Automatic without autonomic responses to familiar faces: Differential components of covert face recognition in a case of Capgras delusion

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Introduction. This study was designed to elucidate the relationship between different types of covert face recognition. Some patients with prosopagnosia (i.e., the profound inability to recognise previously familiar faces) nonetheless evince autonomic face recognition (elevated skin-conductance levels to familiar faces) or behavioural indices of covert recognition (i.e., priming; interference effects; matching effects; face-name learning). One prosopagnosic patient revealed both autonomic and behavioural covert face recognition—which suggests they may arise from some common basis. Method. To test this claim a patient with the Capgras delusion (i.e., holding the belief that others have been replaced by impostors, etc.) was tested on each type of covert face recognition and her results compared with age-matched controls. We know that the Capgras delusion is characterised by good overt or conscious face recognition coupled with the absence of autonomic discrimination between familiar and unfamiliar faces. The question addressed here was whether, compared with age- and gender-matched controls, the patient, B.P., would show neither autonomic nor behavioural covert face recognition. Results. The answer was that, although she showed no autonomic discrimination, her performance on a priming task and a test of face/name interference were normal. The controls, as expected, revealed covert face recognition on both the autonomic and behavioural measures. Conclusions. The results imply in B.P. a clear dissociation between autonomic and behavioural measures of covert face recognition. The theoretical implications of these results are discussed.

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One of the most intriguing revelations from research into the ways we perceive the world and access stored information about it is the finding, repeated across a number of areas, that, in addition to what is consciously processed, information is picked up, stored, and retrieved in ways that are variously described as implicit, covert, or unconscious (Schacter, 1992; Schacter, McAndrews, & Moscovitch, 1988).

This phenomenon has important theoretical ramifications and, therefore not surprisingly, it has also provoked attention from those interested in face recognition. It is a matter of common observation that recognition of a highly familiar face occurs more or less automatically—we cannot look at a familiar person and decide not to recognise him or her. Strikingly, some of these automatic aspects of face recognition seem to be preserved in cases of prosopagnosia, a severe defect of face recognition caused by brain injury. The seminal finding here was published by Bauer (1984, 1986). He investigated a person (L.F.) who was profoundly prosopagnosic following a motorcycle accident and, therefore, unable consciously to recognise previously known faces. Bauer showed that L.F. was nonetheless able to demonstrate some unconscious, covert recognition. Specifically, when shown familiar faces along with correct or incorrect names, L.F. tended to produce the largest autonomic responses (in this case, skin conductance response) when the correct name accompanied the face. For this differential responding to have occurred required at some level a degree of recognition specifically to link names and faces; yet L.F. had no conscious sense of recognition and he performed at chance level when explicitly asked to choose the correct name.

Tranel and Damasio (1985, 1988) confirmed Bauer’s finding of nonconscious recognition of familiar faces in prosopagnosia using a different methodology in which skin conductance responses (SCRs) were measured while a series of faces belonging to previously familiar and unfamiliar people were shown. Again, there was evidence of autonomic discrimination (in the form of larger SCRs to familiar than unfamiliar faces) without conscious recognition.

Just what this covert recognition entails is debatable and we shall return to this question shortly. What should first be said is that such autonomic discrimination has also been described as accompanying normal face recognition. Tranel, Fowles, and Damasio (1985) reported significantly larger skin conductance responses to familiar compared with unfamiliar faces from neurologically normal participants who were simply asked to look at a series of faces. This seems to be a robust phenomenon (Ellis, Quayle, & Young, 1999; Ellis, Young, & Koenken, 1993). It also occurs even when stimuli are presented in such a way as to prevent their being consciously identified (Ellis et al., 1993)—like prosopagnosic patients, neurologically normal observers can show discriminative SCRs to faces they are not aware of having recognised. It may be noted that the only autonomic measure used so far has been SCR: Heart rate, respiration, etc. may well yield similar results but these have not yet been examined.
Bauer (1984, 1986) not only made the initial observation of covert face recognition but he also offered the first theoretical account. His ideas involved a mixture of neurological and psychological hypotheses. At the psychological level, Bauer suggested that there is a difference between overt recognition of a familiar face and our orienting response to that face based on its emotional significance. In these terms, overt recognition is lost in prosopagnosia, whereas orienting responses (i.e., SCRs, assumed to be an index of covert recognition, may be relatively preserved). At the neurological level, Bauer used neuroanatomical ideas based on Bear’s (1983) adaptation of the dual visual processing routes identified by Ungeerleider and Mishkin (1982). Bauer suggested two routes for face recognition each of which begins in the visual cortex and ends in the limbic system but which follow separate pathways: A ventral route along the inferior longitudinal fasciculus, within which information regarding a face’s familiarity, identity, etc. is extracted at different stages; and a dorsal route that projects via the superior temporal sulcus and inferior parietal lobule, extracting information about its significance to the observer. In some prosopagnosics, although the ventral route is obviously damaged, the dorsal route may be less affected, giving rise to autonomic discrimination.

In evaluating Bauer’s ideas it is important to distinguish the neurological and psychological hypotheses (Ellis, 1998; Young, 1998). The plausibility of Bauer’s neurological conception has been questioned by other authorities (Breen, Caine, & Coltheart 2000; Hirstein & Ramachandran, 1997; Tranel, Damasio, & Damasio, 1995), but the idea of a dissociation between overt recognition and orienting responses has been generally accepted.

Autonomic discrimination, however, is not the only manifestation of nonconscious face recognition in prosopagnosia. Numerous examples exist of what can be termed covert behavioural processing in prosopagnosic patients (Bruyer, 1991; Young, 1994; Young & Burton, 1999). These include: better learning of correct face-name associations compared with incorrect pairings (Bruyer et al., 1983; De Haan, Young & Newcombe, 1987a; Sergent & Poncet, 1990; Sergent & Signoret, 1992); better matching of two views of a face when the face was known prior to the onset of prosopagnosia (De Haan et al., 1987a; Sergent & Poncet, 1990); associative priming from “unrecognised” faces (Young, Hellawell, & De Haan, 1988); and interference from faces in name classification tasks (De Haan et al., 1987a; De Haan, Young, & Newcombe, 1987b; Sergent & Signoret, 1992). In such studies, covert recognition of premorbidly familiar faces is inferred from their effects on behaviour—usually behaviour in a task that constitutes an indirect test of recognition (Young & De Haan, 1992). Young and Ellis (in press) provide a useful summary table of the ten different measures of covert face recognition.

The question underlying the present study can now be posed: Is there evidence that autonomic and behavioural covert recognition processes are mediated by the same psychological mechanism? There is an obvious parallel in
that each seems to index an automatic form of recognition that can occur nonconsciously in prosopagnosia. Moreover, a number of reports of behavioural indices of covert recognition have used different behavioural tests with the same patients. When this has been done, covert recognition has invariably been found for all valid indices—there are no reports in the literature of patients who show covert recognition on only some behavioural tests and not others (Young & Burton, 1999). Based on present evidence, therefore, it seems reasonable to infer that the different behavioural indices of covert recognition tap a common underlying psychological mechanism.

However, the position is less clear concerning the relation between behavioural and autonomic indices of covert recognition. Studies of prosopagnosia usually involve only autonomic or only behavioural measures. To date, the sole direct comparison between these measures has been made by De Haan, Bauer, and Greve (1992) who gave behavioural tests of covert face recognition to the patient, L.F., on whom the original study of covert autonomic discrimination was made. L.F. also revealed covert recognition with these tests, leading De Haan et al. to conclude that “…autonomic and behavioural indices of covert recognition reflect the same, or similar, neuropsychological phenomena” (De Haan et al., 1992, p.89).

The fact that L.F. evinced both autonomic discrimination and behavioural signs of covert face recognition is important but, of course, it does not logically mean that there is a single underlying psychological system responsible for covert recognition. It may be coincidental that the one case of prosopagnosia so far studied revealed both manifestations, or it may be that prosopagnosia may be accompanied by relative preservation of more than one part of the face recognition system.

We have identified a new approach to this issue. This rests upon the observation that a group of neuropsychiatric patients diagnosed with Capgras delusion show a pattern that, in some sense, forms the mirror image of prosopagnosia, that is, they can consciously recognise familiar faces but fail to reveal autonomic discrimination (Ellis, Young, Quayle, & de Pauw, 1997; Hirstein & Ramachandran, 1997).

Capgras delusion is a bizarre condition that occurs within a variety of clinical settings, including psychiatric, neurological, and medical illness (Ellis & de Pauw, 1994). Regardless of setting, it is characterised by the belief that others, usually but not necessarily close to the patient, have been replaced by impostors, robots, aliens, etc. (Capgras & Reboul-Lachaux, 1923; Christodoulou, 1977; Enoch & Trethowan, 1991).

Ellis and Young (1990) hypothesised that patients with the Capgras delusion would not reveal the normal, higher skin conductance response (SCR) to familiar compared with unfamiliar faces (Ellis et al., 1993; Tranel et al., 1985). This prediction was unequivocally borne out in two studies: Ellis et al. (1997) tested normal individuals, psychiatric controls, and five Capgras delusion
patients and observed only the latter group to reveal no differential SCRs to familiar and unfamiliar faces; Hirstein and Ramachandran (1997) found identical results in a single neurologically induced case of Capgras delusion. It may be worthwhile noting that the SCRs of some patients with Capgras delusion, like those of the prosopagnosic patient, L.F., are small. This may reflect generalised brain damage or it may be specific to autonomic responses to faces. Although some degree of hyporesponsivity is not unusual in schizophrenic patients (Perry, Felger, & Braff, 1998), the reduction in SCR size cannot in itself account for the failure to find differential responses to known and unknown faces in people with Capgras delusion. Ellis et al. (1997) established that psychiatric controls still showed differential SCRs to familiar faces despite their reduced level of responding, and they demonstrated that transforming the ranges of the SCRs to a common metric still revealed no difference between familiar and unfamiliar faces for people with the Capgras delusion.

The obvious question to ask now is: Will people with Capgras delusion also fail to show automatic responses to familiar faces when tested using behavioural techniques? If the conclusion of De Haan et al. (1992) that autonomic and behavioural indices of covert face recognition share a common basis is correct, then it follows that patients with the Capgras delusion should fail to manifest behavioural signs of automatic face recognition, just as they fail to reveal autonomic discrimination between familiar and unfamiliar faces.

In the following study, for the first time, a patient with Capgras delusion was tested with both behavioural and autonomic measures of automatic recognition of familiar faces. The behavioural measures involved priming and interference experiments similar to those used by De Haan et al. (1992), and her SCRs were recorded to familiar and unfamiliar faces.

**METHOD**

**Case B.P.**

B.P., a 68-year-old female retired clerical worker, was admitted to hospital in a confused state six years ago following a psychotic episode, which included both Capgras delusion and Cotard delusion. There is a family history of depression. During her stay she declared the belief that her doctor had been replaced by someone impersonating him. Evidence of the strength of this belief was her violent attempt to remove what she believed was the ‘‘impostor’s’’ wig. B.P. also failed to acknowledge her daughters when they visited. These delusions to some extent have since been resolved and at the time of testing she was not being administered any neuroleptic drugs.

An EEG examination revealed mild bilateral abnormalities with an excess of slow-wave components particularly evident on the right side. All other physical measures fell within normal ranges.
Over 6 years, B.P. has been treated with various antipsychotic drugs, including chlorpromazine (100 mg at right) and, later, haloperidol (10 mg twice/day) as well as diazepam (5 mg three/day) and Thoridazine (150 mg three/day). At the time of testing B.P. was an outpatient and reported no problems relating to face recognition or identification. She performed at normal levels on the shortened versions of the Warrington Recognition Test for Words (21/25) and the Warrington Recognition Test for Faces (23/25).

Controls

Six nonpsychiatric female controls also completed the tests. These ranged in age from 66 to 75 and had a mean age of 69.3 years. None of these subjects had any history of psychiatric disorders. All the controls were right handed as was B.P. herself.

Behavioural tests

Two behavioural tests were employed, each of which has been used to demonstrate covert face recognition in prosopagnosia (De Haan et al., 1992).

Self priming. The task involves deciding whether a name is that of a familiar person or an unfamiliar (invented) name. On each trial, the name is preceded by a face prime, allowing measurement of whether different types of face will affect reaction times for deciding whether or not the name is familiar (Calder & Young, 1996; Calder, Young, Benson, & Perrett, 1996).

B.P. and the controls were presented with a number of trials, each consisting of the presentation of a face on a computer screen for 2 seconds, followed by a gap of 1 second, then by a target name to which they were required to make a familiarity judgement as rapidly as possible. Eighteen famous names were used and these occurred in each of three conditions:

1. the name preceded by the same person’s face (Same Person);
2. the name preceded by an unfamiliar person’s face (Neutral), and
3. the name preceded by a different famous person’s face (Different Person).

There were, therefore, 56 trials that required a “yes” response. An equivalent number of trials was created that contained nonfamous names as targets (nonfamous names were generated by recombining the first and second names of famous people, to form new names). There were a further eight practice trials using faces and names that were not included in the experimental set. The trials were presented in a fixed pseudorandom order and responses were made via key presses. Reaction times for correct responses to the target names were used to determine the influence of the different types of face prime.
**Interference.** This task investigates whether the presence of familiar face distractors affects the categorisation of famous names (Young, Ellis, Flude, McWeeny, & Hay, 1986).

B.P. and the controls were presented with a face and a name (or just a name) at the same time via a computer screen. Their task was to indicate whether the name was that of a politician or a (television) personality by pressing one of two marked keys. They were told that a face would be shown alongside the name in many of the trials, but that this face should be ignored in order to classify the name as quickly and correctly as possible.

There were 20 different names of famous people (10 politicians, 10 TV personalities, none of which had been used in the Self priming task). These occurred in each of four conditions in a pseudorandom order. The four conditions for each name were:

1. the name presented with the face of the same person (Same Person);
2. the name presented with a face of someone from the same category (Related);
3. the name presented on its own (Name Only); and
4. the name presented with the face of someone from the other category (Unrelated).

The 80 trials resulting from this design were then repeated, giving a total of 160 responses. Reaction times for correct responses were used to determine whether the different types of accompanying face affected categorisation of the name. A random sample of eight of the trials were used as practice.

**Autonomic responses.** Autonomic responses to faces were tested by measuring skin conductance in response to the presentation of faces of either familiar people or unfamiliar people. The procedure followed was based on that recommended by Tranel et al. (1985) and also implemented by Ellis and colleagues (Ellis et al., 1997, 1999). This procedure can be summarised as follows.

Two Ag/AgCl electrodes were attached to participants’ (B.P. or the control) nondominant, left hand and used to measure SCR. The issue of laterality in SCRs to faces, however, has not been investigated and it must be acknowledged that the nondominant hand may yield stronger responses because it is controlled by the cortical hemisphere more identified with emotional responding: This is pure conjecture and merits further investigation. The experiment began by the participant being asked to take several deep breaths and resulting SCR changes being recorded. The experimental procedure was then explained to the participant, who was asked to remain as still as possible during the procedure. Sixty colour images of individuals’ faces were presented on a computer screen at a rate of one every 20 seconds. There were five practice items (all of which were
unfamiliar faces) followed by 40 more unfamiliar faces and 15 famous faces presented in a random order. The amplitude of any peaks in the changes in skin conductance occurring between 1 second and 5 seconds after initial presentation of the face were recorded. Following this procedure, the participant was presented with the same set of faces and asked whether she recognised the person. If she was able to give any specific information about the person then a familiar response was recorded—otherwise the face was considered to be unfamiliar.

RESULTS

Behavioural tests

Mean reaction times for correct responses, standard deviations, and percentage error rates are presented in Table 1.

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<th>Familiar names</th>
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<tr>
<td></td>
<td>Same person</td>
<td>Neutral person</td>
<td>Different person</td>
<td>Unfamiliar names</td>
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<tr>
<td></td>
<td>B.P.</td>
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<td>RT</td>
<td>901</td>
<td>1311</td>
<td>1461</td>
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<td></td>
<td>SD</td>
<td>267</td>
<td>451</td>
<td>298</td>
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<td>% error</td>
<td>11%</td>
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<td>Controls</td>
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<tr>
<td></td>
<td>RT</td>
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<td>1259</td>
<td>1293</td>
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<tr>
<td></td>
<td>SD</td>
<td>267</td>
<td>339</td>
<td>324</td>
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<td>% error</td>
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<tr>
<th></th>
<th>Same person</th>
<th>Related</th>
<th>Name only</th>
<th>Unrelated</th>
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<td></td>
<td>B.P.</td>
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<td>RT</td>
<td>1044</td>
<td>1223</td>
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<td></td>
<td>SD</td>
<td>231</td>
<td>297</td>
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<td>Control</td>
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<td>RT</td>
<td>1057</td>
<td>1107</td>
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<td>SD</td>
<td>250</td>
<td>261</td>
<td>278</td>
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<td>% error</td>
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Note: Percentage error rates are shown for comparison and these include incorrect key presses and names that were not familiar to the participant.
**Self Priming.** The data of principal interest concern reaction times to familiar target names in the Same Person, Neutral, and Different Person conditions. Data for the unfamiliar target names are presented in Table 1 only for comparison.

B.P. failed to recognise two of the 18 famous target names on all three trials using them and a further two famous names on two of the trials, and so the analysis was conducted on the remaining 42 trials to familiar targets. A one-way ANOVA was conducted on the data from the Same Person, Neutral, and Different Person conditions, to analyse responses to the 15 consistently recognised targets across each condition. This demonstrated a significant effect of condition, \( F(2, 26) = 13.11; p < .001 \). Pairwise Tukey comparisons showed a significant difference between the Same Person condition and the Different Person condition. When the analysis was conducted on the log of reaction times the same difference remained significant but the difference between the Same Person and Neutral conditions also became significant.

These results, therefore, show a significant effect of priming condition, indicating that the nature of the prime affected the processing of the target name. However, although the mean RT to the Neutral Condition fell between those from the Same Person and Different Person conditions, differences at this level of analysis were not statistically reliable, leaving it indeterminate whether the effect involved facilitation (Same Person < Neutral), inhibition (Neutral < Different Person), or both.

The control participants’ data were analysed in a similar manner. A summary of their performance is included in Table 1. A two-way ANOVA (subject by condition) was performed on their data. This analysis found a significant effect of condition, \( F(2, 191) = 3.5; p < .05 \). Pairwise Tukey comparisons showed a significant difference between the Same Person condition and the Different Person conditions. The performance of B.P., therefore, was consistent with that of the control participants and cannot be considered to be abnormal for this task.

**Interference.** Incorrect responses and reaction times over 1800 ms (i.e., over 2.5 SDs above mean) were discarded from the analysis (see Table 1). A one-way ANOVA conducted on B.P.’s reaction times revealed a significant effect of condition, \( F(3, 141) = 7.38; p < .001 \). Pairwise Tukey comparisons found significant differences between the Same Person and both the Related and Unrelated conditions and between the Name Only and the Unrelated conditions. The same pattern of significance was found when the log transform of the reaction times were analysed. In comparison with the baseline Name Only condition, the data, therefore, reveal significant interference from Unrelated faces. The facilitation from the face of the Same Person was not significant in the direct comparison to the Name Only condition, but there was an indication of facilitation insofar as the Same Person condition reaction times were faster than those from the Related or Unrelated conditions.
B.P.’s data are similar in pattern to those produced by the control participants. In order to analysis the control data, a two-way ANOVA was conducted (subject by condition). The effect of condition was significant, $F(3, 786) = 6.840; p < .01$. Pairwise Tukey comparisons found significant differences between the Same and Unrelated conditions, and between the Same and Name Only conditions. The performance of B.P. was well within the range of performance of the control participants.

**Autonomic responses.** B.P. showed a low resting skin conductance level (1.7 µS), although this was within the range of the age-matched control participants (1.1–3.6 µS). She failed to recognise one famous face and made false positive recognition judgements to three unfamiliar faces (one she claimed looked like the experimenter). Data from these faces were removed from the analysis. She showed no differential responding to familiar and unfamiliar faces (0.023 µS, SD = 0.026 µS for familiar faces and 0.026 µS, SD = 0.026 µS for unfamiliar faces), $t(49) = 0.6814$.

All six of the control participants showed significantly higher SCRs to recognised famous faces than to the unfamiliar faces (all $p < .01$). The range-corrected SCRs for B.P. and the six controls are shown in Figure 1 (the range correction allows an adjustment that removes individual differences in the absolute size of responses). A normative interval for the range-corrected SCR differential was established such that 95% of subjects should show a differential

![Figure 1. Mean range-corrected SCRs for recognised familiar faces and unfamiliar faces for B.P. and the six control participants (C1 to C6). Error bars show standard errors.](image-url)
between .187 and .360. B.P.’s performance fell outside this range (−.025) and so her SCRs can be interpreted as being abnormal.

DISCUSSION

Consistent with previous studies of Capgras delusion (Ellis et al., 1997; Hirstein & Ramachandran, 1997), B.P. did not show any signs of a differential autonomic response to familiar faces—her SCRs to familiar and unfamiliar faces were essentially identical.

Despite the lack of differential autonomic responses, B.P. revealed behavioural evidence of rapid and involuntary recognition of familiar faces in two tests that have yielded similar data in prosopagnosia (De Haan et al., 1992). Her ability to recognise and categorise familiar names was affected by the presence of task-irrelevant face primes or face distractors.

Both autonomic and behavioural tests of the type used here can be considered indices of automatic aspects of face recognition. In the autonomic test, there is no requirement to make a conscious response to the faces—the task is simply one of passive recognition. In the behavioural tests, face recognition is assessed by its ability to influence a different task (name classification), participants are asked to ignore the faces, and the requirement to respond quickly limits the opportunities for conscious intervention.

The pattern of dissociation between preserved behavioural and absent autonomic indices of automatic aspects of face recognition found with B.P. provides challenges to the theoretical position of De Haan et al. (1992), derived from their finding of both behavioural and autonomic signs of covert face recognition in a prosopagnosic patient. We do not doubt that it may well be the case that autonomic and behavioural forms of automatic recognition will often co-occur in prosopagnosia—but our findings are not consistent with the idea that these reflect a single common psychological or neuroanatomical locus.

The present data from a patient with the Capgras delusion instead imply that behavioural and autonomic indices are at least to some extent involving different mechanisms. This finding has some interesting theoretical ramifications. The most obvious is that it draws attention to what is different between behavioural and autonomic indices of automatic recognition, and what they might still have in common. In addition, it reopens the question of the relationship of both to overt recognition. Do we now need to posit three pathways to face recognition (responsible for overt recognition, automatic behavioural effects, and autonomic responses), or is a simpler schema possible?

An important pointer may come from computer simulation of the properties of face recognition and the deficits found in cases of prosopagnosia. Two notable attempts have been made, involving research groups led by Burton (Burton, 1994; Burton, Bruce, & Johnston, 1990; Burton, Young, Bruce, Johnston, & Ellis, 1991; Young & Burton, 1999) and by Farah (Farah, O’Reilly,
& Vecera, 1993; O’Reilly & Farah, 1999). In both cases, the kinds of task used in behavioural studies of covert recognition are seen as mediated through the same pathways as overt recognition, but as being differentially sensitive to the effects of damage. In other words, the Burton and Farah models each used a common route for overt recognition and those automatic aspects of recognition indexed by indirect behavioural tests, but regard overt recognition as much the more easily disrupted by damage to the system. From this perspective, a person with relatively preserved overt recognition (as is found in Capgras delusion) must also show preserved automatic recognition in behavioural tests. This is exactly in line with our findings for B.P. Interestingly, the computer simulation models’ implication of a necessary relation would, of course, be falsified if someone could demonstrate a person who had overt recognition without showing preserved automatic effects.

Computer simulation accounts, then, suggest that automatic behavioural effects and overt recognition may derive from a common pathway. Unfortunately, the simulations have at present nothing to say about autonomic indices, which simply fall outside the range of phenomena that have been simulated.

Taken together with findings from studies of prosopagnosia (Bauer, 1984, 1986; Tranel & Damasio, 1985, 1988), the findings from Capgras delusion (Ellis et al., 1997; Hirstein & Ramachandran, 1997) and other disorders (Tranel et al., 1995) show a clear dissociation between overt recognition and autonomic responses to familiar faces. This double dissociation remains consistent with Bauer’s (1984) psychological account in terms of different pathways for overt recognition and orienting responses to personally significant stimuli. What has always been less well expressed in this account, though, is the question as to the stage at which these pathways bifurcate.

This issue has been highlighted by Breen et al. (2000). The nub of the question involves whether the pathways used in overt and autonomic recognition bifurcate at a very early stage (and therefore each has its own stored representations of the appearances of familiar faces), or whether they rely on a common set of stored representations which then leads to different output pathways. In terms of the widely used Bruce and Young (1986) model, the point involves whether the pathways bifurcate before (and therefore duplicate) or after (with no need to duplicate) the face recognition units. Breen et al. (2000) favour the latter possibility. They argue that there is only a single face recognition system, but they posit two pathways subsequent to recognition: One of these leads to the processing of biographical and semantic information about the person; and the other accesses the system responsible for generating affective responses to familiar faces. What they do not explain, however, is how the outputs (recognition and affective) are recombined to yield a single percept. Clearly, such integration is necessary; indeed without it not only would there not be a single impression of someone but the discrepancy-based argument for
explaining the Capgras delusion (Ellis & Young, 1990) would not be appropriate.

The plea by Breen et al. (2000) for parsimony in the number of representations of familiar faces needed is certainly appealing, but the mechanisms involved in establishing the personal significance of objects, events, and other people are likely basic to human cognition (Van Lancker, 1991; Zajonc, 1980) and may not respect this dictate. Further investigations of conditions such as the Capgras delusion may offer a useful new perspective.

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