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SELECTIVE INFORMATION PROCESSING IN HYPNOTIC IDENTITY DELUSION: THE IMPACT OF TIME OF ENCODING AND RETRIEVAL

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Abstract

This experiment indexed the impact of hypnotic identity delusion on information processing. During hypnosis, high and low hypnotizable participants received a suggestion to become a same-sex friend (with opposite personality characteristics) and listened to a structured story about two characters with opposite personality characteristics. Importantly, half the participants encoded the story before the delusion suggestion and retrieved it after the suggestion, and half encoded the story after the delusion suggestion and retrieved it after cancellation. The majority of highs, but few lows, passed the suggestion and reported a compelling delusion experience. Of particular interest is that whereas lows' processing of the story was not influenced by the delusion suggestion or the time of encoding and retrieval (they recalled more than highs overall, identified with the story character consistent with their actual identity, and showed no selectivity in recall), highs' processing was influenced both by their delusional experience and the time of encoding and retrieval. Highs who encoded the story after the delusion suggestion identified with the character consistent with their suggested identity and retrieved more information about this character. In discussing these findings we consider the role of encoding vs. retrieval processes, the impact of current conceptions of self on information processing, and the relevance of this work to memory and clinical delusions.

Key words: encoding, hypnosis, hypnotic delusion, information processing, memory, retrieval

Introduction

Theory and research suggest that clinical delusions may either develop from, or produce, biases in information processing. For instance, Stone and Young (1997) argued that deluded individuals prioritize evidence from their own senses in the development of their beliefs, rather than developing beliefs that fit in with their broader knowledge about the world; Garety and Freeman (1999) reported that deluded individuals jump to conclusions when making decisions and readily change their beliefs based on small amounts of first hand evidence; Langdon and Coltheart (2000) proposed that a deficit in a belief-checking mechanism may impair the ability of deluded individuals to access information that refutes a delusional belief; and Conway and Pleydell-Pearce (2000) suggested that a shift in self or identity, such as during a clinical delusion, selectively influences autobiographical remembering and forgetting.

One way to investigate such selective information processing in the laboratory is by using hypnotically suggested delusions. Researchers have developed viable hypnotic analogues of a range of clinical delusions, including models of paranoid delusions, delusions of misidentification (e.g. identity delusion, gender change delusion), mirrored self misidentification, and Anton's syndrome (Barnier, Cox, O'Connor, Coltheart, Langdon, Breen and Turner, in press; Burn, Barnier and McConkey, 2001; Cox and Barnier, in press; McConkey, Szeps and Barnier, 2001; Noble and McConkey, 1995; Sutcliffe, 1961; Zimbardo, Andersen and Kabat, 1981; for review and discussion see Cox and Bryant, 2008; Kihlstrom and Hoyt, 1988). For instance, modelling mirrored self misidentification, Barnier et al. (in press) gave high hypnotizable participants a suggestion to see either: (a) a stranger in the mirror, (b) the mirror as a window, or (c) the mirror as a window with a view of a stranger on the other side. In response, participants in the *stranger in the mirror* and *mirror as a window with a view of a stranger* conditions reported seeing a stranger when they looked in the mirror. They described physical differences between the stranger and themselves, looked around the room to find the stranger and were amused and sometimes disturbed that the stranger in the mirror was copying their actions.

In another experiment, modelling delusions of misidentification, Cox and Barnier (in press) gave high and low hypnotizable participants a suggestion to become someone they thought was *similar* or *dissimilar* to themselves. In response, highs (but not lows) provided a new name, described themselves differently, resisted challenges to their delusional experiences (see also Noble and McConkey, 1995) and, after hypnosis, rated these experiences as extremely real and believable. During the delusion, highs also recalled autobiographical memories consistent with their deluded identity. Whereas lows' memories were general and lacking detail, highs' memories were specific, rich in sensory-perceptual details and viewed from the perspective of the suggested identity. These and other experiments demonstrate compelling, albeit temporary, delusional experiences in response to hypnotic suggestions, with many of the characteristic features of clinical delusions. They also demonstrate selective information processing in the service of the delusion.

In a formal evaluation of selective information processing during a hypnotic delusion (using Orne's real-simulating methodology; Orne, 1962, 1971), Burn et al. (2001) gave real, hypnotized (virtuoso and high hypnotizable) and simulating, nonhypnotized (low hypnotizable) participants a hypnotic suggestion for sex change (from Noble and McConkey, 1995) and played them an audiotape of a structured story about a male and a female character – Jim and Susan. After the story, the hypnotist asked participants three questions to index which character they most identified with. Then after cancelling the suggestion and after hypnosis, the hypnotist asked participants to free recall the story. Burn et al. (2001) were interested in whether participants would recall more story information about the character consistent with their suggested sex or the character consistent with their actual sex. Virtuosos recalled more information about the character consistent with their suggested sex than did highs and lows. Interestingly, this pattern was not due to character identification; virtuosos were actually less likely than highs and lows to identify with the character consistent with their suggested sex. Burn et al. (2001) argued that selective information processing occurred during encoding and that virtuosos, who experienced the suggested sex change extremely strongly, may have self-referenced information about the character consistent with their suggested sex, rather than relating it to the character itself (for similar selectivity following hypnotic mood induction, see Bower, Gilligan and Monteiro, 1981).

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We aimed to extend Burn et al.'s (2001) work by testing whether hypnotized people selectively process information as a result of or in support of a hypnotic delusion. In Burn et al.'s study, all participants heard the story during hypnosis but recalled it after hypnosis. Thus, it is unclear whether participants' recall performance was due to selective encoding during the delusion or to a change in context from encoding to retrieval. We explored the possibility that an identity delusion might produce a combination of selective encoding and selective retrieval. In our experiment, all participants encoded and retrieved the story during hypnosis: one group encoded the story *before* the delusion suggestion was administered and retrieved the story *after* the suggestion was administered (i.e. during their delusion experience); a second group encoded the story *after* the delusion suggestion was administered (i.e. during their delusion experience) and retrieved the story *after* the suggestion was cancelled.

Specifically, drawing on Cox and Barnier's (in press) hypnotic identity delusion work, before hypnosis we indexed high and low hypnotizable participants' (nondeluded) self and asked them to nominate a same-sex friend who was opposite to them in terms of dominant and submissive personality traits. Following a hypnotic induction, we divided participants into two groups – an *encode before suggestion/retrieve after suggestion* condition and an *encode after suggestion/retrieve after cancellation* condition.[1] Since we aimed to replicate and extend Burn et al.'s (2001) work, we adapted their basic methodology and story material. Those in the *encode before suggestion/retrieve after suggestion* condition, first listened to an audiotape of a structured story about two same-sex characters – one dominant and one submissive. We then administered a delusion suggestion for these participants to become the same-sex friend they nominated before hypnosis. We indexed the impact of the suggestion on participants' (deluded) self and then asked them to free recall the story. We cancelled the suggestion, administered a hypnotic deinduction and conducted a post-experimental inquiry where participants described their delusional experiences. Thus, participants encoded the story *before* the delusion suggestion was administered and retrieved the story *after* the suggestion was administered (i.e. during their delusion experience). Those in the *encode after suggestion/retrieve after cancellation* condition were first administered the delusion suggestion to become the same-sex friend nominated before hypnosis. We indexed the impact of the suggestion on participants' (deluded) self and then asked them to listen to the structured story. We then cancelled the suggestion, and asked participants to free recall the story. Finally, we administered the hypnotic deinduction and conducted the post-experimental inquiry. Thus, participants encoded the story *after* the delusion suggestion was administered (i.e. during their delusion experience) and retrieved the story *after* the suggestion was cancelled.

We expected that more highs than lows would pass the delusion suggestion and report a compelling delusional experience (as indexed by name changes, reality and belief ratings). We expected that time of encoding and retrieval would influence both character identification and recall of story information, especially for highs. We predicted that highs' information processing of the story would depend on their (deluded or nondeluded) self at the time of its encoding and retrieval.

Method

Participants and design

We tested 29 high hypnotizable (22 female and 7 male) and 29 low hypnotizable (17 female and 12 male) participants of mean age 20.48 years (SD = 4.51) in a 2

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(hypnotizability: high vs. low) × 2 (time: encode before suggestion/retrieve after suggestion vs. encode after suggestion/retrieve after cancellation) between-subjects design. Our participants were undergraduate psychology students at the University of New South Wales, who received credit towards their psychology course for their involvement. We selected them on the basis of their extreme scores on a modified 10-item version of the Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS:A; Shor and Orne, 1962) and a tailored 10-item version of the Stanford Hypnotic Susceptibility Scale, Form C (SHSS:C; Weitzenhoffer and Hilgard, 1962).[2] Highs scored in the range 7–10 (M = 8.43, SD = 0.85) on the HGSHS:A and 8–10 (M = 9.21, SD = 0.77) on the SHSS:C. Lows scored in the range 0–3 (M = 1.67, SD = 1.06) on the HGSHS:A and 0–2 (M = 1.28, SD = 0.75) on the SHSS:C.

Materials

Before hypnosis, we asked participants to complete a modified version of the Bem sex role inventory (BSRI; Bem, 1974) to index whether they had more dominant (masculine) or submissive (feminine) personality traits. We selected 14 characteristics from the BSRI: 7 dominant (firm, bossy, noisy, show off, aggressive, confident, competitive) and 7 submissive (love children, dependent, patient, needs approval, appreciative, nervous, timid). Participants rated whether each characteristic was true of them (1 = 'never or almost never true', 7 = 'always or almost always true'). We used the BSRI to index participants' (nondeluded) self. Specifically, based on these ratings, we categorized each participant as either predominantly dominant or submissive and then asked them to think of a friend who was opposite to them (e.g. submissive or dominant); this friend became their suggested identity.

During hypnosis, we used an audiocassette recorder to play a story about two friends – 'Jill' and 'Susan' for females, 'Jim' and 'Tony' for males. The story was two minutes long and contained 49 idea units: 18 idea units referred to the dominant character (e.g. 'Jim/Jill was becoming irritable', 'he/she was an adventurous person'), 18 referred to the submissive character (e.g. 'Tony/Susan was invariably sympathetic when people were late', 'he/she was forever dependent on other people for ideas') and 13 were neutral (e.g. 'it was a good looking day', 'it was only a few kilometres between their homes'). Similar to Burn et al.'s story, throughout our story we embedded four words associated with dominant personality types (adventurous, aggressive, unemotional, active), four words associated with submissive personality types (dependent, worrying, sympathetic, anxious), and four neutral words (relaxed, cold, pessimistic, irritable). We selected these words from a stereotypical trait index (Williams and Best, 1990); they were equally favourable or unfavourable in terms of likeableness. The verbatim story for male and female participants was identical, except for character names.

Procedure

Our experiment involved a prehypnotic inquiry, a hypnosis session and a post-experimental inquiry, all of which were conducted by a single experimenter, the hypnotist.

Prehypnotic inquiry

Following informed consent procedures, the hypnotist indexed participants' (nondeluded) self by asking them: (1) to 'think about yourself for a moment … tell me the type of person you are … just describe yourself now to me in a few sentences'; (2) to complete the modified BSRI (Bem, 1974); and (3) to 'give me five sentences, beginning with the words 'I am …' which describe who you are, the kind of person you are' (Kuhn and

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McPartland, 1954). This was 'I am' task 1. The hypnotist then asked participants to name a same sex friend who they believed was the opposite of them and to complete the 'I am' task again for this person (i.e. He/She is…').

Hypnosis session

To begin this session, the hypnotist administered a standard hypnotic induction (based on Weitzenhoffer and Hilgard, 1962) and tested all participants on SHSS:C suggestions for moving hands apart, finger lock and verbal inhibition. Participants were then treated according to their random allocation to either the *encode before suggestion/retrieve after suggestion* condition (n = 31; 16 highs, 15 lows) or the *encode after suggestion/retrieve after cancellation* condition (n = 27; 13 highs, 14 lows). The sequence of events in each time (encoding and retrieval) condition is summarized in Table 1.

For the *encode before suggestion/retrieve after suggestion* condition, after the three SHSS:C suggestions, participants listened to the audiocassette story of Jim and Tony (for males) or Jill and Susan (for females). The hypnotist instructed participants to listen carefully. Afterwards she asked them three questions to index processing of the story and character identification ('which character did you mostly identify with?', 'which character was most prominent?' and 'who had the most details associated with them?'). The hypnotist then administered the delusion suggestion (based on Cox and Barnier, in press). She suggested to participants that they were becoming the friend they nominated in the prehypnotic inquiry as opposite to them (e.g. 'As you listen to my voice and my words, you can feel yourself becoming *[name of nominated friend]*, more and more. So that in a moment you will be *[nominated friend]*, you will be *[nominated friend]* in every way'). The suggestion was given for two minutes. Following this, the hypnotist asked four questions to index participants' experience of the delusion suggestion ('tell me about yourself', 'what type of person are you?', 'what is your name?' and 'how old are you?'), and asked them to complete the 'I am' task again to index (deluded) self (and thus self-change following the delusion suggestion). This was 'I am' task 2. The hypnotist then asked participants to free recall the story as completely as possible and as close to the original as possible. Finally, she cancelled the suggested delusion ('return back to your normal self now') and administered a standard deinduction (based on Weitzenhoffer and Hilgard, 1962).

For the *encode after suggestion/retrieve after cancellation* condition, after the three SHSS:C suggestions, the hypnotist immediately administered the delusion suggestion. As in the *encode before suggestion/retrieve after suggestion* condition, she suggested to participants that they were becoming the friend they nominated in the prehypnotic

Table 1. Sequence of events in each time (encoding and retrieval) condition

Encode before suggestion/retrieve after suggestion				
1 Story encoding	2 Character identification	3 Delusion suggestion	4 Story retrieval	5 Delusion cancellation
Encode after suggestion/retrieve after cancellation				
1 Delusion suggestion	2 Story encoding	3 Character identification	4 Delusion cancellation	5 Story retrieval

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inquiry as opposite to them. The hypnotist then: (a) asked these participants the same four questions to index their experience of the delusion; and (b) asked them to complete 'I am' task 2 to index (deluded) self. Participants then listened to the audiocassette story of Jim and Tony (for males) or Jill and Susan (for females). As in the *encode before suggestion/retrieve after suggestion* condition, the hypnotist instructed participants to listen carefully and afterwards asked them the same three questions to index processing of the story and character identification. The hypnotist then cancelled the suggested delusion (as above) and asked participants to free recall the story as completely as possible and as close to the original as possible. Finally, she administered the standard deinduction as above. We matched the time elapsed between time of encoding and time of retrieval of the story across the two time (encoding and retrieval) conditions (see Table 1).

Post-experimental inquiry

Following the deinduction, the hypnotist asked participants in what ways they felt they had become their suggested identity. To index reality, belief and their sense of actual identity during the delusion she also asked them to rate: 'did you really feel you were *[deluded name]*?' (0 = 'not at all', 7 = 'completely'), 'how much did you believe you were *[deluded name]*?' (0 = 'not at all', 7 = 'completely'), and 'how much of your actual identity did you sense at the time?' (0 = 'none', 7 = 'a lot'). The hypnotist then answered any questions, debriefed participants, and thanked them for their time.

Results

Participants' responses to the delusion suggestion were categorized by the hypnotist and an independent rater (who was unaware of participants' hypnotizability); differences in initial categorization were resolved through discussion. Consistent with previous experiments, we scored participants as passing the suggestion if they changed their name *and* did not deny their suggested identity when asked 'Tell me about yourself?' (Burn et al., 2001; Cox and Barnier, in press; Noble and McConkey, 1995).

Response to the Suggestion

Whereas 26/29 highs (89.66%) passed the delusion suggestion, only 7/29 lows (24.14%) passed. Chi-square analysis confirmed that this pattern was significantly different, χ^2 (1, $N = 58$) = 25.38, $p < 0.001$. For highs, time of story encoding and retrieval had no impact on passing the suggestion: 14/16 highs (87.50%) in the *encode before suggestion/retrieve after suggestion* condition passed and 12/13 highs (92.31%) in the *encode after suggestion/retrieve after cancellation* condition passed, χ^2 (1, $N = 29$) = 0.18, $p = 0.67$.

Consistent with Burn et al. (2001), in all remaining analyses we focused on the 26 highs who passed the delusion suggestion and the 22 lows who failed. Table 2 presents the mean number of self descriptions (from a total of five) provided by high and low hypnotizable participants in the two time (encoding and retrieval) conditions for 'I am' task 2 (after the delusion suggestion was administered), which were different from those provided for 'I am' task 1 (before hypnosis). Higher numbers of different descriptions indicate more self change following the suggestion. Table 2 also presents mean ratings of the reality of the suggested delusion and belief in the experience (where higher ratings indicate a stronger delusional experience), as well as mean ratings of a sense of actual identity during the delusion (where lower ratings indicate a stronger delusional experience). Separate 2 (hypnotizability) × 2 (time) analyses of variance (ANOVA) of these

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Table 2. Highs' and Lows' mean number of different self descriptions, and mean ratings of reality, belief, and sense of actual identity according to time (encoding and retrieval) condition

Time (Encoding and Retrieval)	Highs	Lows
Different Descriptions		
Encode before suggestion/ retrieve after suggestion	4.57 (0.85)	3.11 (2.03)
Encode after suggestion/ retrieve after cancellation	4.67 (0.49)	2.85 (1.35)
Reality		
Encode before suggestion/ retrieve after suggestion	5.14 (1.17)	1.78 (2.54)
Encode after suggestion/ retrieve after cancellation	4.42 (1.08)	0.92 (1.26)
Belief		
Encode before suggestion/ retrieve after suggestion	4.64 (1.39)	0.78 (1.99)
Encode after suggestion/ retrieve after cancellation	4.67 (1.23)	0.23 (0.44)
Sense of Actual Identity		
Encode before suggestion/ retrieve after suggestion	3.00 (2.04)	4.89 (1.54)
Encode after suggestion/ retrieve after cancellation	2.58 (1.68)	5.38 (1.19)

Note: Standard deviations appear in parentheses. For Different Descriptions, values refer to the number of different descriptions provided from a total of five. Reality ratings were made on a scale of 0–7 (0 = 'not at all real', 7 = 'completely real'). Belief ratings were made on a scale of 0–7 (0 = 'no belief', 7 = 'complete belief'). Sense of Own Identity ratings were made on a scale of 0–7 (0 = 'none', 7 = 'a lot').

data yielded only main effects of hypnotizability for 'I am' descriptions, and for ratings of reality, belief and actual identity, $F(1, 44) = 20.72$, $p < 0.001$, $\eta p^2 = 0.32$, $F(1, 44) = 59.72$, $p < 0.001$, $\eta p^2 = 0.58$, $F(1, 44) = 116.77$, $p < 0.001$, $\eta p^2 = 0.73$, and $F(1, 44) = 23.36$, $p < 0.001$, $\eta p^2 = 0.35$, respectively. Highs ($M = 4.62$, $SD = 0.70$) used a greater number of different words to describe their deluded identity than did lows ($M = 2.95$, $SD = 1.62$); highs rated their delusional experience as substantially more real ($M = 4.81$, $SD = 1.17$) and believable ($M = 4.65$, $SD = 1.29$) than did lows (reality: $M = 1.27$, $SD = 1.88$; belief: $M = 0.45$, $SD = 1.30$); and highs ($M = 2.81$, $SD = 1.86$) rated themselves as having much less of a sense of their actual identity during the suggested delusion than did lows ($M = 5.18$, $SD = 1.33$). There were no other main or interaction effects (all F's < 3.18, all p's > 0.08).

During the post-experimental inquiry, highs described themselves as experiencing subjectively real alterations in their physical characteristics and personality traits in response to the delusion suggestion. For instance, one high said 'my body parts started changing into her. I felt my face becoming her. I was her, in her room in Canberra. I put myself in her body'; a second commented 'I felt that she is me sitting here and that my voice is her voice'; and a third stated 'it was like having someone else in my head'. In contrast, lows described the delusion suggestion as difficult and ineffective. One low said 'I didn't feel like him. I thought it just wasn't happening'; and a second commented 'I kept thinking no, I'm me'. Together, these data and comments point to successful and compelling responses to the identity delusion suggestion by high, but not low, hypnotizable participants.

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Processing of the story

To evaluate processing of the story, we first analysed participants' identification with the story characters, which we indexed with three questions after they listened to the story. Consistent with Burn et al. (2001), we scored those who identified with the same character (i.e. Jill or Susan, Jim or Tony) for at least two of the three questions as identifying with that particular character. Figure 1 presents the mean percentage of highs and lows across the two time (encoding and retrieval) conditions that identified with each character. For lows, 36.36% identified with the character consistent with their (dominant or submissive) *suggested* identity and 63.64% identified with the character consistent with their (dominant or submissive) *actual* identity. Although chi-square analysis indicated that there was no significant difference in this pattern (perhaps because of the low count in 3 of the 4 cells), two-thirds of lows identified with the character consistent with their *actual* (nondeluded) identity. These included 10/13 who encoded the story after the delusion suggestion was administered, when they were overwhelmingly experiencing themselves as their *actual* (nondeluded), not their *suggested* (deluded), identity (see Figure 1).

For highs, 46.15% identified with the character consistent with their (dominant or submissive) *suggested* identity and 53.85% identified with the character consistent with their (dominant or submissive) *actual* identity. Although this pattern appears evenly split, chi-square analysis revealed that highs who encoded before the delusion suggestion was administered (and retrieved after it was administered) were more likely to identify with the character consistent with their *actual* (nondeluded) identity, whereas highs who encoded after the delusion suggestion was administered (and retrieved after it was can-

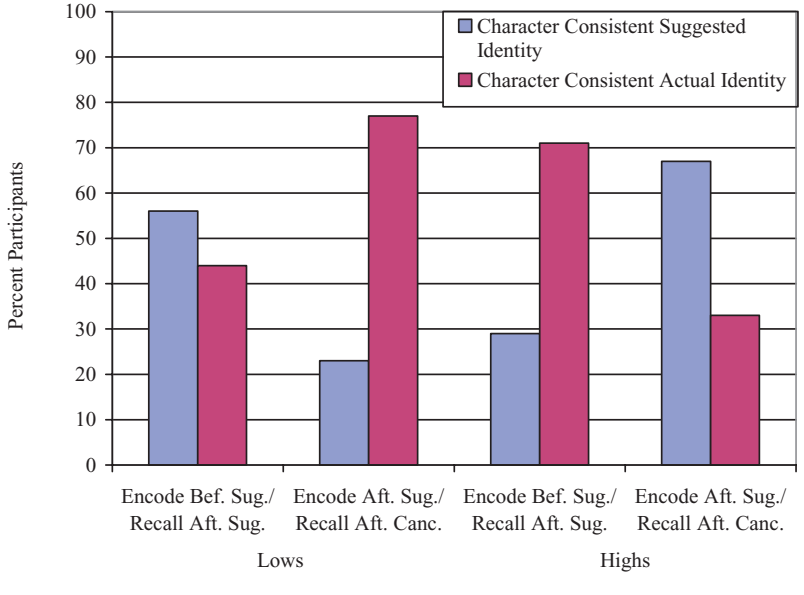

Figure 1. Highs' and Lows' Character Identification According to Time (Encoding and Retrieval) Condition.
Note: Encode Bef. Sug. = Encode Before Suggestion; Encode Aft. Sug. = Encode After Suggestion; Encode Aft. Canc. = Encode After Cancellation.

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Table 3. Highs' and Lows' mean percentage recall of story information Overall, Consistent with Suggested Identity, Consistent with Actual Identity, and Neutral According to Time (Encoding and Retrieval) Condition

Time (Encoding and Retrieval)	Highs	Lows
Overall		
Encode before suggestion/ retrieve after suggestion	24.97 (14.57)	36.98 (14.06)
Encode after suggestion/ retrieve after cancellation	21.31 (12.70)	29.76 (10.54)
Consistent with Suggested Identity		
Encode before suggestion/ retrieve after suggestion	26.22 (16.72)	38.89 (12.05)
Encode after suggestion/ retrieve after cancellation	23.64 (17.38)	30.42 (13.81)
Consistent with Actual Identity		
Encode before suggestion/ retrieve after suggestion	24.13 (20.19)	37.37 (21.89)
Encode after suggestion/ retrieve after cancellation	17.27 (11.30)	28.67 (16.43)
Neutral		
Encode before suggestion/ retrieve after suggestion	24.43 (12.44)	33.99 (10.92)
Encode after suggestion/ retrieve after cancellation	23.53 (14.93)	30.32 (12.44)

Note: Standard deviations appear in parentheses. For Overall information, percentage is calculated from a total of 61 idea units and trait words. For Consistent and Inconsistent information, each percentage is each calculated from a total of 22 idea units and trait words. For Neutral information, percentage is calculated from a total of 17 idea units and trait words.

celled) were more likely to identify with the character consistent with their *suggested* (deluded) identity, χ^2 (1, N = 26) = 3.77, p = 0.05. In other words, high hypnotizable participants' interpretation of the story characters was influenced by their current, whether nondeluded or deluded, self at the time of encoding, when they were asked which characters they identified with (see Figure 1).

We next analysed participants' recall of the story (idea units plus trait words). Note that half of the participants recalled the story after the delusion suggestion was administered (*encode before suggestion/retrieve after suggestion* condition) and half recalled the story after the suggestion was cancelled (*encode after suggestion/retrieve after cancellation* condition). Data for three participants is missing due to a technical malfunction with the recording equipment. Table 3 presents the percentage of story information overall recalled by highs and lows in the two time (encoding and retrieval) conditions. A 2 (hypnotizability) × 2 (time) between subjects ANOVA of this data yielded only a significant main effect of hypnotizability, $F(1, 41) = 6.80$, $p = 0.01$, $\eta p^2 = 0.14$; there were no other main or interaction effects (all F's < 2.00, all p's > 0.17). Irrespective of time of encoding and retrieval, lows (M percent = 32.71, SD = 12.32) recalled more story information overall than did highs (M percent = 23.38, SD = 13.61).

Following Burn et al. (2001), we classified story information (idea units plus trait words) recalled by participants as: (a) consistent with their suggested identity; (b) consistent with their actual identity; or (c) neutral. For example, if a person received the suggestion to become their nominated friend (with a dominant personality) and they recalled from the story that 'Jim was an adventurous person', then this would be

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classified as recall consistent with the suggested identity. Table 3 presents the mean percentage of: (a) story information consistent with suggested identity, (b) story information consistent with actual identity, and (c) neutral idea units, which were recalled by highs and lows in the two time (encoding and retrieval) conditions. Separate 2 (hypnotizability) × 2 (time) between subjects ANOVAs of these data yielded only main effects of hypnotizability for all three variables, $F(1, 41) = 4.46$, $p = 0.04$, $\eta p^2 = 0.10$, $F(1, 41) = 5.20$, $p = 0.03$, $\eta p^2 = 0.11$, and $F(1, 41) = 4.49$, $p = 0.04$, $\eta p^2 = 0.10$, respectively. There were no other main or interaction effects (all F's < 2.10, all p's > 0.15). In line with story information overall, lows recalled more information consistent with their suggested identity (M percent = 33.88, SD = 13.51) than did highs (M percent = 25.10, SD = 16.67); lows recalled more information consistent with their actual identity (M percent = 32.23, SD = 18.87) than did highs (M percent = 21.15, SD = 16.93); and lows recalled more neutral story information (M percent = 31.82, SD = 11.72) than did highs (M percent = 24.04, SD = 13.26).

These analyses suggest that lows simply recalled more information than highs overall. However, we were particularly interested in whether highs who passed the delusion suggestion selectively processed the story, especially depending on when they encoded and retrieved the story. Figure 2 presents the mean percentage of story information – information consistent with suggested identity and information consistent with actual identity – recalled by highs across the two time (encoding and retrieval) conditions. As shown in this figure, highs who encoded the story before the delusion suggestion was administered (and retrieved it after the suggestion was administered) recalled similar amounts of information consistent with their suggested identity and consistent with their actual identity (as indexed by a focused paired samples t-test, $t(12) = 0.71$, $p = 0.49$). In contrast, highs who encoded the story after the delusion suggestion was administered

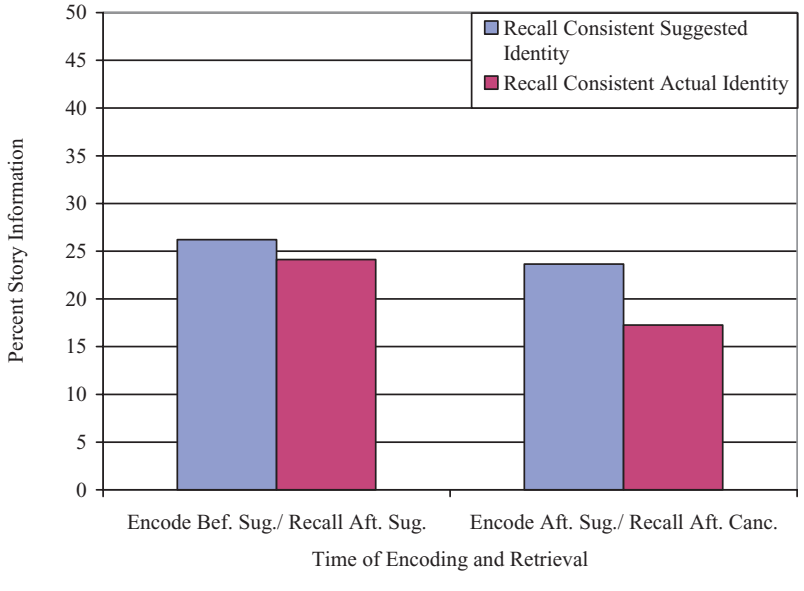

Figure 2. Highs' mean percentage recall of story information according to Time (Encoding and Retrieval) Condition.
Note: Encode Bef. Sug. = Encode Before Suggestion; Encode Aft. Sug. = Encode After Suggestion; Encode Aft. Canc. = Encode After Cancellation.

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(and retrieved it after the suggestion was cancelled) tended to recall more information consistent with their suggested identity than consistent with their actual identity, (as indexed by a focused paired samples t-test, $t(9) = 2.14$, $p = 0.06$).

Discussion

To index whether hypnotized individuals selectively processed information during a suggested delusion, we adapted Burn et al.'s (2001) story technique and explored biases in character identification and recall of story information. Whereas all participants in Burn et al.'s (2001) experiment encoded during the suggested sex-change, we manipulated time of encoding and time of retrieval.

As expected, in response to our delusion suggestion, highs but not lows experienced a compelling change in self (indexed by name changes, 'I am' descriptions, ratings of reality, belief, and sense of actual identity). These findings are consistent with past research on hypnotic delusions in general (Barnier et al., in press; Burn et al., 2001; Noble and McConkey, 1995; Sutcliffe, 1961; Zimbardo et al., 1981) and extend recent work on hypnotic identity delusions in particular. Hypnotic suggestions can successfully create a range of deluded identities, be they for real or nonexistent, similar or dissimilar personalities (Cox, 2007; Cox and Barnier, in press; Cox and Bryant, 2008). In this, as in past experiments, highs' hypnotically suggested experiences were strikingly similar to clinical delusions, especially in terms of their subjective reality and belief. These shared features highlight the value of using hypnosis as a laboratory analogue of clinical delusions (see also Cox and Bryant, 2008; Kihlstrom and Hoyt, 1988).

Our primary focus, however, was participants' processing of the structured story: character identification and story retrieval. Lows predominantly identified with the character consistent with their actual identity, especially those who encoded after the delusion was administered (and retrieved after the suggestion was cancelled). This makes sense given that they did not experience the suggested delusion and, presumably, focused more on the character consistent with their actual (nondeluded) self. Lows also showed no bias in processing the story. Irrespective of time of encoding and retrieval, they recalled similar amounts of information consistent with their suggested identity, information consistent with their actual identity, and neutral information. We noted that overall lows recalled more information than highs. Since we assume that lows did not require or use cognitive resources to experience and maintain a delusional experience (as did highs), lows may have had more resources available to maximize encoding and retrieval of the story.

Turning now to highs, we found differences in character identification. Approximately two thirds of highs who encoded *before* the delusion suggestion was administered identified with the character consistent with their actual identity, whereas approximately two thirds of highs who encoded *after* the delusion suggestion was administered identified with the character consistent with their suggested identity. In other words, their current (nondeluded or deluded) self at the time of encoding influenced which character from the story they most identified with. This finding is consistent with Burn et al. (2001), who found that 86% of (real) highs and 72% of (simulating) lows identified with the character consistent with their suggested gender. However, in this experiment and Burn et al.'s study, some highly hypnotizable people (one third in each of our encoding and retrieval conditions, and approximately half of the virtuosos in Burn et al.'s study) responded to the characters in a manner inconsistent with their current (whether actual or suggested) self.

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We also found differences in recall of the story. Highs who encoded before their delusional experience (i.e. before the delusion suggestion was administered) later recalled equivalent amounts of information consistent with their suggested identity and consistent with their actual identity. In contrast, highs who encoded during their delusional experience (i.e. after the delusion suggestion was administered) later tended to recall more information consistent with their suggested identity than consistent with their actual identity. Burn et al. (2001) reported similar findings: in their study, virtuosos showed higher recall of story information consistent with their suggested sex. This implies that there was selective encoding of material particularly relevant to the current (deluded) self, which in turn later influenced retrieval. This impact of current self on memory is consistent with a range of findings, both of experimentally manipulated self (e.g. via mood inductions) and of clinically disrupted self (e.g. in depression) (Bower et al., 1981; Clark and Teasdale, 1982; Moulds et al., 2007; for review, see Conway and Pleydell-Pearce, 2000).

It is interesting to consider the relationship between character identification, recall of story information, and encoding and retrieval processes in more detail. As we've just noted, those in the *encode after suggestion/retrieve after cancellation* condition appeared to show selective information processing of the story. Two thirds of them identified with the character consistent with their suggested identity, and their focus on this story character during encoding seemed to lead to greater recall of information consistent with their suggested identity (relative to information consistent with their actual identity), even though the recall test was after the delusion suggestion was cancelled. In contrast, those in the *encode before suggestion/retrieve after suggestion* condition identified more often with the character consistent with their actual identity. However, these participants' focus on this character during encoding provided no advantage on the later recall test (which was given after the delusion suggestion was administered). So, one interpretation of our data is that encoding the story before the delusion suggestion was administered lead to no information processing bias, whereas encoding the story after the delusion suggestion was administered – during the delusional experience – did.

This interpretation focuses mostly on encoding. Another interpretation takes into account both time of encoding and time of retrieval. Note first that the level of story information recalled by highs in both the *encode before suggestion/retrieve after suggestion* and *encode after suggestion/retrieve after cancellation* conditions was approx 25% (both for information consistent with suggested identity and information consistent with actual identity). The one exception was recall of information consistent with actual identity by highs in the *encode after suggestion/retrieve after cancellation* condition, which was lower – inhibited – at 17% (see Figure 2). In other words, if encoding the story after the suggestion was administered and retrieving the story after it was cancelled resulted in selective or biased information processing, this bias was inhibitory rather than facilitatory.

We can explain this pattern by considering the sense of self current at encoding and at retrieval. Note first that Conway (2005; see also Conway and Pleydell-Pearce, 2000) proposed that the 'working self' recruits executive control processes to selectively facilitate memories consistent with current self and to selectively inhibit memories inconsistent with current self. With this in mind, consider the pattern of responding across our experiment in the two time (encoding and retrieval) conditions. In the *encode before suggestion/retrieve after suggestion* condition, participants encoded the story before the delusion suggestion was administered when their nondeluded self was salient (they had recently discussed with the experimenter both their own personality traits and those of

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a close friend opposite to them). Perhaps not surprisingly, they identified more often with the character consistent with their actual (nondeluded) self. These participants then recalled the story after the delusion suggestion was administered when their deluded self was salient (moments before they described their compelling experiences of altered self in response to the suggestion). In this condition, selective encoding may have lead to the 25% level of recall for information consistent with actual self and selective retrieval may have lead to the equivalent 25% level of recall for information consistent with suggested self. Thus, both biased encoding *and* biased retrieval in some combination, influenced by current self at these times, may have determined performance by this group.

In the *encode after suggestion/retrieve after cancellation* condition, participants encoded the story after the delusion suggestion was administered when their deluded self was salient. Perhaps not surprisingly, they identified more often with the character consistent with their suggested (deluded) self. Participants in this condition then recalled the story after the delusion suggestion was cancelled when their suggested (deluded) self was no longer salient. We would argue, however, that their actual (nondeluded) self was not especially salient either; participants were simply instructed to return to their 'normal' self and the hypnotist moved on to recall of the story. Thus, whereas selective encoding may have lead to the 25% level of recall for information consistent with suggested identity, the lower level of recall – 17% – for information consistent with actual identity implies that in this condition selective retrieval was less influential than selective encoding.

These findings raise interesting questions and possibilities for future research, although we acknowledge that our analysis of story information for highs in each time (encoding and retrieval) condition was post-hoc and the effect was only near significant. With Conway's theoretical perspective in mind, future work could explore in more detail and with more participants (and thus statistical power) the precise ways in which shifts in current conceptions of self influence encoding and retrieval. This experiment provides an initial test of Conway's (2005; see also Conway and Pleydell-Pearce, 2000) proposal that memories consistent with current self are facilitated and memories inconsistent with current self are inhibited. Using hypnotically elicited changes in self, future experiments could test whether certain shifts in self, such as those involved in clinical delusions, are more likely to bias information processing than others, such as everyday variations in sense of self. Researchers could also test whether certain memory contents, such as emotional or significant autobiographical memories, are more susceptible to shifts in current self and selective information processing than others, such as simple or neutral material.

Our findings confirm and extend Burn et al.'s analysis that hypnotically deluded individuals selectively focus on and encode information consistent with and in support of their delusional experience. Our results suggest that selective encoding may make this information more likely to be retrieved, especially if retrieval is driven also by the delusional experience (or deluded self). Perhaps in the same way, the beliefs of clinically deluded individuals may be supported and maintained by a similar, repetitive cycle of selective encoding and retrieval, whether of autobiographical material or other information. Such biases in memory may help to explain why delusions are so resistant to challenge. Research involving hypnotically suggested delusions can help us to explore these possibilities.

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Notes

1 There are two other possible combinations of encoding and retrieval: (1) encode before delusion suggestion/retrieve after cancellation, and (2) encode after delusion suggestion/retrieve after cancellation. We did not use these combinations because neither can match the time elapsed between story encoding and story retrieval. Further, combination (1) posits no change in self during encoding or retrieval, which was indexed in our design by the low hypnotizable control participants.

2 The 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 10-item modified SHSS:C included: hand lowering, moving hands apart, mosquito hallucination, arm rigidity, dream, age regression, arm immobilization, taste hallucination, visual hallucination and posthypnotic amnesia; anosmia to ammonia and the auditory hallucination were removed to ensure that the procedure could be conducted within the time limits of a 1 hour individual session.

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