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The false memory syndrome: Experimental studies and comparison to confabulations

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Abstract

False memories, or recollections that are factually incorrect but strongly believed, remain a source of confusion for both psychiatrists and neurologists. We propose model for false memories based on recent experimental investigations, particularly when analyzed in comparison to confabulations, which are the equivalent of false memories from neurological disease. Studies using the Deese/Roedinger–McDermott experimental paradigm indicate that false memories are associated with the need for complete and integrated memories, self-relevancy, imagination and wish fulfillment, familiarity, emotional facilitation, suggestibility, and sexual content. In comparison, confabulations are associated with the same factors except for emotional facilitation, suggestibility, and sexual content. Both false memories and confabulations have an abnormal sense of certainty for their recollections, and neuroanatomical findings implicate decreased activity in the ventromedial frontal lobe in this certainty. In summary, recent studies of false memories in comparison to confabulations support a model of false memories as internally-generated but suggestible and emotionally-facilitated fantasies or impulses, rather than repressed memories of real events. Furthermore, like confabulations, in order for false memories to occur there must be an attenuation of the normal, nonconscious, right frontal “doubt tag” regarding their certainty.

Introduction

False memories are semantic or autobiographic memories that did not occur. The existence of false memories is a challenge not only to our self-perceived ability to record truth and report it according to some objective standard, but also raises questions of nonconscious motivations. The understanding of false memories is not only important as a window to the nonconscious but can also lead to basic insights into the mechanisms of memory. In fact, a complete picture of memory is unlikely to emerge without a better understanding of the phenomenon of false memories.

For psychiatrists, the nature of false memories has remained controversial since Freud’s time. When Freud visited Charcot in 1886, Charcot had already concluded that many of his patients’ neurologically inexplicable symptoms and signs were connected to traumatic memories that were not entirely available to consciousness [1]. This view, when combined with his friend Breuer’s work with “Anna O”., would germinate in Freud’s first major publication, the “Studies in Hysteria” of 1895 [1]. In this work, he describes the almost

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uniform assertion, probably made during a state of altered consciousness if not hypnosis, of paternal incest on the part of his young female clients, all of whom disclaimed any conscious awareness of these events. Freud subsequently repudiated the notion that these events had literally occurred. He eventually concluded that the reported "seduction" was the manifestation of imagination and fantasy related to latent infantile sexuality rather than the repressed memory of an actual event.

The "recovered memory" movement that began over three decades ago assumed that the incest described by Freud's patients was real, and that this reality was falsely rejected by Freud. This paved the way for a decade of "uncovering" of memories, whose technique, particularly in children, was fraught with suggestion, and which culminated in bizarre and tragic phenomena such as the McMartin Preschool case of the late 80's in which innocent adults were falsely imprisoned on the basis of children's suggested "memories" of often lurid and theatrical sexual abuse [2]. In the wake of these events, investigators demonstrated that false or altered memories of events, even very traumatic ones, can be endorsed as "real" by otherwise normal people [3–8]. Given certain situations, normal adults have reported false memories or even provide false confessions. We now know that a spectrum of false memories is common, and investigators are beginning to define the mechanisms of false memories in normal individuals, particularly in comparison to neurological patients.

For neurologists, a potential source of understanding of false memories is confabulation from brain disease. Confabulations are false statements without a conscious effort to deceive occurring in clear consciousness in association with neurological disease [9]. They are "honest lying" as confabulators are unaware of the falsehood of their statements. The most common confabulations are provoked or momentary, simple, or minor errors in content or temporal order often elicited by questions about the past [9– 11]. Other, uncommon confabulations are spontaneous, fantastic, grandiose, bizarre, or patently impossible statements [11,12]. Neurological causes of confabulations include Wernicke–Korsakoff's syndrome, ruptured communicating artery aneurysms especially anterior, strategic diencephalic strokes, traumatic brain injury, herpes and other encephalitides, nicotinic acid deficiency, multiple sclerosis with frontal and parietal lesions, hypoxic-ischemic injury such as from attempted hanging, normal pressure hydrocephalus, and frontotemporal dementia.

Hypothesis/theory

We advance a model of characteristics and underlying mechanisms for false memories. Many recent experimental investigations of this phenomenon in normal people, along with related functional magnetic resonance imaging (fMRI) studies, are clarifying our understanding of the false memory syndrome. Because of the similarities to the neurological phenomena of confabulations, we compare and contrast the findings of these false memory studies with our current understanding of the basis of confabulations. Although the comparison is imperfect, as there can be dissociations between false memories and confabulations [13], this comparison does amplify our ability to logically infer underlying neurobiological aspects of false memories. We propose that the sum of the scientific information indicates an origin of false memories consistent with Freud's formulation as originating in internally-generated fantasies or impulses, rather than repressed memories of real events. Our model additionally requires a second step. After the false memory is generated, the subject accepts it because of an attenuation of an automatic, nonconscious sense of uncertainty, mediated by the ventromedial prefrontal cortex (VMPFC). What follows is an evaluation of this model in light of current experimental studies on false memories compared to the related neurological phenomena of confabulations.

Evaluation of evidence from false memory experiments

A broadly-accepted experimental paradigm to measure false memory did not emerge until the advent of the Deese/Roedinger– McDermott paradigm (DRM) [14]. DRM experiments demonstrate the pervasiveness of false memories both to prompting and free recall, and allow manipulation of the variables contributing to the phenomenon. In the DRM paradigm, the investigator presents a list of semantically-related items (e.g., bed, rest, pillow, night), followed, after an interval, by a previously non-presented but thematically-related "lure" item (e.g., sleep). These "lures" are often falsely endorsed, embellished, or even freely-recalled. This DRM response occurs in normal people and is influenced by many conditions, including the number of items in the list and their degree of semantic relatedness [15]; attentional distraction and forewarning of the effect [16]; the medium (verbal, visual) in which the information is presented [17]; the age and cognitive status of the subject [18], and nonconscious cognitive factors [5].

The results from recent DRM studies reveal several pertinent factors that promote false memories. We have interpreted and summarized them into seven categories. DRM responses are associated with increased: (1) Need for complete and integrated memories as reflected in an exaggerated tendency for completion or "filling-in" of incomplete memories and in the inclusion of increased and more coherent context [19–22]. (2) Imagination and fantasy-proneness, wish fulfillment, magical thinking, self-reported anomalies of experience, and vivid imagery schema [8,23– 26]. (3) Familiarity including prior exposure and incidental or indirect encoding [3,4,27–31]. (4) Self-relevance measures including autobiographical information and items related to survival [32– 34]. (5) Emotional-facilitation from events, pictures, and words in normal and stress situations [6,7,35–42]. (6) Suggestibility or the ability to plant or indoctrinate false memories, such as in false confessions or overheard rumors [43,44]. Finally, in addition to support from the DRM literature [45], there are the previously noted psychoanalytic findings showing an increased sexual content of false memories [46].

In addition to the DRM findings, there are three prominent theories of false memories that need consideration. First of all, memory is constructive in nature so that it sometimes leads to the retrieval of distorted illusory information because of abnormal or biased reconstruction [47]. Memory is recast and actively modified with every retrieval or "reconsolidation" [48], and false memories may be emotionally-facilitated by increasing the storage of "free-floating" memory fragments that are poorly located in time, space, and context. Second, the "Fuzzy-Trace" theory posits different levels of encoding including a less stable "verbatim" level with fast decay and a "gist" level with slow decay [49]. False memories may result from over-endorsement and interpretation of "gist" appropriate items on recall. Third, the Source-Monitoring Theory predicts errors according to the internal versus external source of the encoded memory [50]. Upon recall, a false expectancy of source occurs based on the usual context for that type of memory, resulting in a false source memory, e.g., of an external, versus internallygenerated, trace. There are many additional theories of false memories, but these three have support from experimental and neuroanatomical research.

FMRI studies of false memories point to prefrontal cortex, particularly ventromedial and in the right hemisphere, as involved in false memories. False recognition correlate negatively with grey matter density in prefrontal areas (Brodmann's areas 9 and 47) [51]. Although the left prefrontal cortex is involved in both true and false memories [52], the processing of false information is associated with stronger activations in the medial prefrontal cortex, an area involved in decoupling in false belief attribution [53]. False recollections result in activations mainly in the right prefrontal cortex [42], and the false recollection rate is much

higher for right hemisphere compared to left hemisphere presentations [42]. In contrast, the left prefrontal cortex is activated during pretending to know relative to correct rejection and false recognition [54]. An exception to this laterality may be age-related false memories, which have greater processing in the left ventrolateral prefrontal and superior and lateral temporal areas [18,55]. High-confidence responses for false recognition or false memories are associated with frontoparietal activity and the associated superior longitudinal fasciculus [17,52,56,57]. The right anterior hippocampus is activated during false recognition relative to correct rejection and pretending to know [54]. In contrast, the left mesial temporal lobe may contribute to true memories, but not to false memories [52,56]. Electrophysiological studies also indicate that hippocampal and associated mesial temporal lobe activity is more characteristic of true memories than false ones [58,59].

Evaluation of evidence from confabulations

Confabulations usually result from a combination of memory impairment and frontal-executive dysfunction in brain disease [13,60]. Since confabulations affect remote memory, the memory impairment must involve retrieval mechanisms and reconstructive memory processes [61]. In spontaneous confabulations, however, the memory difficulty goes beyond just a cover up of memory gaps. Moreover, since patients accept confabulations as real, the frontal-executive dysfunction must involve impairment in self-monitoring, which is usually mediated by medial and orbital frontal regions. The frontal executive dysfunction also contributes to the memory impairment dysfunction through disturbances in the organization for retrieval, temporal ordering of memories, and post-retrieval monitoring of recovered memories [10,62–64].

The results of studies on neurological patients with confabulations parallel the findings on normal subjects on the DRM protocol. We have interpreted and summarized them. Confabulations are associated with increased: (1) need for completion and integration as reflected in the occurrence of completion errors with momentary confabulations and plausible but false answers created to fill in gaps in memory or coherence [10]. (2) Vivid imagination, fantasy-proneness, wish fulfillment, embellishment, and story or myth-telling with spontaneous confabulations, which arise from internally-generated events or ideas and tend to be pleasant and self-enhancing [60,65,66]. (3) Familiarity including prior and incidental exposures is implied in much of the literature, although there is little dedicated research with confabulations [9,12,60,62]. (4) Self-relevance measures including an inability to retrieve autobiographical information systematically in spontaneous confabulations [60,67]. Confabulation serve important functions of self-coherence (coherent self-narrative), self-monitoring(oneself in relation to the world), or self-enhancement [67]. In contrast to false memories, there is little or no information supporting emotion-facilitation, suggestibility, or a sexual theme in confabulations.

In addition to these characteristics, there are three prominent theories of confabulations that further clarify these findings. First of all, confabulations may result from inability to suppress irrelevant memory traces or to keep from “uploading” anticipated memories [68]. They fail in the extinction of previously appropriate anticipations [11], probably resulting in confusion of untrue memories with true memories [12]. Second, confabulations, like false memories, may be due to source monitoring deficits in context, reality, or time leading to inability to correctly bind memory traces and the incorrect mixing of unrelated memory traces [50]. Source monitoring deficits impair the ability to distinguish real memories from internally-generated thoughts or imaged events with a tendency to identify imagined events as externally driven [10,60]. Third, confabulations may result from deficient strategic retrieval or deficits in the control of memory retrieval [64,69]. In addition to the retrieval of incorrect “memories”, there is a disordered ability to accurately evaluate the retrieved

memories which involves an intuitive, fast, automatic “feeling of rightness”, followed, if necessary, by a conscious, slow, effortful checking process [10,61,70]. In confabulation, there may be an abnormal feeling of rightness, or the absence of a “doubt tag” [70], resulting in an incorrect certainty or conviction and failure to subsequently perform a conscious checking process for the veracity of the confabulation [61,63,70].

Similar to false memories, neuroanatomical studies of confabulation have pointed to prefrontal regions of involvement. These studies have shown orbital and medial frontal cortical disease [71–73]. VMPFC lesions result in disturbed source monitoring with temporal context and content confusions [72]. The VMPFC is particularly involved in the retrieval and production of a narrative and in the feeling of rightness [64]. Failure of orbitofrontal cortex (OFC) mechanisms may additionally result in an inability to suppress the interference of memories that do not pertain to ongoing reality [74]. Spontaneous confabulations may require damage to both the VMPFC and OFC with a faulty doubt tag and disinhibition [10]. Other work has shown that the right ventromedial/orbitofrontal area adds an emotional tag to experience and monitors the appropriateness of decisions [75], whereas, work with split-brain patients has shown that the left hemisphere engages in “storytelling” [76].

Consequences and discussion

Recent interest in false memory, which began in neurology and detoured for many years into psychiatry, has lead to studies that can clarify their underlying characteristics, particularly in comparison to confabulations. The DRM model provides a testable paradigm for examining what we now recognize to be a normal degree of false memory creation in normal adults as well as children. The spontaneous generation and embellishment of false responses in the DRM protocol, coupled with the confabulations or the neurological equivalent of false memories, illuminate processes that are unique to false memories. These include emotional facilitation, suggestibility, and sexual content. Similar to confabulations, there is probable attenuation of a right VMPFC doubt tag. Several theories of false memories and confabulations have some validity and cannot be discounted, including impaired reconsolidation of memories, the Fuzzy-Trace focus on the “gist” with dilapidation of the details, source monitoring deficits, failure to suppress irrelevant memory traces, and problems with strategic retrieval.

There are significant similarities between false memories and confabulations. Both false memories and confabulations are facilitated by the need for integrated and complete memories, the familiarity of the material, and the presence of self-relevant or autobiographical content. False memories and spontaneous confabulations tend to have content that is influenced by imagination and fantastic thinking with elaborative characteristics and fanciful personal narratives [12]. The neuroanatomical information regarding false memories and confabulations points to dysfunction in the VMPFC. Other information and lesions implicate the right frontal lobe more than the left in this process [76].

There are significant differences between false memories and confabulations. Emotional-facilitation is prominent in false memories but not confabulations. Emotions may overwhelm or supersede the feelings of uncertainty, or doubt tag, for an incorrect memory. Suggestibility appears to be another factor in false memories but not in confabulations. This could be a factor for confabulations as well, but may not be evident because of the presence of memory impairment. More difficult to explain is the reason why false memories, as opposed to confabulations, tend to drift to sexual themes. Wishful ideations are powerful generators of positive biases in the content of confabulations, but they are usually not

associated with lurid sexual content. Freud was in the end struck by the monotonous and stereotyped quality of the sexual content. Moreover, a phenomenon, such as Facilitated Communication where communication in an impaired person may be suggested by subliminal cues from the facilitator [77], has resulted in very similar sexual content. From these observations, it appears that sexual material spontaneously emerges from the nonconscious of normal adults without their knowledge. We must conclude that there is at least some evidence to suggest a broad tendency towards sexuality in the creation of false memories.

The very notion of false memory stands as a challenge to our self-image as rational, veridical reporters of actual events, as human tape recorders or cameras. Add to this the further possibility that what we remember may be emotionally-facilitated or a product not only of suggestion but even of fantasy – fantasy of the most inadmissible sort, unavailable to consciousness – and it is little wonder that the main currents of memory research have until fairly recently passed it by as something dark. Insights from DRM studies and confabulations in brain disease may be the key to a better understanding of false memories. In turn, such understanding is bound to yield further insights into memory in general. There are potential clinical and legal implications of this model of false memories as well. Finally, there are many implications of this model of false memories for future research including the testing of fantastic thinking and imagination, implanted imaginings as sources of false memory, and the manipulation of the feelings of uncertainty, or doubt tag, during DRM experiments.

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References

1. Breuer, J.; Freud, S.; Brill, AA. Nervous and Mental Disease Monograph Series. Birmingham, Ala: Classics of Psychiatry & Behavioral Sciences Library; 1990. Studies in Hysteria. Special ed
2. Showalter, E. Hystories: Hysterical Epidemics and Modern Culture. New York: Columbia University Press; 1997.
3. Brown AS, Marsh EJ. Evoking false beliefs about autobiographical experience. Psychon Bull Rev. 2008; 15:186–90. [PubMed: 18605501]
4. Chrobak QM, Zaragoza MS. Inventing stories: forcing witnesses to fabricate entire fictitious events leads to freely reported false memories. Psychon Bull Rev. 2008; 15:1190–5. [PubMed: 19001589]
5. Cotel SC, Gallo DA, Seamon JG. Evidence that nonconscious processes are sufficient to produce false memories. Conscious Cogn. 2008; 17:210–8. [PubMed: 17368912]
6. Meyersburg CA, Bogdan R, Gallo DA, McNally RJ. False memory propensity in people reporting recovered memories of past lives. J Abnorm Psychol. 2009; 118:399–404. [PubMed: 19413413]
7. Porter S, Taylor K, Ten Brinke L. Memory for media: investigation of false memories for negatively and positively charged public events. Memory. 2008; 16:658–66. [PubMed: 18569691]
8. Seamon JG, Blumenson CN, Karp SR, Perl JJ, Rindlaub LA, Speisman BB. Did we see someone shake hands with a fire hydrant? collaborative recall affects false recollections from a campus walk. Am J Psychol. 2009; 122:235–47. [PubMed: 19507429]
9. Berlyne N. Confabulation. Br J Psychiatr. 1972; 120:31–9.
10. Kopelman MD. Varieties of confabulation and delusion. Cogn Neuropsychiatry. 2010; 15:14–37. [PubMed: 19753493]
11. Nahum L, Ptak R, Leemann B, Schnider A. Disorientation, confabulation, and extinction capacity: clues on how the brain creates reality. Biol Psychiatry. 2009; 65:966–72. [PubMed: 19217613]
12. Glowinski R, Payman V, Frencham K. Confabulation: a spontaneous and fantastic review. Aust N Z J Psychiatry. 2008; 42:932–40. [PubMed: 18941957]

13. Kessels RP, Kortrijk HE, Wester AJ, Nys GM. Confabulation behavior and false memories in Korsakoff's syndrome: role of source memory and executive functioning. Psychiatry Clin Neurosci. 2008; 62:220–5. [PubMed: 18412846]
14. Roediger HL III, McDermott KB. Creating false memories: remembering words not presented in lists. J Exp Psychol Learn Mem Cogn. 1995; 21:803–14.
15. Brueckner K, Moritz S. Emotional valence and semantic relatedness differentially influence false recognition in mild cognitive impairment, Alzheimer's disease, and healthy elderly. J Int Neuropsychol Soc. 2009; 15:268–76. [PubMed: 19203441]
16. Peters MJ, Jelicic M, Gorski B, Sijstermans K, Giesbrecht T, Merckelbach H. The corrective effects of warning on false memories in the DRM paradigm are limited to full attention conditions. Acta Psychol (Amst). 2008; 129:308–14. [PubMed: 18804192]
17. Drowos DB, Berryhill M, André JM, Olson IR. True memory, false memory, and subjective recollection deficits after focal parietal lobe lesions. Neuropsychology. 2010; 24:465–75. [PubMed: 20604621]
18. Dennis NA, Kim H, Cabeza R. Age-related differences in brain activity during true and false memory retrieval. J Cogn Neurosci. 2008; 20:1390–402. [PubMed: 18303982]
19. Aminoff E, Schacter DL, Bar M. The cortical underpinnings of context-based memory distortion. J Cogn Neurosci. 2008; 20:2226–37. [PubMed: 18457503]
20. Foley MA, Foley HJ, Scheye R, Bonacci AM. Remembering more than meets the eye: a study of memory confusions about incomplete visual information. Memory. 2007; 15:616–33. [PubMed: 17654277]
21. McCabe DP, Geraci L. The role of extralist associations in false remembering: a source misattribution account. Mem Cognit. 2009; 37:130–42.
22. Pérez-Mata N, Diges M. False recollections and the congruence of suggested information. Memory. 2007; 15:701–17. [PubMed: 17891682]
23. Corlett PR, Simons JS, Pigott JS, Gardner JM, Murray GK, Krystal JH, et al. Illusions and delusions: relating experimentally-induced false memories to anomalous experiences and ideas. Front Behav Neurosci. 2009; 3(1–9):53. [PubMed: 19956402]
24. Foley MA, Foy J. Pictorial encoding effects and memory confusions in the Deese-Roediger–McDermott paradigm: evidence for the activation of spontaneous imagery. Memory. 2008; 16:712–27. [PubMed: 18720219]
25. Nash RA, Wade KA, Lindsay DS. Digitally manipulating memory: effects of doctored videos and imagination in distorting beliefs and memories. Mem Cogn. 2009; 37:414–24.
26. Sjödén B, Granhag PA, Ost J, Roos Af Hjelmsäter E. Is the truth in the details? Extended narratives help distinguishing false "memories" from false "reports". Scand J Psychol. 2009; 50:203–10. [PubMed: 19000104]
27. Brainerd CJ, Yang Y, Reyna VF, Howe ML, Mills BA. Semantic processing in "associative" false memory. Psychon Bull Rev. 2008; 15:1035–53. [PubMed: 19001566]
28. Hirano T, Ukita J, Kashu K. Effects of conceptually based familiarity in memory conjunction errors. Psychon Bull Rev. 2008; 135:205–19.
29. Ost J, Granhag PA, Udell J, Roos af Hjelmsäter E. Familiarity breeds distortion: the effects of media exposure on false reports concerning media coverage of the terrorist attacks in London on 7 July 2005. Memory. 2008; 16:76–85. [PubMed: 18158688]
30. Senese VP, Sergi I, Iachini T. Comparison of activation level between true and false items in the DRM paradigm. Cogn Process. 2009; 11:213–7. [PubMed: 19609786]
31. Sharman SJ, Calacouris S. Do people's motives influence their susceptibility to imagination inflation? Exp Psychol. 2010; 57:77–82. [PubMed: 20178966]
32. Desjardins T, Scoboria A. "You and your best friend Suzy put slime in Ms. Smollett's desk": producing false memories with self-relevant details. Psychon Bull Rev. 2007; 14:1090–5. [PubMed: 18229480]
33. Howe ML, Derbish MH. On the susceptibility of adaptive memory to false memory illusions. Cognition. 2010; 115:252–67. [PubMed: 20096406]
34. Otgaar H, Smeets T. Adaptive memory: survival processing increases both true and false memory in adults and children. J Exp Psychol Learn Mem Cogn. 2010; 36:1010–6. [PubMed: 20565216]

35. Bauer LM, Olheiser EL, Altarriba J, Landi N. Word type effects in false recall: concrete, abstract, and emotion word critical lures. Am J Psychol. 2009; 122:469–81. [PubMed: 20066926]
36. Brainerd CJ, Stein LM, Silveira RA, Rohenkohl G, Reyna VF. How does negative emotion cause false memories? Psychol Sci. 2008; 19:919–25. [PubMed: 18947358]
37. Brennen T, Dybdahl R, Kapidzić A. Trauma-related and neutral false memories in war-induced Posttraumatic Stress Disorder. Conscious Cogn. 2007; 16:877–85. [PubMed: 16901721]
38. El Sharkawy J, Groth K, Vetter C, Beraldi A, Fast K. False memories of emotional and neutral words. Behav Neurol. 2008; 19:7–11. [PubMed: 18413909]
39. Gallo DA, Foster KT, Johnson EL. Elevated false recollection of emotional pictures in young and older adults. Psychol Aging. 2009; 24:981–8. [PubMed: 20025411]
40. Howe ML. Children's emotional false memories. Psychol Sci. 2007; 18:856–60. [PubMed: 17894601]
41. Laney C, Loftus EF. Emotional content of true and false memories. Memory. 2008; 16:500–16. [PubMed: 18569679]
42. Marchewka A, Brechmann A, Nowicka A, Jednoróg K, Scheich H, Grabowska A. False recognition of emotional stimuli is lateralised in the brain: an fMRI study. Neurobiol Learn Mem. 2008; 90:280–4. [PubMed: 18329298]
43. Plancher G, Nicolas S, Piolino P. Influence of suggestion in the DRM paradigm: what state of consciousness is associated with false memory? Conscious Cogn. 2008; 17:1114–22. [PubMed: 18835190]
44. Principe GF, Haines B, Adkins A, Guiliano S. False rumors and true belief: memory processes underlying children's errant reports of rumored events. J Exp Child Psychol. 2010; 107:407–22. [PubMed: 20630537]
45. Geraerts E, Smeets E, Jelicic M, van Heerden J, Merckelbach H. Fantasy proneness, but not self-reported trauma is related to DRM performance of women reporting recovered memories of childhood sexual abuse. Conscious Cogn. 2005; 14:602–12. [PubMed: 16091273]
46. Gardner RA. The psychodynamics of patients with false memory syndrome (FMS). J Am Acad Psychoanal Dyn Psychiatry. 2004; 32:77–90. [PubMed: 15132191]
47. Rosenbaum RS, Gilboa A, Levine B, Winocur G, Moscovitch M. Amnesia as an impairment of detail generation and binding: evidence from personal, fictional, and semantic narratives in K. C Neuropsychologia. 2009; 47:2181–7.
48. Nader K, Einarsson EO. Memory reconsolidation: an update. Ann N Y Acad Sci. 2010; 1191:27–41. [PubMed: 20392274]
49. Reyna VF, Brainerd CJ. Fuzzy-trace theory and false memory: new frontiers. J Exp Child Psychol. 1998; 71:194–209. [PubMed: 9843625]
50. Johnson MK, Hashtroudi S, Lindsay DS. Source monitoring. Psychol Bull. 1993; 114:3–28. [PubMed: 8346328]
51. Marchewka A, Jednoróg K, Nowicka A, Brechmann A, Grabowska A. Grey-matter differences related to true and false recognition of emotionally charged stimuli – a voxel based morphometry study. Neurobiol Learn Mem. 2009; 92:99–105. [PubMed: 19292997]
52. Kim H, Cabeza R. Differential contributions of prefrontal, medial temporal, and sensory-perceptual regions to true and false memory formation. Cereb Cortex. 2007; 17:2143–50. [PubMed: 17110592]
53. Abraham A, Rakoczy H, Werning M, von Cramon DY, Schubotz RI. Matching mind to world and vice versa: functional dissociations between belief and desire mental state processing. Soc Neurosci. 2010; 5:1–18. [PubMed: 19670085]
54. Abe N, Okuda J, Suzuki M, et al. Neural correlates of true memory, false memory, and deception. Cereb Cortex. 2008; 18:2811–9. [PubMed: 18372290]
55. Paz-Alonso PM, Ghetti S, Donohue SE, Goodman GS, Bunge SA. Neurodevelopmental correlates of true and false recognition. Cereb Cortex. 2008; 18:2208–16. [PubMed: 18203693]
56. Kim H, Cabeza R. Trusting our memories: dissociating the neural correlates of confidence in veridical versus illusory memories. J Neurosci. 2007; 27:12190–7. [PubMed: 17989285] Mendez MF, Fras IA. Medical Hypotheses. 2011; 76:492–496. 495. [PubMed: 21177042]

57. Fuentemilla L, Càmara E, Münte TF, et al. Individual differences in true and false memory retrieval are related to white matter brain microstructure. J Neurosci. 2009; 29:8698–703. [PubMed: 19587276]
58. Boggio PS, Fregni F, Valasek C, et al. Temporal lobe cortical electrical stimulation during the encoding, retrieval phase reduces false memories. PLoS One. 2009; 4:e4959. [PubMed: 19319182]
59. Sederberg PB, Schulze-Bonhage A, Madsen JR, et al. Gamma oscillations distinguish true from false memories. Psychol Sci. 2007; 18:927–32. [PubMed: 17958703]
60. Johnson MK, O'Connor M, Cantor J. Confabulation, memory deficits, and frontal dysfunction. Brain Cogn. 1997; 34:189–206. [PubMed: 9220085]
61. Gilboa A, Alain C, Stuss DT, Melo B, Miller S, Moscovitch M. Mechanisms of spontaneous confabulations: a strategic retrieval account. Brain. 2006; 129(Pt 6):1399–414. [PubMed: 16638795]
62. Burgess PW, Shallice T. Confabulation and the control of recollection. Memory. 1996; 4:359–411. [PubMed: 8817460]
63. Hirstein, W. Brain Fiction, Self-Deception and the Riddle of Confabulation. Cambridge MA: MIT Press; 2005.
64. Moscovitch M, Melo B. Strategic retrieval and the frontal lobes: evidence from confabulation and amnesia. Neuropsychologia. 1997; 35:1017–34. [PubMed: 9226662]
65. Fotopoulou A, Conway MA, Tyrer S, Birchall D, Griffiths P, Solms M. Is the content of confabulation positive? an experimental study. Cortex. 2008; 44:764–72. [PubMed: 18489957]
66. Kremen SA, Solis O, Shapira JS, Vinters HV, Mendez MF. Fantastic thinking in pathologically proven Pick's disease. Cogn Behav Neurol. 2010; 23:130–4. [PubMed: 20535063]
67. Fotopoulou A. False selves in neuropsychological rehabilitation: the challenge of confabulation. Neuropsychol Rehabil. 2008; 18:541–65. [PubMed: 18609017]
68. Schnider A, Ptak R. Spontaneous confabulators fail to suppress currently irrelevant memory traces. Nature Neurosci. 1999; 2:677–81. [PubMed: 10404203]
69. Van Damme I, d'Ydewalle G. Memory loss versus memory distortion: the role of encoding and retrieval deficits in Korsakoff patients' false memories. Memory. 2009; 17:349–66. [PubMed: 19255908]
70. Turner M, Coltheart M. Confabulation and delusion: a common monitoring framework. Cogn Neuropsychiatry. 2010; 15:346–76. [PubMed: 20043250]
71. Benson DF, Djenderedjian A, Miller BL, et al. Neural basis of confabulation. Neurology. 1996; 46:1239–43. [PubMed: 8628459]
72. Gilboa A, Alain C, He Y, Stuss DT, Moscovitch M. Ventromedial prefrontal cortex lesions produce early functional alterations during remote memory retrieval. J Neurosci. 2009; 29:4871–81. [PubMed: 19369555]
73. Turner MS, Cipolotti L, Yousry TA, Shallice T. Confabulation: damage to a specific inferior medial prefrontal system. Cortex. 2008; 44:637–48. [PubMed: 18472034]
74. Schnider A, von Däniken C, Gutbrod K. The mechanisms of spontaneous and provoked confabulations. Brain. 1999:1365–75.
75. Mendez MF. What frontotemporal dementia reveals about the neurobiological basis of morality. Med Hypotheses. 2006; 67:411–8. [PubMed: 16540253]
76. Devinsky O. Delusional misidentifications and duplications: right brain lesions, left brain delusions. Neurology. 2009; 72:80–7. [PubMed: 19122035]
77. Mostert MP. Facilitated communication since 1995: a review of published studies. J Autism Dev Disord. 2001; 31:287–313. [PubMed: 11518483]