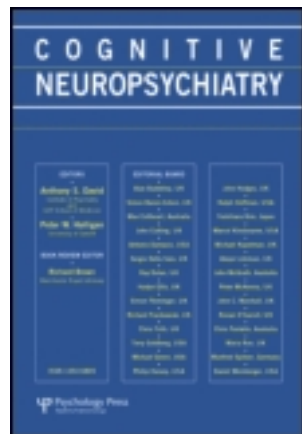


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Hypnotic illusions and clinical delusions: Hypnosis as a research method

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Hypnotic illusions and clinical delusions: Hypnosis as a research method

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Introduction. Hypnosis is not only intrinsically interesting, but it can be used instrumentally as a powerful tool to investigate phenomena outside its immediate domain. In focusing on instrumental hypnosis research, we first sketch the many contributions of hypnosis across a range of areas in experimental psychopathology. In particular, we summarise the historical and more recent uses of hypnosis to create and explore clinically relevant, temporary delusions.

Methods. We then describe in detail the steps that hypnosis researchers take in constructing a hypnotic paradigm to map the features and processes shared by clinical and hypnotic delusions, as well as their impact on information processing (including autobiographical memory). We illustrate with hypnotic versions of mirrored-self misidentification, somatoparaphrenia, alien control, and identity delusions.

Results. Findings indicate that hypnotic analogues can produce compelling delusions with features that are strikingly similar to their clinical counterparts. These similarities encompass phenomenological features of delusions, delusional resistance to challenge, and autobiographical memory during delusions.

Conclusion. We recognise important methodological issues and limitations of such hypnotic analogues, including: indexing response (behaviour vs. experience), alternative explanations (e.g., social compliance), the need for converging data, the need for close and continuing dialogue between the clinic and the laboratory, and generalisability of the findings.

Keywords: Hypnosis; Delusions; Confabulation; Hypnotic analogues.

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INTRODUCTION

People can believe the most extraordinary, clearly false things. Delusional patients may mistakenly believe, for instance, that: “My wife has been replaced by an imposter” or “Whenever I look in the mirror, I see a stranger, not me” (Davies, Coltheart, Langdon, & Breen, 2002). Delusions are common, often cardinal features of a range of neuropsychological and psychiatric disorders (Coltheart, 2007). Delusions can be distressing for the patient and for their families, and can make everyday living extremely difficult. We must understand them fully to treat them effectively.

Langdon and Coltheart (2000; see also Coltheart, 2007; Metcalf, Coltheart, & Langdon, 2007) proposed that we can understand delusions by answering just two questions: (1) What generates the false proposition (belief) in the first place? (2) Once generated, why isn't it rejected as untrue? Langdon and Coltheart's two-factor theory answers these questions by identifying “breaks” in the way the healthy human mind processes information about self and the world. The first break, Factor 1, explains the content of the false belief and why it is generated (e.g., my wife has been replaced by an impostor). The second break, Factor 2, explains why the person fails to reject it as untrue. These breaks are often, but not always, neuropsychological in origin (Coltheart, 2007). According to Langdon and Coltheart (see also Johnson & Raye, 1998), there are other ways to break normal information processing.

In this paper we argue that one such way is with hypnosis. Hypnotic suggestions can break normal cognitive processing, both to generate false beliefs (akin to Factor 1) and to disrupt their normal evaluation (akin to Factor 2), turning these effects on and off with no lasting consequences (Johnson & Raye, 1998; Kihlstrom & Hoyt, 1988; Oakley & Halligan, 2009). Thus, hypnosis offers a way to recreate clinical delusions in the laboratory. This is potentially of great value since there is currently no proven way to experimentally study pathological forms of false belief. With reliable and valid analogues of clinical delusions, we can explore the influence of cognitive, motivational, and emotional factors, for instance, as well as test the conditions under which hypnotic delusions—like clinical delusions—are maintained, acted upon or abandoned. With this work we hope to: (1) extend and apply the two-factor theory to hypnotic analogues of delusions, (2) provide the means to investigate false beliefs in the laboratory, and (3) generate new insights that can inform treatment of delusions.

In this paper we sketch the two-factor theory of delusions, explain what hypnosis is and how it works, describe previous research that has used hypnosis to model clinical phenomena, specify the parameters of our hypnotic delusion paradigm, discuss the implications and challenges posed by this research, and suggest future directions.

DELUSIONS AND THE TWO-FACTOR THEORY

Delusions are described as false beliefs based on incorrect inferences about reality, which are firmly sustained despite what almost everyone else believes and despite what constitutes incontrovertible and obvious proof to the contrary (Coltheart, 2007). They are common in dementia, schizophrenia, and after traumatic brain injury. Langdon and Coltheart proposed a two-factor theory of delusions (for more details see Coltheart, 2007; Langdon & Coltheart, 2000) where two independent factors, or breaks in information processing, combine to create delusions. Factor 1 explains why the false belief is generated in the first place. Factor 2 explains why the person fails to reject it as untrue. Each delusion is associated with (usually) a different Factor 1, explaining the specific content of the delusion. But Factor 2, impaired belief evaluation, is common across delusions. For instance, Breen, Caine, Coltheart, Hendy, and Roberts (2000) described patient FE who, in the early stages of dementia, suffered from mirrored-self misidentification delusion—he believed he saw a stranger in the mirror, not himself. FE's Factor 1 impairment was prosopagnosia; part of his brain was damaged so he had difficulty identifying familiar versus unfamiliar faces. Since people can have prosopagnosia without developing a delusion, a second factor must be involved. The proposed Factor 2 was impairment in FE's ability to evaluate beliefs.

In its original formulation, Langdon and Coltheart's theory focused on neuropsychological impairments (a *two-deficit* theory). More recently, Langdon, Coltheart, and colleagues have acknowledged that these breaks in information processing are often, but not necessarily, neuropsychological in origin. In other words, Factor 1 may involve a motivated or "functional" disruption in information processing (Coltheart, Langdon, & McKay, 2007; McKay, Langdon, & Coltheart, 2005, 2007). However, the Factor 2 impairment still requires specification. It may involve biased reasoning or attributions and/or disrupted reality monitoring (Coltheart, 2007; Johnson & Raye, 1998). It may be influenced by motivation (McKay & Kinsbourne, 2010 this issue), mood and/or situations that discourage critical evaluation (Coltheart, 2007; Fotopoulou, Conway, Griffiths, Birchall, & Tyrer, 2007; Young, 2000).

By developing hypnotic analogues of delusions, we aim to provide the means to efficiently and effectively conduct basic, theoretically driven work, which can then be applied to clinical cases. This is consistent with a cognitive neuropsychology approach in general. Before describing our methods for creating these hypnotic versions of clinical delusions, it is useful first to understand a little of the nature of hypnosis.

BACKGROUND TO HYPNOSIS

What is hypnosis?

Hypnosis has been defined as:

a process in which one person, designated the hypnotist, offers suggestions to another person, designated the subject, for imaginative experiences entailing alterations in perception, memory and action. In the classic case, these experiences are associated with a degree of subjective conviction bordering on delusion and an experienced involuntariness bordering on compulsion. As such, the phenomena of hypnosis reflect alterations in consciousness that take place in the context of a social interaction. (Kihlstrom, 2008, p. 21)

This widely accepted definition captures two key elements of hypnosis: (1) *hypnosis-as-procedure*, what the hypnotist does, and (2) *hypnosis-as-product*, what the subject experiences.

The hypnotic procedure begins with an *introduction* where the hypnotist tells the subject that she will receive suggestions to experience herself and the world differently and that she should respond in whatever way feels comfortable. Next, the hypnotist administers an *induction*, which instructs the subject to close her eyes, to relax and to focus on the hypnotist's words. Exhortations within the induction to focus attention and to become absorbed in the (typically) monotonous communications of the hypnotist engender in the subject a "motivated cognitive commitment" to respond (Sheehan, 1991, p. 526). Following the induction, the hypnotist administers *suggestions* for alterations in perception, memory, action, thought, or emotion. The hypnotist administers, tests, and cancels each suggestion in turn. Following a series of such suggestions, the hypnotist administers a *deinduction*, which instructs the subject to terminate the experience of hypnosis.

These elements of introduction, induction, suggestions, and deinduction constitute hypnosis-as-procedure. But what makes hypnosis so interesting is the subject's reaction to them—hypnosis-as-product. In response to hypnotic suggestions, the subject may experience: (1) an altered sense of reality and/or volition associated with motor actions (e.g., she may be unable to bend her arm after a suggestion for it to feel stiff and rigid); (2) hallucinations (both positive and negative, including analgesia and perceptual distortion; e.g., she may feel no pain when exposed to a painful stimulus); (3) age regression and dreams (e.g., she may behave as if she were a small child); (4) amnesia and hypermnesia (e.g., she may have trouble remembering things that just occurred); and (5) posthypnotic suggestion (e.g., she may scratch her ear after hypnosis every time she hears a particular word).

Who does it work for and how does it work?

Responding to hypnotic suggestions feels very unusual. Hypnotised subjects experience hypnotic phenomena with “involuntariness bordering on compulsion” and “conviction bordering on delusion” (Kihlstrom, 2008, p. 21). However, it is not just that hypnotic responses happen easily or seem real. To a hypnotised person, they feel *surprisingly easy* and *surprisingly real* (see Barnier & Oakley, 2009).

It is worth noting that not everyone responds to hypnotic suggestions. Hypnotisability is normally distributed in the population (E. Hilgard, 1965). Approximately 10–15% of the population are very susceptible to hypnosis (called “high hypnotisable” or “highs”). Another 10–15% respond to few if any hypnotic suggestions (called “low hypnotisable” or “lows”). The remaining 70–80% experience some suggestions but not others (called “medium hypnotisable” or “mediums”) (for more discussion of these issues, see Barnier & Oakley, 2009).

High hypnotisable people may enjoy daydreaming (J. Hilgard, 1965), may be creative and imaginative (Barber & Wilson, 1978), may be able to focus their attention very well (Crawford, 1994; Raz, Shapiro, Fan, & Posner, 2002), and may become easily absorbed in activities (Tellegen & Atkinson, 1974). Attitudes also play an important role in determining a person’s hypnotisability. Although a positive attitude to hypnosis is a necessary condition for successful responding, it is not sufficient. Many low hypnotisable individuals have positive attitudes but cannot experience hypnosis. In contrast, a negative attitude generally guarantees poor or no hypnotic experiences (for more on individual differences in hypnotisability, see Barnier & McConkey, 2004; Barnier & Oakley, 2009). Despite these potential indicators of hypnotic ability, the only reliable way to measure hypnotisability is to administer a standardised test (for a summary of measures, see Barnier & McConkey, 2004).

We noted earlier that hypnotic responding feels surprisingly easy and surprisingly real. Hypnotised people typically describe their hypnotic experiences in ways that suggest that the normal processing or control of cognitive events and motor actions has been disrupted. One view of hypnosis says that this is merely an illusion; that hypnosis disrupts only the subject’s introspective awareness of her internal states (e.g., following a suggestion for hypnotic analgesia she reports feeling no pain when exposed to a painful stimulus) with no effect on her actual internal states (e.g., her heart rate when exposed to the painful stimulus). Another view says that this is not an illusion; that hypnosis may disrupt the actual state of cognitive or physical systems. According to the first view, hypnotic responses are controlled in essentially normal, nonhypnotic ways but executive monitoring is disrupted. According to the second view, hypnotic responses reflect actual disruptions

in the normal, nonhypnotic control of memory, perception and action systems (for detailed discussion, see Barnier & Oakley, 2009; Woody & Sadler, 2008). Both possibilities have value for using hypnosis to recreate and explore clinical conditions in the laboratory.

Hypnotic analogues of clinical conditions

Experimental hypnotic analogues aim to recreate the features of clinical conditions in the laboratory. Once this has been achieved, hypnosis researchers use these analogues in an attempt to model the processes that contribute to clinical disorders. Hypnosis has a long history of modelling a number of conditions including functional blindness, functional amnesia, conversion hysteria, and auditory hallucinations (Barnier, 2002; Bryant & McConkey, 1989a,b; Cox & Barnier, 2003; Haggard, Cartledge, Dafydd, & Oakley, 2004; Halligan, Athwal, Oakley, & Frackowiak, 2000; Szechtman, Woody, Bowers, & Nahmias, 1998; Zimbardo, Andersen, & Kabat, 1981; for a review, see Oakley & Halligan, 2009). Consider research on conversion disorder paralysis where a person experiences unexplained limb paralysis in the absence of any physical cause (that is, their nerves and muscles are intact). Marshall, Halligan, Fink, Wade, and Frackowiak (1997) used PET to examine brain activation in a woman with unexplained paralysis of her left leg. When the woman was asked to move her left leg, activation in her brain (in the premotor cortex and cerebellum) suggested she was genuinely attempting to move her leg. However, she lacked activation in brain areas responsible for motor action (primary sensorimotor areas) and displayed increased activation in two other brain areas (anterior cingulate cortex and right orbitofrontal cortex), suggesting an unconscious inhibition of intended leg movements (see also Oakley & Halligan, 2009).

These researchers then explored whether hypnotically suggested paralysis produced the same neural patterns as conversion disorder paralysis. They used PET to examine the brain of a high hypnotisable man who had received a hypnotic suggestion for left leg paralysis (Halligan et al., 2000). Following the suggestion, they asked the hypnotised man to try to move his left leg. Interestingly, his brain scans showed similar patterns of activation to the woman with conversion disorder paralysis, with a similar lack of activation in brain areas responsible for motor action. This suggests that the same brain mechanisms were involved in the clinical and hypnotic paralysis. More importantly, it suggests that hypnosis is a powerful technique for exploring and potentially treating conversion disorder symptoms (see Oakley & Halligan, 2009).

These studies using neuroimaging during hypnosis also challenge notions that hypnosis can be explained as mere faking or compliance. Indeed,

researchers (Ward, Oakley, Frackowiak, & Halligan, 2003) have compared brain activations of high hypnotisable individuals during hypnotically suggested left leg paralysis and during attempts to fake left leg paralysis. Independent observers could not discern when participants were faking. However, there were clear differences in brain activation. Faked paralysis produced activation in areas not seen in hypnotically suggested paralysis.

These findings of genuine changes in brain activation during hypnotically suggested experiences reinforce the value of using hypnosis to model clinical conditions, especially conditions that have been traditionally difficult to study in the laboratory. This makes hypnosis particularly suited to the task of studying delusions, which are complex, multifaceted, and difficult to study in isolation. We now discuss early research that used hypnosis to study clinical delusions.

HYPNOSIS IN THE STUDY OF DELUSIONS

Hypnosis is particularly suitable for studying delusions because hypnosis and delusions share a number of features. Both are: (1) believed with absolute conviction, (2) resistant to rational counterargument, and (3) maintained regardless of overwhelming evidence to the contrary. These shared features are illustrated by a series of experiments by McConkey and colleagues who used hypnosis to create a sex-change delusion (Burn, Barnier, & McConkey, 2001; McConkey, Szeps, & Barnier, 2001; Noble & McConkey, 1995).

Based on work by Sutcliffe (1961), in their first study (Noble & McConkey, 1995), high and low hypnotisable participants received a hypnotic suggestion to become the opposite sex. Following this suggestion, high hypnotisable participants gave themselves a new name (consistent with being the opposite sex), described themselves as the opposite sex, and resisted challenges to the suggested delusion. In a second study, these researchers explored the impact of a hypnotic sex change delusion on information processing (Burn et al., 2001). Following a hypnotic suggestion to become the opposite sex, participants listened to a story about a male and female character. High hypnotisable participants later recalled more information from the story about the character consistent with their suggested sex, and this was not influenced by the character they identified with. In their third study, McConkey and colleagues investigated whether high hypnotisable participants could experience a sex-change delusion in their normal, waking state (McConkey et al., 2001). They gave high and low hypnotisable participants a hypnotic sex change suggestion, but half of these participants received the suggestion during hypnosis, and half received it whilst not hypnotised. Although McConkey et al. (2001) found that high

hypnotisable participants could experience a suggested sex change in their waking state, the delusion was more compelling for high hypnotisable participants who received the suggestion during hypnosis. Together, these studies indicate that hypnosis is particularly effective at modelling the features of a sex-change delusion and that the hypnotic context plays an important role in facilitating these delusions.

In addition to modelling the features of clinical delusions, hypnosis may also be able to model some of the underlying processes. Recall that Langdon and Coltheart (2000) proposed a two-factor theory of delusions where Factor 1 is responsible for producing the delusional belief in the first place and Factor 2 explains why the belief isn't rejected as untrue. According to this theory, the cognitive disruptions involved in delusions are often neuropsychological in origin. However, there are other ways to disrupt normal information processing. One such way is with hypnosis (Kihlstrom & Hoyt, 1988). From the research described previously and the broader hypnosis literature, there is substantial evidence that hypnotic suggestions can create compelling, albeit temporary breaks in basic cognitive processes (e.g., perception, memory, action) of the kind argued to be involved in delusions (as Factor 1). There are numerous hypnotic phenomena with Factor 1-like features that can be used to create hypnotic versions of Factor 1. Table 1 presents a list of seven delusions.

In addition to modelling these Factor-1 impairments, it is also likely that hypnosis can model Factor 2, which is thought to involve a deficit or disruption to normal belief evaluation. The general view of hypnosis is that the hypnotic state reduces critical thinking and distorts reality monitoring akin to the proposed Factor 2. For instance, hypnotised people will focus on suggested experiences (e.g., when a male subject receives a hypnotic sex-change suggestion to become female) and can ignore contradictory information or challenges (e.g., what he really looks like when he views himself on a videomonitor; Noble & McConkey, 1995). Also, hypnotised people attribute as much reality to suggested events (e.g., that a ball they are holding is heating up) as they do to real events (e.g., when the ball has

TABLE 1
Monothematic delusions and relevant hypnotic phenomena

<i>Delusion</i>	<i>Hypnotic phenomena</i>
Capgras and Fregoli	Emotional numbing and familiarity
Cotard	Sex-change and identity delusions
Mirrored-self misidentification	Hypnotic mirrored-self misidentification
Reduplicative paramnesia	Trance logic and visual hallucination
Alien control	Anomalous control
Thought insertion	Posthypnotic suggestion

chemicals inside it that do heat up; McConkey, 2008). Thus, specific suggestions in hypnosis produce controllable disruptions and distortions to recreate the impact of Factor 1 and Factor 2 in delusions.

The hypnotic sex-change experiments described earlier, involved suggestions for a fully formed delusion. That is, they suggested the complete delusional experience (of being the opposite sex). In contrast, one study has used hypnosis to suggest Factor-1-like deficits. Zimbardo et al. (1981) explored the role of hypnotically induced deafness in paranoia. They gave two groups of high hypnotisable participants a suggestion for posthypnotic deafness. One group was aware of the source of this deafness (i.e., hypnotic suggestion) but the second group received an additional hypnotic instruction to forget the deafness suggestion (accompanying amnesia suggestion). After hypnosis, two confederates in the same room as participants engaged in a conversation with each other that could be misperceived as antagonistic. Both groups of participants reported a hearing deficit but those who received deafness-without-awareness (i.e., those who received the extra amnesia suggestion) became paranoid about the nature of the confederates' conversation and reported more irritation, agitation, hostility, and unfriendliness than participants who received deafness-with-awareness. In this study, the suggestion for deafness can be interpreted as a Factor 1 suggestion. When it was combined with amnesia for the source of the difficulty, it produced a delusion-like experience of paranoia. However, it is worth noting that Zimbardo and colleagues did not directly ask participants about their beliefs. Rather, they used participants' responses to questionnaire measures of paranoia as evidence of their beliefs.

OUR HYPNOTIC DELUSION PARADIGM

Our current work using hypnosis to model delusions was inspired by the previous research just described. Generally, to recreate delusions we begin by administering suggestions for a fully formed delusion. Once we have achieved this, and successfully recreated the features of clinical delusions, we explore underlying processes by administering suggestions for Factor 1 plus Factor 2 impairments. As noted earlier, Factor 1 explains the generation of the false belief or memory; it is responsible for the content of the delusion. Our experiments mimic this with a "Factor 1" hypnotic suggestion that recreates the different, specific break (in perception, action, emotion, agency, or memory) involved in different delusions. Factor 2 explains why the person fails to reject the false belief as untrue; it is responsible for impaired evaluation. Our experiments mimic this with a "Factor 2" hypnotic suggestion that recreates the specific break in evaluation. We based our Factor 2 suggestion on work by Turner (2006) who suggested that Factor 2

in delusions may involve a disruption to the normal process of checking beliefs for plausibility. Specifically, our hypnotic Factor 2 suggestion involves an instruction that any explanations that might account for the Factor-1 experience will seem plausible. To illustrate, Table 2 provides two examples of delusions. For each, we specify: (1) the Factor 1 impairment proposed in the literature, (2) the Factor 1 suggestion we use, and (3) the common Factor 2 suggestion we use. In our research we give participants either a fully formed delusion, only the Factor 1 suggestion (Factor 1 alone), or both the Factor 1 and Factor 2 suggestions (Factor 1 + Factor 2). Previous research indicates that a suggestion for a fully formed delusion generates experiences remarkably similar to clinical delusions. By comparing these three groups we test whether Factor 1 and Factor 2 suggestions—separately and combined—are more effective in generating hypnotic delusions (because they more closely model the proposed underlying mechanisms) than a suggestion for a fully formed delusion. We now describe our research in detail, including the types of suggestions we use, the impact of these suggestions, our challenge procedures, and work examining the impact of a delusion on autobiographical memory.

Types of suggestions

Our work has focused on developing hypnotic suggestions that recreate: (1) reverse intermetamorphosis—the belief that I am someone else, (2) mirrored-self misidentification—the belief that I see a stranger when I look in the mirror, (3) somatoparaphrenia—the belief that my arm belongs to someone else, and (4) alien control—the belief that my movements are caused by someone else. To create credible hypnotic delusions we began by developing fully formed suggestions that would make sense to a hypnotised person and would closely mimic the features of clinical delusions. For example, clinical delusions of misidentification involve a false belief about the identity of oneself or others. A subtype of this delusion is reverse intermetamorphosis which involves personal identity change. Clinical cases of reverse intermetamorphosis indicate that this identity change can occur across a variety of different identities. These individuals may adopt the identity of someone similar to themselves, someone dissimilar to themselves, someone familiar, or someone unfamiliar. Such delusions may encompass beliefs about real, existing individuals, as in the case of a woman known as RZ who believed that she was her father (Breen et al., 2000), or beliefs about nonexistent individuals, as in the case of a woman known as EN who believed that she had a nonexistent twin sister (Baddeley, Thornton, Chua, & McKenna, 1996).

TABLE 2
Hypnotic delusions and confabulations

	<i>Proposed Factor 1</i>	<i>Hypnotic Factor 1 suggestion</i>	<i>Hypnotic Factor 2 suggestion</i>	<i>Fully formed suggestion</i>
Delusions				
Mirrored-self misidentification	Prosopagnosia	Your face looks and feels unfamiliar	You'll have difficulty evaluating the reality of your experiences; any explanation will seem plausible	You see a stranger in the mirror
Somatoparaphrenia	Limb paralysis from brain lesion	Your left hand is paralysed		Your left hand does not belong to you
Confabulations				
Inefficient/disrupted retrieval	Amnesia for event and production of irrelevant memories	You won't remember this event but will fill in gaps in memory	You'll have difficulty evaluating the reality of your memories; any memory you retrieve will seem accurate	You'll remember irrelevant memories and believe them to be true
Temporal confusion	Amnesia for correct event sequence and temporally disorganised retrieval	You won't remember the order of events and will reorder them in any way		You'll remember this event out of order but believe it to be accurate

To map this range of delusional beliefs, we have written and tested a number of fully formed suggestions for reverse intermetamorphosis. These include suggestions for high hypnotisable participants to become real individuals, such as a friend or relative who is very similar, a friend or relative who is very dissimilar, a same-sex sibling who is presumably familiar, or a friend's sibling who is presumably less familiar. We have also administered suggestions for participants to have an extra (nonexistent) same-sex sibling. Although we thought it might be easier for people to experience a hypnotic delusion about someone real, similar, or familiar, we found that all of these suggestions were equally effective in producing a credible hypnotic delusion of reverse intermetamorphosis in high hypnotisable individuals (Cox, 2007; Cox & Barnier, 2009a, 2009b; Cox & Bryant, 2008).

In our work on hypnotic mirrored-self misidentification (Barnier et al., 2008; see also Bortolotti, Cox, & Barnier, 2009), we have administered fully formed suggestions to highs to either: (1) see a stranger in the mirror, (2) see the mirror as a window, or (3) see the mirror as a window with a view of a stranger on the other side. We used these suggestions to map the different pathways from neuropsychological impairment to clinical cases of mirrored-self misidentification. Langdon, McKay, and Coltheart (2008) have suggested that delusions may be seeded by various implausible thoughts so we used these three suggestions to explore the initial thoughts that might "seed" mirrored-self misidentification delusion. We found that whereas participants given the stranger in the mirror suggestion and the mirror as a window with a view of a stranger suggestion reported seeing a stranger in the mirror (and not themselves), participants given the mirror as a window suggestion simply reported that they saw themselves. In other words, the specifics of the suggestion influenced its success and the resulting pattern of delusional performance. This finding is similar to research on hypnotic sex-change delusions, where suggestions to become "more and more like the opposite sex" lead to a more compelling delusional experience than suggestions to become "less and less like your actual sex" (Noble & McConkey, 1995).

We have also developed a fully formed suggestion designed to recreate somatoparaphrenia (Rahmanovic, Barnier, & Cox, 2009). In this suggestion, we touched participants' nondominant arm, and suggested that the arm belonged to someone else. To avoid participants attributing their delusion experience to the hypnotic suggestion, we also gave them accompanying amnesia for the suggestion. This amnesia suggestion maps onto clinical cases where individuals frequently deny that there is anything wrong with their arm. However, this lack of awareness or insight does not necessarily occur in all delusions. Clinical patients may say that they know their beliefs seem implausible but they have them none the less. Following the somatoparaphrenia suggestion, we touched their arm again, and asked

“can you tell me about this arm? Whose arm is this?” In response to this question, 54% of high hypnotisable participants either did not acknowledge ownership of their arm, denied ownership of their arm, or said their arm belonged to someone else.

We have compared this fully formed somatoparaphrenia suggestion with a Factor 1 plus Factor 2 suggestion. In somatoparaphrenia, Factor 1 is arm paralysis, so our hypnotic Factor 1 suggestion was for arm paralysis. Once again, we did not want participants to attribute their arm paralysis to the hypnotic suggestion, so we also gave them accompanying amnesia for the arm paralysis suggestion. Our hypnotic Factor 2 suggestion was: “You will not know why this arm feels paralysed and you will search for explanations to account for it. Any explanation you come up with will seem plausible.” Our findings indicated that highs who received Factor 1 plus Factor 2 generated a variety of explanations for their Factor 1 impairment. For example, participants explained their arm paralysis by saying that their arm had been severed, that they had been in an accident, or that they had slept on their arm and made it feel numb. However, no highs who received the Factor 1 plus Factor 2 suggestion denied ownership of their arm or said that their arm belonged to someone else. One possible explanation for this is that our Factor 1 plus Factor 2 suggestion may not have completely captured all the aspects of somatoparaphrenia.

In our work on alien control, we have given participants a fully formed suggestion that someone else was causing the movements of their dominant hand and arm (Scott, Barnier, & Cox, 2009). Participants were informed that their hand and arm would move to respond to the hypnotist’s instructions, but someone else would be causing these movements. Following this suggestion, we asked participants to pick up a pen and sign their name. During this task, high hypnotisable participants displayed behaviours consistent with the suggestion. For instance, they had difficulty moving and coordinating the movements of their dominant hand and arm. They also reported feeling a lack of control over their dominant hand and arm.

We have also tested a Factor 1 plus Factor 2 alien control suggestion. In alien control, Factor 1 is the inability to monitor the source of one’s own actions so our hypnotic Factor 1 suggestion was for participants to feel as though they were not causing the movements of their dominant hand and arm. This Factor 1 suggestion was combined with a hypnotic Factor 2 suggestion which said: “You will not know why it feels as though you are not causing the movements of your hand and arm and you will search for explanations to account for it. Any explanation you come up with will seem plausible.” However, similar to the Factor 1 plus Factor 2 somatoparaphrenia suggestion, this Factor 1 plus Factor 2 alien control suggestion was less successful than the fully formed suggestion at producing experiences of alien control.

In their hypnotic deafness study, Zimbardo et al. (1981) found that a hypnotic Factor 1 suggestion alone could produce delusion-like experiences. Based on this work, we were interested in whether a suggestion for Factor 1 alone would lead to a complete delusional experience. Further, in their hypnotic sex-change studies, McConkey et al. (2001) found that high hypnotisable individuals could experience a hypnotic sex change delusion outside of hypnosis. However, highs who received the suggestion in hypnosis experienced a more compelling delusion. Therefore, we investigated the impact of a suggestion for Factor 1 alone, with and without hypnosis. Here, we were particularly interested in whether the hypnotic state, which is known to disrupt belief evaluation, might play the role of Factor 2.

We applied this design to mirrored-self misidentification delusion (Connors, Cox, & Barnier, 2008). High hypnotisable participants received either a Factor 1 alone suggestion or a Factor 1 plus Factor 2 suggestion. Half of the participants received the suggestion during hypnosis (hypnosis condition), and the other half received the suggestion while awake (waking condition). The Factor 1 alone suggestion informed participants that when they opened their eyes and looked into the mirror they would not be able to recognise the person they saw. This was based on Coltheart and colleagues' suggestion that Factor 1 in mirrored-self misidentification may involve a deficit in face processing (Breen et al., 2000; Coltheart, 2007). The Factor 1 plus Factor 2 suggestion involved the same Factor 1 suggestion plus a Factor 2 suggestion that any explanations they came up with to account for their inability to recognise the person in the mirror would seem plausible. Figure 1 illustrates the percentage of participants who passed the suggestion (i.e., reported seeing a stranger in the mirror). Focusing first on the hypnosis condition, 73% of participants who received the Factor 1 alone suggestion and 58% of participants who received the Factor 1 plus Factor 2 suggestion reported seeing a stranger in the mirror. This suggests that a separate Factor 2

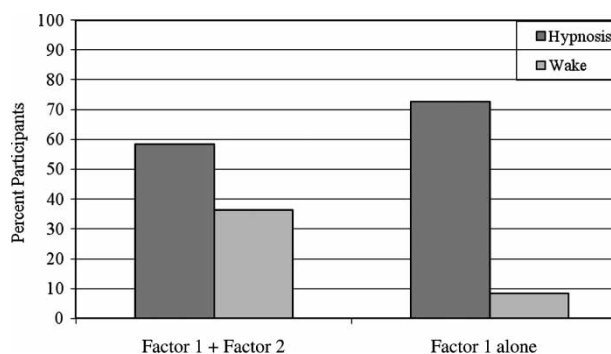


Figure 1. Percentage of highs in hypnosis and waking conditions who passed delusion according to suggestion.

suggestion did not appear to be necessary for creating hypnotic mirrored-self misidentification. In contrast, in the waking condition, only 8% of participants who received the Factor 1 alone suggestion and 36% of participants who received the Factor 1 plus Factor 2 suggestion reported seeing a stranger in the mirror. These results suggest that hypnosis may produce a disruption in belief evaluation akin to the proposed Factor 2. Also, the hypnotic context appears to play an important role in creating delusional experiences.

Impact of suggestions

We have used a variety of measures to index the impact of our hypnotic delusion suggestions. We begin by testing whether participants pass the suggestion (i.e., whether they display evidence of experiencing the suggestion). For example, to test the impact of a suggestion for somatoparaphrenia, we placed a tray of objects next to participants and asked them to pick up each object. Factor 1 in somatoparaphrenia involves arm paralysis so we placed the tray next to the arm targeted by the suggestion and we noted which arm they used to pick up each object. If participants did not use the arm targeted by the suggestion they passed this particular test. As expected, highs displayed difficulty moving this limb and reached across their body to pick up the objects with their other hand. One of the objects on the tray was a bottle which we asked participants to open. Interestingly, many highs managed to open the bottle using just one hand!

To index the impact of a hypnotic suggestion for mirrored-self misidentification, we asked highs to open their eyes, look in a mirror and describe what they could see. In this initial test of the suggestion we were interested in whether participants could recognise themselves in the mirror. If participants did not recognise themselves they passed the suggestion. We found that the majority of highs passed the suggestion and described seeing a stranger in the mirror. The following excerpt illustrates one participant's compelling experience (from Barnier et al., 2008, pp. 417–418):

Hypnotist: Tell me, what do you see?

Participant: (*Participant looks in the mirror and then looks behind him*).
Who's that?

Hypnotist: Tell me about what you see.

Participant: Another person.

Hypnotist: Tell me about the person.

Participant: They're wearing a purple shirt, they've got a big nose, got a mole on their neck.

Hypnotist: Is the person you see a male or a female?

Participant: Male (*Participant looks behind him*).

- Hypnotist: Tell me more about what they look like.
 Participant: They've got short, curly hair, brown eyes, brown hair.
 Hypnotist: Have you ever seen this person before?
 Participant: No (*Participant looks behind him*).
 Hypnotist: Does this person remind you of anyone?
 Participant: I think I've seen him before at school.
 Hypnotist: Tell me about that . . . where you might have seen him.
 Participant: I think he was in the year below me . . . yeah I knew there was something.
 Hypnotist: What do you think his name is?
 Participant: Anthony (*not the participant's name*).
 Hypnotist: In what ways does this person look like you?
 Participant: Same coloured hair. I've got hazel eyes.
 Hypnotist: And what colour eyes does he have?
 Participant: Brown.
 Hypnotist: In what ways does the person you can see look different to you?
 Participant: Different coloured eyes. I think my nose is smaller . . . got bigger lips.
 Hypnotist: He has or you have?
 Participant: I have . . . and I've got more freckles.
 Hypnotist: What is he doing at the moment?
 Participant: Looking into the mirror. I don't know where he is though (*participant looks behind him and around the room*).
 Hypnotist: Is he doing anything in particular or saying anything in particular?
 Participant: Just looking at me. He's saying something but I can't understand.
 Hypnotist: Why can't you understand?
 Participant: Because I can't lip read.
 Hypnotist: Can you hear him?
 Participant: No.
 Hypnotist: How come?
 Participant: Because I can only see him.

This illustrates the compelling reality of the hypnotic delusion as well as highs' ability to maintain the delusion in response to detailed questioning, long after the initial test of the suggestion.

In addition to indexing whether participants pass these suggestions, we have developed a range of other measures to assess the impact of our hypnotic delusions on participants' beliefs and experiences. For example, following a suggestion for reverse intermetamorphosis, which involves a change in self, we measured the impact of the suggestion on identity. We asked participants to say their name, describe themselves, and to list some personal likes and dislikes for their (deluded) identity. We also administered two different self-concept tasks before and during the suggested delusion. The first task was a modified version of Higgins' (1987) self-discrepancy task. In this task, participants provided five words to describe their actual self and five words to describe their ideal self. The second task was an "I am" task (Kuhn &

McPartland, 1954; Rathbone, Moulin, & Conway, 2008). In this task, participants completed five sentences, each beginning with the words "I am". Participants completed these tasks at the beginning of the session and then again following the delusion suggestion when they were experiencing themselves as a different identity. We were interested in the extent to which highs' and lows' self-concept might change following the delusion suggestion so we calculated the number of different self-descriptions provided (i.e., different words and different sentence completions) after the delusion suggestion, compared to before the suggestion. We found that across six experiments, 90% of highs provided a new name and described themselves differently during the suggested delusion. Highs also generated approximately 4.90 personal likes and dislikes for their deluded identity, whereas lows generated 3.09 personal likes and dislikes. Additionally, highs completed the self-concept tasks with approximately 4.39 different self-descriptions, whereas lows completed the self-concept tasks with only 2.57 different self-descriptions (Cox, 2007; Cox & Barnier 2009a, 2009b). Using multiple tasks in this way gives us a more complete understanding of any temporary changes in self following a suggestion for reverse intermetamorphosis.

We have also developed a test to index the impact of a hypnotic alien control delusion suggestion on self-monitoring (Scott et al., 2009). A number of authors have proposed that individuals with alien control delusions have a deficit in self monitoring (Frith & Done, 1989; Stirling, Hellewell, & Ndlovu, 2001; Stirling, Hellewell, & Quraishi, 1998). For example, Stirling et al. (1998) asked schizophrenic and control participants to complete a self-monitoring task where they made three different types of drawings on a computer graphics tablet: (1) eight abstract drawings with their eyes closed, (2) eight drawings of shapes (e.g., triangles, squares) with their eyes closed, and (3) eight drawings of shapes with their eyes open. According to Stirling et al., abstract drawings with eyes closed are the most demanding on self-monitoring and drawings of shapes with eyes open are the least demanding on self-monitoring. After completing each drawing, participants were presented with four images. These included their original drawing and the same drawing rotated 90°, 180°, and 270°. Their task was to select the one they originally drew. Stirling et al. found that schizophrenic patients with alien control symptoms were poorer at recognising their own drawings than controls and their performance worsened as demands on self-monitoring increased.

In our hypnotic analogue, following a suggestion for alien control of the dominant hand and arm, we first asked participants to pick up a pen and sign their name. We then asked them how it felt to sign their name. Many high hypnotisable participants commented that their arm movements felt outside of their control and a number of participants also expressed the

belief that an external agent was responsible for their arm movements. Next, we administered Stirling et al.'s (1998) self-monitoring task. Our results indicated that high hypnotisable participants had more difficulty than low hypnotisable participants at recognising their self-drawn images when they were asked to draw abstract pictures with their eyes closed (the task that was most demanding on self-monitoring). This is consistent with Stirling et al.'s findings and suggests that the hypnotic alien control suggestion lead to an impairment in self-monitoring among high hypnotisable individuals.

Challenge procedures

To examine whether hypnotic delusions are maintained with the conviction displayed by clinically deluded individuals, we have developed challenge procedures inspired by previous research and clinical techniques. We have modified these challenges and tailored them to our hypnotic analogues.

In the hypnotic sex-change research described earlier, McConkey and colleagues introduced two useful challenge procedures: a contradiction and a confrontation. In the contradiction, they asked participants what they would say if a doctor (a hypothetical authority figure) came in and said they were not their suggested sex. In the contradiction, they asked participants to open their eyes, look at themselves on a monitor, and describe what they were experiencing as they did so. McConkey and colleagues found that highs maintained their deluded identity in the face of these challenges. In response to the contradiction they defended their delusional belief, by saying for instance, that the doctor was a "quack". In response to the confrontation, they defended their delusional belief by saying they could see someone else on the monitor (Noble & McConkey, 1995).

We adapted these challenge procedures in our work on reverse intermetamorphosis. In a contradiction, we asked participants what they would say if their mother came into the room and said they were not their suggested identity. In a confrontation, we asked participants to open their eyes, look at themselves on a monitor, and describe what they were experiencing as they did so. Across three experiments, approximately 81% of our highs maintained their suggested identity in the face of these challenges (Cox, 2007; Cox & Barnier 2009a, 2009b; Cox & Bryant, 2008). In response to the contradiction, they made comments such as "mum's gone crazy ... she's lost the plot." In response to the confrontation, they made comments such as "it was very blurry at first. Then my eyes focused and I thought that's my brother on the TV." Notably, in one experiment involving real, high hypnotisable participants (hereafter referred to as "reals") and simulating, low hypnotisable participants (hereafter referred to as "simulators") tested with Orne's (1959, 1962) real-simulating paradigm, we found

that more than twice as many reals than simulators maintained their identity following the confrontation (Cox, 2007; for similar findings, see Noble & McConkey, 1995). This indicates that the delusional experiences of real, high hypnotisable individuals cannot be explained solely in terms of the demand characteristics of the hypnotic setting; that is, participants are not simply faking in order to please the hypnotist. Rather, their responses are a genuine reaction to the delusion suggestion.

We have recently examined the impact of similar challenge procedures on a hypnotic suggestion for somatoparaphrenia (Rahmanovic et al., 2009). In a contradiction we asked participants what they would say if a doctor walked into the room, examined their arm, and said that it belonged to the participant. In response, a number of highs claimed that the doctor was mistaken. In a confrontation, we asked participants to look at themselves in a mirror, focus on their arms, wiggle their fingers, and describe what they could see and how they felt. Some high hypnotisable participants claimed that their arm looked different and that they found it difficult to wiggle their fingers. We also developed a video challenge where we showed participants a video of a person with somatoparaphrenia. After watching the video we asked participants to describe their reactions to the person. Rather than saying that the person in the video was mistaken, some of our highs said that the video reinforced their deluded beliefs and helped them make sense of their experience.

In our hypnotic analogues of mirrored-self misidentification, we have used a graded series of first person, second person and third person challenges designed to map the challenges used by clinical neuropsychologists with delusional clients. Our first person challenges include questions about appearance such as “how is it possible that you and the person you see in the mirror look so similar?” Second person challenges involve the experimenter appearing in the mirror beside participants and asking “who else do you see in the mirror”, and “if there are two people in the room and two people in the mirror, who must the people in the mirror be?” Third person challenges involve behavioural tasks such as asking participants to touch their nose while looking in the mirror and asking “what did the person in the mirror do?”, “why did they do that?”, and “how do you explain that the person you can see always does exactly what you do?” The following excerpt illustrates one participant’s response to this particular challenge:

Hypnotist: I’d like you to touch your nose with your finger.

Participant: He’s copying me (*participant laughs*).

Hypnotist: What did he do?

Participant: He touched his nose (*participant laughs and looks behind him*).

Hypnotist: What do you think he did that?

Participant: Maybe he’s trying to make me seem like I’m crazy or something.

In response to this nose-touching challenge, 94% of high hypnotisable participants maintained their delusion. The most effective challenge involved the hypnotist appearing in the mirror alongside participants. This challenge breached the delusion for approximately 33% of highs (Connors et al., 2008). One reason why this challenge may be so effective is because it diverts participants' attention away from the mirror and asks them to calculate the number of people in the room. Subsequently, they seem to infer that the two people in the mirror must be the same as the two people in the room. However, we found that some highs will maintain their suggested mirror delusion across an entire series of graded challenges. Just like clinical patients, highs can provide a myriad of explanations when confronted with evidence that contradicts their delusional beliefs.

Overall, these challenge procedures indicate that hypnotic delusions are credible, realistic, and held with strong conviction. Highs do not ignore information that contradicts their suggested experiences. Rather, when confronted with challenging information, they appear to interpret it in a way that is consistent with their delusion by generating explanations that support their delusion (see also Burn et al., 2001).

Autobiographical memory during hypnotic delusions

In addition to establishing a hypnotic paradigm that closely maps the features of clinical delusions we have also been interested in the impact of reverse intermetamorphosis on autobiographical memory. Empirical work on autobiographical remembering during delusions has been both limited and mixed (see Baddeley et al., 1996, Corcoran & Frith, 2003, and Kaney, Bowen-Jones, & Bentall, 1999, for mixed findings on memory specificity among deluded individuals). However, clinical cases suggest that autobiographical memories are often distorted during delusions (Baddeley et al., 1996; Breen et al., 2000). Deluded individuals appear to recall memories that "serve" their delusional beliefs. For example, Breen et al. (2000) described the case of a woman known as RZ who suffered from reverse intermetamorphosis and believed she was her father. When RZ's delusion was challenged, she continued to maintain that she was a man and recalled a memory about having an operation to make her look like a woman. She said "I have a man's voice and I've got a man's legs so I can't be female, because Dr R gave me injections in the arm to grow breasts and they castrated me about, in the hospital . . . I just remember going with Wayne and whoever is out on the farm, Doug, I remember going with him to C_____ and having an operation and I woke up . . . and I said 'oh yes, it's been done.' Those were my first words when I woke up" (p. 96). This memory served RZ's delusional belief because it explained why she had man's voice and a woman's body.

To investigate how a hypnotic suggestion for reverse intermetamorphosis influences autobiographical remembering, we asked participants to elicit memories during a suggested delusion. We used participants' responses to an "I am" task to cue specific memories (Kuhn & McPartland, 1954; Rathbone et al., 2008). For example, if participants said "I am confident" we asked them to describe a specific event from their (deluded identity's) past that illustrated this. Across four experiments we found that highs were more likely to generate specific memories than lows: 86% of highs' memories were specific, whereas only 43% of lows' memories were specific (where specific memories were unique events with an identifiable beginning and end as defined by Conway & Pleydell-Pearce, 2000). Also, when challenged, highs provided more justification for having personally experienced their memories than lows. Notably, highs rarely fabricated memories but 30% of lows' memories were fabrications. Highs preferred to recall memories of previously experienced events, but reinterpreted these in light of their delusion and viewed them from the perspective of their deluded identity (Cox, 2007; Cox & Barnier, 2009a).

Together, these findings suggest that during a hypnotic delusion for reverse intermetamorphosis memories consistent with the suggested identity are facilitated. In our work, highs selectively recalled, reinterpreted and built upon memories that supported their deluded identity rather than completely fabricating new events. This is similar to many clinically deluded patients such as RZ (Breen et al., 2000) who appear to remember events that serve their delusions. RZ had been hospitalised on a number of previous occasions and also suffered from hirsutism (excessive hair growth), which was so severe that she needed to shave her face. It is possible that she conflated, reinterpreted, and built upon these experiences, resulting in a "memory" of a sex-change operation. Such memories may provide deluded individuals with evidence for their delusional beliefs. This type of selective and reconstructive remembering may reinforce a delusion and thereby contribute towards its maintenance. Conway and Tacchi (1996) have made a similar argument in their discussion of autobiographical confabulations. They suggest that such confabulations may be reconstructions of existing autobiographical memories rather than entirely new memories. They argue that these reconstructions may help individuals maintain a positive sense of self. The degree to which clinically deluded patients and hypnotic subjects reinterpret and build upon existing memories versus fabricate entirely new memories is an area for future research. However, it is typically difficult to judge the accuracy of autobiographical memories unless they are bizarre or contradicted by other individuals who were present at the time.

INTERPRETATIONS, IMPLICATIONS, CHALLENGES, AND FUTURE DIRECTIONS

Our programme of research indicates that a hypnotic suggestion can produce credible, compelling delusions with features similar to their clinical counterparts (Bortolotti et al., 2009). Hypnotic delusions are most effective for high hypnotisable individuals who receive a formal hypnotic induction (the suggestion can be experienced by highs who receive imagination instructions, but their experience is less compelling; Cox & Barnier, 2009a). Importantly, response to the hypnotic delusion cannot be explained simply in terms of the demands of the experimental procedure because we have consistently found differences in the reactions of real, hypnotised participants and simulating participants (e.g., in response to challenges and in autobiographical memories elicited during the delusion; Burn et al., 2001; Cox, 2007; Noble & McConkey, 1995). In striving to recreate clinical delusions, we have found three striking similarities between clinical cases and our hypnotic analogues. These include: (1) the phenomenological features of clinical and hypnotic delusions, (2) the resistance to challenge displayed by hypnotic and clinically deluded individuals, and (3) the features of autobiographical memory during hypnotic and clinical delusions.

First, in terms of phenomenological features, all our fully formed hypnotic delusion suggestions and our hypnotic Factor 1 alone suggestion for mirrored-self misidentification have successfully recreated features displayed by clinically deluded patients. For example, in reverse intermetamorphosis, clinical patients may believe themselves to be a variety of different identities. Likewise, our hypnotic paradigm was effective across a range of identities—real and nonexistent, similar and dissimilar, familiar and unfamiliar (Cox, 2007; Cox & Bryant, 2008). Also, in mirrored-self misidentification, both clinically and hypnotically deluded individuals make attempts to converse with the person in the mirror and may express frustration at not being able to converse normally with the person (Breen et al., 2000). In our hypnotic analogue, one participant said, “he’s saying something but I can’t understand”. When asked why he couldn’t understand he said, “because I can’t lip read” (Barnier et al., 2008). Notably, our hypnotised individuals, like their clinical counterparts, often expressed discomfort at seeing a stranger in the mirror. They made comments such as: “I felt kind of weird seeing someone just stare at me that close”, and “I didn’t trust the other person”. This suspicion is reminiscent of clinical patients who may cover all the mirrors in their house because they dislike the idea of a stranger peering out at them (Breen et al., 2000).

Second, in terms of resistance to challenge, both clinical and hypnotic delusions are maintained with conviction even in the face of rational

counterarguments or evidence to the contrary. During our challenge procedures for reverse intermetamorphosis, somatoparaphrenia, and mirrored-self misidentification (e.g., contradiction, confrontation, graded challenges), the majority of highs maintained their deluded beliefs. For example, in hypnotic reverse intermetamorphosis subjects claimed that they could see someone else when asked to look at themselves on a monitor. And, in the hypnotic mirrored-self misidentification delusion, subjects claimed that their family would have no trouble distinguishing them from the stranger in the mirror and said that the stranger was copying their actions (e.g., touching their nose). Thus, just like clinical patients, our hypnotically deluded individuals had no difficulty generating reasons to explain and justify their (temporary) deluded beliefs.

Third, in terms of autobiographical memory, in both clinical and hypnotic delusions that influence identity (e.g., reverse intermetamorphosis), individuals recall autobiographical memories that serve their delusion. Like clinically deluded individuals, hypnotic subjects recall these autobiographical events from the perspective of their deluded identity. For example, the patient RZ who believed she was her father, adopted her father's perspective when recalling a memory that involved both her father and herself, making comments such as "I kicked RZ out of the house when she was living there." This change in perspective during a delusion (whether clinical or hypnotic) may help to reinforce the conviction that memories are of self-experienced events, which in turn may help to render these delusions resistant to challenge.

It is worth noting here that across all our studies, the comments and reactions of our hypnotically deluded participants were essentially spontaneous. The delusion suggestions to become another person or to see a stranger in the mirror, for instance, provided very little information about how to react and what such an experience might be like. Our participants were first- and second-year undergraduate students and it is unlikely that they would have knowledge about the delusions that we were attempting to recreate. It is therefore quite remarkable that their reactions so closely mimicked those of clinically deluded individuals. It indicates that a hypnotic suggestion, when coupled with less stringent criteria for evaluating beliefs (produced by the hypnotic state), is sufficient to create a complex and compelling delusional experience. Whereas our hypnotic delusions are able to model many features of clinical delusions, there are important differences between clinical and hypnotic delusions, which we must acknowledge and address in future research.

First, there are differences in the longevity of clinical and hypnotic delusions. Typically, hypnotic effects are confined to the hypnotic setting. In contrast, clinical delusions persist over time, and often in the face of much stronger challenges (e.g., persistent challenges from family and friends).

However, some hypnotic effects can continue outside of the hypnotic context. For instance, Barnier and McConkey (1998) gave participants a posthypnotic suggestion that they would feel compelled to mail a postcard every single day to the experimenter and indeed, some high hypnotisable individuals mailed postcards everyday for up to 16 weeks! It remains to be tested whether hypnotically suggested beliefs, especially delusions, can be maintained outside the hypnotic context and over long periods of time.

Second, the intensity and behavioural consequences of clinical and hypnotic delusions are markedly different (Kopelman, 2007). For instance, in mirrored-self misidentification, the belief that one's reflection is that of a stranger might be so overwhelming that the person avoids looking in the mirror and covers up all the mirrors in the house (as in the case of TH; Breen et al., 2000). In Capgras delusion, the belief that someone emotionally close, such as a family member, has been replaced by an impostor, is occasionally accompanied by acts of violence (Bourget & Whitehurst, 2004; for discussion of the classic case of a son who decapitated his father in the belief that the father was a robot, see Stone & Young, 1997). However, the range of behavioural responses to the Capgras delusion is variable (for discussion, see Davies et al., 2002). Although we think it unlikely that hypnotic suggestions would ever engender beliefs that lead to such extreme or criminal behaviour, there is strong evidence from clinical applications of hypnosis that hypnotic suggestions can lead to significant and long lasting cognitive and behavioural changes, at least until they are cancelled and perhaps even after cancellation (Nash & Barnier, 2008).

Third, clinical and hypnotic delusions may differ in their aetiology. A number of clinical delusions are thought to arise when a neuropsychological impairment (e.g., brain injury) produces perceptual and/or affective deficits, combined with faulty belief evaluation processes (Langdon & Coltheart, 2000). In contrast, hypnotic delusions arise due to a combination of cognitive (e.g., dissociative) and social/motivational processes. Notably, however, Langdon, Coltheart, and colleagues have acknowledged that some clinical delusions may involve a motivated or functional disruption in information processing (McKay et al., 2005), rather than a neuropsychological impairment (e.g., persecutory delusions). Hypnosis may be best suited to modelling these sorts of delusions. This is supported by research we described earlier on hypnotic analogues of conversion disorder paralysis. Halligan, Oakley, and colleagues reported that the patterns of brain activation in a clinical case of conversion disorder paralysis were remarkably similar to the patterns in a hypnotic analogue. They argued that these clinical and hypnotic versions shared the same neural underpinnings (Halligan et al., 2000; see also Barnier & Oakley, 2009; Oakley, 2006). In a similar way, hypnotic analogues may be able to model both the features and underlying neural processes involved in certain types of delusions.

Fourth, clinical and hypnotic delusions differ in the extent to which individuals may be aware of the source of their difficulties. After giving participants a hypnotic Factor 1 suggestion for somatoparaphrenia, we administered accompanying amnesia for this Factor 1 suggestion. We administer this amnesia suggestion to model neuropsychological cases where clinical patients may have a Factor 1 deficit that they are unaware of. For instance, a clinical patient with mirrored-self misidentification may have lost the ability to recognise faces (Factor 1) and will also be unaware of this Factor 1 deficit. Our hypnotic amnesia suggestion creates a similar lack of awareness in hypnotically deluded subjects for the content of their hypnotic experience. However, we acknowledge that during hypnotic delusions, individuals are potentially aware of the source of their deficits. This is because the hypnotic amnesia is reversible, they may have implicit awareness of the hypnotic suggestion (Schacter, 1987), and they are likely to be motivated to experience the suggested effects (Sheehan, 1991).

Extending our hypnotic analogues to confabulation

We can extend this instrumental use of hypnosis to explore whether hypnosis can model other pathological conditions (see Oakley & Halligan, 2009). One condition we are currently focusing on is clinical confabulation. Just like delusional patients, confabulators may believe and remember extraordinary, clearly false things. Confabulating patients might mistakenly remember, for instance, that “I had a huge argument with my [long dead] father yesterday” (Downes & Mayes, 1994) or “I met my friend’s mother; she had the head of a bee” (Turner & Colheart, 2010 this issue). Although both delusions and confabulations involve distortions of reality, they are generally considered distinct pathologies, demanding different explanations and treatments (Kopelman, Guinan, & Lewis, 1995). But Langdon, Colheart, and colleagues recently proposed that confabulations can be understood by extending their influential two-factor theory of delusions (Metcalf et al., 2007). By their view, we don’t need to distinguish between the two pathologies. We just need to answer the same two questions: (1) What generates the false proposition (belief or memory) in the first place? (2) Once generated, why isn’t it rejected as untrue? This positioning of the two-factor theory as a common explanatory framework has generated much interest and controversy, and needs to be tested. To do this, we can use hypnosis to create temporary versions of confabulations.

Confabulations involve the “production of fabricated, distorted, or misinterpreted memories about one’s self or the world without the conscious intention to deceive” (Fotopoulou et al., 2007, p. 6). Like delusions, they are common in dementia, schizophrenia, and after traumatic brain injury. The

richness and specificity of these false memories is illustrated by a male patient, who started to confabulate after brain surgery. In the following excerpt from Fotopoulou et al. (2007), he describes seeing an ophthalmologist.

Patient: I used to come and he used to try my eyes and say “that eye, the lens is not working properly”. He used to take the lens off, polish it, or replace it.

Examiner: The lens in your spectacles?

Patient: No, my eyes.

There is no single theory of confabulations but they may involve: (1) inefficient/disrupted memory retrieval leading to the inability to adequately specify a sought after memory (Moscovitch & Melo, 1997), (2) temporal confusion, where fragments of different memories are inappropriately conjoined, or where previous memories are reexperienced as current (Dalla Barba, Cappelletti, Signorini, & Denes, 1997), and/or (3) poor reality monitoring, where elements of imagination and memory are inappropriately combined and never experienced events are misattributed as real (Johnson, Hashtroudi, & Lindsay, 1993). Some argue that motivation combines with these processes to influence the content of confabulations (Fotopoulou et al., 2007). Laying aside these explanations, there is a strong view that delusions and confabulations are distinct pathologies (Kopelman et al., 1995). Delusions are supposed to be fixed, held with conviction, resistant to counterargument, and acted on, whereas confabulations are supposed to be fleeting, quickly abandoned, and generally not acted on. But recent clinical reports highlight overlap and confusion. For instance, whereas a delusional patient’s conviction in their false belief may wax and wane, a confabulator may report the same false memory day after day (Turner & Coltheart, 2010 this issue; see also Coltheart, 2007). And some people show both delusion and confabulation according to established criteria, which makes diagnosis extremely challenging. In light of these overlaps, Langdon, Coltheart, and colleagues proposed that confabulations may be understood by extending the two-factor theory (Metcalf et al., 2007). By their view, both delusions and confabulations involve a distinct Factor 1, a broken process that generates the false belief or memory, and a common Factor 2, a broken process that impairs evaluation.

We have identified three pathways—potential Factor 1s—to confabulation. With hypnosis we can recreate these Factor 1 impairments and the common Factor 2 impairment. As in our delusion paradigm, we can compare fully formed confabulation suggestions, Factor 1 plus Factor 2 suggestions, and Factor 1 alone, inside and outside hypnosis. Confabulators are also typically amnesic to varying extents, suggesting that amnesia may be a necessary component of clinical confabulation. Using hypnosis, we can recreate the three versions of confabulation described previously (see Table 2

for examples): (1) To recreate the inability to adequately specify a sought-after memory, we can suggest complete or partial amnesia for a life period or event, combined with a suggestion to fill in any gaps in memory (while we note that the inability to specify a sought-after memory occurs as a consequence of a retrieval disruption, our current suggestion is an attempt to convert this hypothesised retrieval disruption into a hypnotic suggestion); (2) to recreate temporal confusion we can suggest confusion for the sequence of events or suggest the inappropriate conjunction of two events; and (3) to recreate the inappropriate combination of imagination and memories due to poor reality monitoring, we can suggest imagination inflation for never experienced events. Additionally, as a control condition, we can examine the impact of amnesia alone as Factor 1 and combine this with a Factor 2 suggestion for difficulty evaluating the reality and accuracy of memories.

In our current work, we are giving participants a hypnotic suggestion to either: (1) forget everything that has happened to them since they started university, (2) forget everything that has happened to them since they started university plus a suggestion to fill in gaps in their memory, or (3) forget the correct order of events that have happened since they started university. We are indexing response to the suggestions by asking highs to complete a modified confabulation battery (Dalla Barba et al., 1997) consisting of personal semantic information (e.g., name, age), episodic memories, and impossible questions (where the answer should be “I don’t know”). After hypnosis, highs indicate whether they confabulated and rate the qualities (e.g., vividness, emotionality) and source their memories.

CONCLUSION

Research indicates that hypnosis is a powerful technique to investigate (as well as treat) complex clinical phenomena. Our instrumental use of hypnosis allows us to explore aspects of delusions that have been either neglected in research or difficult to study in the laboratory. Our hypnotic techniques offer a new way to explore the separate and combined effects of Factor 1 and Factor 2 in delusions. They also offer a novel technique for examining Langdon and Coltheart’s (2000) two-factor theory of delusions and its controversial extension to confabulation. By developing hypnotic versions of delusions and confabulations, this research can improve our understanding of these conditions and provide an important link between the clinic and the laboratory. In this way, our research adds to a long tradition in the field of hypnosis, and will have both theoretical and practical benefits for the fields of delusion and confabulation.

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