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Delusions in the Hypnosis Laboratory: Modeling Different Pathways to Mirrored-Self Misidentification

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Mirrored-self misidentification is the delusional belief that one's reflection in the mirror is a stranger. According to an influential theory, the content of this delusion can arise from either impaired face processing (and hence a difficulty in recognizing oneself) or mirror agnosia (an inability to use mirror knowledge when interacting with mirrors). We used hypnotic suggestions to model these two deficits and recreate features of the delusion. Sixty high-hypnotizable participants received a hypnotic induction and a suggestion for either the fully-formed delusion, impaired face processing, or mirror agnosia. All suggestions successfully recreated features of the mirrored-self misidentification delusion in the majority of participants. However, only participants given the mirror-agnosia suggestion, and not the impaired-face-processing suggestion, showed an impaired ability to use and define mirrors. These findings show that we can hypnotically recreate the delusion from its theorized components and illustrate the value of using hypnotic suggestions to model psychopathology.

Keywords: delusion, hypnosis, instrumental hypnosis, mirrored-self misidentification, self-recognition

Hypnotic suggestions can recreate many clinical symptoms. Specific suggestions, for example, can cause hypnotized participants to hallucinate, to show amnesia, or to feel that their limbs are paralyzed (Hilgard, 1965; Kihlstrom, 2008). These hypnotic effects resemble the symptoms of clinical disorders, although such effects are temporary and completely reversible. As a result, researchers can use specific hypnotic suggestions to model and study clinical symptoms under controlled laboratory settings (Kihlstrom, 1979). According to Oakley and Halligan (2009), this approach provides an experimental form of "virtual patients" (p. 266). In particular, researchers can investigate the role of possible contributory factors in the clinical disorder by manipulating relevant factors in the hypnotic model and examining their effect (Woody & Szechtman, 2011). In this experiment, we applied this approach to study the mirrored-self misidentification delusion—the delusional belief that one's reflection in the mirror is a stranger (Breen, Caine, & Coltheart, 2001).

Mirrored-Self Misidentification Delusion

Patients with mirrored-self misidentification delusion report that the person they see in the mirror is not themselves and maintain this belief when challenged. Indeed, many patients with mirrored-self misidentification remain able to recognize other people's reflections in the mirror and to define the reflective properties of mirrors (Breen et al., 2001). Mirrored-self misidentification occurs most frequently in dementia. The delusion is common at advanced stages of decline (Biringer & Anderson, 1992), al-

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though it can occur at earlier stages and before other symptoms are detectable (Breen et al., 2001). Approximately 2% to 10% of patients with Alzheimer's disease misidentify their reflection in the mirror (for a review, see Connors, Langdon, & Coltheart, in press). Mirrored-self misidentification delusion has also been reported in patients with schizophrenia (Gluckman, 1968) and right frontal ischemic stroke (Villarejo et al., 2011).

Mirrored-self misidentification delusion is an example of a monothematic delusion—a delusion restricted to a single topic. An influential theory of monothematic delusions is the two-factor account (Langdon & Coltheart, 2000; see also Coltheart, 2007; Coltheart, Langdon, & McKay, 2011). According to this theory, two separate factors are jointly responsible for a delusional belief. The first factor (Factor 1) explains the delusion's content and typically involves some anomaly in perceptual and/or emotional processing. In the case of mirrored-self misidentification, either impaired face processing (and hence difficulty recognizing one's face in the mirror) or mirror agnosia (an inability to use mirror knowledge when interacting with mirrors) can lead patients to misinterpret their reflection as another person. Evidence for these two pathways comes from Breen et al.'s (2001) study of two patients with mirrored-self misidentification, one of whom had impaired face processing, and the other mirror agnosia. A second factor (Factor 2) explains why the delusion is not rejected and involves a deficit in belief evaluation. This factor accounts for why some patients with impaired face processing or mirror agnosia do not develop a delusion (Coltheart et al., 2011; Connors & Coltheart, 2011). Thus, patients who have both Factor 1 (either impaired face processing or mirror agnosia) and Factor 2 (a deficit in belief evaluation) will develop mirrored-self misidentification delusion.

Using Hypnosis to Study the Delusion

Mirrored-self misidentification, like other delusions, can be difficult to study because of co-occurring symptoms and impairments. The extensive cognitive and neurological deterioration associated with dementia can make it difficult to identify features that are specifically relevant to the delusion. The use of hypnotic suggestions to model the delusion provides a means of studying some aspects of the delusion. Hypnotic suggestions are particularly suited to modeling clinical delusions for two reasons. First, hypnotic phenomena and clinical delusions share many attributes. In particular, both involve distorted beliefs about reality that can be resistant to counterevidence (Kihlstrom, 1979; Kihlstrom & Hoyt, 1988; Sutcliffe, 1961). These shared attributes allow researchers to use hypnotic suggestions to model the surface features of delusions. Second, the two-factor theory of delusions is a general cognitive model (Langdon & Coltheart, 2000). According to this view, disruptions at a cognitive level are the proximate cause of a delusion, irrespective of whether neurological damage is also present. Hypnosis can temporarily generate cognitive disruptions in a top-down manner without the neurological damage. This may allow researchers to model and manipulate the underlying processes of clinical delusions (Connors, 2012b; Cox & Barnier, 2010; Oakley & Halligan, 2009).

Given this suitability, in previous work, we attempted to model the mirrored-self misidentification delusion using hypnotic suggestions. We did this in two stages of research. In the first stage, we attempted to model the delusion by directly specifying the overall experience of the delusion in the suggestion. In two experiments (Barnier et al., 2008; Barnier, Cox, Connors, Langdon, & Coltheart, 2011), we gave high-hypnotizable participants (*highs*) a suggestion to see a stranger in the mirror (we refer to this suggestion as a *fully-formed suggestion* because it specifies the fully-formed delusion). In response, we found that 68% of participants reported seeing a stranger in the mirror. The majority of these participants also maintained their delusion when challenged with evidence that contradicted the delusion. Overall, these participants showed features strikingly similar to the clinical delusion (see Bortolotti, Cox, & Barnier, 2012, for a discussion).

In the second stage of research, we attempted to model the delusion from its underlying Factor 1 and Factor 2 components. In our first experiment (Connors, Barnier, Coltheart, Cox, & Langdon, 2012), we focused on impaired face processing as the Factor 1 responsible for the delusion's content. To model Factor 1, we gave highs a suggestion to not recognize the face they saw in the mirror (it is

important to note that this does not necessarily imply seeing a stranger; an individual might, e.g., think that their own facial appearance has changed). To model Factor 2, we gave half the participants an additional suggestion to impair belief evaluation by suggesting that they would accept any explanation that came to mind as plausible. As hypnosis itself may disrupt belief evaluation without the need for an additional suggestion (Bryant & Mallard, 2003; Oakley, 2008; Shor, 1959), we compared participants given the suggestions during hypnosis with participants given the suggestions outside hypnosis (in a wake control). We found that the suggestion for impaired face processing in combination with hypnosis was most successful in generating the delusion and that more participants experienced the delusion with hypnosis than in the wake control. These findings indicated that we can create a hypnotic analogue of the delusion from its components and that hypnosis itself might act as Factor 2.

In another experiment (Connors, Cox, Barnier, Langdon, & Coltheart, 2012), we focused on mirror agnosia as the Factor 1 responsible for the delusion's content. We used two different hypnotic suggestions to model mirror agnosia, and hypnosis itself to model the deficit in belief evaluation. In this experiment, we took a case study approach in which we examined the responses of a small number of carefully selected high-hypnotizable participants in detail. We gave five participants a suggestion to not understand how mirrors work and five participants a suggestion to experience the mirror as a window. The suggestion to experience the mirror as a window drew upon the presumed experience of what it would seem like for a patient with mirror agnosia to look into a mirror. We found that three participants given the suggestion to not understand mirrors reported seeing a stranger in the mirror and showed features consistent with mirror agnosia. In contrast, no participants given the suggestion to see a window reported seeing a stranger. Although limited by the small number of participants, these findings indicated that the suggestion to not understand mirrors could be used to model the mirror-agnosia pathway to the delusion.

Current Experiment

In the current experiment, we sought to integrate these different streams of research and directly compare the three different suggestions for the first time. In particular, we were interested in evaluating the predictions of the two-factor theory about the different pathways to the delusion. According to the two-factor theory, both impaired face processing and mirror agnosia can generate the content of the delusion. However, only patients who develop the delusion through mirror agnosia should have difficulty interacting with mirrors. In one test used to assess this, patients sit facing a mirror, and an object is held above their shoulder so that it is only visible by its reflection in the mirror (Connors & Coltheart, 2011). According to the two-factor theory, when asked to touch the object, patients with impaired face processing should correctly reach for the ball above their shoulder because they retain a procedural understanding of mirrors. In contrast, patients with mirror agnosia should reach directly into or behind the mirror in an attempt to grasp the ball because of their impairment using mirrored space. As such, we were interested in directly comparing the responses of participants given the different hypnotic suggestions.

We used a large sample of 60 high-hypnotizable participants to compare the effects of the three suggestions in detail. We gave participants a hypnotic induction and a suggestion for either the fully-formed delusion, impaired face processing, or mirror agnosia. As in previous experiments, we asked participants to look in a mirror and to identify and describe who they saw. We then tested participants' semantic and procedural understanding of mirrors. We did this by asking them to define a mirror and to reach for a ball that was visible only by its reflection in the mirror. If participants reported seeing someone other than themselves, we tested this belief with an extensive series of graded challenges. We expected that all suggestions would be able to recreate the delusion. However, we expected that the different suggestions would produce different features of mirrored-self misidentification. In particular, we expected that only participants given the suggestion for mirror agnosia would show impairment using mirrors to reach the ball held above their shoulder.

Method

Design and Participants

We tested 60 high-hypnotizable participants (32 female and 28 male) of mean age 19.72

($SD = 2.82$) years in a between-subjects design (suggestion: fully-formed vs. impaired face processing vs. mirror agnosia). Participants were undergraduate students at the University of New South Wales, who received either payment ($25 for 2 hr) or credit toward their course for their involvement. Participants were selected on the basis of their high scores on a 10-item modified version of the Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS:A; Shor & Orne, 1962) and a 10-item tailored version of the Stanford Hypnotic Susceptibility Scale, Form C (SHSS:C; Weitzenhoffer & Hilgard, 1962). All participants scored in the range 7 to 10 on the HGSHS:A ($M = 7.77$, $SD = 0.95$) and 7 to 10 on the SHSS:C ($M = 8.33$, $SD = 1.00$). Participants were asked not to participate if they had a history of substance abuse, serious head injury or neurological illness, or if they were receiving treatment for any ongoing psychological condition. Research was approved by the local human research ethics committee.

Materials and Procedure

A hypnotist (R. Cox or V. Polito) tested participants individually in a 2-hr video-recorded session that consisted of an experimental session and a postexperimental inquiry. The hypnotist told participants that the experiment examined people's experiences and reactions to a variety of hypnotic phenomena. The hypnotist was not aware of the specific prediction that different suggestions would produce different features of mirrored-self misidentification.

Experimental session. The hypnotist administered a standard induction procedure (approximately 10 min, based on the SHSS:C induction; Weitzenhoffer & Hilgard, 1962) and three simple hypnotic suggestions (also from the SHSS:C), including hand lowering, mosquito hallucination, and taste hallucination. The hypnotist then uncovered a mirror (approximately 40 cm × 50 cm) that was fixed to the wall to the right of the participants' chair.

Suggestions. Participants were randomly allocated to receive either the fully-formed suggestion, the impaired-face-processing suggestion, or the mirror-agnosia suggestion. All participants were told,

> You feel pleasantly and deeply hypnotized as you continue to listen to my voice. In a moment, I am going to ask you to open your eyes, and when you do, I would like you to lean forward and to look to your right.

Participants given the fully-formed suggestion were told,

> When you look to your right, there will be a mirror there, and you will see a person in it. The person you see in the mirror will not be you, it will be a stranger. When you open your eyes and turn your head to your right, while remaining as deeply relaxed and comfortably hypnotized as you feel now, you will see a stranger in the mirror.

Participants given the impaired-face-processing suggestion were told,

> When you look to your right, there will be a mirror there, and you will see a person in it. When you see this person in the mirror you will not be able to recognize this person. When you open your eyes and turn your head to your right, while remaining as deeply relaxed and comfortably hypnotized as you feel now, you will see a face in the mirror that you will not be able to identify, as if you have never seen this face before.

Participants given the mirror-agnosia suggestion were told,

> When you look to your right, you will find that you do not understand how mirrors work. That's right, you will not understand how mirrors work. When you open your eyes and turn your head to your right, while remaining as deeply relaxed and comfortably hypnotized as you feel now, you will not understand how mirrors work.

After each suggestion, the hypnotist checked that participants understood the suggestion.

Test of the suggestion. To test the suggestion, the hypnotist asked participants the following:

1. Please tell me what you see in the mirror.
2. How do you explain seeing that person in the mirror?

If participants reported seeing themselves in the mirror, the hypnotist gave participants the test of mirror knowledge. If participants reported seeing someone other than themselves in the mirror, the hypnotist first asked,

3. I would like you to tell me more about the person you can see in the mirror.
4. [If not specified] Is the person you can see male or female?
5. What do they look like?

6a. Have you ever seen this person before?
[If yes]: 6b. Who is this person?

6c. What is it about the person that makes you think they are . . . ?
6d. How do you explain being able to see this person in the mirror?
[If no]: 6b. Do they remind you of anybody? Who do they remind you of?
6c. What is it about the person in the mirror that reminds you of . . . ?
7. In what ways does the person you see look like you?
8. In what ways does the person you see look different to you?

Test of mirror knowledge. The hypnotist tested all participants' ability to define and use mirrors. The hypnotist asked participants,

9. Do you know what mirrors are for? How would you define what they are?

The hypnotist held a tennis ball over the participants' shoulder so that the tennis ball was only visible to participants by its reflection in the mirror. The hypnotist said,

10a. I would like you now to touch the tennis ball [wait for participants to touch the ball or the mirror]. What did the person in the mirror do?
10b. Why did they do that?

We were interested to see whether participants correctly reached above their shoulder to touch the ball or whether they reached into the mirror, like patients with mirror agnosia (Connors & Coltheart, 2011). At this point, if participants had reported seeing themselves in the mirror and did not show any difficulty defining or using mirrors, the hypnotist said, "That's fine. You see yourself in the mirror," and cancelled the suggestion (described later in this section). For all other participants, the hypnotist administered a series of challenges that were based on the techniques used by Barnier et al. (2011) and Breen et al. (2001).

Appearance challenges. The hypnotist gave the challenges to participants who continued to report seeing someone other than themselves in the mirror. If participants breached their delusion at any point during the challenges by identifying themselves in the mirror, the hypnotist said, "That's fine. You see yourself in the mirror," and immediately cancelled the suggestion.

The hypnotist also gave the challenges to participants who initially recognized themselves in the mirror but who had difficulty defining or using mirrors (i.e., they showed no evidence of the delusion and only showed mirror agnosia). We were interested to see if these participants maintained their mirror agnosia. However, only three participants showed this pattern of responses. For these three participants, the hypnotist gave a slightly modified version of the challenges. In particular, the hypnotist did not refer to "the person" and instead asked participants how it was possible that they could see themselves. In addition, the hypnotist continued with the challenges if these participants identified themselves, but immediately cancelled the suggestion if they indicated that they understood that they were looking at a mirror.

In the first set of challenges, the appearance challenges, the hypnotist asked participants,

1. How is it possible that you and the person you see look so similar?
2a. What are you wearing?
2b. What is the person wearing?
2c. [If clothing is the same] How do you explain the fact that they are wearing the same clothes as you?
3. If a close friend or a member of your family came into the room right now and looked at you and looked in the mirror, what would they say about what they could see?
4. How would they be able to tell you apart from the person you see?
5. How would you explain to them what they see?

Behavioral challenges. In the second set of challenges, the hypnotist said,

1a. I would like you now to touch your nose [wait for participants to touch their nose]. What did the person in the mirror do?
1b. Why did they do that?
2. How do you explain that the person you can see always does exactly what you do?

Visual challenges. In this final set of challenges, the hypnotist moved position so that

their reflection in the mirror was also visible to participants. The hypnotist asked,

1a. Who do you see now?
1b. [If participants report seeing the hypnotist but not themselves]. How do you explain that you can see me but not you?

The hypnotist touched participants on the shoulder and asked,

2a. Who did I touch?
2b. What happened over there?

The hypnotist picked up a handheld mirror and passed it to participants. The hypnotist said,

3a. Please look at this . . . Tell me what you see.
3b. How does what you see compare with what you see over there? [Point to mirror on wall]
3c. How do you explain what you see?

The hypnotist took the handheld mirror from participants.

Cancellation and deinduction. The hypnotist cancelled the suggestion by telling participants that they could see themselves in the mirror and that they could understand how mirrors worked. The hypnotist then checked that participants recognized themselves and administered a standard hypnotic deinduction (based on Weitzenhoffer & Hilgard, 1962).

Postexperimental inquiry. The hypnotist explained to participants that they would watch a video recording of the experimental session together and that the hypnotist would stop the video at particular points to ask them about their experiences. This methodology was adapted from the experiential analysis technique (EAT) of Sheehan and McConkey (1982) but did not use an independent inquirer. The hypnotist showed participants the video footage of when they first looked into the mirror and asked, (a) "What did you experience when you looked at the mirror?"; (b) "On a scale of 1 to 7, to what extent did you believe that you were looking at a stranger (1 = *not at all*, 7 = *completely*)?"; (c) "On a scale of 1 to 7, to what extent did you believe that you were looking through a window (1 = *not at all*, 7 = *completely*)?"; (d) "On a scale of 1 to 7, how surprising was it for you to look in the mirror (1 = *not at all surprising*, 7 = *extremely surprising*)?"; (e) "On a scale of 1 to 7, how distressing was it to look in the mirror (1 = *not at all distressing*, 7 = *extremely distressing*)?"; (f) "On a scale of 1 to 7, how confusing was the experience (1 = *not at all confusing*, 7 = *extremely confusing*)?" If participants reported the delusion, the hypnotist showed them a replay of the challenges they received and asked about their experiences of each challenge. Finally, the hypnotist thoroughly debriefed participants and thanked them for their time.

Coding of responses. Two independent raters (one of whom was blind to the aims and conditions of the experiment) watched the videotapes and scored whether or not participants experienced the delusion and, if so, at what point it was breached. Interrater reliability was 100%.

Results

Response to the Suggestion

Participants were scored as experiencing mirrored-self misidentification if they reported seeing someone other than themselves in the mirror. Participants were also tested on their ability to define mirrors and their ability to use mirrors procedurally to reach for a ball held above their shoulder. Table 1 shows the responses of participants to each of these tests.

Table 1
Participants' Responses to the Mirror According to Suggestion

	Reported seeing a stranger	Unable to define mirrors	Reached into the mirror
Fully-formed	14 (70%)	1 (5%)	1 (5%)
Impaired face processing	12 (60%)	0 (0%)	0 (0%)
Mirror agnosia	11 (55%)	11 (55%)	9 (45%)

Chi-square analysis indicated that all suggestions were similarly effective at generating the mirrored-self misidentification delusion, $\chi^2(2) = .987$, $p = .610$. As expected, however, the mirror-agnosia suggestion was more effective at disrupting participants' abilities to define mirrors and use mirrors procedurally than the other suggestions, $\chi^2(2) = 21.535$, $p < .001$, and $\chi^2(2) = 9.245$, $p = .010$, respectively. Three participants given the mirror-agnosia suggestion who failed the delusion were unable to define mirrors and reached into the mirror. Overall, the findings show that whereas all suggestions were able to produce mirrored-self misidentification, only the mirror-agnosia suggestion reliably impaired participants' ability to define and use mirrors.

Qualitative Features of the Delusion

The 37 participants who reported seeing a stranger showed evidence of compelling alterations in their experience. When asked if they had seen the person before, 13 participants (35%; 3 fully-formed, 4 impaired face processing, 6 mirror agnosia) said they had seen this person before, 20 participants (54%; 10 fully-formed, 6 impaired face processing, 4 mirror agnosia) said they had never seen the person before, and 4 participants (11%; 1 fully-formed, 2 impaired face processing, 1 mirror agnosia) said they were unsure. When asked how the person they saw looked similar and different to themselves, 5 participants (14%; 1 fully-formed, 3 impaired face processing, 1 mirror agnosia) breached the delusion, so they did not receive any further questions or challenges. Of the remaining 32 participants (13 fully-formed, 9 impaired face processing, 10 mirror agnosia), 28 participants (88%; 12 fully-formed, 9 impaired face processing, 7 mirror agnosia) identified specific physical similarities, and 15 participants (47%; 6 fully-formed, 6 impaired face processing, 3 mirror agnosia) identified specific physical differences between themselves and the person in the mirror. Chi-square analysis indicated no difference between suggestions in terms of participants' responses to these questions (all χ^2s < 3.816; all ps $> .431$).

The participants who reported similarities made comments like, "Same color eyes, the nose looks kind of similar," "He's got the same facial hair and glasses," and "They've got the same clothes that I'm wearing today." The participants who reported differences made comments like, "Their face is more square and their eyebrows are different," "They have a slightly different complexion to me and different eyes," and "The face is longer, the nostrils wider and their ears are too big." When asked to explain the similarities between the stranger and themselves, participants made comments like, "I don't understand, I don't know," "Coincidence. It just happens I guess. We've both got similar features," and "I don't know, we could be related, someone I don't who is part of the family." When asked to explain the similar clothing, participants made comments like, "I wouldn't know how to explain it," "I guess there's a chance that we may have the same jumper," and "Maybe we like similar things."

The comments of some participants in the postexperimental inquiry indicated a very compelling experience. One participant, for example, given the fully-formed suggestion with hypnosis said, "I knew it was a mirror, so it was supposed to be reflecting me but I just didn't know who it was." Another participant given the fully-formed suggestion said, "I saw a person. There was a slight notion in my head that it was someone I knew." Participants who received the impaired-face-processing suggestion made similar comments about the perceived reality of their experience. One participant given the impaired-face-processing suggestion said, "I thought, 'Who is this in the mirror?' It was weird. I wasn't expecting the suggestion to work." Likewise, a participant given the mirror-agnosia suggestion said, "I got really confused because there was another person wearing the same clothes as me."

Four participants given the mirror-agnosia suggestion reported during the experiment that the stranger was physically identical to themselves in all respects and that they were unable to account for this similarity. One participant, for example, described seeing a stranger that was "an almost exact replication" of himself and reported feeling somewhat "scared and freaked out." Another participant said, "It looks like me but it isn't, I promise you it's not." A third participant said, "It's a person. They look exactly like me!" In the postexperimental inquiry, one participant said, "There was somebody on the other side of here [the mirror] . . . I now understand how twins feel to see an exact

replication of themselves. I was freaked out, yet also intrigued." Another participant said, "It was baffling. The best [explanation] that I could come up with was that it was a copy . . . I didn't feel scared because it seemed like—because they were copying—that they had no intelligence . . . so it wasn't really a threat . . . it was like a puppet."

A further four participants given the mirror-agnosia suggestion reported seeing a stranger behind what they took to be a window. In the postexperimental inquiry, one participant said, for example, "I was really feeling like there was a window and there were actually people behind it." Another participant said, "When I first looked, I just thought it was a window . . . I didn't understand because the mirror was a foreign concept . . . I couldn't remember what it was." A fifth participant, who formally failed the delusion, said in the postexperimental inquiry that she thought she was looking at herself through a window and was very confused about how this was possible.

The ratings from the postexperimental inquiry of the participants who experienced the delusion are shown in Table 2. We focused only on the ratings of participants who experienced the delusion to compare the effects of the different suggestions. Across suggestions, these participants gave moderate to high ratings for their belief in a stranger and their surprise, distress, and confusion. One-way ANOVAs revealed that there were no statistical differences across suggestions (all Fs < 1.673; all ps $> .213$). However, participants given the mirror-agnosia suggestion rated their belief that the mirror was a window more highly than participants given the other two suggestions, $F(2, 35) = 8.589$, $p = .006$.

Response to Challenges

Table 3 shows the number of participants maintaining the delusion in response to the challenges. Chi-square analysis indicated that there were no differences between suggestions in responses to the challenges. Of the 32 participants who experienced the delusion and received the challenges, only four participants (12%; all of whom received the fully-formed suggestion) breached the delusion. This left 28 (88%) participants who maintained the delusion through all the challenges.

When asked to identify the hypnotist's reflection in the mirror, 23 of the 30 participants experiencing the delusion (77%; 8 fully-formed, 8 impaired face processing, 7 mirror agnosia) identified the hypnotist; the other 7 participants (23%; 3 fully-formed, 1 impaired face processing, 3 mirror agnosia) said they saw another stranger. When asked to compare the handheld mirror to the mirror on the wall, 15 of the 28 participants experiencing the delusion (54%; 3 fully-formed, 4 impaired face processing, 8 mirror agnosia) reported seeing a stranger in both mirrors; the other 13 participants (46%; 6 fully-formed, 5 impaired face processing, 2 mirror agnosia) reported recognizing themselves in the handheld mirror but not in the mirror on the wall.

In addition to the 32 participants who experienced the delusion and received the challenges, three participants who failed the delusion but showed evidence of mirror agnosia received a modified version of the challenges (these three participants are not included in Table 3). The three participants with mirror agnosia all received the mirror-agnosia suggestion. They reported seeing themselves but said that they did not know how it was possible for them to look at themselves. One participant, for example, said, "There must be a hidden camera somewhere inside to track my movements and then turn it into pictures." The other two participants also said that it could be a video, but were not sure where the camera was. These three participants maintained their inability to under-

Table 2
Postexperimental Ratings of Participants Who Experienced the Delusion

	Belief stranger	Belief window	Surprise	Distress	Confusion
Fully-formed ($n = 14$)	5.21 (1.67)	3.14 (2.14)	4.71 (1.73)	3.14 (2.11)	5.36 (1.95)
Impaired face processing ($n = 12$)	5.44 (1.01)	2.56 (1.67)	5.44 (2.07)	3.50 (1.41)	5.78 (1.30)
Mirror agnosia ($n = 11$)	5.38 (1.41)	4.56 (1.80)	6.06 (1.15)	4.13 (2.01)	6.38 (0.52)

Note. Ratings were made on the scale 1 = *not at all*, 7 = *completely.*

Table 3
Participants Maintaining the Delusion in Responses to the Challenges

	Fully-formed	Impaired face processing	Mirror agnosia
Participants receiving the challenges	13	9	10
Appearance challenges			
1. Explain similarity to stranger	13 (100%)	9 (100%)	10 (100%)
2. Compare clothes to stranger	11 (85%)	9 (100%)	10 (100%)
3. Describe what a friend would say	11 (85%)	9 (100%)	10 (100%)
4. Describe how a friend could distinguish	11 (85%)	9 (100%)	10 (100%)
5. Explain to a friend what they can see	11 (85%)	9 (100%)	10 (100%)
Behavioral challenges			
1. Touch their nose and explain	11 (85%)	9 (100%)	10 (100%)
2. Explain why the stranger copied them	11 (85%)	9 (100%)	10 (100%)
Visual challenges			
1. Hypnotist stands so visible in the mirror	11 (85%)	9 (100%)	10 (100%)
2. Hypnotist touches participants' shoulder	11 (85%)	9 (100%)	10 (100%)
3. Handheld mirror	9 (69%)	9 (100%)	10 (100%)

Note. Percentages indicate the proportion of participants maintaining the delusion from the total number of participants who experienced the delusion and received the challenges in each condition.

stand mirrors throughout all the challenges but did not develop the delusion.

When interviewed in the postexperimental inquiry, the participants who developed the delusion reported that they continued to believe that they were looking at a stranger despite the challenges. A participant given the fully-formed suggestion, for example, said, "It was copying me. It was trying to freak me out . . . I was just confused . . . I was certain that somebody else could tell us apart." A participant given the impaired-face-processing suggestion said, "They were doing exactly the same thing I was doing . . . I thought that it was another person . . . it just felt like it wasn't me." Another participant given the mirror-agnosia suggestion said, "There was someone who looked exactly the same as me. I just felt really helpless that I wouldn't be able to convince other people that I was me." After the cancellation, all participants reported seeing themselves in the mirror. No participants reported being distressed in the postexperimental inquiry or debriefing. In addition, no participants reported prior knowledge of mirrored-self misidentification delusion.

Discussion

Overview

As expected, all three hypnotic suggestions were able to recreate features of the mirrored-self misidentification delusion. Regardless of the suggestion, the majority of participants reported seeing a stranger in the mirror and maintained this belief when challenged. Indeed, regardless of the suggestion, participants who experienced the delusion showed a remarkable level of persistence in their belief despite the extensive challenge procedures, and only a small number of participants breached the delusion. Importantly, however, the suggestions differed in terms of whether they disrupted participants' semantic and procedural knowledge of mirrors. With one exception, only participants given the mirror-agnosia suggestion showed impairment using mirrors. Overall, these findings are consistent with the predictions of the two-factor theory and support the idea that there are two different pathways to the mirrored-self misidentification delusion.

Recreating the Delusion

Our findings are consistent with previous research that has used hypnotic suggestion to model the mirrored-self misidentification delusion (Barnier et al., 2008, 2011; Connors et al., 2013; Connors, Cox, et al., 2012). As in previous studies, the fully-formed suggestion, which directly specified the delusion to participants, was able to recreate the surface features of the delusion (Barnier et al., 2008, 2011). Likewise, the two Factor 1 suggestions—the impaired-face-processing suggestion and the mirror-

agnosia suggestion—were also able to recreate the delusion's features (see Connors, Barnier, et al., 2012; Connors, Cox, et al., 2012). In this experiment, we directly compared the three different suggestions for the first time. In this way, we could assess the relative effectiveness of the three suggestions in modeling the delusion in the same sample of participants and with the same set of challenges.

We found that the two Factor 1 suggestions were just as effective as the fully-formed suggestion. This is notable because the Factor 1 suggestions did not specifically mention a stranger and required participants to generate this idea for themselves. In addition, the Factor 1 suggestions were based on the hypothesized neuropsychological deficits responsible for the delusion's content. The similar proportion of participants responding to the suggestions and the similar features of the resulting delusions in this experiment indicate that the level of specification in the fully-formed suggestion is unnecessary. These findings also support the view that these Factor 1 deficits play a causal role in generating the content of the clinical delusion. Although not directly told to see a stranger, participants reached this idea on the basis of the Factor 1 specified in the suggestions. More generally, the findings support the idea that perceptual anomalies can underpin bizarre delusional content (see Ellis & Young, 1990; Langdon & Coltheart, 2000; Maher, 1974).

Different Pathways to the Delusion

This experiment showed that two different Factor 1 suggestions could generate the same delusional content. The majority of participants who were given either the impaired-face-processing suggestion or the mirror-agnosia suggestion developed the hypnotic mirrored-self misidentification delusion. These findings are consistent with Breen et al.'s (2001) study of two patients with the delusion. Breen found that although one patient had impaired face processing and the other patient had mirror agnosia, they both shared the same delusional belief. The findings are also consistent with the two-factor theory, which, following Breen et al.'s study, proposed that these two different deficits can generate the same delusional content (Coltheart et al., 2011). According to this theory, when combined with a deficit in belief evaluation (Factor 2), either of these deficits can produce the delusion (see also Coltheart, 2007). Our previous work has indicated that Factor 2 can be modeled by the presence of hypnosis, which itself disrupts belief evaluation (see Connors, Barnier, et al., 2012, 2013). Thus, the combination of hypnosis and suggestion allows us to model the delusion from its Factor 1 and Factor 2 components.

Consistent with both Breen et al.'s (2001) findings and the two-factor theory, we demonstrated a dissociation between the impaired face processing and mirror-agnosia pathways in terms of participants' semantic and procedural knowledge of mirrors. Participants given the impaired-face-processing suggestion retained an intact ability to define and use mirrors, despite the fact that they reported seeing a stranger. All participants correctly defined mirrors and were able to use the mirror to reach a ball held over their shoulder. In contrast, participants given the mirror-agnosia suggestion showed a disrupted ability to define and use mirrors. The majority of participants given this suggestion did not provide a definition of mirrors when tested and reached directly into the mirror when asked to touch the ball. Like patients with mirror agnosia, these participants scratched on the mirror's surface in an attempt to grasp the ball, apparently confusing the reflected image for the real object. This dissociation provides further support for the view that two different pathways can generate the delusion. Future work could strengthen this approach by including a test of face processing and demonstrating a dissociation between the two suggestions on this measure as well. Such a dissociation is plausible. In other work, we found that a modified suggestion to impair recognition of all faces disrupted the performance of some high-hypnotizable participants on a formal neuropsychological test of face processing (Connors, 2012a), though we did not examine the effect of the mirror-agnosia suggestion.

It should be noted, however, that participants in all three conditions reported high levels of confusion and surprise at seeing the stranger in the mirror. This illustrates an important difference between the hypnotic model and clinical patients: Whereas the hypnotic delusion is seen at its inception, the clinical delusion is usually only seen when it is well established and has attracted the attention of caregivers and health

professionals. The hypnotic model may thus provide insight into the initial experiences of clinical patients, but may differ in some ways from the established delusion in which patients may be accustomed to seeing the stranger. Likewise, although most participants given the mirror-agnosia suggestion did not define mirrors when asked, some clinical patients with mirror agnosia are able to do so. These clinical patients show intact semantic understanding of mirrors despite their impaired ability to physically interact with them (Connors & Coltheart, 2011). It seems that participants in the current experiment might have interpreted the suggestion to not understand mirrors literally and, therefore, to entail both semantic and procedural deficits. As a result, they may have experienced effects more pervasive than the clinical condition (see also Connors, Cox, et al., 2012). In any case, this finding is consistent with our previous experiment that used hypnotic suggestion to model mirror agnosia (Connors, Cox, et al., 2012). It is also consistent with other research that used hypnotic suggestion to create agnosia for other objects, such as for scissors (Hilgard, 1965). In these previous experiments, hypnotic suggestions for agnosia created both semantic and procedural deficits in participants (see Hilgard, 1965; Kihlstrom, 1997).

Despite differences in their ability to define and use mirrors, participants given either the impaired-face-processing suggestion or the mirror-agnosia suggestion showed a similar ability to recognize other people in the mirror. Regardless of the suggestion, the majority of participants correctly identified the hypnotist's reflection during the challenges, yet continued to maintain their delusion. These findings do not support Coltheart's (2007) proposal—based on Breen et al.'s (2001) two patients—that the ability to recognize other people in the mirror indicates the presence of intact mirror knowledge and so distinguishes the two pathways. According to this view, whereas patients with impaired face processing may be able to recognize other people in the mirror because their ability to recognize their own face is most affected (see also Langdon, 2011), patients with mirror agnosia fail to recognize other people in the mirror because they interpret other people's reflections as being in a different region of space to the people themselves.

One possible explanation is that hypnotized participants interpret the hypnotic suggestions as interfering only with self-recognition and so remain able to recognize other people in the mirror. An alternative explanation is that the current findings indicate problems with drawing strong inferences from Breen et al.'s two patients. Although Breen et al. observed that their patient with mirror agnosia identified all people in the mirror as strangers, a failure to understand mirrored-space associated with mirror agnosia may not, by itself, prevent patients from recognizing other people in the mirror because other people are typically encountered in external space anyway. In support of this, two recently translated articles report patients with both mirrored-self misidentification delusion and mirror agnosia who were able to correctly identify other people in the mirror (see Connors & Coltheart, 2011; Kumakura, 1982).

The findings of the hypnotic model, together with clinical reports, thus point to a large degree of heterogeneity in the delusion. Hypnotized participants and clinical patients, for example, vary in their attitude toward the stranger, their appraisal of how closely the stranger resembles themselves, and their ability to recognize themselves in handheld mirrors. This variation is difficult to account for solely within the current framework of the two-factor theory of delusions. Although two deficits may account for the core belief that there is a stranger in the mirror, it seems likely that other deficits and individual differences may nuance the final presentation of the delusion. This is an important issue for future research and for future refinements of the two-factor theory.

Other Responses to Suggestion

A number of other participants in this experiment showed Factor 1 deficits without the delusion. Despite identifying the person they saw as themselves, four participants given the impaired-face-processing suggestion reported difficulty recognizing themselves, and three participants given the mirror-agnosia suggestion showed an impaired ability to use and define mirrors. In previous work, we argued that hypnosis itself might act as Factor 2. The fact that these participants did not develop the delusion despite being hypnotized suggests that, in their case, hypnosis did not sufficiently disrupt their

belief evaluation, or that other factors might be involved. It is possible, for example, that these participants interpreted the suggestion differently than other participants (see McConkey, 1991), or had an incomplete response to the suggestion that led them to experience the Factor 1 deficit only partially, so they did not develop the delusion (see Spanos, 1986). In either case, the findings further highlight the presence of interpersonal variability in the hypnotic model, just as there is in the clinical delusion. Some of this interpersonal variability would appear to prevent certain participants from developing the delusion.

Interestingly, another subset of participants given the mirror-agnosia suggestion reported other beliefs associated with seeing the stranger in the mirror. Four participants given the mirror-agnosia suggestion reported seeing a duplicate or someone who looked physically identical to themselves. This description is very similar to one given by clinical patient, SM (Feinberg & Shapiro, 1989), who reported seeing a person who looked physically identical to herself in the mirror. In addition, four participants given the mirror-agnosia suggestion reported seeing a stranger through what they took to be a window. The ability of the mirror-agnosia suggestion to generate these ideas implies that mirror agnosia could also serve as Factor 1 for other variants of clinical delusions, such as the delusion of subjective doubles (the belief that one has a physical duplicate in the world; see Christodoulou, 1978) and the phantom boarder delusion (the belief that uninvited strangers are living in one's house; Hwang, Yang, & Tsai, 2003; see also Breen et al., 2001). These delusions differ from mirrored-self misidentification in that they are not limited to mirrors and involve different beliefs about the identity of the stranger.

Clinical patients with both mirror agnosia and a deficit in belief evaluation may develop mirrored-self misidentification because their reflection appears to occupy a different region of space in external space. It is possible that some patients who notice the physical resemblance of the stranger to themselves may conclude that they have a duplicate. Other patients who do not notice the resemblance, or who reject the idea of a duplicate, may instead conclude that they have a phantom boarder living with them. In support of this latter possibility, Hwang et al. (2003) found that approximately 21% of patients with phantom boarder delusion also misidentified their own reflection in the mirror. Future research could test if mirror agnosia could contribute to the delusion of subjective doubles, at least in some instances, by formally assessing mirror use in patients with this delusion.

Other deficits, however, could also produce the content of these other two delusions without the need for mirror agnosia. Autoscopic phenomena, in which patients hallucinate their own body in extrapersonal space, or depersonalization, in which patients feel detached from their mental processes or physical body, could generate the idea of a physical double (Christodoulou, 1978). Likewise, auditory or visual hallucinations (Hwang et al., 2003), or even memory deficits that lead to an inability to remember the location of personal belonging, could generate the idea of a phantom boarder. In all three of the delusions discussed, the different possible sources of their content highlight the need to examine a range of different cognitive abilities when assessing clinical patients.

Implications

Our previous work demonstrated that both high hypnotizability and a hypnotic induction are necessary to reliably produce the analogue (Connors, Barnier, et al., 2012, 2013). It remains to be seen, however, whether alternative explanations for participants' responses are possible. Some theorists, for example, have noted that features of the experimental context can sometimes invite particular responses from participants through the pressures and roles of the social interaction (see Kihlstrom, 2002; Orne, 1959; Sheehan & Perry, 1976). To address this issue in another experiment, we employed a real-simulator design in which we compared the responses of genuinely hypnotized highs given the impaired-face-processing suggestion to the responses of low-hypnotizable participants instructed to fake their responses (Connors et al., 2013). We found that simulators reported the delusion but gave responses that differed from genuinely hypnotized highs in a number of subtle ways. In particular, simulators tended to overplay their responses, were more likely to offer an explanation for seeing a stranger, and responded differently to the challenges. This

indicated that although the overall task requirements were clear to participants, the responses of highs were unlikely to be explained in terms of demand characteristics alone. In another experiment, we gave participants the mirror-agnosia suggestion and, after the hypnosis session was terminated, conducted a postexperimental inquiry with a second, independent experimenter (Connors, Cox, et al., 2012). Participants continued to report that they had experienced a compelling delusion to the second experimenter. Although not conclusive, this provides further evidence that the hypnotic delusion cannot be explained in terms of mere acting or role playing in response to situational pressures.

Overall, the current experiment illustrates how hypnotic analogues can be used to investigate and inform theoretical accounts of clinical delusions. Hypnosis is able to create a subjectively compelling likeness to the clinical disorder and directly test whether naïve participants are able to arrive at the delusion from Factor 1. By comparing the effects of different suggestions that were based on proposed underlying causes of mirrored-self misidentification, we were able to test various theoretical predictions in the hypnotic model. Consistent with the two-factor theory of delusions, both the impaired-face-processing suggestion and mirror-agnosia suggestion were able to recreate specific features of mirrored-self misidentification delusion. Although there are important differences between hypnotic and clinical delusions in terms of etiology and duration, hypnosis provides a way of testing hypotheses under controlled experimental conditions and generating new ideas for research (Woody & Szechtman, 2011). In this way, hypnotic models offer a means of gaining valuable insights into the causes of delusions and the nature of the delusional experience. In the future, these insights may help to inform more effective treatment methods and also provide a greater understanding of how nonpathological beliefs are formed.

References

Barnier, A. J., Cox, R. E., Connors, M., Langdon, R., & Coltheart, M. (2011). A stranger in the looking glass: Developing and challenging a hypnotic mirrored-self misidentification delusion. *International Journal of Clinical and Experimental Hypnosis, 59,* 1–26. doi:10.1080/00207144.2011.522863

Barnier, A. J., Cox, R. E., O'Connor, A., Coltheart, M., Langdon, R., Breen, N., & Turner, M. (2008). Developing hypnotic analogues of clinical delusions: Mirrored-self misidentification. *Cognitive Neuropsychiatry, 13,* 406–430. doi:10.1080/13546800802355666

Biringer, F., & Anderson, J. R. (1992). Self-recognition in Alzheimer's disease: A mirror and video study. *Journal of Gerontology, 47,* P385–P388. doi:10.1093/geronj/47.6.P385

Bortolotti, L., Cox, R., & Barnier, A. (2012). Can we recreate delusions in the laboratory? *Philosophical Psychology, 25,* 109–131. doi:10.1080/09515089.2011.569909

Breen, N., Caine, D., & Coltheart, M. (2001). Mirrored-self misidentification: Two cases of focal onset dementia. *Neurocase, 7,* 239–254. doi:10.1093/neucas/7.3.239

Bryant, R. A., & Mallard, D. (2003). Seeing is believing: The reality of hypnotic hallucinations. *Consciousness and Cognition: An International Journal, 12,* 219–230. doi:10.1016/S1053-8100(03)00003-5

Christodoulou, G. N. (1978). Syndrome of subjective doubles. *The American Journal of Psychiatry, 135,* 249–251.

Coltheart, M. (2007). The 33rd Bartlett Lecture: Cognitive neuropsychiatry and delusional belief. *The Quarterly Journal of Experimental Psychology, 60,* 1041–1062. doi:10.1080/17470210701338071

Coltheart, M., Langdon, R., & McKay, R. (2011). Delusional belief. *Annual Review of Psychology, 62,* 271–298. doi:10.1146/annurev.psych.121208.131622

Connors, M. H. (2012a). *Modelling the mirrored-self misidentification delusion with hypnosis* (Unpublished doctoral dissertation). Macquarie University, Sydney, Australia.

Connors, M. H. (2012b). Virtual patients in the hypnosis laboratory. *The Psychologist, 25,* 786–789.

Connors, M. H., Barnier, A. J., Coltheart, M., Cox, R. E., & Langdon, R. (2012). Mirrored-self misidentification in the hypnosis laboratory: Recreating the delusion from its component factors. *Cognitive Neuropsychiatry, 17,* 151–176. doi:10.1080/13546805.2011.582287

Connors, M. H., Barnier, A. J., Langdon, R., Cox, R. E., Polito, V., & Coltheart, M. (2013). A laboratory analogue of mirrored-self misidentification delusion: The role of hypnosis, suggestion, and demand characteristics. *Consciousness and Cognition, 22,* 1510–1522. doi:10.1016/j.concog.2013.10.006

Connors, M. H., & Coltheart, M. (2011). On the behaviour of senile dementia patients vis-à-vis the

mirror: Ajuriaguerra, Strejilevitch, and Tissot (1963). *Neuropsychologia, 49,* 1679–1692. doi:10.1016/j.neuropsychologia.2011.02.041

Connors, M. H., Cox, R. E., Barnier, A. J., Langdon, R., & Coltheart, M. (2012). Mirror agnosia and the mirrored-self misidentification delusion: A hypnotic analogue. *Cognitive Neuropsychiatry, 17,* 197–226. doi:10.1080/13546805.2011.582770

Connors, M. H., Langdon, R., & Coltheart, M. (in press). Misidentification delusions. In D. Bhugra, S. Gupta, & G. S. Malhi (Eds.). *Troublesome disguises* (2nd ed.). Wiley-Blackwell.

Cox, R. E., & Barnier, A. J. (2010). Hypnotic illusions and clinical delusions: Hypnosis as a research method. *Cognitive Neuropsychiatry, 15,* 202–232. doi:10.1080/13546800903319884

Ellis, H. D., & Young, A. W. (1990). Accounting for delusional misidentifications. *The British Journal of Psychiatry, 157,* 239–248. doi:10.1192/bjp.157.2.239

Feinberg, T. E., & Shapiro, R. M. (1989). Misidentification-reduplication and the right hemisphere. *Neuropsychiatry, Neuropsychology, & Behavioral Neurology, 2,* 39–48.

Gluckman, L. K. (1968). A case of Capgras syndrome. *Australian and New Zealand Journal of Psychiatry, 2,* 39–43. doi:10.3109/00048676809159206

Hilgard, E. R. (1965). *Hypnotic susceptibility*. New York, NY: Harcourt, Brace & World.

Hwang, J.-P., Yang, C.-H., & Tsai, S.-J. (2003). Phantom boarder symptom in dementia. *International Journal of Geriatric Psychiatry, 18,* 417–420. doi:10.1002/gps.853

Kihlstrom, J. F. (1979). Hypnosis and psychopathology: Retrospect and prospect. *Journal of Abnormal Psychology, 88,* 459–473. doi:10.1037/0021-843X.88.5.459

Kihlstrom, J. F. (1997). Hypnosis, memory, and amnesia. *Philosophical Transactions of the Royal Society B: Biological Sciences, 352,* 1727–1732. doi:10.1098/rstb.1997.0155

Kihlstrom, J. F. (2002). Demand characteristics in the laboratory and the clinic: Conversations and collaborations with subjects and patients. *Prevention & Treatment, 5,* 1–22. doi:10.1037/1522-3736.5.1.536c

Kihlstrom, J. F. (2008). The domain of hypnosis, revisited. In M. R. Nash & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis: Theory, research and practice* (pp. 21–52). Oxford, UK: Oxford University Press. doi:10.1093/oxfordhb/9780198570097.013.0002

Kihlstrom, J. F., & Hoyt, I. P. (1988). Hypnosis and the psychology of delusions. In T. M. Oltmanns & B. A. Maher (Eds.), *Delusional beliefs* (pp. 66–109). New York, NY: Wiley.

Kumakura, T. (1982). The mirror sign in presenile and senile dementias (especially Alzheimer-type dementia). *Seishin Shinkeigaku Zasshi. Psychiatria Et Neurologia Japonica, 84,* 307–335.

Langdon, R. (2011). Delusions and faces. In A. Calder, G. Rhodes, M. Johnson, & J. Haxby (Eds.), *The Oxford handbook of face perception* (pp. 877–892). Oxford, UK: Oxford University Press. doi:10.1093/oxfordhb/9780199559053.013.0045

Langdon, R., & Coltheart, M. (2000). The cognitive neuropsychology of delusions. *Mind & Language, 15,* 184–218. doi:10.1111/1468-0017.00129

Maher, B. A. (1974). Delusional thinking and perceptual disorder. *Journal of Individual Psychology, 30,* 98–113.

McConkey, K. M. (1991). The construction and resolution of experience and behavior in hypnosis. In S. J. Lynn & J. W. Rhue (Eds.), *Theories of hypnosis: Current models and perspectives* (pp. 542–563). New York, NY: Guilford Press.

Oakley, D. A. (2008). Hypnosis, trance, and suggestion: Evidence from neuroimaging. In M. R. Nash & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis: Theory, research and practice* (pp. 365–392). Oxford, UK: Oxford University Press. doi:10.1093/oxfordhb/9780198570097.013.0014

Oakley, D. A., & Halligan, P. W. (2009). Hypnotic suggestion and cognitive neuroscience. *Trends in Cognitive Sciences, 13,* 264–270. doi:10.1016/j.tics.2009.03.004

Orne, M. T. (1959). The nature of hypnosis: Artifact and essence. *The Journal of Abnormal and Social Psychology, 58,* 277–299. doi:10.1037/h0046128

Sheehan, P. W., & McConkey, K. M. (1982). *Hypnosis and experience: The exploration of phenomena and process*. Hillsdale, NJ: Erlbaum.

Sheehan, P. W., & Perry, C. W. (1976). *Methodologies of hypnosis: A critical appraisal of contemporary paradigms of hypnosis*. Hillsdale, NJ: Erlbaum.

Shor, R. E. (1959). Hypnosis and the concept of the generalized reality-orientation. *American Journal of Psychotherapy, 13,* 582–602.

Shor, R. E., & Orne, E. C. (1962). *Harvard Group Scale of Hypnotic Susceptibility, Form A*. Palo Alto, CA: Consulting Psychologists Press.

Spanos, N. P. (1986). Hypnotic behavior: A social-psychological interpretation of amnesia, analgesia, and "trance logic". *Behavioral and Brain Sciences, 9,* 449–467. doi:10.1017/S0140525X00046537

Sutcliffe, J. P. (1961). "Credulous" and "skeptical" views of hypnotic phenomena: Experiments on esthesia, hallucination, and delusion. *Journal of Abnormal and Social Psychology, 62,* 189–200. doi:10.1037/h0046745

Villarejo, A., Martin, V. P., Moreno-Ramos, T., Camacho-Salas, A., Porta-Etessam, J., & Bermejo-Pareja, F. (2011). Mirrored-self misidentification

in a patient without dementia: Evidence for right hemisphere and bifrontal damage. *Neurocase, 17,* 276–284. doi:10.1080/13554794.2010.498427

Weitzenhoffer, A. M., & Hilgard, E. R. (1962). *Stanford Hypnotic Susceptibility Scale, Form C.* Palo Alto, CA: Consulting Psychologists Press.

Woody, E., & Szechtman, H. (2011). Using hypnosis to develop and test models of psychopathology. *Journal of Mind–Body Regulation, 1,* 4–16. Retrieved from http://mbr.synergiesprairies.ca/cjh/index.php/mbr

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