Case 3 involved a high hypnotizable man, fluent in both French and English, who was regressed to age five. Like Orne's (1972) trance logic subject who spoke German when age regressed, this person spoke French in response to the hypnotist's English questions. However, following hidden observer instructions, like E. R. Hilgard's (1992) hypnotic deafness subject, Sheehan and McConkey's subject answered the hypnotist's questions in English, then French, then English again when tapped

repeatedly on the shoulder. These findings shaped Sheehan (1991, 1992) and McConkey's (1991) theoretical views. Specifically, based on their case studies, Sheehan and McConkey (1982) proposed a range of pathways to and profiles of hypnotic responding (see also McConkey, 1991; McConkey & Barnier, 2004; Sheehan, 1991, 1992). Whereas some highs are inclined to listen to suggestions and wait for the suggested effects, other highs work actively on the suggestions and their experiences of them (McConkey, Glisky, & Kihlstrom, 1989). This possibility of distinct cognitive styles, of different trajectories or correlates of hypnotizability still resonates as an important insight into the nature and mechanisms of hypnosis, and one that we return to at the end of this article (see also Barber, 1999; Laurence et al., 2008; Terhune, Cardeña, & Lindgren, 2011a, 2011b; Woody & McConkey, 2003).

### Highs in Psychological Science

It is a mistake to think of hypnosis as belonging only to abnormal psychology, and of research in hypnosis contributing only to an understanding of hypnosis. The understanding of consciousness, of voluntary and involuntary action, of control systems affecting sensory, affective, and motor processes, of reality distortion in perception—these are all problems that belong to a complete psychology, independent of hypnosis, but to the resolution of which hypnosis contributes. In addition, hypnosis provides a methodology useful in studying many problems not originating through the investigator's interest in hypnosis.—E. R. Hilgard (1979, p. 34)

The science of hypnosis has been shaped by our domain's long history of conversation and collaboration (Kihlstrom, 2002) between researchers and talented hypnotic people. However, these collaborations also have been crucial to contributions that extend well beyond the domain to the fields of psychology, psychiatry, and neuroscience. In the formative period of contemporary psychology, for instance, Clark Hull (1933) believed that hypnosis was a testing ground for the (then) new science of experimental psychology. By his view, if experimental psychology was any good as a science, then it should be able to explain hypnosis (Kihlstrom, 2007). Furthermore, as argued by E. R. Hilgard (1979), information about hypnosis is relevant to more general scientific problems.

### Contributions of “Intrinsic” Research: Research That Focuses on Hypnosis Itself

In the late 19th century, Edmund Gurney’s research on posthypnotic suggestion (suggestions given during hypnosis to behave in a particular way after hypnosis) influenced William James’ (1890) notions of the stream of consciousness, secondary consciousness, and dissociative mechanisms (Gauld, 1992; Kihlstrom & McConkey, 1990). Working with talented hypnotic subjects, Gurney (1885–1887) demonstrated that they would perform difficult behavioral and cognitive tasks outside their awareness when they were prompted by the suggested posthypnotic cue. Over two decades, the Stanford Hypnosis Laboratory (1957–1979) extended these 19th century insights via research on registration without perception, attention and cognitive control, imagination and imagery, illusions and hallucinations, time distortion, memory, linguistic analysis, and creativity (E. R. Hilgard, 1979). Highs were central to this work as the most responsive to suggested effects.

More recently, broadly relevant, “intrinsic” (Reyher, 1962) hypnosis research with highs has included (but not been limited to) work on source amnesia, implicit memory and implicit perception, reality monitoring, automatic versus controlled processes, and states of consciousness, as well as neuroscience investigations of pain, perceptual and motor processes, varieties of anomalous experiences, and the default network (for reviews, see Cardeña, 2014; Cardeña, Krippner, & Lynn, 2014; Cox & Bryant, 2008; Halligan & Oakley, 2014; Kihlstrom, 1987, 2007, 2014; Oakley & Halligan, 2009, 2013). One productive line of intrinsic research is on highs’ hypnotic and nonhypnotic performance on the Stroop test. The Stroop (1935) test is a benchmark measure of attention and automaticity in cognitive and general psychology, where people name the color of the ink of a printed word under color-congruent (color name and meaning are congruent with the print color: e.g., “red” in red ink), color-incongruent (color name and meaning are incongruent with the print color: e.g., “red” in blue ink), or neutral (printed word is unrelated to color: e.g., “low” in red ink) conditions. People respond more slowly and with more errors to incongruent than to

congruent or neutral stimuli (known as the Stroop Interference Effect).

In the first major investigation of hypnotic Stroop performance, Sheehan, Donovan, and MacLeod (1988) found that simply being hypnotized (without specific suggestion) caused highs to show more interference than when not hypnotized, implying that they processed the meaning of words more automatically during hypnosis. However, highs eliminated Stroop interference when given a specific strategy to focus their attention. Away from the context of hypnosis and again without specific suggestion, Dixon, Bruent, and Laurence (1990) and Dixon and Laurence (1992) reported that highs processed words more automatically than lows as well as applied a strategy to modulate Stroop more successfully than lows. Being high hypnotizable seemed to be associated with especially flexible attentional capacities. Finally, MacLeod and Sheehan (2003) reported that when they gave one high hypnotizable subject a specific suggestion during hypnosis to disrupt his reading, he showed no Stroop interference. Raz and colleagues have since replicated and programmatically explored (in and out of hypnosis, behaviorally and neurally) this surprising finding of Stroop elimination (for review, see Lifshitz, Aubert Bonn, Fischer, Kashem, & Raz, 2013). This work is important well beyond hypnosis because it helps to define the parameters of attention and controlled and automatic responding. These findings raise a key theoretical question for psychology more generally about the conditions under which highly practiced behaviors such as reading might be overridden (Kihlstrom, 2007; MacLeod, 2011). They also are relevant to discussions about sense of agency and actual agency (Polito, Barnier, & Woody, 2013). Future work could apply these insights to situations where apparently automatic responding either is helpful (e.g., expert performance) or unhelpful (e.g., passivity phenomena in schizophrenia).

### Contributions of “Instrumental” Research: Research That Puts Hypnosis to Work

In the quote at the start of this section, E. R. Hilgard (1979) referred also to what Reyher (1962) called “instrumental” research, where hypnosis is a tool of experimental psychopathology. It offers the ability to temporarily turn

high hypnotizable people into “virtual patients” (Halligan & Oakley, 2014; Oakley & Halligan, 2009) and to then study in a controlled manner particular phenomena or clinical symptoms of interest. For example, motivated by psychoanalytic concepts, researchers in the 1930s and then the 1960s and 1970s used “paramnesia” suggestions to generate compelling experiences in highs, which were covered by amnesia, but nevertheless elicited in them strong emotional reactions such as anger or guilt (Brickner & Kubie, 1936; Reyher, 1962; for review see Sheehan & Perry, 1976). This was seen as a laboratory analog of the processes of repression and pathological symptom formation. In a typical experiment, Sommerschild and Reyher (1973) gave high hypnotizable subjects suggestions to create conflicts involving sexual or aggressive impulses toward a female laboratory assistant; highs showed more negative cognitive and physiological symptoms than lows asked to simulate hypnosis. This approach allowed researchers to explore hypotheses very difficult to test in any other context.

More recently, instrumental hypnosis research with highs has included (but again not been limited to) analogs of hallucinations and delusions; functional amnesia, blindness, pain, and paralysis; obsessive–compulsive disorder and the suppression of unwanted thoughts and emotions (for reviews, see Cox & Barnier, 2010; Cox & Bryant, 2008; Kihlstrom, 1979, 2007, 2014; Oakley & Halligan, 2009, 2013; Woody & Szechtman, 2011). One productive line of instrumental research is on posthypnotic amnesia as an analog of functional amnesia. Case reports of functional amnesia describe individuals who, in the classic view, lose access to part or all of their personal past after a traumatic experience. However, they show “implicit” evidence of the forgotten events and their memories return as suddenly as they were lost (e.g., Schacter, Wang, Tulving, & Freedman, 1982). The features of posthypnotic amnesia are remarkably similar: highs given a posthypnotic amnesia suggestion show impaired explicit memory of the target information but spared implicit memory; this effect is reversed by cancelling the suggestion (Barnier, 2002; Kihlstrom, 1980).

Working with high hypnotizable people who show profound amnesia, researchers have mapped dissociations between explicit and im-

PLICIT memory; indexed people’s control over their remembering and forgetting; compared hypnotic and nonhypnotic forgetting paradigms; extended hypnotic forgetting from simple word lists and events of hypnosis to complex autobiographical material; and started to examine the neural underpinnings of hypnotic and clinical amnesias (e.g., Barnier, 2002; Cox & Barnier, 2003; Geiselman, Bjork, & Fishman, 1983; Kihlstrom, 1980; McConkey & Sheehan, 1981; Mendelsohn, Chalamish, Solomonovich, & Dudai, 2008). Posthypnotic amnesia offers a powerful means to explore claims about the ways in which people intentionally or unintentionally regulate their memories (see also Kihlstrom, 2014; Mazzoni, Laurence, & Heap, 2014).

### Highs in Hypnotic Analogs of Delusion

Working with high hypnotizable people (and hypnotic techniques) allows researchers to investigate psychological phenomena under conditions and in ways that they would not be able to do as easily otherwise. Hypnotic analogs of delusion illustrate this point as well. Delusions are “fixed beliefs that are not amenable to change in light of conflicting evidence” (American Psychological Association, 2013, p. 87). Following a tradition of investigating hypnotically created delusions (see Sutcliffe, 1961), over the last 20 years at the University of New South Wales and Macquarie University we have developed laboratory models of a range of monothematic delusions (i.e., delusions that involve a single theme) (for review, see Cox & Barnier, 2010). Monothematic delusions are a common symptom in neuropsychological conditions such as dementia, stroke, after traumatic brain injury, and in psychiatric conditions such as schizophrenia. People come to believe, for instance, that they are a different person (reverse intermetamorphosis), there is a stranger in the mirror (mirrored-self misidentification), one of their limbs belongs to someone else (somatoparaphrenia), someone or something else is controlling their movements (alien control), they are being followed by someone they know who is in disguise (Fregoli), their spouse or loved one has been replaced by an imposter (Capgras), or they are loved from afar (erotomania) (Davies, Coltheart, Langdon, & Breen, 2001).

Our current hypnotic models of these false beliefs involve difficult cognitive-delusory suggestions, which usually are experienced fully (albeit temporarily) only by talented highs. In the majority of these hypnotic models, highs display striking similarities with their clinical counterparts in terms of what they say and do in response to delusion suggestions (Bortolotti, Cox, & Barnier, 2012). Highs believe the suggested delusions with conviction, maintain their beliefs despite evidence to the contrary, and experience them as involuntary and as compellingly real (Cox & Barnier, 2010).

To illustrate these similarities, consider our work on mirrored-self misidentification delusion, which is the delusional belief that when I look in the mirror, I see a stranger rather than myself. In an initial experiment, we gave high hypnotizable subjects a hypnotic suggestion to see a stranger in the mirror and then asked them to open their eyes, look into a mirror, and describe what they see (Barnier et al., 2008; see also Barnier, Cox, Connors, Langdon, & Coltheart, 2010; Connors, Barnier, Coltheart, Cox, & Langdon, 2012; Connors, Barnier, Langdon, Cox, Polito, & Coltheart, 2013; Connors, Barnier, Langdon, Cox, Polito, Quinto, & Coltheart, in press; Connors, Cox, Barnier, Langdon, & Coltheart, 2012). Highs expressed surprise when they initially looked into the mirror and some looked behind them to search for the “stranger” in the room. They claimed that a family member would have no trouble distinguishing them from the stranger because the stranger had physical characteristics different to their own. When we asked them to touch their nose while looking in the mirror, they said that the stranger was copying their actions. In contrast, lows almost never reported seeing a stranger in the mirror and never looked around the room in search of a stranger. Interestingly, after we cancelled the suggestion and asked highs to look in the mirror again, some engaged in seemingly subconscious grooming behaviors (e.g., touching their hair and face) when they once again recognized themselves in the mirror.

Highs’ responses to hypnotic delusions are especially remarkable given how unlikely it is they would have heard of the delusions we are attempting to model. Nevertheless, after a hypnotic delusion suggestion, highs regularly display features of delusions that parallel very closely their clinical presentation. For example,

in clinical mirrored-self misidentification, patients often try to talk to the stranger but are unable to hear a reply. One clinical patient said: “he goes past the mirror . . . I always speak to him, you know, silently”; another said: “I haven’t been able to get him to talk since I’ve known him” (Breen, Caine, Coltheart, Hendy, & Roberts, 2000). Similarly, high hypnotizable subjects experiencing the hypnotic version of this delusion make comments such as: “He’s saying something but I can’t understand . . . I can’t lip read” (Bortolotti et al., 2012).

In another example, when we attempted to model somatoparaphrenia (the delusional belief that one of my limbs belongs to someone else; Rahmanovic, Barnier, Cox, Langdon, & Coltheart, 2012), one version of our suggestion instructed subjects to believe their arm belonged to someone else. Almost all of the highs who received this suggestion displayed arm paralysis, which is a key feature of clinical somatoparaphrenia. During the suggested delusion, these highs behaved as if they could not move their arm even though the hypnotist never mentioned paralysis. Highs extrapolated the features of this delusion based upon their belief their arm belonged to someone else.

One of the goals of our research is to examine the circumstances under which hypnotic delusions might resolve or reverse, without formal cancellation of the suggestion. To do this, we ask hypnotically deluded subjects to respond to counter evidence. This counter evidence is based upon the types of counter evidence presented to clinically deluded patients (Breen et al., 2000). For example, in mirrored-self misidentification, we ask highs to touch a ball held over their shoulder and explain why the person in the mirror does the same thing. Rather than abandoning their delusional beliefs, highs easily generate explanations to justify their continued belief that there is a stranger in the mirror. For instance, highs claim that the stranger also is touching the ball, or that the stranger is imitating them because they are outside and want to come inside (Bortolotti et al., 2012).

Another interesting feature displayed by highs is the ability to reinterpret information that contradicts their delusions to maintain their beliefs. In work on hypnotic identity delusions (delusional beliefs about personal identity; Cox & Barnier, 2008, 2013), we suggested to subjects they would become a same-sex sibling or



friend and then asked them what they would say if their mother came into the room and said they were not their suggested identity. Highs claimed their mother was being silly or having a joke. We also presented counterevidence by asking subjects to open their eyes and look at their image on a monitor. Highs denied seeing themselves and claimed they could see their sibling or friend sitting in a chair. More important, we demonstrated that when subjects simulated a hypnotic identity delusion (as per the real-simulating paradigm of hypnosis; Orne, 1972), they were more likely to abandon their delusion when shown their image compared to genuinely hypnotized highs (Cox & Barnier, 2013; see also Noble & McConkey, 1995).

We also have examined the impact of presenting counter evidence in an accumulative manner versus a single powerful challenge to the delusion. In work on mirrored-self misidentification, most highs maintained their delusion in response to direct contradictions (e.g., asking subjects how a family member would distinguish them from the person in the mirror; Barnier et al., 2008, 2010). However, when we administered consecutive challenges that became progressively more difficult we found the delusion broke down over the course of multiple challenges (Connors, Barnier, Coltheart, Cox, & Langdon, 2012). We found that a particularly powerful challenge involved the hypnotist appearing in the mirror beside subjects. This challenge may be especially effective because the hypnotist subtly points out the impossibility of the delusion by encouraging subjects to count the people in the room and the people in the mirror. In this way, highs can infer there is not a stranger in the mirror in the absence of a direct contradiction. Notably, however, there always is a subset of highs who maintain their delusional beliefs across all types of challenges. These findings are relevant not just to cognitive neuropsychology and neuropsychiatry but more broadly to cognitive psychology and neuroscience. Hypnosis provides a novel means to temporarily disrupt perceptual systems and test theories of face identification.

High hypnotizable subjects experience suggested delusions in a range of contexts including during and after hypnosis. This points to the validity and value of hypnotic analogs because clinical delusions continue to be expressed outside of formal testing or therapeutic situations.

For example, in work on hypnotic alien control (the delusional belief that my actions are controlled by someone else), we gave highs and lows a suggestion to behave in a clumsy manner by making a mess of objects, dropping things on the floor, and scattering items about the room. We tested half of the subjects during hypnosis and the other half after hypnosis. Although more highs behaved in a clumsy manner during hypnosis, many also exhibited clumsy behavior posthypnotically. In contrast, lows rarely behaved consistent with the suggestion when they were tested hypnotically or posthypnotically. Thus, talented highs could experience two of the most difficult hypnotic suggestions—posthypnotic responding and a cognitive-delusory suggestion—simultaneously.

Given that highs experience compelling hypnotic delusions when suggested by the hypnotist, we wondered whether they also would be susceptible to socially transmitted delusions similar to those seen in a clinical condition known as folie à deux (Lasègue & Falret, 1877). In folie à deux, a primary individual transmits a delusional belief to one or more secondary individuals. We examined whether a hypnotized high would adopt beliefs suggested to them by someone other than the hypnotist (i.e., by a confederate who was not hypnotized). After a hypnotic induction, we informed highs and lows that someone would enter the room and talk to them. We told half of the subjects that this person was very credible and we told the other half this person was merely interesting. The primary then entered the room, looked into the mirror and attempted to convince the subject their reflection (i.e., the primary's reflection) was a stranger. Next, the primary asked subjects to look into the mirror and asked them about their own reflection (i.e., the subject's reflection). Two thirds of high hypnotizable subjects adopted the primary's statements and claimed that the primary's reflection was a stranger. Notably, when the primary was perceived as credible, then some highs elaborated upon the initial "delusional" statements and claimed their own reflection also was a stranger. This study demonstrated for the first time that highs will adopt complex cognitive-delusory beliefs that originate from someone other than the hypnotist (Freeman, Cox, & Barnier, 2013). This work has implications for the spread of mistaken beliefs in the general population among psycho-

logically healthy individuals. Further work on this could use hypnotic suggestions to examine how a person might convince someone else of their beliefs or examine whether the relationship between people (e.g., friends vs. strangers) influences types of beliefs that can be transmitted. It also could be placed more broadly in the theoretical landscape of influential communications and the conditions under which they are accepted or rejected (e.g., Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012).

As described above, after a suggestion for a hypnotic delusion, high hypnotizable people display surface features that are strikingly similar to clinical cases. However, there is evidence to suggest these similarities extend beneath the surface and reflect more profound changes in underlying processes. Our research indicates that highs experience alterations in both information processing and memory during hypnotically suggested delusions. For example, during hypnotic identity delusions, highs recall autobiographical memories consistent with the delusion but inhibit or avoid memories inconsistent with the delusion (Cox & Barnier, 2008, 2013). Highs also appear to adopt a new perspective when recalling these memories, enabling them to reframe and reinterpret memories in a way that allows them to maintain their delusional beliefs. Similarly, we found that during a hypnotic erotomania delusion, highs interpreted ambiguous information in ways that supported their delusion (Attewell, Cox, Barnier, & Langdon, 2012). We presented highs with a story involving themselves and the target of their delusion (who they believed was in love with them) and asked them to interpret some scenarios. For example, in one scenario, the target of their delusion was talking to a group of people but they all stopped talking as the subject approached. When we asked highs why they all stopped talking, highs claimed that it was because the target was telling the group how much he or she was in love with them.

We also have found evidence for underlying changes in a hypnotic analog of alien control. Here, highs received a suggestion that someone else was controlling the movements of their dominant hand. In response, highs had difficulty signing their name, which is unusual given that signing one's name is

well practiced and automatic. We also gave subjects a self-monitoring task where we asked them to identify their own self-drawn images from copies rotated 90, 180, and 270 degrees. Highs had difficulty identifying their original drawings in ways very similar to patients with schizophrenia who experienced alien control delusions (Stirling, Hellewell, & Quraishi, 1998). Once again, the hypnotic suggestion appeared to impair underlying processes, but only among highs.

Some research indicates that hypnotic suggestions also may lead to corresponding changes in highs at a neural level. Halligan and colleagues compared neural activation in a clinical case of conversion disorder paralysis (paralysis that does not have an organic basis; Marshall, Halligan, Fink, Wade, & Frackowiak, 1997) with a high hypnotizable subject who received a hypnotic suggestion for limb paralysis (Halligan, Athwal, Oakley, & Frackowiak, 2000). They found that the experiences, behavior, and brain activation of the hypnotized subject were very similar to the clinical patient. They also demonstrated that these neural patterns differed from brain activity during intentionally faked paralysis (Ward, Oakley, Frackowiak, & Halligan, 2003). Other evidence that supports the possibility that hypnosis produces changes in highs at a neural level comes from work on hypnotic auditory hallucinations (Szechtman, Woody, Bowers, & Nahmias, 1998). In Szechtman et al.'s (1998) research, highs who received a hypnotic suggestion to hallucinate a recorded voice displayed the same neural activity as when actually listening to the recorded voice. Of interest to the authors, patterns of neural activity were different when subjects were asked to imagine hearing the recorded voice (for similar results for pain, see Derbyshire, Whalley, Stenger, & Oakley, 2004).

In summary, high hypnotizable people have contributed immensely to the study of delusional beliefs via their distinctive responses to delusion suggestions. Their genuine, albeit temporary, firmly held, false beliefs have allowed us to develop valid, innovative ways to test theoretical predictions about delusions, broader cognitive processes and, in the future, their neural correlates.

### Why Highs Are So Helpful: Correlates of High Hypnotizability

High hypnotizable people are helpful in these scientific enterprises first because their hypnotic experiences are rich, compelling and, perhaps most importantly, reasonably controllable. As noted above, hypnotic versions share many features with the clinical conditions and psychological phenomena we aim to map and model. How close does this overlap need to be? [Woody and Szechtman \(2011\)](#) noted that “skeptics may question whether such hypnotic recreations of clinical disorders really capture something about the essence of the disorders, rather than merely imitating their surface features” (p. 13). However, they argued, it is enough for hypnotic methods to offer “a likeness not a replica” (p. 13). It is enough for hypnotic models created in partnership with highs to be theoretically, empirically, and methodologically useful rather than entirely complete, as illustrated by our research program on delusions.

Highs are helpful also because correlates of their hypnotic ability may provide insight into predictors of the phenomena they help us study. Recent research suggests we should adopt a specific, component- and perhaps performance-based approach to reveal these overlaps ([Laurence et al., 2008](#)). Traditionally, hypnosis researchers have looked for personality predictors of general hypnotic responding, often via pen and paper measures. Hypnotizability correlates weakly, if at all, with most personality variables, except for “absorption” ([Tellegen & Atkinson, 1974](#); for review of research on correlates, see [Laurence et al., 2008](#); for discussion of absorption, see [Kihlstrom, 2014](#)). A different approach, consistent with [Woody, Barnier, and McConkey’s \(2005\)](#) “building block” conceptualization of hypnotizability, focuses on abilities that predict performance on subtypes of hypnotic items. [Woody et al. \(2005\)](#) analyzed a large set of combined HGSHS:A and SHSS:C data and identified a general hypnotizability factor as well as four component factors: Direct Motor, Motor Challenge, Perceptual-Cognitive, and Posthypnotic Amnesia. Of most interest, scores on the four subscales independently and differentially predicted performance on other hypnotic phenomena, beyond the scales themselves. For example, only the Perceptual-Cognitive subscale uniquely predicted perfor-

mance on a hypnotic color blindness task ([Woody et al., 2005](#)).

Returning to delusions, whereas correlates of general hypnotizability (such as absorption) may tell us something of why hypnotic delusions are involving and believable, they may not tell us why hypnotic subjects respond so similarly to clinically deluded patients. Monothematic delusions have been explained as the result of two independent factors (often, but not always, neuropsychological in origin) that combine to create delusional experiences. Factor 1 explains the content of the false belief and why it is generated (e.g., I see a stranger in the mirror not myself). Factor 2 explains why the person fails to reject it as untrue ([Coltheart, 2007](#)). In two studies we correlated hypnotizability with specific traits associated with delusions and these proposed factors ([Connors et al., 2014](#)). Modest correlations (.25 to .30) indicated that more highly hypnotizable people were more likely to report unusual experiences and beliefs (the cognitive-perceptual subscale of schizotypy) and were more open to delusional ideation (delusion proneness). Notably, delusion proneness scores predicted which particular highs responded to a hypnotic suggestion for the Fregoli delusion. These results imply that some highs offer successful models of delusions because they share underlying traits with clinically deluded patients that influence the expression of delusional experiences, even though the cause of their Factor 1 and Factor 2 disruptions is quite different: neuropsychological versus hypnotic.

In ongoing research we are exploring performance predictors of delusions. For instance, do high hypnotizable people jump to conclusions (as measured by a probabilistic inference beads task; [Garety, Hemsley, & Wessely, 1991](#)) or show more or fewer “prediction errors” (as measured by an associative learning food allergy task; [Corlett & Fletcher, 2012](#); see also [Barnier et al., 2008](#)) in the same way, for instance, that patients with schizophrenia do? Does performance on these tasks predict response to hypnotic delusion suggestions? Such investigations will extend the science of hypnosis as well as contribute further to the fields of psychology, psychiatry, and neuroscience.

## Conclusions

Hypnosis is not just intrinsically interesting but useful in examining phenomena across the field of psychology (Cox & Barnier, 2010; Hilgard, 1979). In the same way, the abilities and experiences of high hypnotizable people are not just fascinating but helpful in understanding the essence of the human experience. Highs have played crucial theoretical roles in the (early and modern) science of hypnosis and collaborations between hypnosis researchers and highs have contributed in important and distinctive ways to psychological science across the subfields of cognitive psychology, social psychology, experimental psychopathology, and others. Although hypnosis essentially is a private phenomenon, which makes it challenging to investigate, so too are many of the broader phenomena we use hypnosis to model (e.g., anomalous experiences, hallucinations, delusions, pain, and remembering). Hypnosis researchers have developed clever approaches to help understand and draw inferences from these subjective experiences and from subjects' points of view (e.g., McConkey, 1991; Orne, 1972; Sheehan & McConkey, 1982). These approaches and collaborations with talented hypnotic subjects can be, have been, and should continue to be put to work across the field of psychological science.

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