Similarities of Neuropsychological Presentation in Two Cases of Capgras Syndrome with Comorbid Depression

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Capgras Syndrome (CS) is one of several disorders loosely grouped under the rubric of delusional misidentification syndromes (Christodoulou, 1991). The core feature of Capgras Syndrome (CS) is the belief that familiar persons have been replaced by physically similar doubles. There are several other subtypes of delusional misidentification syndromes, for example, the syndrome of Fregoli (belief that unfamiliar persons are replaced by physically similar familiar persons).

As with many of the misidentification syndromes, CS may arise from varied etiologies; neuropsychological testing generally reveals deficits associated with right hemisphere compromise, primarily in nonverbal memory and visuospatial and constructional skills. Two patients with CS arising from differing etiologies and with comorbid depression are presented. The neuropsychological profiles of these two patients are similar, and involve deficits in performance on tests associated with both right and left hemisphere dysfunction. It is proposed for these patients deficits in verbal memory are chiefly a reflection of depressed mood, while deficits in visuospatial skills and nonverbal memory is reflective of those right hemisphere deficits normally associated with CS.

First described by Kahlbaum (1866), CS may arise from various etiologies. Affective, psychotic, and mixed classifications of disorders are among the diagnostic categories in which CS patients most frequently fall (Signer, 1994); in one study, almost half of subjects with CS had a comorbid mood disorder (Signer, 1987). Less common etiologies include head trauma (O'Connor, Walbridge, Sandson & Alexander, 1996), toxic-metabolic disorders (Signer, 1992) and structural brain disorders (Cummings, 1985) including vascular dementia (Tsai, Hwang, Yang, Liu & Lo, 1997). Capgras has also been reported as a sequela of transient physiological disturbances, such as pneumocystis pneumonia in an HIV+ patient (Crichton & Lewis, 1990), migraine headache (Bhatia, 1990), overdose of a bronchial dilator containing adrenaline and adropinemethonitrate (MacCallum, 1973), and interictal psychosis of epilepsy (Lewis, 1987); in all of these cases CS resolved upon treatment. These cases suggest the possibility that altered neurotransmitter functioning, in the absence of structural lesions, may be sufficient to precipitate CS (Gray, Feldon, Rawlins, Hemsley & Smith, 1991).

Neuroanatomical sites of compromise associated with CS which have been suggested in the literature include the parietal lobes (Hayman & Abrams, 1977), the frontal lobes (Joseph, 1983) and the entire right hemisphere (Joseph, 1983; Quinn, 1981). Neuropsychological testing of Capgras patients generally has suggested right hemisphere dysfunction, including problems with visual memory, spatial organisation, nonverbal skills and facial recognition (Doran, 1990; Sautter, Briscoe & Farkas, 1991). The typical neuropsychological profile of CS patients thus reflects deficits in tests primarily associated with right hemisphere compromise. A few researchers have failed to find significant neuropsychological compromise in their Capgras patients (Pellettier, Bartolucci & Wallace, 1985).

In contrast, although affective disorders are a far more common occurrence than CS, few carefully controlled neuropsychological studies have been carried out on

depressed younger adults. Several recent studies (c.f. Brown, Scott, Bench, & Dolan, 1994; Elliot, Sahakian, McKay, & Herrod, 1996) found depressed patients to have deficits in memory, working memory, attention and language function; however, others have failed to find such patterns (c.f. Purcell, Maruff, Kyrios, & Pantelis, 1997). Burt, Zembar, and Niederehe (1995), in a comprehensive meta-analytic study, found significant and consistent relationships between depression and memory impairment. Although there is some neurobiological evidence that depression involves changes to brain structures and substances associated with memory (Nussbaum, 1997), changes in cognitive processes such as vigilance, attention and reaction time are also common in depression and may in turn have a negative impact on neuropsychological test performance, particularly with respect to memory.

We present two cases of CS with comorbid mood disorder. In the following cases of a young woman diagnosed with Hashimoto's thyroiditis (struma lymphomatosa) who experienced transient CS delusions, and of a man with diagnoses of both CS and Doppelganger Syndrome, right hemisphere and frontal dysfunction are implicated on neuropsychological testing. The results are discussed in light of the presence of a comorbid mood disorder.

Case descriptions

The first patient, a 22 year old right-handed single Caucasian female with 17 years of education, presented to her family physician with complaints of depressed mood, reduced concentration, psychomotor slowing and episodic blurred vision. The patient was referred for neuropsychological and psychiatric examinations after the onset of delusions that her mother had been replaced by an "impostor." The onset of her depressive symptoms followed her rejection for post-graduate study at a highly competitive university. Over the course of several months after this incident the patient experienced increasing dysphoria and anhedonia, decreased sleep and appetite, increased fatigue, a 20 pound weight loss, and amenorrhea.

The CS symptoms began shortly after the patient's mother came to stay with her to help her through her depression over the rejection from post-graduate study. The patient, while initially relieved to have her mother with her, came to believe over the course of several days that her mother was "not the person she says she is, not the same as my usual mom." As a result of these beliefs the patient was briefly admitted to an inpatient psychiatric ward, where she continued to have feelings that people were not who they said they were, stating that after a few days her roommates were replaced by impostors. The patient's feelings that people had been replaced by impostors extended to other family members and close friends. The patient denied malicious intent by the "impostors," stating that perhaps they were here to "help her out of this [situation]." At this point, after several psychiatric interviews, the patient was found to meet DSM-III-R criteria for major depressive disorder and also received a tentative diagnosis of Capgras disorder.

The patient and her family, originally from North America, lived in Asia from the time of the patient's second birthday. The patient was regarded as being a high academic achiever; her mother described her social life prior to the onset of symptoms as very full. Medical history was significant for an episode of Dengue Fever several years before the onset of cognitive and psychiatric symptoms, and for a recent diagnosis of hypothyroidism. No previous history of psychiatric illness, learning disability, substance abuse or head injury was reported. Additional serological work-up (including HIV test), MRI of the head, and lumbar puncture were all within normal limits. Treatment with 5 mg of haloperidol to control agitation was started two weeks prior to neuropsychological testing. The patient denied any significant family medical or psychiatric history.

Neurobehavioral observations included significant weight loss, notable motor retardation and rigidity, with evidence of masked facial expression and some restlessness. Upon exam affect was markedly blunted with depressed mood; brief periods of tearfulness were noted. Speech was slow and hypophonic, with reduced output. At the time of testing the patient denied hallucinations or delusions other than those involving the replacement of her mother and several other acquaintances by "impostors." During testing the patient was guarded and suspicious, only reluctantly offering information about her thoughts and feelings, and then only monosyllabically.

The second patient, a 36 year old right-handed single Caucasian male with 16 years of education, presented for neuropsychological testing with a fifteen year history of recurrent severe major depressive episodes both with and without psychotic features. The patient had been treated for depression intermittently at several medical facilities. Although psychotic features were noted as part of his presentation, he never met DSM-III-R criteria for either schizophrenia or schizoaffective disorders. The patient was referred for neuropsychological and psychiatric examinations after recent escalation of depressive symptomatology and complaints of memory impairment. The onset of increasing depressive symptoms and memory problems followed a period of a few weeks when the patient was temporarily homeless.

The patient stated he believed he had a double, possibly a clone, and that the government was involved in this. He also indicated that his brother and sisters all have doubles, but that the doubles are younger than his true siblings. The patient also believed he had been under surveillance by government agencies while he had been living out in an isolated area. The patient stated that he has had these beliefs for approximately five months, and that he was aware of the "impossibility" of his beliefs.

The patient completed a four year tour of duty in the military between attending high school and university. His first bout with depression occurred shortly after graduating from university in 1985; a prior history of psychiatric episodes was denied. He received intermittent outpatient treatment for depression, including a variety of antidepressant and antipsychotic medications, from 1985

on, and had worked at a variety of odd jobs during this time.

Patient 2 denied any significant medical history, other than tinnitus from an aspirin overdose sustained during a suicide attempt in 1993. He denied any significant family medical or psychiatric history apart from his father's alcoholism. Neuroradiological testing (MRI) was negative for lesions or other intracranial abnormalities.

The patient appeared dishevelled and was easily distractible during testing. Significant weight loss, tremor or overt signs of psychosis were not noted. Although the patient appeared initially reserved, he did become more personable and co-operative through the course of testing. Mood was dysthymic. Speech was mildly monotonic with respect to prosody, but normal for rate, volume and output.

Neuropsychological Test Results

Table 1 summarises the results of a number of neuropsychological tests administered to both Patient 1 and Patient 2. Patient 1's performance on the Wechsler Adult Intelligence Scale - Revised (WAIS-R; Wechsler, 1981) revealed a 43 point discrepancy between Verbal (121) and Performance (79) subtest scores. Similarly, Patient 2's performance on the WAIS-R revealed a 42 point discrepancy between Verbal (131) and Performance (89) subtest scores. For both patients, low scores on Performance subtests of the WAIS-R as well as other perceptual/constructional tasks suggested perceptual disturbances interfering with the assimilation and organisation of visual percepts as well as psychomotor retardation, with slowing more pronounced for Patient 2 compared to Patient 1.

Both patients' language abilities, including ability to generate word meanings (vocabulary subtest) and verbal comprehension (comprehension subtest) were average to high average. However, while Patient 1's confrontational naming skills were intact, Patient 2 did less well on the Boston Naming Test (Kaplan, Goodglass & Weintraub, 1983), with his low average performance characterised by many semantic paraphasias.

Both patients' performances on verbal memory tasks (California Verbal Learning Test; Delis, Kramer, Kaplan & Ober, 1987; and subtests of the Wechsler Memory Scales - Revised (WMS-R; Wechsler, 1987) ranged from average to frankly impaired, and were suggestive of difficulties retrieving encoded information and poor self-monitoring. For Patient 1, recall of simple figures (visual reproduction subtest of the WMS-R) was within normal limits, as was her copy and delayed recall of the more complex Rey Osterrieth Figure (Osterrieth, 1944; Rey, 1941). Patient 2 scored in the borderline impaired and low average ranges on these tasks, respectively. Visuospatial skills were relatively intact in both patients.

Frontal systems functioning was variable in both patients, with normal (Patient 1) as well as low average (Patient 2) performance on Trailmaking B (Reitan, 1958). While both patients scored well on number of categories achieved on the Wisconsin Card Sorting Test (Heaton, 1981), Patient 2's high number of perseverative responses places him in an impaired range of functioning on this test. Performances by Patient 1 on a verbal fluency task (FAS; Lezak, 1995), and an effortful attentional measure (Auditory Consonant Trigrams; Lezak, 1995) were in the borderline to impaired ranges, while Patient 2's performance on these tasks was much better (average and high average, respectively). Both patients performed poorly on the Stroop Task (Lezak, 1995).

Abstraction abilities (e.g. proverb interpretation) and scores on tasks tapping sustained attention/concentration and psychomotor speed were depressed across the majority of tests for both patients. A tendency to give concrete answers and to perseverate was noted for both throughout the testing.

Unfortunately, neither patient was tested with regard to the intactness of facial perception, memory for faces, or recognition of familiar faces. Although some theorists (e.g. Ellis & Young, 1990) have postulated that Capgras represents a "mirror image" of prosopagnosia (agnosia for faces) others (e.g. Cutting 1991; Hirstein & Ramachandran, 1997) argue that Capgras has more to do with deficits in recognising the uniqueness or personal relevance of stimuli rather than misperception of faces per se.

A Beck Depression Inventory administered to Patient 1 revealed a total score of only 13/61, indicating minimal depression. However, both the examiner and the treating psychiatrist felt this objective measure clearly underestimated her level of distress and was rather a reflection of her general guarded approach to test-taking. Patient 2 was administered an MMPI-2 but was unable to complete the test, citing fatigue.

Medical/psychological follow-up

Shortly after the neuropsychological work-up, Patient 1 was diagnosed with autoimmune (Hashimoto's) thyroiditis (struma lymphomatosa). It is suspected that this patient developed Hashimoto's thyroiditis as an autoimmune response following subacute thyroiditis of unknown duration. Treatment with Synthroid .025 mg resulted significant improvement and the patient's symptoms, including CS delusions, resolved in several weeks time. Her depression improved but did not resolve completely at 3 month follow-up.

Feedback to the referring psychiatrist focused on alleviating Patient 2's depression, and fluoxetine was prescribed along with psychotherapy. Medication compliance was poor, however, and Patient 2 was subsequently lost to follow-up.

Discussion

The two patients presented above, despite differing clinical histories, present with similar neuropsychological profiles across several domains of cognitive functioning. In both patients, Verbal IQ is significantly higher than Performance IQ, replicating Christodoulou's (1977) finding among CS patients of an average 20 point discrepancy in V-P IQ scores,

Table 1. Demographic and neuropsychological characteristics of Patients 1 and 2

	Patient 1 score (%ile)	Patient 2 score (%ile)
Age	22	36
Education	17	16
WAIS-R Subtests (age-corrected scale scores: normal range = 10 + 3)		
Information	13 (84th)	16[2] (98th)
Digit Span	12 (75th)	11 (63rd)
Vocabulary	16[2] (25th)	16[2] (98th)
Arithmetic	11 (63rd)	12 (75th)
Comprehension	17[2] (99th)	13 (84th)
Similarities	10 (50th)	11 (63rd)
Picture Completion	8 (25th)	10 (50th)
Picture Arrangement	6[1] (9th)	8 (25th)
Block Design	5[1] (5th)	8 (25th)
Object Assembly	7 (16th)	10 (50th)
Digit Symbol	7 (16th)	8 (25th)
WAIS-R Summary Scores (normal range = 100 + 15)		
WAIS-RVerbal IQ	122[2] (~91st)	131[2] (~98st)
WAIS-R Performance IQ	79 (~9th)	89 (~25th)
WAIS-R Full Scale IQ	102 (~50th)	105 (63rd)
Trail Making Test		
Part A	28 sec (16th)	53 sec[1] (<1st)
Part B	37 sec (79th)	68 sec (22nd)
Boston Naming Test (number correctly named without phonemic cues)	57/60 (66th)	54/60 (18th)
Wechsler Memory Scales-Revised		
Mental Control	5/6 (37th)	**
Logical Prose (immediate recall)	15/30[1] (7th)	12/30[1] (4th)
Logical Prose (delay)	9/30[1] (4th)	4/30[1] (2nd)
Paired Associates (immediate)	19/24[1] (6th)	**
Paired Associates (delayed)	6/8[1] (1st)	**
Visual Reproductions (immediate)	38/41 (81st)	22/41[1] (9th)
Visual Reproductions (delayed)	33/41 (65th)	10/41[1] (2nd)
California Verbal Learning Test (CVLT)		
Short Delay Free Recall	12/16	8/16
Long Delay Free Recall	14/16	10/16
Recognition	16/16	14/16
Rey Osterrieth Complex Figure		
Copy	32/36 (23rd)	35/36 (62nd)
Delay	22/36 (45th)	12/36 (13th)
Verbal Fluency Test (FAS) (total words in 3 minutes)	28[1] (<1st)	47 (33rd)
Wisconsin Card Sorting Test		
Categories Achieved	6 (66th)	5 (27th)
Perseverative Errors	11 (47th)	30 (1st)
Failure to Maintain Set	0 (73rd)	0 (73rd)
Stroop Test		
A	78 sec[1] (1st)	117 sec[1] (<1st)
B	67 sec[1] (<1st)	60 sec[1] (1st)
C	134 sec[1] (5th)	180 sec[1](<1st)
Auditory Consonant Trigrams - Number Correct	40/60	47/60
Finger Tapping		
Dominant (right) Hand	46 (60th)	50 (61st)
Nondominant (left) Hand	40 (46th)	44 (45th)
Grooved Pegboard		
Dominant (right) Hand	87[1] (<1st)	60 (54th)
Nondominant (left) Hand	111[1] (<1st)	66.7 (52nd)
Beck Depression Inventory	13 (moderate)	28 (severe)

1 = borderline or impaired, 2 = significantly above average, otherwise within the average range. ** denotes missing data.

with lowered Performance scores in both our patients as well as those of Christodoulou. Both patients had some difficulties with visually-mediated attentional tasks (e.g. Stroop Test, Trailmaking Task) and visuospatial tasks, consistent with other researchers' findings of right hemisphere decrements on neuropsychological testing (Cutting, 1991; Christodoulou, 1977).

Despite varying etiologies, these patients demonstrate overlap in terms of cognitive domains compromised. In particular, their attentional deficits are on tasks which have a visual component. Both are able to perform in at least the low average range when attentional tasks are verbally mediated (e.g. digit span, mental control and Auditory Consonant Trigrams). However, both show greater deficits on tasks which require greater visual processing (Digit Symbol, Trailmaking Task and Stroop Test).

Both patients also show moderate deficits in verbal learning and memory ability. It is possible that these poor performances on selected verbal tasks reflect their depressed mood; poor performance by depressed patients on memory tasks is documented in the literature as described above. These patients' poor performances on selected visual spatial tasks are more reflective of the typical performance of CS patients on neurocognitive tasks. This combination of depression and CS symptomatology is thus postulated to explain why both patients showed deficits across a range of both verbal and nonverbal tasks.

However, the profiles of these two patients show some differences in terms of performance on selected tasks. Patient 1 showed significantly more psychomotor retardation than Patient 2, hence her lower scores on Grooved Pegboard. Patient 2 had a more pronounced tendency towards perseverative responding, evident on the WCST and on Visual Reproductions. Each patient also had specific tests which seemed to particularly fluster them; for example, Patient 1 was quite tongue-tied during the verbal fluency task, and Patient 2 was a little overconcerned with accuracy while completing Trails A. These data are seen as reflecting their unique cognitive profiles while not detracting from the overall similarity across several cognitive domains.

It is of further note that both patients display similar neuropsychological profiles despite differences in the etiology of their delusional symptoms. The overlap of deficits in both hemispheres is at first unexpected in light of anticipated right hemisphere dysfunction in CS patients. However, taking into account their depressed mood, the neuropsychological profiles for these two patients are more reasonable. It is possible that as more thorough neuropsychological testing of CS patients with mood disorders appears in the literature, this pattern of test results reflecting components of both verbal and nonverbal dysfunction will be replicated.

References

Bhatia, M. S. (1990). Capgras syndrome in a patient with migraine. *British Journal of Psychiatry, 157*, 917-918.

Brown, R. G., Scott, L. C., Bench, C. J., & Dolan, R. J. (1994). Cognitive function in depression: Its relationship to the presence and severity of intellectual decline. *Psychological Medicine, 24*, 829-847.

Burt, D. B., Zembar, M. J., & Niederehe, G. (1995). Depression and memory impairment: a meta-analysis of the association, its pattern and specificity. *Psychological Bulletin, 117*, 285-305.

Christodoulou, G. N. (1977). The syndrome of Capgras. *British Journal of Psychiatry, 130*, 556-564.

Christodoulou, G. N. (1991). The delusional misidentification syndromes. *British Journal of Psychiatry, 159* (suppl. 14), 65-69.

Crichton, P. & Lewis, S. (1990). Delusional misidentifications, AIDS and the right hemisphere. *British Journal of Psychiatry, 146*, 184-197.

Cummings, J. L. (1985). Organic delusions: Phenomenology, anatomical correlations, and review. *British Journal of Psychiatry, 157*, 608-610.

Cutting, J. (1991). Delusional misidentification and the role of the right hemisphere in the appreciation of identity. *British Journal of Psychiatry, 159* (suppl. 14), 70-75.

Delis, D. C., Kramer, J. H., Kaplan, E., & Ober, B. A. (1987). *California Verbal Learning Test, Research Education Manual.* San Antonio: Psychological Corporation.

Doran, J. M. (1990). The Capgras Syndrome: Neurological/ neuropsychological perspectives. *Neuropsychology, 4*, 29-42.

Elliot, R., Sahakian, B. J., McKay, A. P. & Herrod, J. J. (1996). Neuropsychological impairments in unipolar depression: The influence of perceived failure on subsequent performance. *Psychological Medicine, 26*, 975-989.

Ellis, H. D. & Young, A. W. (1990). Accounting for delusional misidentifications. *British Journal of Psychiatry, 157*, 239-248.

Gray, J. A, Feldon, J., Rawlins, J. N. P., Hemsley, D. R., & Smith, A. D. (1991). The neuropsychology of schizophrenia. *Behavioral and Brain Sciences, 14*, 1-84.

Hayman, M. K., Abrams, R. (1977). Capgras syndrome and cerebral dysfunction. *British Journal of Psychiatry, 130*, 68-71.

Heaton, R. K. (1981). *Wisconsin Card Sorting Test Manual.* Odessa, FL: Psychological Assessment Resources.

Hirstein, W. & Ramachandran, V. S. (1997). Capgras syndrome: a novel probe for understanding the neural representation of the identity and familiarity of persons. *Proceedings of the Royal Society of London, 264*, 427-444.

Joseph, A. B. (1983). In support of a focal theory of Capgras syndrome. *Canadian Journal of Psychiatry, 28*, 671.

Kahlbaum, K. L. (1866). Die Sinnesdelirien. C. Die Illusion. *Allgemeine Zeitschrift fur Psychiatrie, 23*, 56-78.

Kaplan, E. F., Goodglass, H., & Weintraub, S. (1983). *The Boston Naming Test* (2nd ed.). Philadelphia: Lea & Febiger.

Lewis, S. (1987). Brain imaging in a case of Capgras Syndrome. *British Journal of Psychiatry, 150*, 117-120.

Lezak, M. D. (1995). *Neuropsychological assessment* (3rd ed.). New York: Oxford University Press.

MacCallum, W. A. G. (1973). Capgras symptoms with an organic basis. *British Journal of Psychiatry, 123*, 639-642.

Nussbaum, P. D. (1997). "Late life depression: A neuropsychological perspective". In P. D. Nussbaum (Ed.), *Handbook of neuropsychology and aging: Critical issues in neuropsychology*. New York: Plenum Press.

O'Connor, M., Wallbridge, M., Sandson, T. & Alexander, M. (1996). A neuropsychological analysis of Capgras Syndrome. *Neuropsychiatry, neuropsychology and behavioral neurology, 9*, 265-271.

Osterreith, P. A. (1944). Le test de copie d'une figure complex: Contribution à l'etude de la perception et de la memoire. *Archives de Psychologie, 30*, 286-356.

Pellettier, J. R, Bartolucci, G., & Wallace, J. (1985). Capgras syndrome - The many avenues to delusional misinterpretation. *Canadian Journal of Psychiatry, 30*, 225-227.

Purcell, R., Maruff, P., Kyrios, M. & Pantelis, C. (1997). Neuropsychological function in young patients with unipolar major depression. *Psychological Medicine, 27*, 1277-1285.

Quinn, D. (1981). The Capgras syndrome: Two case reports and a review. *Canadian Journal of Psychiatry, 26*, 126-129.

Reitan, R. M. (1958). Validity of the Trailmaking Test as an indication of organic brain damage. *Perceptual and Motor Skills, 8*, 271-276.

Rey, A. (1941). L'examen psychologique dans les cas d'encéphalopathie traumatique. *Archives de Psychologie, 28*, 286-340.

Sautter, S. W., Briscoe, L., & Farkas, K. (1991). A neuropsychological profile of Capgras syndrome. *Neuropsychology, 5*, 139-150.

Signer, S. F. (1987). Capgras' syndrome: The delusion of substitution. *Journal of Clinical Psychiatry, 48*, 147-150.

Signer, S. F. (1992). Capgras symptoms and delusions of reduplication in neurologic disorders. *Neuropsychiatry, Neuropsychology and Behavioral Neurology, 5*, 138-143.

Signer, S. F. (1994). Localization and lateralization in the delusion of substitution. *Psychopathology, 27*, 168-176.

Tsai, S. J. Hwang, J. P. Yang, C. H. Liu, K. M. & Lo, Y. (1997). Capgras' syndrome in a patient with vascular dementia: a case report. *Kaohsiung Journal of Medical Sciences, 13*, 639-642.

Wechsler, D. (1981). *Manual for the WAIS-R*. New York: Psychological Corporation.

Wechsler, D. (1987). *Wechsler Memory Scale - Revised.* New York: Psychological Corporation.

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