

MULTIPLE FREGOLI DELUSIONS AFTER TRAUMATIC BRAIN INJURY

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ABSTRACT

A 61 year old man after a traumatic brain injury resulting in right frontal and left temporoparietal contusions developed florid Fregoli-type misidentifications. Extensive neuropsychological testing demonstrated significant deficits in executive and memory functions. The patient's neuropsychological profile closely resembled that seen in previously reported patients with Capgras syndrome. Our findings are consistent with the hypothesis that a combination of executive and memory deficits may account for cases of delusional misidentification associated with brain lesions. However, the form which the delusion takes may be influenced by other factors including motivation.

Key words: Fregoli syndrome, misidentification.

INTRODUCTION

In 1927, Courbon and Fail described a 27 year old woman with schizophrenia who believed that famous actresses, family members, and persecutors were appearing in the form of acquaintances, strangers, and hospital staff. They referred to this condition as the Syndrome d'illusion de Fregoli after an actor who was famous for his impersonations. The Fregoli syndrome is one of a number of disorders known as delusional misidentification syndromes (DMS) along with the Capgras syndrome (Capgras and Reboul-Lachaux, 1923), the syndrome of intermetamorphosis (Courbon and Tusques, 1932), the delusion of subjective doubles (Christodoulou, 1978) and reduplicative paramnesia (Pick, 1903). In all of these, a patient incorrectly identifies or reduplicates persons, places, objects, or events (Feinberg and Shapiro, 1989; Feinberg and Roane, 1997a).

While Capgras syndrome has traditionally been associated with psychiatric illness, there has been increasing recognition that Capgras occurs with neurological diseases such as Alzheimer's disease (Mendez, Martin and Smyth, 1992), head trauma (Alexander, Stuss and Benson, 1979), cerebrovascular disease (Forstl, Almeida, Owen et al., 1991), epilepsy (Forstl et al., 1991) and Parkinson's disease (Roane, Rogers, Robinson et al., 1998). To a lesser extent, the Fregoli syndrome has also been linked to neurological dysfunction. Christodoulou (1976) found EEG abnormalities in 7 consecutive Fregoli patients,

including 6 diagnosed with schizophrenia. Joseph and O'Leary (1987) found greater frontal and temporal atrophy in 10 patients with Fregoli syndrome than in 10 matched controls. De Pauw, Szulecka and Poltock (1987) described a patient who developed the Fregoli syndrome after a right temporo-parietal lobe infarct, but this patient had a previous history of psychiatric treatment and paranoid symptoms.

Given the overlap between neurological and psychiatric causation of DMS, it is important to analyze cases in which no preexisting psychiatric pathology is in evidence and to obtain adequate neuropsychological data to determine the integrity of underlying neurocognitive functions. We had the opportunity to examine a patient with no premorbid psychiatric history who developed florid Fregoli-type misidentifications following a traumatic brain injury. We conducted extensive structured interviews with the patient and his wife and completed neuropsychological assessment during the period of Fregoli misidentification. This was done in an effort to correlate the phenomenologic features of Fregoli syndrome with the cognitive and neuropathologic substrates.

HISTORY, BACKGROUND INFORMATION AND ANATOMIC ANALYSIS

BJ is a 61 year old right handed man who sustained a moderate to severe closed head injury following a fall down a flight of stairs leading to his basement. Prior to the injury, he was employed as a supervisor for a large communications company and had a forty year work history. He has been married for forty-four years and has two adult children. He was a high school graduate. The past medical history is significant for hypertension and alcohol use but no evidence of significant disturbance in functional capacity.

On the day of the injury, he was found by his wife at the bottom of the basement stairs. He was reportedly muttering a few words but was otherwise unresponsive to verbal prompts. He was combative en route to the hospital and was given a Glasgow Coma Scale score of 10 on admission to the emergency room. Neurologic examination found "raccoon eyes", left hemotympani, sluggish pupillary reactivity on the left and mild left hemiparesis. Lab studies showed an elevated blood alcohol level. The initial CT scan (Figure 1) showed, in addition to a left parietal depressed skull fracture, large right frontal and smaller left temporoparietal contusions with surrounding edema and encephalomalacia.

Progressive improvement in mental status was noted across the acute course and BJ was transferred for inpatient rehabilitation on day 16.

NEUROPSYCHOMETRIC FINDINGS

Formal neuropsychological assessment was completed approximately three months from the date of injury. At the time of the evaluation, BJ was generally compliant although periods of irritability were noted. He was oriented to person and year but mis-stated the name and location of the hospital. Spontaneous speech was logorrheic and responses to questions regarding circumstances

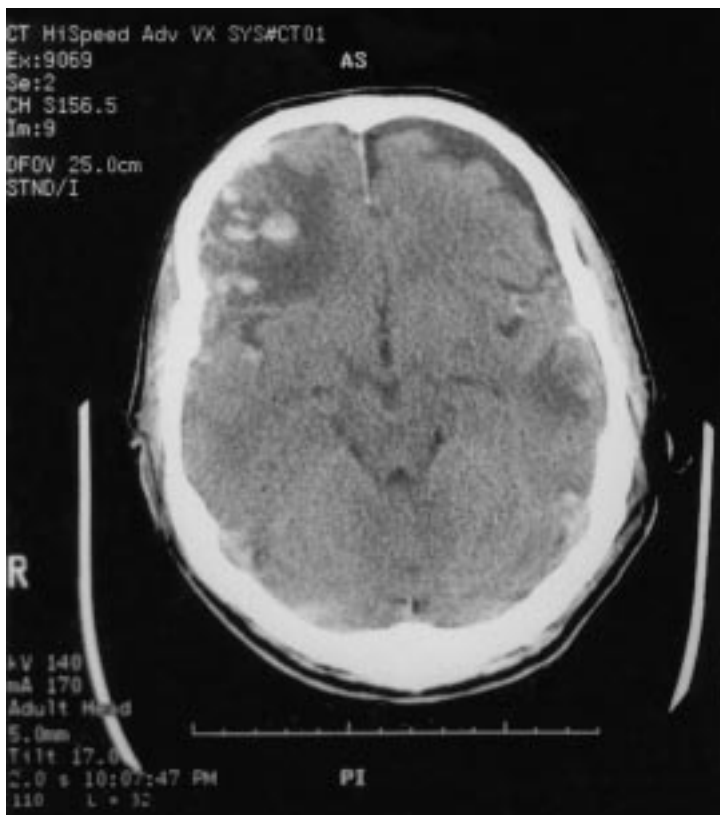


Fig. 1 – CT of patient demonstrates large right frontal and smaller left temporoparietal contusions.

surrounding the injury and reason for hospitalization showed obvious confabulation. He was frequently distracted by internal events and environmental stimuli but could be verbally redirected. Basic attentional functions were intact on tasks involving alphabet recitation and backward counting from 20.

Table I summarizes the neuropsychometric findings. Tests of basic attention including Digit Span Forward and Visual Span Forward (Wechsler, 1987) were within the average range as was visuomotor processing speed on Trails A (Reitan and Wolfson, 1985). On more complex tests of attention requiring dual tracking (Digit Span Backward, Visual Span Backward and Serial Threes) (Wechsler, 1987) and alternation of mental set (Trails B) (Reitan and Wolfson, 1985), there were multiple sequencing and “loss of set” errors. On tests of selective attention requiring detection of auditory targets embedded within a

TABLE I
Summary of Neuropsychometric Findings by Cognitive Area

Test	Raw Score	T Score/Percentile Rank	Range
Motor speed			
Finger Tapping			
R	44	T = 43	WNL
L	37	T = 35	Borderliner
Attention/Mental control			
Trail Marking			
A	52"	T = 38	WNL
B	Discontinued; 4 errors on sample item		
CPT-A			
Omissions	17	PR < 1	Impaired
Delays	12	PR < 1	Impaired
Commissions	24	PR < 1	Impaired
WMS-R			
Digits Forward	9	PR = 70	WNL
Digits Backward	5	PR = 31	WNL
Visual Span Forward	8	PR = 55	WNL
Visual Span Backward	4	PR = 9	Borderline
Memory			
CVLT; Test Discontinued			
Trial 1	2		
Trial 2	3		
Trial 3	2		
Perseverations	2		
Intrusions	11		
Rey CFT			
Copy	47	PR < 1	Impaired
Immediate Recall	16	PR = 9	Borderline
Delayed Recall	0	PR < 1	Impaired
Language			
MAE			
Naming	46	PR = 12	WNL
Token Test	31	PR < 2	Impaired
Verbal reasoning			
WAIS-R			
Comprehension	12	T = 29	Impaired
Similarities	5	T = 35	Borderline
Executive functioning			
WCST; 1 Deck Version			
Categories	0		Impaired
Perseverative Responses	63		Impaired
Perseverative Errors	47		Impaired
Non-perserverative Errors	2		WNL
Total Errors	49		Impaired
Loss of Set	0		WNL
SBCT; Test Discontinued			
Subtest I	11 errors		

Note: CPT-A = Continuous Performance Test of Attention; WMS-R = Wechsler Memory Scale-Revised; CVLT = California Verbal Learning Test; MAE = Multilingual Aphasia Examination; WAIS-R = Wechsler Adult Intelligence Scale-Revised; WCST = Wisconsin Card Sorting Test; SBCT = Short Booklet Category Test.

field of distractors (Continuous Performance Test of Attention) (Cicerone, 1997), there was a high frequency of perseverative and commission errors suggesting deficient response regulation and inhibition.

Performance on memory measures was severely impaired reflecting superficial search and retrieval processes. For example, free recall following exposure to a 16 word list CVLT (Delis, Kramer, Kaplan et al., 1987) was characterized by retrieval of general semantic categories (i.e., "fruits") as opposed to specific items within that category (i.e., "apricots"). In addition, there was a tendency to select incorrect but related semantic categories (i.e., "vegetables"). Other responses on this test were indicative of social disinhibition (e.g., references to female sex organs), tangentiality and failure to maintain cognitive set during recall. On tests of visual memory, there was dramatic loss of visuospatial material following a 20 minute delay. Immediate recall of the Rey Complex Figure (Denman, 1984) was characterized by only 34% savings relative to the copy trial, and there was a complete inability to recall any elements of the design following a 20' delay. The delayed recall trial was also characterized by perseverative responses and intrusions.

Conversational speech was tangential and interspersed with semantic paraphasias as well as occasional neologisms. Confrontation naming on the Boston Naming Test (Kaplan, Goodglass and Weintraub, 1983) was in the low average range although there were paraphasic errors and disinhibited sexual references. On the Revised Token Test (Spreen and Benton, 1968) comprehension of verbal commands incorporating syntactic demands was reduced. This appeared to be secondary to a decreased capacity to simultaneously hold and manipulate multiple elements of information in working memory.

Visuoperceptual function was assessed using the Rey Complex Figure Test. The approach to copying the figure was non-systematic with placement to the right of the page. There was a predominance of left-sided errors, including perseveration of design features. Overall performance fell in the severely impaired range.

Executive functions were borderline to severely impaired across measures assessing conceptual and social reasoning, self-monitoring and mental flexibility. The Short Booklet Category Test (Wetzel and Boll, 1987) was discontinued due to apparent failure to follow task instructions and requirements. On the Wisconsin Card Sorting Test (Heaton, 1981) 98% of responses were perseverative, indicating a striking inability to generate alternative hypotheses and to alter behavior in response to environmental feedback. Verbal responses in the WAIS-R Comprehension and Similarities subtests (Wechsler, 1981) measuring social and abstract reasoning were off-topic and frequently devoid of meaningful content.

A structured interview was conducted to discern the degree to which BJ was aware of the previously-described deficits. He indicated that he was "fairly certain" that he did not have any cognitively-based problems. Interestingly, he acknowledged that his therapists had pointed out areas of impairment of which he had previously been unaware. He could not directly relate this knowledge to any specific areas of difficulty.

FREGOLI-TYPE MISIDENTIFICATIONS

BJ displayed multiple Fregoli-type misidentifications (FM 1-13) as shown in Table II. Four types of Fregoli-type misidentifications were apparent. Five misidentifications concerned family members (FM 1-5), four involved co-workers (FM 6-9), three were of prior acquaintances (FM 10-12), and one involved the self (FM 13).

TABLE II
Fregoli-Type Misidentifications

	Claimed identify	Appearing as
Family misidentification		
FM 1	Younger son	Patient in a wheelchair
FM 2	Older son	Boxer on television
FM 3	Daughter-in-law	Aide on units
FM 4	Daughter-in-law	Young woman on unit
FM 5	Son	Patient in "girl's group"
Coworker misidentification		
FM 6	Coworker	Fellow male patient
FM 7	Work client	Fellow female patient
FM 8	Coworker	Brother of patient upstairs
FM 9	Coworker	Female visitor
Acquaintance misidentification		
FM 10	Former town mayor	Nursing home administrator
FM 11	Former boss	Social worker
FM 12	Family friends	Patient's wife and visitor
Self-misidentification		
FM 13	Himself (BJ)	Professional ice skater

Note: This table shows the various Fregoli misidentifications demonstrated by the patient. In the center column are the patient's stated identities of the actual persona in the right hand column.

Misidentifications Concerning Family Members (FM 1-5)

During the inpatient rehabilitation stay, while discussing his hospitalization with staff members, BJ approached a severely disabled, wheelchair-bound patient in his early twenties whom he had never met before, and claimed that the patient was his younger son (FM 1). He maintained this misidentification despite clear differences in physical appearance between the falsely identified patient and his son. Even when these distinctions were pointed out by staff, BJ maintained his original assertion that the patient was his son. The manner in which BJ interacted with the falsely identified patient, including facial expression and voice inflection, was actually more akin to the first meeting between strangers than to a father-son relationship.

Another misidentification regarding his family occurred when BJ reported seeing his older son on television (FM 2). He recalled that, "I was watchin' TV here with a couple of fellows in here and when I had a chance at home I put it on and who do I see goin' out and doin' the fighting but my son. He had done

this for a film for them, kinda like he didn't realize he was making a film for them that was gonna be on TV. So, sometimes it happens that way." He identified a treatment aide on the unit as his daughter-in law, TJ (FM 3), and after passing a young female patient in the hallway, he also indicated that the woman was his other daughter-in law, LJ (FM 4).

On one occasion, BJ claimed that his younger son had been in the hospital for a back injury, but had presented himself as "a girl" in order to be accepted into what he referred to as a "girl's group" (FM 5). He reported that he had seen his son leaving a room on the unit with a group of girls and explained that "there was an opening in a girls' group, and he [the son] grabbed it for himself." He further recalled taking his son to task about this, commenting that "I was bustin' his chops about him bein' in the girls' group. I said you're doin' this to the girls' group. Them poor girls. You know there are girls that really want to get in there, and what the hell are you doin' that for?" He later indicated that his son had pretended to be a girl in order to get into the group but that he knew that his son was not actually a girl: "That's how he got in there [the group], and he's out of it now. He's out of the hospital. He told me that he's not a girl. He said, 'Dad I'm not a girl. Don't get the wrong idea. I'm not a girl.' And he's uh, fine now."

In contrast to most of the other Fregoli-type misidentifications listed in Table II, BJ was never actually witnessed mistaking a female patient as his son. Rather this delusion became apparent during a clinical interview with one of the authors.

Misidentifications Concerning Co-Workers (FM 6-9)

BJ reported that a man he used to work with was in the hospital as a patient in a wheelchair (FM 6). He believed that this co-worker was calling himself by a different name, which was actually the real name of another patient hospitalized on the unit at the same time. BJ described how, "I busted his chops about it a few times, and then my wife was talking to him, and she told me leave the guy alone: 'He's got the name. Don't cause him any problems here.' And I agreed with her. It's not the thing to do. I get out and he gets out, he's gonna wind up back with me [at work] and that's it."

BJ was able to recognize the physical differences as well as similarities between his co-worker and the actual patient who was misidentified, on one occasion stating, "He used to have light blond hair and he always had a big beard". Yet, he insisted that the two shared the same identity.

A second work-related misidentification occurred when BJ reported that another patient in the hospital was a former female client (FM 7). Again, he had claimed that her name had been changed because he was aware that other people referred to her by another (i.e. actual) name. He stated that "There's a woman here who was uh, was my customer contact... I've known her for twenty years. A very nice woman, and when I tried to talk to her... the people here got upset and told me you're tryin' to flirt with the girl." He added "They were sayin' that I was flirtin' with her, and I wasn't cause she was here with her husband." The individual BJ identified as his co-worker's husband was actually the husband of

the misidentified patient. He recounted another occasion when he did approach the woman: "... one night I came back with my wife. She [the female patient] was in there doin' something, so I went in there and I sat down and I spoke to her... I inferred to her that... they wouldn't let me call her name and all that stuff... And she said she understood all that."

The third misidentification occurred when BJ claimed that the brother of a patient residing in the same building was one of his employees (FM 8). He produced the following account: "I saw this guy in the elevator and I said that guy looks familiar. I walked over and shook his hand. It was a guy who worked for me. He says 'I'm here to visit my brother who's up on the next floor but I've seen you here so much.'" The patient recalled that his employee gave him advice: "This is the Marine Corps and you gotta do what you gotta do what you gotta do."

The final co-worker misidentification involved a female visitor to the rehab center (FM 9). BJ identified the woman by name as an employee of his former company. BJ's wife confirmed that both of the women's names he gave were former colleagues whom he had known for an extended period of time.

Misidentifications Concerning Previous Acquaintances (FM 10-12)

A third class of Fregoli-type misidentifications involved the false recognition of other individuals associated with the rehabilitation center, as prior acquaintances. There appeared to be an intriguing relationship between the social status of the mis-identified individual and the status of the substituted entity. For example, he stated that the administrator of the rehabilitation center was the former mayor of his town (FM 10) and that his social worker, who was responsible for communicating significant decisions regarding his hospital course, was his former boss (FM 11). On another occasion, after observing a wheelchair-bound patient with his wife and a visitor, he claimed that these individuals were merely friends of the family (FM 12). The observation that BJ appeared to endow the misidentified entity with actual characteristics of the veridical counterpart suggests that he may have adequately encoded the *gist* of who these individuals were, but was incapable of encoding person-specific details relative to place and time.

Misidentification of the Self

A final form of misidentification was not observed directly by staff but was reported by the patient's wife. She stated that, as they were viewing a professional ice skating pair on television, BJ identified himself as the male skater (FM 13). The female skater was identified as a co-worker.

Other Misidentifications

In addition to the plethora of Fregoli-type misidentifications, BJ demonstrated related phenomena. For example, responses to orientation questions evidenced instances of reduplicative paramnesia (RP) (Weinstein and

Kahn, 1955). RP is the erroneous belief that a person, place, thing or event has been duplicated. BJ reported that he had checked into "Hartwyck" (the actual name of the rehabilitation facility), but "It wasn't the one I thought it was. It was another one right next to it." On another occasion, he related that he had been to three hospitals, all of which were called "Hartwyck".

There was also an instance of a reduplication for an event. BJ stated that his older son was currently hospitalized in the same facility with him because of a work-related back injury, which his son actually experienced some time prior to BJ's injury.

RESPONSE TO FEEDBACK

Although we did not monitor the duration of each specific misidentification, some were one-time events while others re-emerged at different times across the length of stay. In addition, BJ displayed a variety of misidentifications, particularly about his younger son, in which the content tended to change over time. When these beliefs were directly confronted, he did not refute the corrective feedback but subsequently showed little evidence that they had been permanently modified in accord with the information presented.

DISCUSSION

The neuropsychological evaluation was primarily remarkable for severe impairments in executive and memory functions. Consequently, BJ's behavior in unstructured (i.e. on the unit) as well as in structured settings (i.e. during evaluation) was characterized by a striking failure to evaluate and subsequently, to regulate his thoughts and actions. This was clearly evidenced by his logorrheic speech, tangential thinking and the high rate of intrusive, perseverative and commission errors noted throughout the assessment. There was an obvious tendency toward loosening of associations, indicating faulty monitoring and selection mechanisms. Further, he was unable to sustain a "mental set" for more than a few minutes at a time. The bidirectional nature of the cognitive dysregulation, in which perseveration co-existed with the inability to sustain "set", is perhaps the hallmark sign of executive system dysfunction. These symptoms suggest loss of the capacity to test subjective experience against extrapersonal feedback. The net result of this disturbance was a failure in reality testing that resulted in a passive acceptance of "things as they seem."

This was accompanied by severe memory disturbance in which BJ appeared to be able to acquire general, but not specific, information regarding current experience, suggesting greater sparing of the semantic versus episodic memory system. These problems were well-illustrated on tests of memory.

The amnesic disturbance likely served to hinder the ongoing recording of current experience further impeding the essential process of evaluating the relationship between the internal milieu (i.e., thoughts and feelings) and environmental events. It appears then, in combination, that severe disturbance in

executive function coupled with the anterograde amnesia may set the stage for the development of a misidentification syndrome.

Ellis and Young (1990), among other, have suggested a role for impairment in facial recognition in the production of DMS. In Rapcsak, Polster, Glisky et al. (1994), a patient (case 1) who falsely recognized unfamiliar for familiar persons was found to have significant difficulties in facial recognition akin to prosopagnosia. This patient had a large right hemisphere lesion. Our patient showed no evidence of prosopagnosia in that familiar faces were never misidentified. For instance, he had no difficulty recognizing family members. While more extensive neuropsychological testing might have revealed a subtle disturbance in facial recognition than was otherwise apparent, our patient more closely resembles another patient described by Rapcsak, Polster, Comer et al. (1996) (case 21) who falsely recognized unfamiliar faces but had no prosopagnosia. In this case, as in ours, right hemisphere damage was limited to the frontal lobe.

How does the neuropsychological profile seen in our case relate to the Fregoli variety of DMS? Many theories have been proposed to explain DMS (for reviews see Christodoulou, 1986; Ellis, Luaute and Retterstol, 1994). We have dichotomized the Capgras and Fregoli syndromes along the dimension of either an increase or a decrease in familiarity (Feinberg and Roane, 1997b). Vie (1930) first hypothesized that Capgras syndrome represents the illusion of negative doubles and Fregoli represents the illusion of positive doubles. Christodoulou (1976) subsequently defined Capgras syndrome as delusional hypo-identification and Fregoli syndrome as delusional hyper-identification; de Pauw (1994) described Capgras as either hypo-identification or denial of familiarity and Fregoli as hyper-identification or affirmation of familiarity; and Feinberg and Shapiro (1989) associated Capgras with pathological unfamiliarity or *jamais vu* and Fregoli as pathological familiarity or *déjà vu*.

The conceptualization of Capgras as a loss of familiarity or relatedness is consistent with the suggestion that Capgras results from an anatomical disconnection between new experience and established memory. Thus, Staton, Drumbach and Wilson (1982) proposed that disconnection of the hippocampus from other parts of the brain important for memory storage could result in an inability to associate new information with previous memories, leading to reduplication. Along the same lines Alexander et al. (1979) argued that right temporolimbic-frontal disconnection could result in a disturbance in familiarity of people and places with resulting reduplication. Joseph (1986) hypothesized that interhemispheric disconnection of cortical areas could allow each hemisphere to establish independent images of a person, place or event leading to various forms of reduplication.

Formulations which emphasize disconnection seem most suitably applied to those aspects of Capgras and reduplication phenomena where there is a failure to match a current experience with premorbid memories. However, it is not clear how this type of disconnection could apply to the Fregoli syndrome in which there is an over-relatedness or over-familiarity with the environment. When one attempts to understand delusional misidentification of the Fregoli type in the context of cerebral dysfunction, a reasonable starting point is Korsakoff (1892).

Korsakoff (Victor and Yakovlev, 1955) hypothesized that in the course of what is now known as Wernicke-Korsakoff syndrome (Victor, Adams and Collins, 1989) "patients confused old recollections with the present impressions. Thus, they may believe themselves to be in the setting (or circumstances) in which they were 30 years ago, and mistake persons who are around them now for people who were around them at that time" (Victor et al., 1989) (emphasis added). Williams and Rupp (1938) argued that confabulations always derive from preserved past memories, and Talland (1961) agreed that most confabulations are based on actual past experience inserted into the present. However, he noted that real memories could be distorted and combined with events experienced secondhand and with imagined events to form confabulations or pseudo-remiscences. As an example, he commented that amnesic confabulators tended to misidentify their doctors as old acquaintances.

A similar account was presented by J. Hughlings Jackson (Taylor, 1958) who pointed out that patients with neurological dysfunction often revert to automatic thinking in which the most entrenched memories predominate. Thus, a delirious patient would be apt to mistake his nurse for his wife. Levin (1945) characterized this tendency as "the law of the unfamiliar mistaken for the familiar." He argued that this could account for patients who mistakenly believe that a stranger is actually a close acquaintance and could also apply to the misidentification of a foreign environment, such as a hospital, as the patient's home.

What then is the proper way of thinking about Capgras and Fregoli that encompasses both over- and under-identification? Recently Feinberg and Roane (1997b) viewed these conditions as a disturbance in personal relatedness between the self and the environment. In this scheme, Capgras results from a withdrawal of personal relatedness and Fregoli entails an insertion of personal relatedness. According to this viewpoint, Capgras is *under-personalized misidentification* and Fregoli is *over-personalized misidentification*. We suggest that both the Capgras and Fregoli syndromes represent *confabulations* (Feinberg and Shapiro, 1989) characterized by an alteration in relatedness to the environment which may be increased, decreased or both.

From a purely neuropsychological standpoint, it is therefore possible that BJ's over-misidentifications resulted from (1) mnemonic associations derived from routine thoughts about work, (2) the tendency to select inappropriate associations because of their personal salience versus relevance to the situation (secondary to faulty filtering), (3) an inability to generate alternative hypotheses concerning the resultant misperceptions (secondary to perseveration) and (4) passive acceptance of the inaccurate conclusions reached (secondary to impaired self-monitoring). These elements could combine to produce an over-relatedness to relatively novel stimuli.

Given the clinical distinction between Capgras and Fregoli misidentifications, it is important to determine whether this discrepancy can be attributed to differences in the underlying neurocognitive substrate. Despite the abundance of case reports describing misidentification syndromes, relatively few include information concerning performance on neuropsychometric assessment. We found 3 representative cases of Capgras with sufficient neuropsychological data to perform comparisons.

TABLE III
Comparison of Reported Neuropsychological Findings in Capgras and Fregoli Misidentification Syndromes by Cognitive Function

Function	Capgras syndrome			Fregoli syndrome
	Staton	Alexander	O'Connor	Feinberg
Attention Span	N/A	Normal (DS)	Normal (WMS-R)	Normal (DS)
Vigilance	Impaired (SRT, TMT)	N/A	Impaired	Impaired (CPT-A)
Language Naming	Normal (AS)	Normal (Tests not reported)	Normal (BNT)	Normal (MAE)
Paraphasic Errors	No	—	No	Yes
Comprehension	Normal (AS)	—	N/A	Impaired (TT)
Visuoperceptual/Visuoconstructional	Impaired (AS)	Normal (RCFT Copy BD, HVOT)	Normal (JOLO, FRT, RCFT)	Impaired (RCFT Copy)
Memory Verbal	Impaired (WMS LM)	Normal (WMS MQ)	Impaired (RAVLT)	Impaired (CVLT)
Visual	Impaired (BVRT, WMS VR)	Impaired (RC, CT)	Impaired (RCFT)	Impaired (RCFT)
Frontal-Executive Resp. Inhibition	N/A	Impaired (ST)	Impaired (ST)	Impaired (CPT-A)
Mental Flexibility	Impaired (BCT, PM)	Impaired (WCSAT, PT)	Impaired (WCST, TMT B)	Impaired (WCST, TMT B)
False + Bias	N/A	N/A	Impaired (RAVLT)	Impaired (CVLT)

Note: N/A = Not assessed or information not available; DS = Digit Span; WMS-R = Wechsler Memory Scale-Revised; WMS LM = Wechsler Memory Scale Logical Memory; WMS VR = Wechsler Memory Scale Visual Reproduction; WMS MQ = Wechsler Memory Scale Memory Quotient; SRT = Seashore Rhythm Test; TMT = Trail Making Test (Part A or B); CPT-A = Continuous Performance Test of Attention; AS = Halstead Reitan Aphasia Screening Test; BNT = Boston Naming Test; MAE = Multilingual Aphasia Test; RCFT = Rey Complex Figure Test; BD = Block Design; HVOT = Hooper Visual Organization Test; JOLO = Judgement of Line Orientation Test; RFT = Facial Recognition Test; RAVLT = Rey Auditory Verbal Learning Test; CVLT = California Verbal Learning Test; BVRT = Benton Visual Retention Test; ST = Stroop Test; BCT = Booklet Category Test; WCST = Wisconsin Card Sorting Test).

Examination of the neuropsychometric test data of these previous cases of Capgras misidentification (Alexander et al., 1979; Staton et al., 1982; and O'Connor, Wolbride, Sandson et al., 1996) and the current case of Fregoli syndrome, reveals considerable similarity across the neuropsychological profiles. Table III compares the neuropsychometric findings across the four cases of misidentification. Within the context of intact basic attentional capacities, pronounced impairments in memory and executive functioning are most apparent. Specifically, three of the four cases demonstrate a global amnesic disorder, while the fourth (Alexander et al., 1979) shows significant deficiency in nonverbal memory only. It is important to point out that the measures used by Alexander et al. to assess memory do not gauge delayed recall or retention but rely primarily on immediate memory. All four cases were found to have marked

executive dysfunction including perseveration, disinhibition and other forms of behavioral dysregulation. Visuo-perceptual and visuoconstructive disturbance does not appear to distinguish the two syndromes.

Given the degree of similarity in the neuropsychometric profiles between the Fregoli and Capgras cases, it is not possible to account for the direction of the delusional misidentification (i.e. disavowal of familiarity as in Capgras, or a sense of over-relatedness, as in Fregoli delusions). Both mnemonic and executive dysfunction appear necessary, although not sufficient, for the development of the misidentification syndromes.

This raises the question what determines whether under or over relatedness occurs in any given instance of misidentification. One possible factor may be motivation. Paterson and Zangwill (1944) reported a case of reduplication for place in which a head injury patient acknowledged that he was hospitalized in Scotland "if it comes to the map", but insisted, simultaneously, that he was located in his home town of Grimsby (in England). The authors argued that the patient's disorientation was prolonged (in spite of his cognitive improvement) because of his desire to be home. Weinstein and Kahn (1955) noted that in patients with anosognosia, denial, confabulation and reduplication, motivational factors were important. Similarly, Ruff and Volpe (1981) presented four patients who believed that their hospital rooms were located in their homes. They pointed out that each patient possessed a strong desire to return home and felt this might have played a role in the reduplications. Finally, our patient tended to minimize impairments and frequently stated his wish to return to work. As many of his Fregoli misidentifications involved his prior coworkers, it is possible that the nature of his confabulations was influenced by motivational factors.

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