

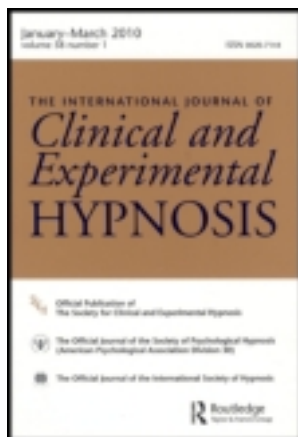
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MODELING EROTOMANIA DELUSION IN THE LABORATORY WITH HYPNOSIS

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Abstract: Erotomania is the delusional belief that one is loved from afar by another person (the *target*). This study used hypnosis as a novel cognitive neuropsychological research tool to model erotomania. The authors developed 2 versions of a hypnotic erotomania suggestion and tested their impact by asking subjects to recall and interpret a story featuring ambiguous scenarios. They also challenged the delusion by asking subjects to justify their beliefs. The hypnotic erotomania suggestions successfully recreated the features of the clinical delusion for many high hypnotizable subjects. They believed that the target loved them, interpreted ambiguous information consistent with this belief and confabulated evidence in service of their delusion. Some also resisted all challenges to their delusion. These features are strikingly similar to clinical cases and highlight the value of using hypnosis to model clinical delusions. The authors also discuss some limitations of this approach.

Approximately 1% to 2% of people will experience a delusion at some point in their lives (American Psychiatric Association [APA], 1995; Davies, Coltheart, Langdon, & Breen, 2002), but until recently there has been no viable way of investigating clinical delusions in the laboratory (Barnier et al., 2008). However, researchers have turned to hypnosis as a technique for studying clinical phenomena such as delusions (Cox & Barnier, 2010; Oakley & Halligan, 2009). According to Oakley and Halligan, hypnotic suggestions can produce “virtual patients.” Although these virtual patients are neurally intact, specific suggestions during hypnosis can be used to selectively disrupt information processing in ways analogous to clinical disorders. The present study adopted this approach by using hypnosis to create “virtual patients” within a cognitive neuropsychological framework.

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Specifically, the aim of this study was to create a hypnotic analogue of the clinical features of erotomania, the delusional belief that one is loved from afar by another person (APA, 1995; Kelly, 2005).

FEATURES OF EROTOMANIA

Erotomania can be classified into two types: primary erotomania and secondary erotomania (Kelly, 2005). Primary erotomania presents in isolation from other psychiatric symptoms (e.g., hallucinations), involves a single primary theme and therefore is defined as a monothematic delusion. It is a nonbizarre delusion (i.e., it involves situations that could plausibly occur in real life; APA, 1995) and is classified as a subtype of delusional disorder in the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (*DSM-IV*; APA, 1995). In contrast, secondary erotomania presents as a symptom of known organic or psychiatric disorders (e.g., schizophrenia; Mullen & Pathé, 1994; Phillips, West, & Wang, 1996) and typically co-occurs with other psychiatric symptoms, including other delusions with nonerotomania themes, in which case it arises as part of a polythematic delusional system. Primary erotomania can be viewed as a “pure” case of erotomania, and, because it does not have the comorbidities associated with secondary erotomania, we considered it the best place to start when developing a hypnotic analogue.

The following clinical case of primary erotomania reported by Jordan et al. (2006) highlights some features of erotomania. The patient was a 21-year-old female who appeared to be quite well adjusted until she began talking about her “intended boyfriend.” Despite the patient having only ever seen the intended boyfriend in class, she spoke of him as though they were in a romantic relationship. She said she knew he loved her intensely and she was attracted to him because of this. She believed he was empty without her and he was pursuing her. She justified why they were not openly together by saying that other people, including classmates, family, and neighbors, were plotting to keep them apart. She believed that he sent her messages of love through environmental cues such as license plates and the color purple. She believed that the world, including the President of the United States, knew about their love for each other.

As illustrated in the above example, erotomania can be an elaborate delusion with many interconnected features (Segal, 1989). In the present study, our aim was to model four key features of this delusion. First, we attempted to model characteristics of people targeted by erotomania patients (hereafter referred to as the *target*). The target of an erotomania delusion typically has little or no contact with the patient (Fujii, Ahmed, & Takeshita, 1999; Segal, 1989) and can be

(a) someone who does not exist (i.e., fictional), (b) someone who the patient once knew but who has since died or relocated, (c) a total stranger or someone unknown, (d) someone with whom the patient has never conversed, or (e) a former acquaintance, friend, or partner (Jordan et al., 2006). The target is usually (but not always) of higher status than the patient (APA, 1995; Kelly, 2005; Singer, 1991) and this can refer to financial status (Fujii et al., 1999) or social status (e.g., a teacher, doctor, or lawyer; Anderson, Camp, & Filley, 1998).

Second, we attempted to model the patient's misinterpretation of the target's intent. Erotomania patients often provide illogical interpretations of the target's behavior, which they insist is evidence of the target's love for them (APA, 1995; Kelly, 2005). These misinterpretations may involve delusions of reference, which occur when seemingly trivial comments and activities of people or other completely unrelated and commonplace events are misinterpreted as being personally relevant (Langdon & Coltheart, 2000). For instance, it is common for patients to report that the target communicates his/her feelings to the patient through such things as special looks, glances, or signals or (in extreme cases) telepathy and messages via the media and the environment (Fujii et al., 1999; Mullen & Pathé, 1994).

Third, we attempted to model the patient's resistance to and reinterpretation of evidence that conflicts with their delusional belief. Like other delusions, erotomania is resistant to challenge and patients often reinterpret information in a way that supports their belief. For instance, if the target repeatedly denies any interest in the patient (Mullen & Pathé, 1994), the patient often asserts that the love is somehow forbidden (Singer, 1991). This reinterpretation of potential counterevidence helps the patient to explain the target's continued rejection. For example, Phillips et al. (1996) reported a male patient (who was in the army) who believed that the target of his delusion did not openly express her love toward him as it was against the army's rules.

Fourth, we attempted to model the confabulations that are frequently generated by erotomania patients. Confabulations are fabricated or distorted memories about oneself and the world that are produced without any intention to deceive (Fotopoulou, Conway, Griffiths, Birchall, & Tyrer, 2007). They can range from simple, provoked memory distortions to spontaneous, bizarre fabrications (Fotopoulou et al., 2007). The deluded beliefs of erotomania patients are usually "supported" by confabulated memories of interactions with the target, which the patient uses as evidence of the target's love (Berrios & Kennedy, 2002). For example, Kopelman, Guinan, and Lewis (1995) reported a female patient who claimed she had been working on a fruit-picking farm in East Anglia when she encountered an internationally famous orchestral conductor. She claimed the conductor was in love with her and that he followed her to London. Even though the

conductor had never been to a fruit-picking farm, all of the patient's delusional beliefs surrounded her distorted memory of this initial meeting. Such confabulations are frequently used by erotomania patients to justify their delusion as well as help them to reject any evidence that threatens their delusion (Berrios & Kennedy, 2002; Breen, Caine, Coltheart, Hendy, & Roberts, 2000).

EXPLAINING EROTOMANIA WITHIN THE TWO-FACTOR THEORY OF DELUSIONS

Langdon and Coltheart's (2000) two-factor theory of delusions provides a cognitive neuropsychological model for explaining the formation and maintenance of monothematic delusions. Their theory holds that for a delusion to form there must be (a) a disruption in normal brain processing that accounts for the generation of the delusion's content (Factor 1) and (b) a disruption of normal belief evaluation that explains why the delusional belief is maintained and not rejected as untrue (Factor 2) (Langdon & Coltheart, 2000). This second factor is necessary because not everyone with a Factor 1 deficit develops a delusion. For example, in Capgras delusion (the delusional belief that a loved one has been replaced by an impostor), Factor 1 is believed to be a deficit in the patient's affective response to the perception of familiar faces (Coltheart, 2007; Ellis & Young, 1990). However, people can experience a deficit in their affective response to familiar faces and not develop Capgras delusion (see, Tranel, Damasio, & Damasio's 1995 study of nondelusional ventromedial patients). Thus, a second factor must be involved in delusional beliefs.

Langdon and Coltheart's (2000) two-factor theory is a prominent current model for explaining monothematic clinical delusions, especially for neuropsychological delusions where a Factor 1 neuropsychological impairment has been specified (see Davies et al., 2002, for eight examples). However, no neuropsychological Factor 1 deficit has been identified for erotomania (Coltheart, 2007). Delusions such as erotomania (with unspecified neuropathology) are often described as "functional" delusions and contrasted with "organic" delusions. This terminology also applies to functional disorders such as conversion hysteria (where patients claim to experience physical debilitation without any underlying physical or medical cause; Oakley & Halligan, 2009). Functional delusions commonly occur in psychiatric contexts and have been conceptualized in terms of psychodynamic or motivational influences on belief evaluation (McKay, Langdon, & Coltheart, 2005).

McKay et al. (2005) provided a psychodynamic two-factor account of functional delusions, which may help to explain erotomania. According

to their account, motivation and self-deception lead to the formation of delusory beliefs. These delusory beliefs are then maintained due to the psychological benefits they provide, such as relieving distress, tension, pain, as well as maintaining self-esteem. In erotomania, there appears to be a number of motivational aspects involved in the formulation and persistence of the delusion. For example, Segal (1989) argued that erotomania may provide a sense of worth, as being loved is a fundamental form of approval. Thus, the delusion may be one way of protecting the patient from a reality of social isolation. Motivational factors in erotomania may act also to disrupt information processing by producing an interpretive bias about the target's intent. This interpretive bias may in turn lead to other common features of erotomania such as delusions of reference, resistance to, and reinterpretation of conflicting evidence and confabulations in service of the delusion.

McKay et al. (2005) suggested a synthesis of the two-factor theory and motivational accounts of delusions. They argued that motivation, while not a neuropsychological deficit, could determine the content of a delusion and act as Factor 1. They suggested that, as in delusions of neuropsychological origin, Factor 2 involves a disruption of belief evaluation but is the result of motivated constraints on, or biases in, the processing of belief-related information. In support of this, Anderson et al. (1998) highlighted that while it is not uncommon to misinterpret or misunderstand another person's intentions, these are usually corrected when the belief is tested. In erotomania, however, the patient fails to reality test and/or to correct the belief and maintains it despite considerable evidence to the contrary. On this analysis, erotomania, while a motivated, functional delusion, may also be explained within the two-factor framework.

USING HYPNOSIS TO STUDY CLINICAL DELUSIONS IN THE LABORATORY

Hypnosis provides a powerful cognitive neuropsychological approach to investigating clinical delusions for a number of reasons. For instance, hypnosis has been used instrumentally to model a range of clinical phenomena including auditory hallucinations (Szechtman, Woody, Bowers, & Nahmias, 1998), obsessive-compulsive disorder (OCD; Woody et al., 2005), déjà vu (O'Connor, Barnier, & Cox, 2008), and delusional beliefs (Cox & Barnier, 2010). For example, Woody et al. successfully recreated features of OCD with hypnosis. Their hypnotic OCD suggestion involved a two-step procedure. First, during hypnosis the hypnotist instructed high and low hypnotizable subjects (with no clinical OCD symptoms) to imagine being in contact with something contaminated. Second, the hypnotist gave subjects a suggestion

designed to re-create OCD. Specifically, the hypnotist told them that they would not experience a sense of satisfaction when washing their hands. Woody et al. found that highs, but not lows, experienced particularly strong emotional responses to their mental images of contamination and potential harm. Also, highs experienced significantly less satisfaction from hand washing than lows even though they spent longer washing their hands than lows. These features of hypnotic OCD were strikingly similar to the features of clinical OCD and allowed Woody et al. to develop and test a new theory about the disorder (i.e., their "Security-Motivation" theory of OCD). This line of research indicates that the instrumental use of hypnosis is a powerful tool for modeling the features of clinical conditions in the laboratory and has the potential to inform and develop theories of such conditions.

Another good reason for using hypnosis to model delusions is that the cognitive disruptions that give rise to Factors 1 and 2 are not necessarily neuropsychological in origin (Coltheart, 2007). Thus, we should be able to investigate them using other techniques that can disrupt cognitive processing (even if only temporarily), such as hypnosis. Hypnotic suggestions can generate anomalous experiences and false beliefs about the world (similar to Factor 1) as well as disrupt normal evaluation of these experiences and beliefs (similar to Factor 2) (Barnier & McConkey, 2004; Barnier et al., 2008).

Hypnosis is also suited to studying delusions because hypnotic phenomena, produced via specific suggestions during hypnosis, and clinical delusions share a number of features. Both are (a) believed with conviction, (b) resistant to rational argument and (c) often maintained in the face of strong evidence to the contrary. Indeed, recent research indicates that hypnotic suggestions are particularly successful at modeling the features of a number of clinical delusions such as sex-change delusions (the delusional belief that I have become the opposite sex; Noble & McConkey, 1995), reverse intermetamorphosis (the delusional belief that I have been physically and psychologically changed into another person; Cox & Barnier, 2009a, 2009b), and mirrored-self misidentification (the delusional belief that the person I see when I look directly in the mirror is a stranger; Barnier, Cox, Connors, Langdon, & Coltheart, 2011; Barnier et al., 2008). For these "virtual patients" (Oakley & Halligan, 2009), the resulting delusional experiences were compelling, resistant to challenge, and mapped closely to their clinical counterparts (for a summary, see Cox & Barnier, 2010).

Specific suggestions during hypnosis have also been used to successfully model a number of functional disorders, including functional blindness (Bryant & McConkey, 1989a, 1989b), functional amnesia (Barnier, 2002; Barnier, McConkey, & Wright, 2004), and conversion disorder (Halligan, Athwal, Oakley & Frackowiak, 2000; Marshall, Halligan, Fink, Wade, & Frackowiak, 1997). Notably, in their work on

conversion disorder, Halligan et al. found that brain activation in a clinical case of conversion disorder paralysis was strikingly similar to brain activation produced by a hypnotic analogue. Halligan et al. argued that the same neural underpinnings may be shared by the clinical and hypnotic versions of this disorder. This suggests that hypnotic analogues of functional disorders may mimic both the surface features of the disorder as well as the underlying neural mechanisms involved. Thus, hypnosis may be particularly effective at modeling the features of functional delusions such as erotomania.

MODELING EROTOMANIA WITH HYPNOSIS

In this study, we aimed to model four major features of primary erotomania with hypnosis. First, we aimed to model the characteristics of the target. Our target was a nonexistent person but we suggested to subjects that he/she was real. Since erotomania involves nonbizarre delusions (APA, 1995), we wanted the target to be someone that our subjects could plausibly have met and developed a relationship with. So for our university student subjects, we placed our target in the context of university. And since clinical cases have involved high-status targets (more typically) as well as equal-status targets (Jordan et al., 2006), we gave half of our subjects a suggestion for a high-status target (a lecturer/tutor) and half of our subjects a suggestion for an equal-status target (a fellow student). We were interested in whether, like clinical patients, our hypnotic subjects might be more likely to develop a delusion about the high-status target. We introduced the target as "Jo Pearson," a name that did not identify the target as male or female, thus allowing for sexual preferences.

We based our erotomania suggestion on Woody et al.'s (2005) two-step procedure for hypnotically modeling OCD (discussed above). Woody et al. reported that disgusting experiences imagined during hypnosis, rather than real disgusting experiences, resulted in strong and compelling emotional responses, especially from high hypnotizable subjects (i.e., disgust leads to increased hand washing). In the same way, in the present study we first described to our subjects the fictional character of Jo Pearson (thus avoiding potential ethical complications targeting the erotomania suggestion at a real person). We then suggested that Jo Pearson was in love with the subjects. We expected that more highs than lows would report that they believed that Jo Pearson existed and that he/she loved or liked them.

The second feature we aimed to model was misinterpretation of the target's intent. To test this, during the delusion suggestion, we presented subjects with a story that contained ambiguous social scenarios (based on Amin, Foa, & Coles, 1998). We asked them to recall

the story and to interpret each scenario. We expected that more highs than lows, especially highs experiencing the temporary erotomania delusion, would interpret the ambiguous story information in a way consistent with the belief that the target liked or loved them (consistent with the findings of Cox & Barnier, 2009b). We then asked subjects to select the most likely explanation for each ambiguous scenario from four multiple-choice options (one erotomania option, one positive option, one neutral option, and one negative option). Again, we expected that more highs than lows, especially those experiencing the delusion, would choose the options consistent with erotomania.

The third feature we aimed to model was resistance to, and reinterpretation of, conflicting evidence. To do this, we used three challenges. In the first challenge, we asked subjects to provide evidence that the target liked/loved them. In the second and third challenges, we asked subjects to respond to information that contradicted the suggested delusion (adapted from other hypnotic delusion research, e.g., Barnier et al., 2008; Cox & Barnier, 2009a, Cox & Barnier, 2010; Noble & McConkey, 1995). Consistent with the resilience of other hypnotic delusions (see Barnier et al., 2008; Cox & Barnier, 2009a; Noble & McConkey, 1995), we expected that more highs than lows would resist these challenges and maintain their delusional experiences.

Finally, we aimed to model confabulations that occur during hypnotic erotomania, so we noted whether subjects introduced confabulated material in the form of explanations or memories into their interpretation of the ambiguous social scenarios and/or in their response to the challenges. Consistent with clinical cases of erotomania (Berrios & Kennedy, 2002; Kopelman et al., 1995), clinical cases of other delusions (Baddeley, Thornton, Chua, & McKenna, 1996) and Cox and Barnier's hypnotic analogue of reverse intermetamorphosis (Cox & Barnier, 2009a), we expected that more highs than lows, especially those experiencing the delusion, would confabulate in service of their delusion.

METHOD

Design and Participants

We tested 24 (3 males, 21 females) high hypnotizable subjects of mean age 21.58 years ($SD = 4.32$) and 16 low hypnotizable subjects (6 males, 10 females) of mean age 20.25 years ($SD = 3.30$) in a 2 (hypnotizability: high vs. low) \times 2 (status: high status vs. equal status) between-subjects design. Subjects were undergraduate psychology students at Macquarie University who received credit towards their psychology course or \$20 remuneration for their involvement. We carefully selected them on the basis of their scores on a modified 10-item

version of the Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS:A; Shor & Orne, 1962) and a modified 11-item version of the Stanford Hypnotic Susceptibility Scale, Form C (SHSS:C; Weitzenhoffer & Hilgard, 1962).² Highs scored 7–10 ($M = 7.96$, $SD = 0.88$) on the HGSHS:A and 7–11 ($M = 8.42$, $SD = 1.25$) on the SHSS:C. Lows scored 0–3 ($M = 2.16$, $SD = 1.00$) on the HGSHS:A and 0–3 ($M = 1.87$, $SD = 1.09$) on the SHSS:C.

Procedure

A single experimenter (the hypnotist), who was blind to subjects' hypnotizability scores, tested each person individually in a session that lasted approximately 1.5 hours and involved a hypnosis session and a posthypnotic inquiry session.

Hypnosis session. Following informed consent, the hypnotist administered the SHSS:C (Weitzenhoffer & Hilgard, 1962) hypnotic induction to subjects. She asked subjects to fixate their gaze on a red dot on the wall and then gave them suggestions to relax. After the induction, the hypnotist administered the first 10 SHSS:C (Weitzenhoffer & Hilgard, 1962) items.

Suggestion for existence of the target. Next, to begin modeling the characteristics of the target, the hypnotist suggested the existence of the fictional person, Jo Pearson. She told subjects:

In a moment I am going to describe a very interesting person to you. You will believe this is a real person, a person whom you find very attractive. This person's name is Jo Pearson.

She told subjects in the high-status condition ($n = 20$, 12 highs, 8 lows):

Jo Pearson is a lecturer at Macquarie University and is your tutor for one of your classes this year.

She told subjects in the equal-status condition ($n = 20$, 12 highs, 8 lows):

Jo Pearson is a student at Macquarie University and is taking some of the same subjects as you this year.

²The 10-item modified HGSHS:A included head falling, eye closure, hand lowering, finger lock, moving hands together, communication inhibition, experiencing of fly, eye catalepsy, posthypnotic suggestion, and posthypnotic amnesia; arm rigidity and arm immobilization items were removed to ensure that the procedure could be conducted within the time limits of a 1-hour class. The 11-item tailored SHSS:C included hand lowering, moving hands apart, mosquito hallucination, taste hallucination, arm rigidity, dream, age regression, arm immobilization, anosmia, negative visual hallucination, and posthypnotic amnesia; the auditory hallucination item was removed to ensure that the procedure could be conducted within the time limits of a 1-hour individual session.

Then she told all subjects:

You find Jo Pearson very attractive, just like the type of person you would like to date. Can you imagine what Jo looks like? Members of the opposite sex find Jo very good looking. Jo is very friendly and other people seem to like Jo quite a lot. I want you to spend a few minutes thinking carefully about Jo. Think about what Jo looks like . . . think about Jo's face . . . think about the color of Jo's hair and eyes . . . think about the sound of Jo's voice . . . think about the clothes that Jo likes to wear. Try to picture Jo Pearson in as much detail as possible. You believe that Jo Pearson is a real person but you won't remember me telling you about Jo. I will now give you one minute to think about Jo Pearson.

After 1 minute, the hypnotist used a deepening procedure; she counted from 1 to 5 and instructed subjects to go into a deeper state of hypnosis. The hypnotist then said: "Now, listen carefully. I want you to think about a particular person. Think back, do you know someone called Jo Pearson?" If subjects said they did know Jo Pearson, the hypnotist administered the erotomania suggestion (below). If subjects said they did not know Jo Pearson, the hypnotist prompted them with:

(High status) Isn't Jo a lecturer and tutor for one of your classes this year?
(Equal status) Isn't Jo a fellow student?

If subjects continued to maintain that they did not know someone called Jo Pearson, the hypnotist asked them to imagine that they did know Jo Pearson (2 highs and 10 lows required this). They then received the erotomania suggestion.

Erotomania suggestion. All subjects were then instructed to believe that Jo Pearson was in love with them but were told that they would not remember receiving this suggestion:

I'd like you now to think about Jo Pearson. You have had little contact with Jo Pearson and have not spent any time socializing together. However, you believe that Jo Pearson is in love with you. Jo has never told you this but you are still completely certain that Jo is in love with you. That's right, although you have never socialized with Jo, you are convinced that Jo is in love with you. You believe Jo is in love with you, but you won't remember me giving you this suggestion. As you sit there relaxed and hypnotized I want you to start thinking about how much you believe that Jo is in love with you. I want you to start feeling more and more convinced that Jo is in love with you, more and more convinced, more and more convinced that Jo is in love with you. I want you to start to feel totally convinced that Jo is in love with you. As you listen to my voice, you may start to experience this thing that I am asking you to experience. You are becoming more and more convinced that Jo is in love with you. Whatever sensations you are now starting to feel, you notice how

you are becoming more and more convinced that Jo is in love with you. As you continue to listen to my voice and my words—deeply relaxed and deeply hypnotized, you notice that you are completely convinced that Jo is in love with you. In every way, in every way. In a little while I might ask you about Jo. You will be convinced that Jo loves you but you won't know that this is because I suggested it to you. So, you will be certain that Jo is in love with you but you won't remember me giving you this suggestion.

By instructing subjects to forget that the hypnotist had suggested this, we were aiming to produce amnesia for the source of their belief. We did not want subjects to say that they believed Jo liked them because the hypnotist suggested it. This use of amnesia was based on work by Zimbardo and colleagues (Zimbardo, Andersen, & Kabat, 1981) who gave subjects a hypnotic suggestion for deafness plus an instruction to forget that the hypnotist had suggested this. Later, these subjects did not attribute their deafness to the hypnotist's suggestion.

The hypnotist then used the deepening procedure again.

Test of suggestion. To directly test the erotomania suggestion, the hypnotist asked all subjects five questions about Jo Pearson:

1. Can you tell me how you know Jo?
2. What does Jo look like?
3. How do you feel about Jo?
4. How does Jo feel about you? Can you tell me why you think that?
5. Is there anything more you can tell me about Jo?

During these questions, the hypnotist noted whether subjects provided a gender for Jo Pearson. If, in response to any one of these questions, subjects denied knowing Jo Pearson or claimed that Jo Pearson was fictional, the hypnotist asked nothing further in this set of questions and went directly to the ambiguous story.

Ambiguous story. To examine whether subjects misinterpreted the target's intent, the hypnotist then read them a story that contained four ambiguous social scenarios:

Now I am going to describe to you a story involving you and Jo.

[For high status]: Jo is a lecturer at your university and is the tutor of your psychology tutorial class.

[For equal status]: Jo goes to your university. You have noticed that Jo is taking psychology with you and is in the same tutorial class.

One day as you enter class, Jo says hello to you [*Ambiguous Scenario 1*]. You say hi in return and sit down in your usual seat. In today's class you are looking at visual illusions, which are quite interesting.

[For high status]: Jo asks you to read a passage from the textbook out loud.

[For equal status]: The tutor asks you to read a passage from the textbook out loud.

When you finish you notice that Jo and another student are both looking at you [*Ambiguous Scenario 2*]. A few days later, you are leaving a lecture and are on your way to buy lunch. As you are walking to the food court, you see Jo having a conversation with a group of people but they stop talking as you approach [*Ambiguous Scenario 3*]. Just near the food court, you notice that tickets are being sold for a show at Macquarie theatre that you would really like to see. You decide to purchase a ticket for the Friday night show. On Friday night you arrive at the theatre, find your seat in the audience, and wait for the show to begin. Soon afterwards you notice that Jo arrives and has the seat next to you [*Ambiguous Scenario 4*]. The show finishes quite late and it has started to rain so you catch a taxi home.

Immediately after reading the story, the hypnotist asked subjects to recall the story in as much detail as possible.

The hypnotist then asked subjects about the four ambiguous social scenarios. She posed an open-ended question about each scenario and asked subjects to select the most likely reason for each scenario from four multiple-choice options. The four options were an erotomania interpretation, a positive interpretation, a neutral interpretation, and a negative interpretation; we randomized the order of these options across the four scenarios. For the first ambiguous social scenario (Jo says "hello" in class), the hypnotist asked:

As you entered class Jo said hello to you. Why? Which of the following is the most likely explanation: (1) Jo says hello to everyone [*neutral*], (2) Jo loves you [*erotomania*], (3) Jo wants to get to know you [*positive*], or (4) Jo feels sorry for you because you are alone [*negative*]?

For the second ambiguous social scenario (Jo is looking at you in class), the hypnotist asked:

When you finished reading the passage out loud in class you noticed that Jo was looking at you. Why? Which of the following is the most likely explanation: (1) Jo liked the way you read the passage [*positive*], (2) Jo thought you messed up the passage [*negative*], (3) Jo was looking at notes written on the board behind you [*neutral*], or (4) Jo was trying to communicate feelings of love to you [*erotomania*]?

For the third ambiguous social scenario (Jo stops talking as you walk by), the hypnotist asked:

As you were walking to the food court, you saw Jo having a conversation with a group of people but they stopped talking as you approached. Why? Which of the following is the most likely explanation: (1) They were laughing about what you were wearing [*negative*], (2) Jo had been telling them nice things about you [*erotomania*], (3) They just ended their conversation [*neutral*], or (4) Jo was about to greet you [*positive*]?

Finally, for the fourth ambiguous social scenario (Jo has the seat next to you), the hypnotist asked:

On Friday night you arrived at the theatre and you noticed that Jo had the seat next to you. Why? Which of the following is the most likely explanation: (1) It was just a coincidence [*neutral*], (2) Jo wanted to sit next to someone he/she knew [*positive*], (3) Jo sat there on purpose to show you he/she loves you [*erotomania*], or (4) Jo thought you had no friends [*negative*]?

Erotomania challenges. Next, the hypnotist examined whether subjects would resist or reinterpret evidence that conflicted with the suggested delusion. To do this, she challenged the suggested erotomania delusion for all subjects who indicated that they believed Jo Pearson loved/liked them. First, the hypnotist asked subjects to provide evidence that would support their delusion. She asked:

(1) How do you know that Jo is in love with you/likes you?

The hypnotist then administered two more challenges—both contradictions:

(2) What would you say if I told you that Jo had a partner?

(3) What would you say if Jo walked into the room right now and said that he/she was not in love with you/did not like you?

Cancellation and deinduction. Finally, the hypnotist cancelled the erotomania suggestion for all subjects. She suggested to subjects that they would no longer believe that Jo Pearson was a lecturer/fellow student at their university. Then she said:

Jo is a fictional person and you no longer believe that he/she loves you. Everything is back to normal and you can stop believing that Jo is in love with you. Jo Pearson is a fictional person and you are no longer convinced that he/she loves you. Just continue to remain comfortably relaxed and deeply hypnotized. You no longer believe that Jo is in love with you and you know that Jo Pearson is a fictional person.

The hypnotist then administered a standard deinduction (based on Weitzenhoffer & Hilgard, 1962), which included the 11th SHSS:C item—a posthypnotic amnesia suggestion to forget the events of hypnosis. After the deinduction, the posthypnotic amnesia suggestion was tested and cancelled.

Posthypnotic inquiry session. During this session, the hypnotist explored subjects' reactions to the erotomania suggestion. She began by asking subjects if they were in a romantic relationship. She then asked

them to rate the extent to which they had believed in the existence of Jo Pearson by asking:

Can you rate on a scale of 1 to 7 how much you believed in the existence of Jo, if 1 means you did not believe at all and 7 means you were totally convinced.

She also asked them to rate the extent to which they had believed that Jo Pearson loved them by asking:

Can you rate on a scale of 1 to 7 how much you believed that Jo was in love with you/liked you, if 1 means you did not believe at all and 7 means you were totally convinced.

For subjects who received the contradiction challenges (2 and 3 above), the hypnotist asked whether these challenges had influenced their belief that Jo Pearson loved/liked them. Finally, the hypnotist debriefed subjects, gave them the opportunity to ask questions and thanked them for their time.

RESULTS

All responses were categorized by the hypnotist and an independent rater who was blind to the subjects' hypnotizability. Interrater agreement was calculated using Cohen's kappa; there was complete agreement between raters, $k = 1.00$.

Success of the Erotomania Suggestion

We first examined whether subjects said they knew Jo Pearson and found that 22 (91.7%; 11 in high status; 11 in equal status) highs and 6 (37.5%; 2 in high status, 4 in equal status) lows claimed to know Jo. Chi-square analysis confirms that highs were more likely than lows to state that they knew Jo, $\chi^2(1, N = 40) = 13.41, p < .01$. Subjects who indicated they knew Jo Pearson were asked to provide a description of him/her. Twenty-one highs (87.5%; 9 in high status, 12 in equal status) and 6 lows (37.5%; 1 in high status, 5 in equal status) provided detailed descriptions. Chi-square analysis confirms that highs were more likely than lows to provide a description of Jo, $\chi^2(1, N = 40) = 10.94, p < .01$. For example, 1 high in the high status condition said:

He has nice arms, brown hair, hazel eyes. He's tall. He likes to wear a nice shirt to work and always wears the sleeves rolled up. . . . Normally wears black pants and nice shoes. And has a deep voice but not too deep. And he has stubble, he's not clean shaven.

In terms of the total number of confabulated features provided to describe Jo, highs in the high-status condition provided 5.36 ($SD =$

1.91) features and highs in the equal-status condition provided 4.63 ($SD = 1.30$); the number of confabulated features provided by highs across status conditions did not differ, $t(17) = 0.94, p = .36$.

In terms of whether subjects said Jo Pearson liked/loved them, we found that 20 (83.3%; 11 in high status; 9 in equal status) highs and 3 (18.8%; 1 in high status, 2 in equal status) lows claimed that Jo liked/loved them. Chi-square analysis confirms that highs were more likely than lows to state that Jo liked/loved them, $\chi^2(1, N = 40) = 16.39, p < .01$. When asked why they thought Jo Pearson loved or liked them, 17 highs (70.8%; 8 in high status; 9 in equal status) provided justifications for their suggested belief compared to only 2 lows (12.5%; 2 in equal status). Chi-square analysis confirms that highs were more likely than lows to provide justifications for their suggested belief, $\chi^2(1, N = 40) = 13.1, p < .01$. An additional chi-square analysis focusing just on highs revealed that highs in the high-status and equal-status conditions were equally likely to justify their belief, $\chi^2(1, N = 19) = 0.61, p > .05$. Four highs (21.1%; all high status) said they believed Jo Pearson loved or liked them because of Jo Pearson's behavior, including the way Jo Pearson acted around them and the good grades they received from him/her. For example, 1 high in the high-status condition said that Jo Pearson "always gives me good exam marks and always focuses on me in tutes." Seven highs (36.8%; 6 in high status; 1 in equal status) said they thought Jo Pearson loved or liked them because of facial expressions including smiling and special looks. For example, 1 high in the equal status condition said, "The way that he looks at me in class and smiles at me. He's always looking at me." Six highs (31.58%; 3 in high status; 3 in equal status) said it was because they "just knew" that he/she did.

So, subjects were scored as passing the suggestion if they reported that they believed in Jo Pearson's existence and claimed that he/she loved or liked them.³ Table 1 presents the number and percentage of highs and lows in each status condition (high vs. equal status) who experienced the erotomania delusion. Chi-square analysis initially compared the number of highs and lows who passed the delusion and, as expected, highs (79.2%) were much more likely to report that Jo Pearson loved or liked them than were lows (12.5%), $\chi^2(1, N = 40) = 17.11, p < .01$. Since few lows passed the suggestion, subsequent analysis of just highs found no significant difference in pass rates across the two status conditions, $\chi^2(1, N = 24) = 2.27, p = .13$. In other words,

³Of course, if subjects believed that Jo loved them, we might assume that they believed Jo existed. However, this dual criteria captures the possibility that subjects believed Jo existed but did not believe that Jo loved them (since these were the focus of separate suggestions) or, more unusually, that they believed Jo loved them but did not believe Jo existed (which applied to one high).

Table 1
Impact of Erotomania Suggestion

| Hypnotizability & Status | Experience of Delusion | | |
|--------------------------|------------------------|------------------|-------------------|
| | Passed Suggestion | Existence Rating | Erotomania Rating |
| Highs | | | |
| High status | 11 (91.67) | 5.36 (1.12) | 4.55 (2.02) |
| Equal status | 8 (66.67) | 5.25 (1.49) | 4.83 (1.70) |
| Lows | | | |
| High status | 1 (12.50) | 1.75 (1.39) | 1.71 (1.25) |
| Equal status | 1 (12.50) | 1.75 (1.39) | 2.25 (1.28) |

Notes. Passed suggestion = subjects who passed the delusion suggestion (percentages are in parentheses). Existence Rating = Can you rate on a scale of 1–7 how much you believed in the existence of Jo? (1 = *you didn't believe that Jo was a fellow student/lecturer*, 7 = *you were totally convinced that Jo was a fellow student/lecturer*). Erotomania Rating = Can you rate on a scale of 1–7 how much you believed that Jo was in love with you? (1 = *you didn't believe that Jo was in love with you at all*, 7 = *you were totally convinced that Jo was in love with you*). For all ratings, standard deviations are in parentheses.

highs were equally likely to respond to the erotomania suggestion involving a high- or equal-status target.

Posthypnotic inquiry ratings. Subjects made posthypnotic inquiry ratings of how much they had believed in Jo Pearson's existence and how much they had believed that Jo Pearson was in love with them. Table 1 presents these ratings across status conditions. Separate 2 (hypnotizability) \times 2 (status) analyses of variance (ANOVAs) of these ratings showed that highs believed strongly in the existence of Jo Pearson, whereas lows did not, $F(1, 35) = 65.44$, $p < .01$, and highs believed strongly that Jo Pearson loved them, whereas lows did not, $F(1, 34) = 24.16$, $p < .01$. In other words, consistent with the pass rates reported above, highs' belief in the suggested delusion was much stronger than lows.

Thus, following the erotomania suggestion, highs reported compelling delusional experiences; lows did not. Highs were more likely to say that Jo Pearson loved or liked them. Highs described Jo Pearson in great detail, justified their assertions that he/she loved or liked them and expressed strong belief in their delusional experience. Importantly, the status of the target did not influence subjects' experience of hypnotic erotomania. Subjects' current romantic status (i.e., in or not in a relationship) also had no influence, $\chi^2(1, N = 38) = 0.11$, $p = .74$.

Impact on Ambiguous Social Story Interpretation

Consistent with the analytic strategy of Cox and Barnier (2009a), all subsequent analyses focused on highs who passed the suggestion (11 in high status; 8 in equal status) and lows who failed the suggestion (7 in high status; 7 in equal status).⁴ Note that in subsequent analyses, subject numbers are small so care should be taken when drawing inferences from these findings. During the suggested erotomania delusion, subjects listened to and recalled a story containing four ambiguous social scenarios to examine whether they misinterpreted the target's intent. A 2 (hypnotizability) \times 2 (status) ANOVA of the number of scenarios recalled revealed that highs ($M = 2.58$, $SD = 1.22$) recalled fewer scenarios than lows ($M = 3.58$, $SD = 0.67$), $F(1, 27) = 7.25$, $p = .01$. There were no other main or interaction effects.

After subjects recalled the story, the hypnotist asked them to give an open-ended response about why they thought each ambiguous scenario had occurred. She then asked them to select one of four multiple-choice options as the most likely explanation. We scored participants' open-ended verbal responses as either consistent with erotomania or inconsistent with erotomania. We scored a response as consistent with erotomania if subjects indicated that they believed that Jo Pearson loved/liked them.

For Scenario 1, where Jo Pearson says hello as the subject enters class, more highs than lows gave a response consistent with erotomania, $\chi^2(1, N = 30) = 4.59$, $p = .03$. For example, 1 high in the high-status condition said, "Jo always says hello to me because he is in love with me." For Scenario 2, where Jo Pearson and another student were looking at the subject after they read aloud, the analysis approached significance; highs were more likely than lows to give an open-ended response consistent with erotomania, $\chi^2(1, N = 30) = 3.59$, $p = .06$. For example, 1 high in the high-status condition said, "Maybe he thinks I'm special"; another subject in the high-status condition said, "When I read aloud in class he looks at me because he loves me." For Scenario 3, where Jo Pearson and a group of people stop talking as the subject walks by, the analysis again approached significance; highs were more likely than lows to give a response consistent with erotomania, $\chi^2(1, N = 30) = 3.59$, $p = .06$. For example, 1 high in the high-status condition said, "He was probably telling them how he was in love with me." For Scenario 4, where Jo Pearson sat next to the subject at the theatre, more highs than lows gave a response consistent with erotomania, $\chi^2(1, N = 30) = 9.85$, $p < .01$. For example, 1 high in the equal-status condition said, "He

⁴This selection of highs and lows in the analysis provides a more pure index of the impact of the delusion suggestion by comparing genuine hypnotic erotomania with non erotomania.

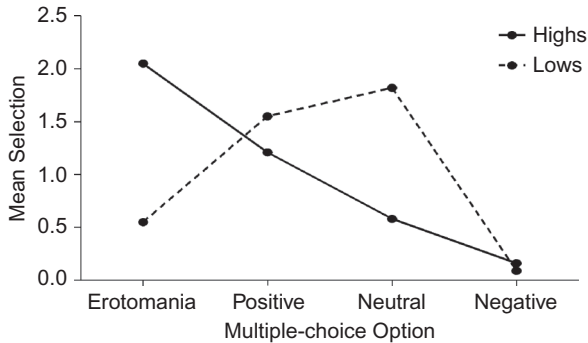


Figure 1. Mean number of times highs and lows selected each multiple-choice option.

found out I was going to that show and he somehow spoke to someone to find out about the seat next to me. He did what he had to do to sit next to me at that show.”

The four multiple-choice options for each ambiguous social scenario contained an erotomania-, a positive-, a neutral-, and a negative-oriented explanation. A 2 (hypnotizability) \times 2 (status) \times (4) (multiple-choice option: erotomania vs. positive vs. neutral vs. negative) mixed-model ANOVA of these data found a significant main effect of multiple-choice option, $F(3, 78) = 6.03, p < .01$. Overall, subjects were most likely to select erotomania options ($M = 1.50, SD = 1.57$), followed by positive options ($M = 1.33, SD = 1.18$), followed by neutral options ($M = 1.03, SD = 1.33$), followed by negative options ($M = 0.13, SD = 0.43$). There was also a significant interaction between hypnotizability and the multiple-choice option, $F(3, 78) = 6.44, p < .01$. Figure 1 shows this interaction. Four follow-up independent t tests (controlling Type I error at $p < .05/4$), of the number of times highs and lows selected each multiple-choice option revealed that highs were more likely than lows to select erotomania options, $t(28) = 3.15, p < .01$, and lows were more likely than highs to select neutral options, $t(28) = 2.47, p = .01$. There were no other significant differences.

Interestingly, 5 highs (26.3%; 3 in high status; 2 in equal status) misremembered some of the information in the story and confabulated events consistent with the delusion. For example, 1 high in the high-status condition said, “We went to a show . . . at first he was ignoring me in front of everyone and then we went to the show and sat next to each other. Then we caught a taxi home.”

Thus, the majority of highs misinterpreted ambiguous information in the story in a way consistent with the erotomania delusion. This

was apparent in both their open-ended interpretations and multiple-choice selections. Whereas highs recalled less story information than lows, they confabulated more than lows. Interestingly, some highs misremembered information from the story in a way that supported hypnotic erotomania.

Response to Challenges

All subjects who passed the suggestion received three challenges to the erotomania delusion to examine whether they would resist or reinterpret information that conflicted with the suggestion. Since only two lows passed the suggestion, the challenge results reported here will focus only on the 19 highs who passed. In response to each challenge, highs were scored as maintaining the delusion if they responded in a way consistent with erotomania. They were scored as breaching the delusion if they responded in a way that indicated that their belief (that Jo Pearson loved or liked them) had lessened.

The first challenge was a request to provide evidence that supported their delusional belief that Jo Pearson loved or liked them. Here, if subjects confabulated evidence to support their suggested delusion, they were scored as maintaining the delusion. Of the 15 highs (80%; 10 in high status; 5 in equal status) who confabulated evidence, 9 (47.4%; 5 in high status; 4 in equal status) confabulated about Jo Pearson's facial expressions (e.g., smiles and special looks). For example, 1 high in the equal-status condition said, "He's really nice to me . . . gives me little looks in class. Every time I pass by him he always stops what he's doing to look at me." Eleven (57.9%; 8 in high status; 3 in equal status) highs confabulated about Jo Pearson's behavior (e.g., giving good marks and giving attention). For example, 1 high in the high-status condition said, "He asks me to read in class. He always says hi to me and he favors me over the other students." There were no differences in the number of highs in each status condition who maintained the delusion in response to this first challenge, $\chi^2(1, N = 19) = 2.25, p > .05$.

In the second challenge, the hypnotist asked subjects what they would say if she told them Jo Pearson had a partner. In response, 8 highs (42.1%; 3 in high status; 5 in equal status) maintained the delusion. Of the highs who maintained, 6 (75.0%; 2 in high status; 4 in equal status) said that they did not believe Jo Pearson had a partner. For example, 1 high in the high-status condition said, "No. Jo's not married." The remaining 2 highs (1 in high-status condition; 1 in equal-status condition) who maintained reconstructed the information to be consistent with the delusion. One high in the high-status condition said, "Maybe he's cheating on her." There were no differences in the number of highs in each status condition who maintained the delusion in response to this challenge, $\chi^2(1, N = 19) = 2.36, p > .05$. In the posthypnotic inquiry, 10 (55.6%) highs said that this contradiction had lessened

their belief that Jo Pearson loved or liked them. Eight (44.4%) said it did not lessen their belief. For example, 1 high in the high-status condition said, "He doesn't have a partner. He couldn't possibly . . . He was in love with me so he couldn't have another partner. . . . [My] other thought was he must not love her then because he loves me."

In the third challenge, the hypnotist asked subjects what they would say if Jo Pearson walked into the room and said that he/she did not love or like them. In response, 5 highs (26.3%; 3 in high status; 2 in equal status) maintained the delusion. Of the highs who maintained, 4 (80.0%; 2 in high status; 2 in equal status) said that they did not believe that Jo Pearson would do that. For example, 1 high in the high-status condition said, "He wouldn't do that. He loves me! That's silly." The remaining subject in the high-status condition who maintained the delusion reconstructed the information to be consistent with the delusion and said, "I would laugh at him 'cause he would be lying." There were no differences in the number of highs in each status condition who maintained the delusion in response to this challenge, $\chi^2(1, N = 19) = 0.01, p > .05$. In the posthypnotic inquiry, 11 (68.8%) highs said that this contradiction had lessened their belief that Jo Pearson loved or liked them. Five (31.3%) said it did not lessen their belief. For example, 1 high in the high-status condition said, "That wasn't actually going to happen . . . that's a lie . . . because he's in love with me, he wouldn't come in here and tell me that he's not." When asked why he would lie, this same subject said, "Because he's a lecturer and so he can't actually be . . . he's not allowed to be in love with me even though he is. He would have to say it but he would still be in love with me." Another high in the equal-status condition said, "For a split second I imagined her being under duress . . . probably from the partner."

Thus, with each successive challenge, fewer highs maintained the erotomania delusion. Despite this breaching of the erotomania suggestion for many, some highs maintained their hypnotic delusion in the face of all the challenges.

DISCUSSION

Findings from this study indicate that hypnosis and specific hypnotic suggestion can effectively model some of the clinical features of primary erotomania. Many highs experienced the delusional belief that Jo Pearson loved or liked them, interpreted ambiguous information consistent with this belief and confabulated evidence to support their belief. A subset of highs also resisted all challenges to their belief. Some highs' responses were extremely compelling, involving strong emotional reactions and unshakable belief in the suggested hypnotic delusion. Notably, these features of hypnotic erotomania were

strikingly similar to clinical cases, suggesting that hypnosis can indeed create temporary “virtual patients” (Oakley & Halligan, 2009).

Modeling the Features of Primary Erotomania

The percentage of highs who passed the erotomania suggestion (79%) matches pass rates observed in previous research that has used hypnosis to model delusions. For example, Noble and McConkey (1995) reported pass rates of 100% for virtuosos (excellent hypnotic subjects who respond to all or nearly all hypnotic suggestions) and 89% for highs for hypnotic sex-change; Burn, Barnier, and McConkey (2001) reported pass rates of 100% for virtuosos and 88% for highs for hypnotic sex-change; Cox and Barnier (2009a) reported pass rates of 78% for highs in their first experiment and 90% for highs in their second experiment for hypnotic reverse intermetamorphosis (the belief that I have physically and psychologically become another person); and Barnier et al. (2008) reported a pass rate of 67% for highs for hypnotic mirrored-self misidentification. Our findings indicate that status of the target did not influence whether subjects passed the suggestion. Jo Pearson’s role as a university lecturer/tutor in the high-status condition may not have been elevated enough in comparison to the equal-status condition. Although there are documented cases of erotomania between students and professors (Jordan et al., 2006), subjects in the present study may not have interpreted the lecturer/tutor status of Jo Pearson as sufficiently different from themselves. Since university lecturers/tutors may not always be discernably different from students, future work could examine pass rates for other high-status individuals (e.g., celebrities). However, the similarity observed between the high- and equal-status conditions is consistent with work by Cox and Barnier (2009a, 2009b) who found that individuals could experience identity delusions for a range of different identities during hypnotic reverse intermetamorphosis.

To index whether subjects misinterpreted the target’s intent following the hypnotic erotomania suggestion, we asked them to listen to and recall a story containing four ambiguous social scenarios. Contrary to predictions, lows recalled more story information than highs. However, given that lows were not experiencing the erotomania delusion, they may have had more cognitive resources available to encode and retrieve the story, leading to better recall. In contrast, highs’ slightly poorer recall may have been due to selective encoding and/or retrieval. In previous research on hypnotic sex-change (Burn et al., 2001) and hypnotic reverse intermetamorphosis (Cox & Barnier, 2009b), subjects selectively encoded information that was particularly relevant to their delusion. This encoding bias later resulted in better retrieval of information consistent with the delusion and poorer retrieval of less relevant

information. In the present study, highs may have found some of the story scenarios more relevant to their erotomania delusion than others and may have consequently focused on these scenarios at the expense of others. It would be useful to test this effect with clinical erotomania patients in order to demonstrate the potential value of the hypnotic analogue.

Interestingly, over one quarter of highs misremembered some information from the story and recalled it in a way that supported their delusion. For example, 1 high confabulated, "We both caught a cab . . . the same one." Such details were not in the original story. Thus, although highs had poorer recall of the story than lows, some highs confabulated extra story elements. Such confabulations are consistent with clinical cases of erotomania, where patients confabulate false memories of interactions with the target, which they subsequently use as evidence of the target's love (Berrios & Kennedy, 2002). For example, in a clinical case presented by Singer (1991), a female patient believed that the King of Belgium was in love with her and claimed that he wrote letters to her. Such biased and confabulated remembering confirms that, as in clinical cases, hypnotic erotomania may disrupt and/or distort information processing (for similar findings see Burn et al., 2001; Cox & Barnier, 2009a, 2009b).

We explored whether hypnotic erotomania was resistant to challenge and found that with each of three successive challenges, more highs breached the hypnotic delusion. Interestingly however, a subset of highs maintained their erotomania delusion throughout. This pattern of breaching is consistent with previous research that has used hypnosis to model delusions; although the likelihood of breaching depends on the specific delusion suggestion. For instance, Noble and McConkey (1995) reported that 56% of highs breached their hypnotic sex-change delusion in response to a contradiction (where they were asked what they would say if a doctor told them there was no reason to say they were the opposite sex) and 100% of highs breached their delusion in response to a confrontation (where they were asked to describe what they experienced as they looked at an image of themselves on a monitor). In contrast, in their study on reverse intermetamorphosis, Cox and Barnier (2009a) reported that only 10% of highs had their delusional beliefs breached in response to a contradiction challenge and 20% of highs had their delusional beliefs breached in response to a confrontation challenge.

In response to our first challenge, most highs confabulated evidence that Jo Pearson loved/liked them, suggesting that this challenge was not especially difficult. Clinical patients likewise have little difficulty confabulating evidence to support their delusion (Berrios & Kennedy, 2002). However, in response to our second and third challenges, more highs breached the delusion. These challenges may have been more

successful because they forced subjects to evaluate their deluded beliefs in light of contradictory evidence. As in clinical cases, those hypnotic subjects who maintained their deluded beliefs during these challenges did so by resisting or reinterpreting the conflicting information as consistent with their delusion. For instance, when asked what they would say if Jo told them he/she was not in love with them, they made comments such as "He wouldn't do that. He loves me. That's silly," and "I would laugh at him 'cause he would be lying." Subjects' posthypnotic inquiry comments further illustrated such reinterpretations. For example, one subject said "He's a lecturer . . . he's not allowed to be in love with me even though he is." Such responses are strikingly similar to clinical cases of erotomania. For example, Anderson et al. (1998) reported a patient who believed that the target of her erotomania delusion would return her affections if he were not constrained by his work as a physician. In both the clinical and hypnotic cases, the target's occupation was used to justify any conflicting behavior and allowed the delusion to be maintained.

Thus, for many highs there was an increasing rate of breaching across the three challenges. This may be due to the accumulation of the challenges that progressively made the delusion more difficult to maintain. However, some highs resisted all the challenges and actively reinterpreted contradictory information in line with the suggested erotomania delusion.

Overall, in attempting to model four of the clinical features of erotomania—characteristics of the target, misinterpretation of the target's intent, resistance to and reinterpretation of conflicting evidence, and confabulations that support the delusion—some subjects showed all of these features and demonstrated a strong analogue of the clinical delusion. But there was variability; the suggested delusion was not limited to high-status targets as is often (but not always) the case in clinical delusions. Also, our hypnotic subjects differed in the strength of their delusional belief, ranging from transient delusions that were easily breached to full-blown delusions that could not be breached. However, this need not invalidate the hypnotic analogue but rather reflect individual variation. Indeed, it suggests that the hypnotic analogue can also model nonclinical delusional ideation in the normal population.

Implications for Treatment

One potential role of hypnotic analogues of delusions is that they may provide a useful future testing ground for treatment ideas. There is increasing interest in cognitive behavioral therapy (CBT) for certain subtypes of delusional disorder (e.g., persecutory type, O'Connor et al., 2007; somatic type, Moorhead & Turkington, 2001) that involves undermining conviction and reality testing delusional beliefs (O'Connor

et al., 2007; Rektor & Beck, 2002). The challenges used in this and similar studies may provide insights into how to lessen conviction in erotomania and other delusions.

Hypnotic analogues of delusions may also offer a means to explore potential retraining of interpretive biases in delusions. Retraining has been shown to be successful in other clinical disorders that feature interpretive biases, such as generalized social anxiety disorder (Schmidt, Richey, Buckner, & Timpano, 2009) and pathological worry (Hazen, Vasey, & Schmidt, 2009). In the present study, hypnotic erotomania elicited interpretive biases in high hypnotizable individuals. Thus, hypnotic analogues can first be used to test the efficacy of specific techniques designed to retrain interpretive biases, before their implementation in a clinical setting.

Limitations and Future Directions

Although the hypnotic analogue developed in this study was inspired by Langdon, Coltheart, and colleagues' two-factor theory of delusions (as noted in the introduction), we did not attempt to re-create erotomania from its Factor 1 and Factor 2 components but rather attempted to re-create the "fully formed" delusion via a suggestion for the complete delusional experience (consistent with work on hypnotic mirrored-self misidentification and reverse intermetamorphosis; Barnier et al., 2008; Cox & Barnier, 2009a). The next step should be to re-create erotomania using separate Factor 1 and Factor 2 suggestions. For example, Connors, Barnier, Coltheart, Cox, and Langdon (in press) have re-created mirrored-self misidentification in this way. They gave subjects a Factor 1 suggestion to not recognize the person they saw in the mirror (based on the suggestion that Factor 1 in this delusion involves a deficit in identifying familiar faces; Breen et al., 2000; Coltheart, 2007) and a Factor 2 suggestion that any explanations they came up with to account for this would seem plausible (based on the suggestion that Factor 2 might involve a failure to check beliefs for plausibility; Turner & Coltheart, 2010). Connors et al. found that these separate Factor 1 plus Factor 2 suggestions produced an experience of hypnotic mirrored-self misidentification that was comparable to a fully formed suggestion (which instructed subjects to see a stranger in the mirror). Thus, some delusions can be hypnotically re-created from their component factors and can lead to a delusional experience that is at least as compelling as a fully formed suggestion. It remains to be seen whether erotomania can be re-created from separate Factor 1 and Factor 2 suggestions. Factor 1 might involve a hypnotic suggestion for motivated information-processing biases. Alternatively, Factor 1 could involve a mood induction to induce poor self-esteem and the desire for a romantic relationship (i.e., the motivational components that might facilitate the erotomania delusion).

Despite the success of this study in modeling—at least in part or for some—four clinical features of erotomania in the laboratory, the present study has its limitations and there is a need for future research. One limitation is that the profile of our subjects may not have matched the profile of erotomania patients. Our high hypnotizable subjects were selected from a predominantly female undergraduate population but we do not know whether they possessed characteristics of typical erotomania patients. These patients are typically socially inept and inexperienced in romantic, sexual relationships, despite having a strong desire for such relationships (Anderson et al., 1998; Fujii et al., 1999; Jordan et al., 2006; Kennedy, McDonough, Kelly, & Berrios, 2002; Segal, 1989). Although findings indicated that subjects' relationship status did not affect their response to the suggestion, in future research it may be beneficial to limit subjects to those who are single and have a desire for a romantic relationship to produce a closer match with the characteristics of erotomania patients. It may also be worthwhile to ask subjects in future studies to complete self-report inventories of empathy and social skills, for example.

A second possible limitation is the terminology that we used in this hypnotic analogue. Although we did not specifically tell subjects that Jo Pearson was fictional, we implied that he/she was fictional by instructing subjects to “believe” he/she was a real person. We did this because we did not want subjects to simply say they knew Jo because the hypnotist had told them about him/her. We also read subjects a “story” about Jo Pearson and asked subjects who did not pass the suggestion to “imagine” Jo Pearson. In this first attempt at modeling erotomania, we developed our hypnotic suggestion based on advice from a team of cognitive and clinical neuropsychologists. However, we realize that mere words can produce remarkably different hypnotic experiences (Barnier & Oakley, 2009) and at times we may have inadvertently implied that Jo Pearson was fictional. Since hypnotic behavior, experiences, and even underlying neural activation can be different across hypnotically suggested versus imagined experiences (e.g., Derbyshire, Whalley, Stenger, & Oakley, 2004; Halligan et al., 2000; Szechtman et al., 1998), future work could examine whether such choices of terminology produce different or weaker/stronger delusional experiences.

Another key challenge for hypnosis research is managing the possibility that the responses observed in subjects are simply a result of the subject complying with perceived experimental demands (Cox & Bryant, 2008). The major paradigm that is used to index the potential role of demand characteristics in hypnosis is Orne's real-simulating paradigm (1962, 1971). This paradigm compares highs who are hypnotized (“reals”) with lows who have been asked to fake hypnosis (“simulators”). The simulators act as a quasi-control condition as their

responses reflect the demand characteristics of the hypnotic setting. If there are differences in the way that reals and simulators respond, it can be inferred that the reals were not responding to social cues alone. However, if their responses are similar, demand characteristics cannot be ruled out (Cox & Bryant, 2008). It is worth noting that the open-ended questions and multiple-choice options for each ambiguous scenario in the story may have lead subjects to respond in a socially desirable way. For instance, the erotomania option in the multiple-choice options may have reminded subjects of the erotomania suggestion and may have influenced how they responded to the questions. Thus, future research should use the real-simulating paradigm to address these possibilities.

Most importantly, although this study successfully modeled four features of erotomania, this does not necessarily imply that hypnosis can model the underlying processes involved in erotomania. The etiology of clinical delusions and hypnotic delusions may be quite different. But according to the two-factor theory of delusions, any process that disrupts normal cognitive processing (whether hypnotic or clinical) in belief formation and evaluation should have similar effects. Indeed, imaging studies on clinical and hypnotic functional disorders (e.g., conversion disorder, Halligan et al., 2000) have shown remarkable similarities in underlying neural processes. This suggests that hypnotic suggestions may be capable of modeling the underlying processes involved in erotomania.

CONCLUSION

In this first attempt at hypnotically modeling erotomania, albeit temporarily, we found that specific suggestions given during hypnosis re-created important features of the delusion. The striking similarities between our hypnotic erotomania subjects and clinical cases are consistent with Oakley and Halligan's (2009) notion of "virtual patients." These findings add to the research on hypnotic analogues of functional conditions (e.g., conversion disorder, Halligan et al., 2000) and support the use of hypnosis to study other functional delusions such as pathological jealousy (or Othello syndrome) and persecutory delusions (Coltheart, 2007). Overall, this work highlights the value of using hypnosis to investigate clinical delusions by providing a framework for testing theoretical accounts of delusions and a context for exploring new treatment possibilities.

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Experimentelle Hypnotische Modellierung der Erotomanie

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Abstrakt: Erotomanie ist die Selbsttäuschung daß man aus der Ferne von einer anderen Person (dem Zielobjekt) geliebt wird. Diese Studie benutzte Hynose als ein neuartiges kognitives neuropsychologisches Forschungsinstrument zur Modellierung der Erotomanie. Die Autoren entwickelten 2 Versionen einer hypnotischen erotomanischen Suggestion und testeten deren Einfluß durch Interrogation von Subjekten, die angeleitet wurden sich an eine Erzählung mit ambigösen Vorfällen zu erinnern und diese zu interpretieren. Sie bezweifelten auch die Selbsttäuschung damit daß sie die Subjekte nach der Grundlage ihre Überzeugung fragten. Die hypnotischen erotomanischen Suggestionen spiegelten die Eigenschaften klinischer Selbsttäuschungen für viele hoch- hypnotisierbare Individuen wider. Sie glaubten daß das Zielobjekt sie liebte, interpretierten ambigöse Information in Einklang mit dieser Überzeugung, und erfanden Bestätigung im Dienste der Selbsttäuschung. Einige widerstanden auch allen Angriffen auf ihre Selbsttäuschung. Diese Verhaltensweisen zeigten erstaunliche Ähnlichkeiten mit klinischen Fällen und unterstreichen den Wert des Nutzen der Hypnose in der Modellierung klinischer Selbsttäuschungen. Die Autoren erörtern auch die Begrenzungen dieses Vorgehens.

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Modélisation de l'érotomanie en laboratoire grâce à l'hypnose

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Résumé: L'érotomanie est l'illusion délirante d'être aimé à distance par une autre personne (la *cible*). L'hypnose a été utilisée dans la présente étude comme nouvel outil de recherche neuropsychologique pour modéliser l'érotomanie. Les auteures ont élaboré deux versions d'une suggestion hypnotique d'érotomanie et en ont testé l'effet en demandant aux sujets de mémoriser, puis d'interpréter une anecdote contenant des scénarios ambigus équivoques. Elles ont également remis en question l'illusion des sujets en leur demandant de justifier leur conviction. Les suggestions d'érotomanie hypnotique ont pu recréer les caractéristiques de l'illusion clinique chez de nombreux sujets hautement hypnotisables. Ces sujets croyaient vraiment que la cible les aimait, interprétaient l'information équivoque conformément à leur conviction, et inventaient des preuves pour justifier leur illusion. Certains résistaient même à toute remise en question de leur illusion. Ces caractéristiques ressemblent de façon frappante à celles de cas cliniques et témoignent de la valeur de l'utilisation de l'hypnose pour modéliser les illusions cliniques. Les auteures abordent également les limitations de cette approche.

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Modelando un delirio de erotomanía en el laboratorio con hipnosis

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Resumen: La erotomanía es una creencia delirante de que uno es amado desde lejos por otra persona (el objetivo). Este estudio usó la hipnosis como una herramienta cognitiva neuropsicológica novedosa para modelar la erotomanía. Los autores desarrollaron dos versiones de sugerencias hipnóticas erotomaniacas, y evaluaron su impacto al pedirle a los sujetos que recordaran e interpretaran una historia que contenía escenarios ambiguos. Las sugerencias hipnóticas erotomaniacas recrearon exitosamente las características de un delirio clínico en muchos de los sujetos altamente hipnotizables. Ellos creyeron que el objetivo los amaba, interpretaron información ambigua de forma consistente con esta creencia, y confabularon evidencia en servicio de su delirio. Algunos incluso resistieron todos los cambios a su delirio. Estas características son notablemente similares a los casos clínicos y destacan el valor del uso de la hipnosis para modelar delirios clínicos. Los autores también discuten algunas de las limitaciones de este acercamiento.

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