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Psychological factors in retrograde amnesia:  
Self-deception and a broken heart

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Shortened title: PSYCHOLOGICAL FACTORS IN RETROGRADE AMNESIA

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Abstract

We explored potential contributing psychological factors in a patient (‘XF’) with focal retrograde amnesia, within the framework proposed by Kopelman (2000). In particular, we investigated the psychological trait of self-enhancement. We constructed a self-report questionnaire measure of self-enhancement and compared XF’s score on this measure with the scores of 61 control participants. XF was found to have a significantly greater level of self-enhancement than the entire control group, and also than a smaller sample of age- and sex-matched controls. We propose that heightened self-enhancement may reflect a premorbid tendency that potentially predisposes individuals to develop retrograde amnesia.

Key words not in title: self-enhancement, positive illusions, self-report measures.
Introduction

Focal retrograde amnesia is an intriguing condition that has received considerable attention in the recent literature (see Cortex 2002 Volume 38, and reviews by Kapur, 2000; Kopelman, 2000). It is characterised by impaired retrograde memory, or inability to retrieve remote information, including autobiographical, semantic and in some cases procedural memories, in contrast with relatively well-preserved anterograde memory, or ability to learn and retrieve new information. The aetiology of this condition is a topic of great controversy that raises questions about the long-held organic versus psychogenic distinction.

In many reported cases of focal retrograde amnesia, the aetiology is unclear (see Kopelman, 2000 for a review of cases), and several authors have proposed that the organic/psychogenic dichotomy fails to provide for the common coexistence and potential aetiological contribution of both organic and psychological factors (Hodges, 2002; Kopelman, 2000; Markowitsch, 2002). In an attempt to address this concern, Markowitsch et al. (1999, p.227) proposed the term ‘mnestic block syndrome’ as a label that acts as “a bridge between the former division into ‘organic’ and ‘psychogenic’ caused memory disorders”. Defined as a ‘blockage’ of autobiographical memory processing, it is speculated that this syndrome is underpinned by biochemical brain processes, specifically the excessive and prolonged release of stress hormones such as glucocorticoids that bind to receptors found in memory- and affect-related mesial temporal regions. Markowitsch and colleagues (e.g. Markowitsch, 2003; Markowitsch et al., 2000) have found altered brain metabolism in memory processing regions,
specifically hypometabolism in the right frontotemporal region in a number of patients with ‘psychogenic’ or ‘functional’ amnesias. This has led to the notion that organic and functional/psychogenic amnesia are ‘two sides of the same coin’, both arising from a common brain mechanism. The precipitant of this syndrome is argued to be extreme stress against a background of traumatic conditions in early childhood (Markowitsch, 2003).

A number of studies have documented psychological factors associated with focal retrograde amnesia (e.g. Fujiwara et al., 2008; Kritchevsky, Chang, & Squire, 2004). Some studies have included an assessment of psychiatric and personality factors using scales such as the Minnesota Multi-Phasic Personality Inventory (MMPI) (e.g. Kritchevsky, Chang, & Squire, 2004; Markowitsch, 1999), the Symptom Checklist-90-Revised (SCL-90-R) and the Freiburg Personality Inventory-Revised (FPI-R) (Fujiwara et al., 2008), or psychodynamic tests such as the Rorschach and Blacky (Barbarotto, Laiacina, & Cocchini, 1996; Serra, Fadda, Buccione, Caltagirone, & Carlesimo, 2007) and/or clinical interviews (e.g. Lucchelli & Spinnler, 2002; Papagno, 1998). MMPI results have typically showed abnormal scores on the hypochondriasis, schizophrenia and depression scales (Kritchevsky, Chang, & Squire, 2004; Markowitsch et al., 1999), and psychodynamic tests have suggested histrionic personality traits (Barbarotto, Laiacina, & Cocchini, 1996; Serra, Fadda, Buccione, Caltagirone, & Carlesimo, 2007). Clinical interviews have revealed either no abnormalities (Case 1 & 3 Lucchelli & Spinnler, 2002), psychosocial stressors such as relationship break-ups (e.g. Kapur, Ellison, Smith, McLellan, & Burrows, 1992; Papagno, 1998) or financial problems (e.g. Case 2...
Kopelman, Green, Guinan, Lewis, & Stanhope, 1994; Lucchelli & Spinnler, 2002), and/or premorbid psychiatric conditions such as depression or post traumatic stress disorder (Cases 1 and 5 Fujiwara et al., 2008; all 10 patients Kritchevsky, Chang, & Squire, 2004; e.g. Case 2 Lucchelli & Spinnler, 2002). Despite the observation that the majority of patients with focal retrograde amnesia reported in the literature have premorbid psychosocial stressors or psychiatric conditions, the nature of these potentially precipitating factors is not well understood.

In the psychiatric literature, some studies have investigated personality factors associated with dissociative conditions. For example, Simeon et al. (2002) used questionnaires to examine temperamental, psychodynamic and cognitive schemata factors associated with dissociation in patients with DSM-IV defined depersonalisation disorder. They found that harm avoidant temperament, immature defences, overconnection and disconnection cognitive schemata were significantly correlated with dissociation scores on the Dissociative Experiences Scale, and concluded that these personality factors may predispose the manifestation of dissociative symptoms. There have been some interesting observations from the results of personality inventories in patients with focal retrograde amnesia. For example, Fujiwara et al. (2008) found that four of their five patients had abnormal scores on the openness dimension of the Freiburg Personality Inventory-Revised, a validity scale indicating socially desirable behaviour. The authors commented that this may reflect the patients’ reaction to their memory impairment. An alternative possibility is that this reflects a premorbid personality trait that may predispose individuals to focal retrograde amnesia.
Kopelman (2000) has emphasised the need for more detailed reporting of psychological factors in patients with focal retrograde amnesia and has noted that many published cases on this topic have failed to adequately explore psychosocial contexts. He has proposed a model of “social factors and brain systems influencing autobiographical memory retrieval and personal identity”, which postulates that severe stress affects frontal/executive systems that inhibit the retrieval of autobiographical and episodic memories. This inhibition is predisposed and/or exacerbated by a past learning experience of transient amnesia, extreme arousal or depression. Anterograde learning and ‘new’ episodic memory retrieval remains intact due to the preservation of the medial temporal/diencephalic system. Four areas of ‘severe precipitating stress’ are identified, namely marital, employment, financial and offence (Kopelman, 2000, p.608). The specific nature of these stressors required to elicit an amnesic reaction, however, has not been characterised. Kopelman’s model also includes ‘personal semantic belief system’, comprising self and identity, in addition to the contribution of temporal and frontal executive brain systems.

Other authors have argued that such ‘psychogenic triggers’ are not relevant to the aetiology of focal retrograde amnesia (De Renzi, 2002; Lucchelli & Spinnler, 2002). In support of this notion there is the observation that despite the frequency and heterogeneity of psychosocial stressors in everyday life, focal retrograde amnesia is a rare but stereotyped syndrome (Lucchelli & Spinnler, 2002). Furthermore, De Renzi (2002) notes that the supposed precipitating event in many cases is a longstanding stressful
condition to which the individual has adapted, and he questions how this can precipitate a sudden and complete loss of past memories. He argues that the mere finding of a cerebral lesion is not sufficient for attributing aetiological significance to that lesion unless the features of the symptom in question are congruous with the location of the lesion. Thus, “why should we accept that the mere finding of a state of psychic discomfort, no matter what its nature, intensity and length, should be responsible for the sudden loss of past memories?” (De Renzi, 2002, p.680).

If focal retrograde amnesia partly constitutes a kind of defensive retreat from psychosocial stress, one must account for why it is that so few individuals seek this refuge. One possibility is that patients with this condition are premorbidly extreme on a continuum of self-deception – i.e. premorbidly predisposed to engage in the kind of defensive psychological manoeuvring that strategic forgetting involves. For the onset of such psychogenic retrograde amnesia to occur, therefore, an individual would not only need to be experiencing significant psychosocial stress, but would need to be predisposed toward self-protective psychological manoeuvres. This is a possibility that we investigate in the present study.

We describe a patient with focal retrograde amnesia and explore the potential psychological factors contributing to this condition. In particular, we investigate the psychological trait of ‘self deception’, which we operationalise as a tendency to make unrealistically positive self-evaluations, or to self-enhance (Paulhus, Harms, Bruce, & Lysy, 2003). We construct a self-report questionnaire measure of self-enhancement for
this purpose – specifically a measure of positive illusions (Taylor, 1989; Taylor & Brown, 1988).

**Patient “XF”**

Patient “XF” is a 25-year-old male who was seen for neuropsychological assessment over two days in September 2006 at the Neuropsychiatry service of James Fletcher Hospital, Newcastle, Australia. XF provided informed consent to participate in the study.

**Background**

The onset of XF’s retrograde amnesia was 8 months prior to assessment. On a Friday night he had returned to his parent’s house (where he was living at the time) after socialising at the pub where he worked. He was taken home by a friend who thought he was drunk. He told his mother he had “lost time”, and complained of headache. According to his mother he was otherwise fine and slept for most of the weekend. On Monday he phoned the ambulance when his parents were at work. He told the phone operator “I’m in trouble, I need help. I don’t know who I am or where I am”. He was asked to read out the address on any mail he could find, and he gave his parents’ address. He did not recognise their names or the address. The ambulance report noted that on their arrival XF was conscious and sitting in an armchair. He complained of pain in the occipital region of head and posterior neck. He said he had woken on the bathroom floor and could not remember how he got there and had then phoned the ambulance. He could not recall his name, address, date of birth or family situation. Glasgow Coma Score was 14/15, with one point lost for orientation.
On admission to the emergency department at the local hospital it was noted that XF had initial bilateral limb weakness. There were no focal neurological signs. He denied substance use, apart from some social drinking. He failed to recognise his parents, brother and friends on their arrival. He did not know how to use his mobile phone. Nursing staff noted that he was sleeping excessively and was flat in his affect. He was evasive when questioned about his mood. His response to most questions was “I can’t remember”.

XF was transferred to the Brain Injury Unit after nine days on the ward. He frequently complained of headache that was not relieved by pain medications. The occupational therapist noted that he required assistance in identifying kitchen items such as a saucepan and chopping board during meal preparation. He did not know how to use a microwave. He was, however, able to play a card game in the evening that a nurse had taught him during the day, and was able to recall staff names and verbal information. XF was oriented within the unit. On his first visit home he asked to go back ‘home’ (to the hospital) after half an hour as he felt uncomfortable. He told staff that he was uncomfortable kissing and hugging family members. Over the duration of his stay his mood improved and he was seen laughing with friends and family. He was discharged home after 11 days.

**Investigations**

A CT brain scan at the time of presentation was normal, with an incidental finding of cysts on the anterior and medial walls of right maxillary atrium. An MRI brain scan and
EEG investigation were also normal. A SPECT scan performed 8 months after onset of his retrograde amnesia showed mild diffuse hypoperfusion in the left cerebral hemisphere, most pronounced in the parietal lobe.

**Past medical history**

XF had recurrent otitis media as a young child with removal of grommets at two years of age. Five years prior to retrograde amnesia onset he was mugged and hit on the head with a brief loss of consciousness but there were no cognitive sequelae subsequent to this. Four years prior to the onset he fell down some stairs. He had a brief loss of consciousness, and on waking did not recognise his fiancée at the time (see marital/relationship section under ‘potential stressors’ below). This occurred on the weekend that they had announced their engagement. When his brother arrived XF recognised him but commented that he looked older. XF claimed that he (XF) was 16 years old (he was actually 20 at the time). His ‘fiancée specific’ amnesia was transient and resolved after one hour.

Eight months prior to the onset of his current retrograde amnesia XF suddenly collapsed in a car park. His mother was with him and reported that he had flu-like symptoms at the time. He had a brief loss of consciousness. On waking he was twitchy, drowsy and very pale. He had left sided upper and lower limb weakness, which resolved after 40 minutes. Three months prior to onset he was punched in the head by a group of boys after retrieving a bottle that had been stolen by one of the boys from the bottle shop where he worked. He did not lose consciousness but vomited once and had a headache.
Social, educational and occupational history

At the time of assessment XF was living with his parents. His mother reported that they are a close family who are open and affectionate with one another. His mother denied any significant or traumatic childhood events with the exception of XF being very upset that he was unable to say goodbye to his grandfather who died when XF was 18 years old.

XF completed four years of secondary school and described himself as an average student. He denied any learning difficulties and did not repeat any grades. He began a locksmith apprenticeship with his uncle, but did not enjoy this so left to undertake bar work. At the time of onset he was working as a bar manager at a local pub and studying business part time. According to his mother his studies were progressing well. At the time of the assessment XF was employed full time as a car detailer at a car sales yard. His duties include cleaning sales cars, and adding details such as roof racks.

Potential stressors according to the model outlined by Kopelman (2000).

Marital/relationship

XF’s mother reported that his fiancée broke off their engagement two years prior to the onset of his retrograde amnesia and that he was ‘devastated’ at the time. He subsequently had difficulty sleeping and was frequently tearful for six months. XF’s mother was not aware of him having any significant relationships since then, with the exception of a few brief ‘flings’. After his admission to hospital, however, XF’s mother searched through
his bags and found a diamond ring. She tracked it to a local jewellery shop and discovered that it was purchased just before Valentines Day (3 weeks prior to onset), and that he had told the jeweller it was a Valentines Day gift. XF denied any knowledge of the ring and it remains unknown who the intended recipient was. None of his friends were aware of the ring or of any current girlfriend. The ring was subsequently returned and XF was reimbursed.

Financial

XF moved in with his parents three months prior to onset due to his work hours being decreased to only one night per week and consequent financial stress.

Employment

XF experienced some stress associated with the decline in the number of shifts he was allocated at his work, and had intended to search for alternative work at the time of onset.

On the Friday night prior to the onset of retrograde amnesia, XF was socialising at the pub where he worked and called his father to say that he had won a cheque in a promotional competition but “there may be problems later”. He asked whether his father could come by later if needed, which he agreed to do, but XF did not call again. His parents were unsure of the nature of the potential ‘problems’.

Offence

XF and his mother denied any forensic history.
**Presentation**

XF presented as a slightly overweight young man who was confident and witty. He appeared somewhat indifferent to his memory loss, saying he had “learnt to live with it and accept it”. Friends had told him about a documentary of a similar case, but he was not interested in seeing it, and commented, “it could be a completely different situation to mine. Everyone is looking for answers but I just think if [my memory] is going to come back it will. I just take it day to day.” He claimed that he would like to get his memory back if he could, and said, “I know that there’s been some bad times but I still want to remember”.

XF said that the main disadvantage of his memory loss was the difficulty in meeting apparent strangers who claimed to know him. He said, “it’s strange to think they know more about me than I do. It’s hard to only be able to say stuff that I’ve learnt about myself.” At initial assessment XF claimed to dislike talking about his condition, as it is “such a big story”. He commented at this time that friends had encouraged him to sell his story to the media but he was not interested: “I don’t want my life under a microscope”. On review two months later, however, XF had recorded a story for a local current affairs television program. He denied contacting the program and was vague about how they had heard of his story; he claimed that they must have seen his comments in an ‘internet chatroom’. XF said that appearing on the program was “a way for people he had not spoken to for a while to see his story”. He had not told his work mates as he did not want to be treated differently, and felt that his appearance on the program “got it out in the
open”. XF claimed that he was not given any financial incentive for the interview. He was irritated that the reporter had asked his family and friends if they thought he was lying, and was upset by their question “what have you got to gain?” He said he did not want to be thought of as a liar.

When questioned about any changes in personality XF said he had been told he was now more adventurous with food and that his music tastes had changed. He had previously loved to sing karaoke and performed at his 21st birthday party, but now felt that he “would have to be very drunk to do it”. Interestingly, on review two months after his initial assessment he had returned to karaoke singing and recently competed in the grand final for his local area. He had 'relearned' the songs he had sung at his 21st birthday party for this event. He said, “I’m still a smart ass and am happy to make people laugh. Humour seems to work”. He described feeling like a “different person” and commented, “I’m 25 years old but experiencing everything for the first time”.

**Self report of memory function**

XF described impaired anterograde memory function for the initial three months after the onset of his retrograde amnesia (but note the nursing reports in ‘Background’ section above). He said his ‘first [new] memory’ after the onset was shaving his beard off and listening to music CDs in preparation to go to a music concert with his brother, approximately three months after onset. Since then he described normal anterograde memory. XF watches television programs such as ’50 years of television’ to learn about past events, and commented that this “is usually the reason that I know things”. In regard
to procedural memory, XF commented that he had no difficulty driving or swimming, but that playing baseball was a ‘whole new experience’ and he had had to relearn all the rules, despite having played the game for 10 years.

On review two months after the initial assessment XF reported no change in memory function. He remained somewhat indifferent, but commented “it would be nice to know things myself rather than friends telling me”. He denied any depressive and anxiety symptoms. He was focused on saving for an overseas trip. His mother denied any significant mood symptoms, but noted that he became irritable if things were not going his way. She said he is a “25 year old but has the mind of a child. He just wants to have fun all the time, and tires very easily”. She felt that he was more affectionate and loving towards her since immediately after the onset of amnesia. Interestingly, while interviewing his mother alone, XF became very irritable in the waiting room and called her on her mobile phone to say that he was tired of waiting and wanted to leave. His mother appeared very anxious and eager to please him and the interview was discontinued.

**Neuropsychological assessment results**

The results of XF’s neuropsychological assessment are displayed in TABLES 1 and 2. With the exception of impaired autobiographical memory function as assessed by the Autobiographical Memory Interview (M. Kopelman, Wilson, & Baddely, 1990) (AMI, see TABLE 2), his performance in all cognitive domains, including verbal, visual and semantic memory was intact (see TABLE 1). Of note, XF was able to recognise the faces
of a range of famous individuals including sporting stars, actors and current political figures, but commented that he had ‘re-learnt’ them after seeing them on TV after the onset of his amnesia. He denied any significant depressive or anxiety symptoms as assessed by the Beck Depression Inventory-II (BDI-II, Beck, 1988) and Depression Anxiety Stress Scales-21 (DASS-21, Lovibond & Lovibond, 1995) (see TABLE 1).

Methods

Experimental Investigation:
The following self-report questionnaire measure of self-enhancement was administered to XF on the second day of the neuropsychological assessment.

Self-Enhancement / Positive Illusions: Taylor and colleagues (Taylor, 1989; Taylor & Brown, 1988) document a series of biased self-perceptions that they refer to as positive illusions. These illusions include unrealistically positive self-evaluations and unrealistic optimism about the future (which Hoorens, 1995 subsumes under the label "self-serving biases"). To illustrate the first, evidence indicates that there is a widespread tendency for most people to see themselves as better than others on a range of dimensions - this is the better-than-average effect (Alicke, 1985). For example, most business managers consider their job performance to be superior to that of others (French, 1968), while most college instructors believe that they are better-than-average teachers (Cross, 1977). In regard to
the second bias, people tend to believe that they will have a longer-than-average lifespan (Myers, 2002), and that their chances of having health problems (e.g. Weinstein, 1982) or of becoming the victim of crime (e.g. Perloff, 1987) are lower than average.

Given our intention to measure individual differences in self-enhancement (see Brown, 1986; Paulhus, Harms, Bruce, & Lysy, 2003), we constructed an 18-item instrument for the measurement of these positive illusions (see APPENDIX A). Each item is presented with an associated rating scale (ranging from 0 to 100%). Participants are asked to rate themselves, relative to their “peers”, for each item. In every case a rating of 50% is average. The items incorporate a range of randomly intermixed positive characteristics (e.g. ethical, kind), negative characteristics (e.g. unhygienic, prejudiced) and negative future events (likelihood of developing a drinking problem, or of getting divorced). The average of these ratings (after appropriate reverse-scoring for half of the 18 items) was used in this study to index an individual's degree of self-enhancement\(^1\).

**Control Participants:** XF’s score on this questionnaire measure of self-enhancement was compared with that of a sample of control participants, comprising 61 undergraduate psychology students (10 males, 51 females) with a mean age of 20.6 years (\(SD = 1.8\)). Participants received course credit for taking part and provided informed consent.

**Results**

\(^1\) Note that our measure might, strictly speaking, be considered a measure of self-aggrandizement rather than self-enhancement, as it measures the degree to which individuals rate themselves more positively than they rate others, rather than the tendency to overestimate one’s positivity relative to a credible criterion (see Paulhus, 1998). However, we have followed other authors (e.g. Brown, 1986) in using the more common term of self-enhancement. We return to the criterion issue in our Discussion.
Based on the responses of our control participants, we first conducted a brief evaluation of the positive illusions questionnaire measure we had constructed. In order to investigate whether the individual items of the questionnaire elicited positive illusory responses, we conducted a series of 18 single-sample t-tests to compare the mean rating of each item (reverse-scored if negative) with 50 (in the absence of bias, the mean rating of each item should not significantly differ from this value). Owing to the large number of comparisons, we adopted a stringent alpha level (.001) so as not to inflate Type I error. The mean ratings of all 18 items were significantly greater than 50 at this level, indicating that each item elicited positively distorted responses in the control participants. A Cronbach’s ( of .78 for these 18 items indicated that the internal consistency reliability of our measure was satisfactory.

XF’s average rating on our positive illusions questionnaire (78.05) was compared to that of the control group (63.05, $SD = 8.4$) using Crawford and Howell’s (1998) modified t-test\(^2\) (one-tailed). XF was found to have a significantly greater level of self-enhancement on this measure than the control group, $t(60) = 1.78, p = .04$. In fact, XF’s score on this measure was higher than all but one of our 61 control participants.

Given the high proportion of females in our control sample, we conducted an additional analysis comparing XF’s average rating on our positive illusions questionnaire to that of an age- and gender-matched subset of our control sample, namely the average rating of the ten male control participants (Mean age 20.9 years, $SD = 2.4$). There was no

\(^2\) Computed using Crawford and Garthwaite’s (2002) signlims.exe program.
significant difference in age between XF and this control subgroup, \( t(9) = 1.62, p = .14 \).³ Our finding was unchanged in that XF’s average rating was significantly greater than that of the matched control group \((60.94, \ SD = 8.5), t(9) = 1.93, p = .04 \).⁴ See Figure 1 for a comparison of XF’s scores on the 18 individual questionnaire items with those of the matched control group.

Insert FIGURE 1 here

Discussion

In this case study we have described a patient with focal retrograde amnesia and explored potential psychological factors contributing to this condition using the framework outlined by Kopelman (2000). In particular, we investigated the psychological construct of ‘self deception’, which we operationalised as a tendency to self-enhance. This is the first study to document significantly heightened levels of positively biased self-appraisals in a patient with retrograde amnesia, compared with controls.

According to the model proposed by Kopelman (2000), there are several psychosocial factors that may contribute to the manifestation of ‘psychogenic’ amnesia. He outlines four areas of ‘severe precipitating stress’, namely employment, financial, offence and marital. XF had only mild employment and financial difficulties and denied any previous

³ (1998) modified t-test (two-tailed). The difference in age between XF and the larger, mixed-gender control group was significant using this test, \( t(60) = 2.47, p = .02 \).

⁴ Crawford and Howell's (1998) modified t-test (one-tailed).
forensic offences. In contrast, we can speculate that his marital/relationship situation may have been a precipitating stressor. He suffered significant distress two years prior to onset after the break up of his engagement, and the discovery of a diamond ring among his possessions after the onset of his amnesia raises the possibility that he may have been rejected again. There have been previous reports of retrograde amnesia manifesting after relationship break ups (see Kapur, Ellison, Smith, McLellan, & Burrows, 1992; Cases F & G Kopelman, 2000; Papagno, 1998). Nevertheless, this is a very common psychosocial stressor and retrograde amnesia is a rare condition, thus other factors must also play a role.

Kopelman (2000) also identifies ‘current emotional state’, specifically ‘extreme arousal’ and ‘depression’, as influential in psychogenic amnesia. XF’s family were unaware of any emotional problems around the time of onset and denied that he showed any signs of distress. However, we could again speculate that he may have experienced ‘extreme arousal’ associated with the rejection of his diamond ring and/or the suspicious event in the pub a few nights prior to the onset when he called his father asking for help. In terms of ‘learning experience’, Kopelman (2000) suggests that past transient experiences of organic amnesia are common in cases of psychogenic amnesia. XF had previously sustained four mild head injuries and briefly lost consciousness on three of these occasions. Of note, four years prior to his current retrograde amnesia he had experienced a transient amnesia after falling down some stairs. At the time he was unable to recognise his fiancée and believed that he was four years younger than his actual age. This occurred on the weekend that he announced his engagement and resolved after one hour. In
summary, many facets of XF’s psychosocial status are in keeping with Kopelman’s (2000) model and may have contributed to the manifestation of his retrograde amnesia.

An additional component of Kopelman’s (2000) model is a ‘personal semantic belief system’, comprising self and identity (see also Kopelman, Stanhope, & Kingsley, 1999). We propose that psychological tendencies such as a tendency toward self-enhancement form part of this system. Our finding of significantly exaggerated self-enhancement in XF is interesting in the light of a recent study by Fujiwara et al. (2008). These authors found “a tendency for social desirability” in four patients with retrograde amnesia. This was indicated by an unusually low score on the openness dimension of the Freiberg Personality Inventory-Revised in three patients, pointing to self-repressive tendencies in social situations, and a heightened score in one patient, indicating a disregard of social norms (Fujiwara et al., 2008). As in our case, these individuals completed the personality inventory after the onset of their amnesia, and thus it is impossible to determine whether this represents a premorbid trait or a post amnesia state (see further discussion of this issue in the Limitations section below).

One feature of our case that is interesting to note is the absence of frontal executive dysfunction. XF’s performance on five tests sensitive to executive dysfunction was within the normal range. Other case studies of focal retrograde amnesia have also reported preserved performance on various executive tests (Di Renzi, Lucchelli, Muggia, & Spinnler, 1997; Repetto et al., 2007). In contrast, some cases have shown impaired performance on selective executive tests (Fujiwara et al., 2008; Markowitsch et al., 1999;
Serra, Fadda, Buccione, Caltagirone, & Carlesimo, 2007). Many others have failed to assess executive functions (Barbarotto, Laiacona, & Cocchini, 1996; Kritchevsky, Chang, & Squire, 2004; Luccheli, Muggia, & Spinnler, 1998; Nakamura et al., 2002; Sellal, Manning, Seegmuller, Scheiber, & Schoenfelder, 2002). Neuroimaging findings addressing this issue are also inconsistent. Some studies have documented frontal deactivation in psychogenic amnesia (e.g. Markowitsch, 2003; Markowitsch et al., 2000), which would suggest impaired performance on frontal/executive tests. In contrast, Anderson et al. (2004) documented bilateral dorsolateral frontal activation during memory suppression. This fits with Kopelman’s (2000) proposal that the inhibition of autobiographical retrieval in some cases of focal retrograde amnesia is due to excessive inhibition by frontal control mechanisms, implying supra-normal frontal or executive activation and integrity of frontal executive test performance. The limited evidence to date prevents any conclusion on this issue. Further research is needed to examine the relationship between focal retrograde amnesia and executive functioning.

In regard to ‘organic’ factors that may have contributed to XF’s retrograde amnesia, eight months after the onset of his retrograde amnesia he had an abnormal SPECT finding (see ‘investigations’ section above), specifically mild diffuse hypoperfusion in the left cerebral hemisphere, most pronounced in the parietal lobe. Interestingly, this brain region contains the precuneus, which has been implicated in a number of functions that are highly relevant to this case (see Cavanna & Trimble, 2006 for a review). For example, recent neuroimaging studies have demonstrated that the precuneus plays a role in episodic memory retrieval. In particular, the left precuneus is activated during retrieval of
source information (Lundstrom et al., 2003) and specific autobiographical events (Addis, McIntosh, Moscovitch, Crawley, & McAndrews, 2004). Furthermore, it has been found that this brain region is involved in self processing tasks such as the processing of self relevant traits (Kircher et al., 2002) and assigning first person perspective (Vogeley et al., 2001). It has been suggested that in conjunction with the medial prefrontal regions, the precuneus represents a network that links personal identity and past experiences. These are the exact functions that are impaired in retrograde amnesia. While this link is intriguing, the aetiological significance of XF’s abnormal SPECT finding is unclear, and in any case the finding must be considered with caution given the absence of any quantitative data and the margin of error associated with reported imaging abnormalities on SPECT scans. Future studies will need to explore the integrity of the precuneus in patients with retrograde amnesia.

In regard to the previously used terms organic, psychogenic, and functional amnesia, XF’s condition is not easily categorised under any of these labels. His retrograde amnesia cannot be considered purely organic, given the likely contribution of psychosocial factors discussed above. It is not purely psychogenic, as he showed an abnormal SPECT finding, suggesting a functional brain abnormality, as discussed above (with appropriate caveats). Furthermore, XF’s retrograde amnesia cannot be labelled functional, as there is evidence of a brain abnormality and psychological factors, as opposed to no clear evidence of either. Thus, this case clearly challenges the organic/psychogenic dichotomy. In keeping with the view of other authors (e.g. Hodges, 2002; Markowitsch, 2002), we suggest that XF’s retrograde amnesia arises from the coexistence and potential aetiological
contribution of both organic and psychological factors, operating either independently or as different explanatory levels of a single causative process (in which case retrograde amnesia may represent "simultaneously a low-level neurological impairment and a high-level psychological palliative", McKay & Anderson, 2007, p. 1102; see also McKay, Langdon, & Coltheart, 2005; McKay, Langdon, & Coltheart, 2007, for further discussion in the domain of delusions).

Limitations

It is important to point out some limitations of our study. Firstly, given that XF completed our positive illusions questionnaire after the onset of his retrograde amnesia, it is impossible to determine whether his heightened self-enhancement represents a ‘state’ or ‘trait’. In particular, it is possible that rather than reflecting a cause of his memory difficulties, the observed self-enhancement may actually be an effect of those difficulties. After all, previous research has indicated that threats to self-esteem can occasion self-protective attempts to enhance self-esteem (see, for example, Brown & Gallagher, 1992; Wood, 1989). Insofar as XF’s memory difficulties (and/or the other psychosocial stressors documented above) constituted a threat to his self-esteem, these difficulties may have been the impetus for defensive self-enhancement. Future studies might profitably administer our self-report measure of self-enhancement (notwithstanding the limitations of this measure; see below) to individuals with other forms of memory impairment (including amnesias with unequivocally organic aetiologies), to determine whether self-
enhancement is a unique feature of focal retrograde amnesia or whether it is simply a feature of memory impairment per se.\(^5\)

In any case, although it is possible that XF’s tendency to self-enhance may have developed in association with his retrograde amnesia, we feel that our results are suggestive of a more interesting possibility, namely that his results on our questionnaire reflect a premorbid tendency that may have predisposed him to develop retrograde amnesia. Longitudinal studies of patients with this condition pose obvious logistical obstacles, but may be necessary to settle this issue decisively.

A second limitation concerns our methodology for gauging self-enhancement. We constructed a self-report measure requiring participants to compare themselves with their peers across a range of characteristics and possible future events (c.f. Brown, 1986). Our intention here was to measure individual differences in self-enhancement. This approach to measuring self-enhancement, however, is open to an important criticism, namely the fact that no indicator of external reality is involved (Colvin, Block, & Funder, 1995). In other words, our approach makes no provision for distinguishing accurate self-evaluations from positively biased self-evaluations. If XF actually is more intelligent,

\(^5\) We note in this connection that other studies have found evidence of positive biases in organic memory syndromes. Fotopoulou, Conway, Griffiths, Birchall and Tyrer (2007), for example, found that the confabulations of a patient (“LH”) who had undergone surgical clipping of an anterior communicating artery (ACoA) aneurysm were significantly more positively valenced than both his true memories and the memories of five healthy control participants. Although these authors suggested that LH’s self-enhancing confabulations were best explained as the product of motivational influences on memory construction that had become heightened as a result of his devastating brain damage (permitting him to ‘escape’ the unpleasantness of his reality), they noted that “Interestingly, LH’s pre-morbid behaviour suggested that he had always been someone who has tended to inflate his abilities and importance, particularly when undergoing stressful and self-threatening periods” (p. 14; see also Fotopoulou, Solms, & Turnbull, 2004; Turnbull, Berry, & Evans, 2004).
ethical, original and successful (etc.) than most of his peers, then he is not self-enhancing by indicating as much on our questionnaire. Given the wide range of items on our questionnaire, we think it unlikely that this factor accounts for XF’s significantly high score. Nevertheless, we recommend that future investigations of this topic employ alternative measures of self-enhancement, for example criterion discrepancy measures (which index self-enhancement by the extent to which a participant's self-ratings are more positive than warranted by a credible criterion; see Funder & Colvin, 1997; Jansen, Smeets, Martijn, & Nederkoorn, 2006) or perhaps the over-claiming technique (the tendency to claim knowledge of non-existent items; see Paulhus, Harms, Bruce, & Lysy, 2003).

In conclusion, we have provided a thorough investigation of psychological and psychosocial factors in a patient with focal retrograde amnesia. In particular, we have demonstrated for the first time that this condition is associated with significantly heightened positive self-appraisals, which we consider to be a form of ‘self deception’. While we acknowledge that this case study does not provide proof of any causal relationship, we suggest that this heightened level of self-enhancement may reflect a premorbid tendency that could potentially predispose individuals to develop focal retrograde amnesia. Further research is required to determine the aetiological significance of this and other psychological factors in retrograde amnesia.
APPENDIX A – POSITIVE ILLUSIONS QUESTIONNAIRE

Below are a series of items, each with an associated rating scale. You are asked to rate yourself, relative to your peers, for each item. In every case a rating of 50% is average. For example, item 1 is “Please rate how intelligent you are relative to your peers”. If you feel that you are of average intelligence, you would make a clear mark at 50%. If, however, you feel that you are extremely intelligent, in the top 10% of people for example, you might make a mark between 90% and 100%. If you feel that you are extremely unintelligent relative to your peers, perhaps in the bottom 10% for intelligence, you would place your mark below 10%.

These items are not part of a test, and there are no right or wrong answers. Please attempt to answer all of them as honestly as you can, and try to answer with the first thing that comes to mind – don’t think too much.

Your answers will be kept strictly confidential. Thank you for your assistance.

1. Please rate how intelligent you are relative to your peers.

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

2. Please rate how unreliable you are relative to your peers.

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

3. Please rate how original you are relative to your peers.

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

4. Please rate how friendly you are relative to your peers.

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

5. Please rate how likely it is that you will become infected by the AIDS virus relative to your peers.

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

6. Please rate how ethical you are relative to your peers.

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

7. Please rate how prejudiced you are relative to your peers.

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

8. Please rate how unhygienic you are relative to your peers.
9. Please rate how much you care about social issues relative to your peers.

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

10. Please rate your ability to get along with others relative to your peers.

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

11. Please rate how good your sense of humour is relative to your peers.

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

12. Please rate how kind you are relative to your peers.

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

13. Please rate how bad-mannered you are relative to your peers.

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

14. Please rate how likely it is that you will develop a drinking problem relative to your peers.

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

15. Please rate how likely it is that you will have a heart attack before age 40 relative to your peers.

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

16. Please rate how successful you are relative to your peers.

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

17. What do you think your life expectancy is likely to be? (50% = average, below 50% = below average, above 50% = above average).

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%

18. If you get married (or if you are already married), how likely are you, relative to your peers, to end up getting divorced?

0………10%………20%………30%………40%………50%………60%………70%………80%………90%………100%
References


### TABLE 1. Results of neuropsychological tests administered to XF.

<table>
<thead>
<tr>
<th>Test</th>
<th>Patient XF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intellectual functioning:</strong></td>
<td></td>
</tr>
<tr>
<td>Full Scale IQ (WAIS-III)</td>
<td>102</td>
</tr>
<tr>
<td>Verbal IQ</td>
<td>92</td>
</tr>
<tr>
<td>Performance IQ</td>
<td>114</td>
</tr>
<tr>
<td><em>WAIS-III subtest</em></td>
<td><em>Age-Scaled Scores</em></td>
</tr>
<tr>
<td>Vocabulary</td>
<td>9</td>
</tr>
<tr>
<td>Similarities</td>
<td>8</td>
</tr>
<tr>
<td>Arithmetic</td>
<td>9</td>
</tr>
<tr>
<td>Digit Span</td>
<td>11</td>
</tr>
<tr>
<td>Information</td>
<td>8</td>
</tr>
<tr>
<td>Comprehension</td>
<td>8</td>
</tr>
<tr>
<td>Picture Completion</td>
<td>15</td>
</tr>
<tr>
<td>Digit Symbol-Coding</td>
<td>11</td>
</tr>
<tr>
<td>Block Design</td>
<td>11</td>
</tr>
<tr>
<td>Matrix Reasoning</td>
<td>13</td>
</tr>
<tr>
<td>Picture Arrangement</td>
<td>11</td>
</tr>
<tr>
<td><strong>Verbal memory:</strong></td>
<td></td>
</tr>
<tr>
<td>Recognition Memory Test (words)</td>
<td>&gt;75%ile (49/50)</td>
</tr>
<tr>
<td>RAVLT total learning</td>
<td>69%ile</td>
</tr>
<tr>
<td>Recall after distraction</td>
<td>58%ile</td>
</tr>
<tr>
<td>Delayed recall</td>
<td>62%ile</td>
</tr>
<tr>
<td>Recognition</td>
<td>66%ile</td>
</tr>
<tr>
<td>Logical memory (WMS-III) I</td>
<td>ASS = 16</td>
</tr>
<tr>
<td>II</td>
<td>ASS = 14</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Visual memory:</strong></td>
<td></td>
</tr>
<tr>
<td>Recognition Memory Test (faces)</td>
<td>50%ile (43/50)</td>
</tr>
<tr>
<td>Visual reproduction (WMS-R) I</td>
<td>99%ile</td>
</tr>
<tr>
<td>II</td>
<td>99%ile</td>
</tr>
<tr>
<td>Rey Complex Figure</td>
<td></td>
</tr>
<tr>
<td>Immediate recall</td>
<td>90%ile</td>
</tr>
<tr>
<td>Delayed recall</td>
<td>90%ile</td>
</tr>
<tr>
<td><strong>Language:</strong></td>
<td></td>
</tr>
<tr>
<td>Boston Naming Test</td>
<td>27%ile</td>
</tr>
<tr>
<td><strong>Executive tests:</strong></td>
<td></td>
</tr>
<tr>
<td>Word Fluency: Phonemic (CFL)</td>
<td>50%ile</td>
</tr>
<tr>
<td>Semantic (animals)</td>
<td>25-50%ile</td>
</tr>
<tr>
<td>Trail Making Test B</td>
<td>75-90%ile</td>
</tr>
<tr>
<td>Stroop (DKEFS) Inhibition</td>
<td>ASS = 11</td>
</tr>
<tr>
<td>Inhibition/ Switch</td>
<td>ASS = 13</td>
</tr>
<tr>
<td><strong>Speed of information processing:</strong></td>
<td></td>
</tr>
<tr>
<td>Trail Making Test A</td>
<td>50%ile</td>
</tr>
<tr>
<td>Digit Symbol-Coding (WAIS-III)</td>
<td>ASS = 11</td>
</tr>
<tr>
<td><strong>Mood:</strong></td>
<td></td>
</tr>
<tr>
<td>Beck Depression Inventory-II</td>
<td>5 (minimal)</td>
</tr>
<tr>
<td>Depression Anxiety Stress Scale-21</td>
<td>1 (normal)</td>
</tr>
</tbody>
</table>

Abbreviations and normative data used in order of appearance:


IQ = Intelligence Quotient.

%ile = percentile.


ASS = Age-Scaled Score.

Rey Complex Figure: Rey A (1964) *L'examen clinique en psychologie (2nd edition)*. Presses universitaires de France: Paris.


TABLE 2. XF’s results on the Autobiographical Memory Interview

<table>
<thead>
<tr>
<th>Autobiographical Memory Interview*</th>
<th>Personal semantic</th>
<th>Autobiographical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum 21</td>
<td>Maximum 9</td>
</tr>
<tr>
<td>Childhood</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Early adulthood</td>
<td>4.5</td>
<td>1</td>
</tr>
<tr>
<td>Recent life</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>25.5/63</td>
<td>5/27</td>
</tr>
</tbody>
</table>

Figure 1: Comparison of XF's positive illusions questionnaire scores with those of the matched control group.