
'I Know your Name but not your Face': Explaining Modality-based Differences in Access to Biographical Knowledge in a Patient with Retrograde Amnesia

Catherine Haslam, Michael Cook¹ and Max Coltheart²

School of Psychology, University of Exeter, Exeter EX4 4QG, UK, ¹Division of Psychology, The Australian National University, Canberra and ²School of Behavioural Sciences, Macquarie University, Sydney, Australia

Abstract

In current functional models of person recognition it is proposed that there exists a single common body of semantic information concerning people accessible from all modalities (e.g. names, faces). In this paper, we present evidence that challenges this view. Two experiments are discussed investigating residual autobiographical and public knowledge in a patient suffering from retrograde amnesia. Knowledge about people was investigated in each case by asking a series of questions, ranging from the very general to the very specific. Experiment 1 examined knowledge about famous people. The results showed that the patient accessed more information about famous people when cued with names than when cued with faces. Experiment 2 examined knowledge about people known personally to the patient. Again, the same pattern of results emerged. While the patient responded accurately to all questions posed with name cues, her ability to recall the same information when prompted with face cues was clearly inferior. This modality-based difference in accessing biographical knowledge is discussed in relation to models of person recognition.

Introduction

Biographical information is accessed through a variety of sources. It can be cued by exposure to a person's face, name or even a semantic context. Irrespective of the original cue, once biographical information is tapped it can be accessed in response to all cue types. This notion of equal accessibility is incorporated in current models of person recognition. In this paper, we provide evidence that challenges this view. Specifically, we present data from a patient who shows a differentiation in her knowledge about people when cued with faces and names. This patient retrieved more semantic information about people when cued with their names than with their faces.

There have been relatively few changes to Bruce and Young's (1986) original functional model of face recognition, with perhaps one of the most significant being the introduction of other modalities, such as names, in the recognition process (Burton *et al.*, 1990; Valentine *et al.*, 1991; Burton and Bruce, 1992, 1993; Brédart *et al.*, 1995). Several stages are involved in the process of recognizing and accessing information about people. The first stage involves the formation of a representation that contains a visual description of a seen face. This is compared with all known faces which are believed to be contained in the face recognition units.

Name recognition units serve a similar function to face recognition units, but are stored separately. These modality-specific units contain the information required to identify an individual's face, name or even voice as familiar. Information from these units is then combined in the person-identity nodes (PINs), allowing recognition of a particular person, and through this route semantic knowledge is activated. Name retrieval occurs as a final stage in the process. These processes are illustrated in Fig. 1.

The implication of this model is that semantic information available via the face route should also be available via the name route. However, recent evidence of modality-based differences in access to semantic information about famous people challenges this. Eslinger *et al.* (1996) found different patterns of residual biographical knowledge in patients with retrograde amnesia depending on lesion location. One patient, EK, with more extensive damage in the left temporal region, was unable to access information about famous people from name cues but was relatively unimpaired in providing information in response to faces. The reverse pattern was evident in another patient, DR, whose damage was largely confined to the right anterior and medial temporal region. In this case, the patient was impaired in several tests of famous

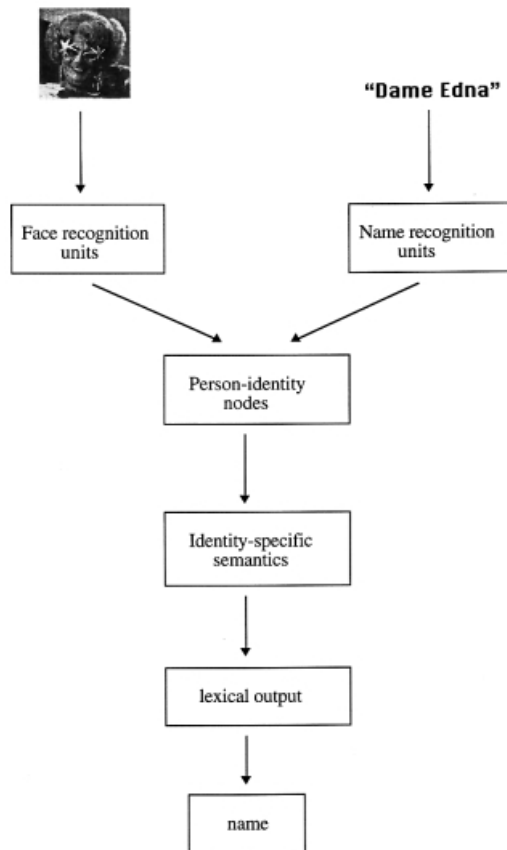


Fig. 1. Central features of the functional model of person recognition.

face knowledge (including face–name matching with face prompts and forced choice recognition), but performed normally on all tasks involving proper names. Based on this evidence, Eslinger *et al.* (1996) suggested that biographical information about famous people may be processed asymmetrically in the temporal lobe with the left hemisphere implicated in accessing and storing information associated with names and the right hemisphere critical in knowledge associated with faces.

There are difficulties in explaining the findings for DR in particular, using existing models of person recognition. In the case of EK, a modality-based difference was found in her familiarity ratings, with face familiarity better than name familiarity. This suggests that EK's superior knowledge with faces may stem from a disconnection between the name recognition units and PINs and, accordingly, fits the model. The results for DR, however, are more difficult to explain. His performance on the face–name matching task is probably the most pertinent in attempting to identify the locus of damage. On this task his performance was only impaired with face cues. The task obviously requires more than mere familiarity as a particular face must be associated with a particular name. In fact, there was no discrepancy between modalities in DR's familiarity judgements, although both were somewhat lower than that of the controls. Whether the damage occurs at the level of the PINs or semantics might be debated, but this does not change the fundamental difficulty

in explaining this result using the existing model of person recognition. According to this model, there is no differentiation between modalities once the PINs are reached. Hence, any modality-based difference that emerges from this level onwards cannot be explained.

There are other reports of modality-based differences in access to biographical information. For instance, McCarthy and Warrington (1992) found a difference in the amount of semantic information that their patient RFR could provide about famous people when cued with faces and names. With face cues, RFR could select the famous face contained in a set of unknown faces, but failed to provide more detailed information (e.g. such as identifying their profession). However, the information sourced by names was richer in detail. Not only was RFR able to recognize famous names as familiar, he could also provide the superordinate professional role for the majority of names presented. There are two possible explanations for RFR's deficient knowledge in the case of faces. It might be argued that the route between the face recognition units and the PINs is damaged. Such an explanation can be accommodated easily within existing models of person recognition provided RFR based his fame judgements on familiarity. Accordingly, any familiar face would be judged as belonging to a famous person. However, this is not the only knowledge that RFR may have used to support such judgements. It could be argued that to ensure accuracy in fame judgements, access to at least some semantic information is required. If RFR accessed semantic information to make fame judgements, then route damage alone would not explain his performance. In this event, the damage must lie in the store of semantic knowledge concerning faces and, as already noted, current models cannot account for modality differences in access to biographical information.

Evans *et al.* (1995) reported a similar modality-based difference in access to biographical information in their patient VH. On initial examination, VH provided detailed semantic information about 39 of the 50 famous names presented. When presented with the faces of these famous people, VH could only provide identifying information in 11 cases. It was also reported that VH accessed general semantic information in response to face cues (i.e. concerning a person's profession), but only in a small number of cases. Thus, while VH could provide some identifying semantic information in response to faces, he provided more detailed information in response to names. The deficiency in VH's case is clearly at the level of the semantic store, but restricted to a single modality.

In this paper, we present another case of differential access to biographical knowledge. In this case though, the difference emerged in both public and autobiographical domains. Two experiments were conducted to examine knowledge in each domain. In these experiments the patient was asked to answer a series of questions about famous and personally familiar people, ranging from the very general to the very specific. The modality-based difference that emerged in our patient adds to the existing evidence that challenges current opinion

about the processes involved in accessing biographical information.

Case history

TG was 36 years old when she was diagnosed with herpes simplex encephalitis. As a result of her illness, TG developed a dense retrograde and anterograde amnesia. Cranial magnetic resonance imaging (MRI) reports noted altered signal intensity within the cortex of both temporal lobes, mainly involving the medial temporal region, but extending around the anterior pole of the right temporal lobe on to the lateral cortex. An EEG report noted slow waves in the right temporal region. Her case history and neuropsychological profile have been described in detail previously (Haslam *et al.*, 1998) and thus only the relevant details will be summarized here. The relevant test results are presented in Table 1.

TG's retrograde amnesia in the autobiographical domain is characterized by a dissociation between semantic and episodic memory. The deficit to personal semantic (or factual) knowledge covers a period of at least 20 years, while that to personal autobiographical (or episodic) knowledge extends back to childhood. Remote public knowledge was not examined given that the famous faces and events test in existence was deemed to be inappropriate for an Australian population. TG's anterograde memory loss is profound and global. This was evident in her inability to recall any information at all following interference or a delay of several minutes. TG's deficit to remote and newly acquired knowledge occurs in the context of preserved semantic memory as noted in her performance in tests of general word knowledge, comprehension, picture naming and fluency. Visual perception and face recognition was also preserved.

Experiment 1

The aim of experiment 1 was to determine how much information TG could provide about famous people in response to face and name cues. The examination focused on TG's remote memory only. A series of direct questions was asked to probe knowledge for a range of details, from the very general to the very specific, about these people (see Fig. 1). Given her intact perception (see Table 1), if the current model of person recognition is accurate, then the amount of biographical information accessible from faces and names should be equal. A finding to the contrary would be inconsistent with this model and raise questions about the manner in which biographical details are accessed.

An important point of clarification concerns the knowledge hierarchy illustrated in Fig. 2. In this hierarchy, names are the lowest level of specificity, as they represent one of the most unique features about a person. However, in placing names at this level, we are not suggesting that they comprise the lowest level of knowledge hierarchies in general. The classification of a low entry into a semantic hierarchy is implied by its properties (e.g. knowing that someone is an

Table 1. TG's neuropsychological profile (complete results available in Haslam *et al.*, 1998)

<i>General intellectual function</i>			
WAIS-R			
Verbal IQ	101		
Performance IQ	95	Vocabulary	13
Full-scale IQ	99	Comprehension	13
<i>Anterograde memory</i>			
WMS-R			
Verbal memory index	68		
Visual memory index	67		
General memory index	61		
Attention/concentration index	112		
Delayed recall index	<50		
RAVLT			
Trials 1–5 (/15)	4, 6, 6, 5, 5		
Recall after interference	1(+2)/15		
30 min recall	0/15		
30 min recognition	13(+27)/15		
Rey figure			
Copy	36		
3 min delay	0		
30 min delay	0		
<i>Autobiographical remote memory</i>			
AMI			
Personal semantic			
Childhood	19		
Early adult	15		
Recent life	10		
Autobiographical			
Childhood	0		
Early adult	0		
Recent life	0		
Modified Crovitz technique (10 cue words)	8/30		
<i>Semantic memory (additional tests)</i>			
Letter fluency	39		
Category fluency			
Total animate	35		
Total inanimate	36		
Picture naming (BORB)	69/76		
Comprehension			
Token test	163/163		
<i>Visual perception</i>			
Benton's facial recognition (long conversion)	43/54		
Benton's judgement line orientation (total)	28/30		
BVRT: form discrimination	32/32		

WAIS-R, Wechsler Adult Intelligence Scale-Revised; WMS-R, Wechsler Memory Scale-Revised; BVRT, Benton's Visual Retention Test; RAVLT, Rey Auditory Verbal Learning Test; AMI, Autobiographical Memory Interview; BORB, Birmingham Object Recognition Battery.

actor entails knowing that they are an entertainer and that they are famous). There are no properties intrinsically associated with a name. Each name could belong to any branch in the hierarchy. In this sense, it could be argued that the association between a person's name and their occupation, for example, is the same as that between their face and occupation. The decision to include names at the lowest level was guided by specificity of reference. It does not reflect a belief that knowledge systems are organized in this manner. Considered from this point of view, while the hierarchy

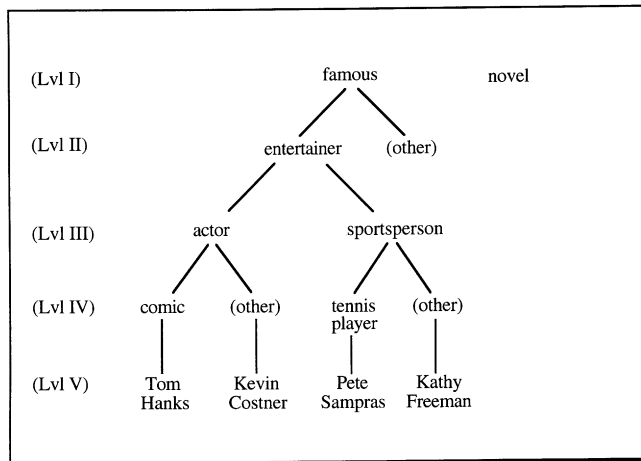


Fig. 2. The hierarchy of knowledge levels used in experiment 1.

shown in Fig. 1 is a hierarchy of specificity it is only partially based on semantic associations.

Bearing this in mind, in this experiment names were used in two ways. In the first instance, when faces were used as cues, names were included at the most specific level (i.e. level V) to examine knowledge of face–name associations. Second, the person’s name was used to cue information about their profession at various levels (i.e. levels I–IV). In this second usage, the association between the person’s name and information about their profession was considered to be similar to that between the person’s face and information about their profession. In other words, from this point of view, the names and faces used in this experiment are arbitrary stimuli associated with a semantic complex relating to profession.

Design

The independent variables were cue type and knowledge level, both of which were manipulated within subjects. Cue type had two levels, faces and names. Five knowledge levels were examined with faces. These comprised: fame status, general occupational category (entertainer/not entertainer), basic occupational category (actor/sports person), specific occupational category (subtype of actor and subtype of sports person) and name. Knowledge at the first four levels was also examined using name cues. The dependent measure was memory performance, determined on the basis of responses to yes/no recognition.

Participants

Nine people took part in the experiment—three amnesic patients (TG, GS and IP) and six matched controls. Two patients, GS and IP, suffered only from the anterograde form of amnesia and were included as additional controls. IP is a 17-year-old male who became amnesic following an intracerebral haemorrhage, due to an aneurysm at the bifurcation of the left internal carotid artery. His condition was complica-

ated by ventricular enlargement requiring insertion of a ventriculo-peritoneal shunt. GS is a 33-year-old male who also suffered a brain haemorrhage, in this case as a result of an aneurysm in the anterior communicating artery. Two controls were matched to each patient on the basis of age and education.

Materials

The materials consisted of a set of face cue cards and two sets of name cards. The face cues comprised 40 faces, half of which were famous and the other half were not famous. The famous people comprised 10 actors and 10 sports people. In each category, half were male. The names of the famous people are listed in Appendix 1. They were selected on the basis of being currently famous and salient to an Australian population. They were initially chosen on the basis of responses to a pilot survey requesting the names of famous individuals ($n = 10$) and were subsequently identified as highly recognizable by a small group of first year psychology students ($n = 9$, mean age = 21 years, $SD = 2.1$). Salient famous people were selected to maximize the probability that they were known to patients prior to the onset of amnesia. The pictures did not contain any features that would provide clues about the occupation of the subject. They were scanned into a computer using Adobe Photoshop software to control for factors such as colour, size and background. All faces were printed in black and white on a 600 dpi laser printer and were scaled to a width of 8 cm and a height of between 10 and 12 cm. The 20 non-famous faces were collected from advertisements in magazines. They were matched to the famous people as closely as possible in terms of age, sex and attractiveness and were also scanned and reproduced using the above procedure.

There were two sets of name cards. One set was used to test knowledge about famous people. This set consisted of 40 names. Half of these names were those of famous people and the remainder were unknown. The latter names were constructed by selecting common surnames from the local telephone directory (i.e. at least 15 people or more with that surname) and adding a common first name to each one. The second set of name cards was used with face cues to examine knowledge of face–name associations and there were two types of cards. One type contained a single name and the other type contained a pair of names. Half of the single name cards contained correct names and the remainder were incorrect. The incorrect names were produced by changing the second syllable of the surname (e.g. ‘Mel Gibson’ was changed to ‘Mel Gibbons’, see Appendix 1). The name pair cards contained two famous names from the same gender and basic occupational category (e.g. two actors or two sports people). On half of the trials the correct name was the first item in the name pair and on the remaining trials it was the second item.

Procedure

Knowledge was tested in two ways—using face cues and name cues. In the case of patients, knowledge was examined first with face cues and then with name cues. The order of cue presentation was counterbalanced across the two controls matched to each patient. A short break of 10 min was provided between the two phases of testing.

Five knowledge levels were examined with face cues and knowledge at each level was elicited by asking questions. The questions ranged from the very general to the very specific. Specificity was determined by the number of people who shared the attribute in question. The attribute was shared by 20 people at the most general knowledge level, and this number decreased progressively as the questions became more specific. The questions presented at each level were as follows:

- level I: 'Is this person famous?'
- level II: 'Is this person primarily in the entertainment industry?'
- level III: 'Is this person an actor?' or 'Is this person a sportsperson?'
- level IV: 'Is this person a comic actor (i.e. appeared in comedy)?' or 'Is this person a tennis player?'
- level V: 'Is this person's name _____?'

Knowledge at levels I–V was assessed progressively, in descending order. The entire set of 40 face cues (both famous and non-famous) were presented individually and randomly at level I. From this level onwards, only the famous faces were presented. At two knowledge levels (i.e. levels III and IV), one of two questions was presented with faces. For half of the items at level III, the participants were asked whether the face was that of an actor and for the remainder whether the face was that of a sports person. At level IV, the participants were asked to judge whether actors were comic actors and whether sports people were tennis players. Knowledge of face–name associations was examined at level V.

Knowledge at the first four levels was re-examined with name cues using the same questions. As with the case for faces, 40 name cues were presented at level I and 20 name cues were presented at the remaining levels. All level I items were presented before proceeding to level II and so on until knowledge at the four levels had been examined.

Results and discussion

The face and name cue data for TG and patients with anterograde amnesia only are provided in Table 2. Both hit and false alarm rates are provided for each cue type.

Faces.

As expected, TG (the only retrograde amnesic) was the only patient who had difficulty answering questions associated with famous people. She was significantly better than chance in discriminating famous from non-famous faces at level I

($P < 0.01$), but her performance declined at the next three levels. Thus, she had insufficient knowledge about famous people to discriminate entertainers from non-entertainers, actors from sports people and subtypes of actor as well as subtypes of sports person.

TG's performance at level V was unexpected. From this result it appears that she can access sufficient information about famous people to make accurate face–name associations despite her inability to make less specific judgements at the previous three levels. However, it is also possible that her responses to these questions were based on familiarity with names rather than knowledge of face–name associations. This is because incorrect names would be sufficiently different from studied names to be classified as unfamiliar. For instance, TG may have decided that the name 'Mel Gibbons' was unfamiliar and on this basis judge that the association is incorrect. To distinguish between these alternatives, the famous faces were presented again but this time with two famous names. The incorrect name in each pair was that of another famous person included in the test sample (see Appendix 1) from the same professional category (e.g. if the target name belonged to an actor then the incorrect name also belonged to an actor). TG's task was to identify the name that matched the face. Accurate performance on this two-alternative forced choice task requires specific knowledge of face–name associations. TG's performance on this latter task was no better than chance. She only matched 14 of the 20 face–name pairs correctly ($\chi^2_{(1)} = 2.5$, ns; Yates' correction for continuity applied here), indicating that the result at level V was not based on knowledge of particular face–name associations but rather on a lack of familiarity with non-famous or novel names. Overall, TG's results with face cues indicate that she was capable of accessing some knowledge directly about famous people when cued with faces, but that this was restricted to the most general level examined. In contrast, the remaining patients (IP and GS) and matched controls were significantly better than chance in their responses to the questions at levels I–V ($P < 0.01$ at all levels) and to items in the additional two-alternative forced choice task ($\chi^2_{(1)}$ ranged between 14.45 and 18.05, all $P_s < 0.01$).

Names.

The name cue data for patients are also presented in Table 2. Again, TG was the only participant who showed any evidence of impairment on this task, but only at the most specific level of knowledge examined. She was significantly better than chance in discriminating names on the basis of fame ($P < 0.01$), general occupational category ($P < 0.01$) and basic occupational category ($P < 0.01$). However, she did not discriminate between subtypes of actor and subtypes of sports person. The errors she made in the latter discrimination were distributed fairly equally across the two occupational groups. IP, GS and the matched controls responded accurately at all four knowledge levels examined ($P < 0.01$ at all levels).

It was possible that TG's performance with names was

Table 2. Hit rates (HR), false alarm rates (FAR) and *P* values^a for face and name cues at knowledge levels investigated for famous people in patients with retrograde (TG) and anterograde (IP and GS) amnesia

Level	TG						Anterograde amnesic (IP)						Anterograde amnesic (GS)					
	Faces			Names			Faces			Names			Faces			Names		
	HR	FAR	<i>P</i>	HR	FAR	<i>P</i>	HR	FAR	<i>P</i>	HR	FAR	<i>P</i>	HR	FAR	<i>P</i>	HR	FAR	<i>P</i>
I	0.7	0.1	<0.01	1.0	0.05	<0.001	1.0	0.15	<0.001	1.0	0.05	<0.001	0.95	0.05	<0.001	1.0	0	<0.001
II	0.6	0.3	ns	0.9	0	<0.01	1.0	0	<0.01	1.0	0	<0.01	1.0	0	<0.01	1.0	0	<0.01
III	0.5	0.2	ns	1.0	0.1	<0.01	1.0	0	<0.01	1.0	0	<0.01	1.0	0	<0.01	1.0	0	<0.01
IV	0.6	0.5	ns	0.9	0.5	ns	1.0	0.1	<0.01	0.8	0	<0.01	1.0	0.1	<0.01	0.8	0	<0.01
V	0.9	0.1	<0.01	–	–	–	1.0	0	<0.01	–	–	–	1.0	0	<0.01	–	–	–

^a*P* value for Fisher's exact test provided except when the number of items exceeded 30, in which case the *P* value for χ^2 is provided. ns, not significant.

facilitated by prior exposure to the same questions, as they had been presented first with face cues. To examine this, the experiment was repeated 3 months later, but this time the order of cue presentation was reversed, i.e. knowledge was examined first with name cues and then with face cues. Despite the reversal of cues, the results on repeat testing were consistent with those obtained on initial examination. TG was significantly better than chance in discriminating names at the first three levels ($P < 0.01$ at all three levels), but could only discriminate faces at the most general level ($P < 0.05$).

In summary, the results of this experiment show that TG accessed considerably more information about famous people from their names than she did from their faces. This pattern emerged on initial testing and was confirmed on re-examination of TG's knowledge several months later, indicating that the original finding was not an isolated result. Given the differentiation observed in TG's knowledge about people in the public domain, one might ask whether it also occurs in the autobiographical domain. This question was investigated in experiment 2.

Experiment 2

In experiment 2, TG's knowledge about personally familiar people was examined to determine whether a modality-based difference emerged in access to autobiographical information. As in experiment 1, a series of direct questions was asked to elicit knowledge about people known personally to TG. The questions probed knowledge at a range of levels, from the very general to the very specific.

Design

The independent variables were cue type and knowledge level, both of which were manipulated within subjects. Cue type had two levels, faces and names. Five knowledge levels were examined with faces, but only four were examined with names. The dependent measure was memory performance

and this was determined on the basis of responses to yes/no recognition.

Participants

One patient with retrograde amnesia, TG, took part in this study.

Materials

Two sets of material were used—one set of face cards and one set of name cards.

The set of face cards consisted of 66 faces. There were two categories of faces. One category consisted of faces that were familiar to TG ($n = 46$) and the other consisted of novel or unknown faces ($n = 20$). The familiar faces comprised: family members ($n = 10$), friends ($n = 10$), friends' children ($n = 6$) and famous people ($n = 20$). Pictures of people were either collected from magazines or supplied by TG's husband. Both famous and unknown faces were matched as closely as possible to those of family members and friends on the basis of age, sex and attractiveness. A list of the famous people used in this experiment is provided in Appendix 2. It consists of television, movie, sporting and royal personalities. The pictures/photographs were scanned into a computer and were reproduced using the same procedure discussed for the previous experiment. They were printed in black and white, had a neutral background and were 5 cm in width and 6–7 cm in height.

The name cue cards consisted of 68 names (first name and surname pairs) and these belonged to familiar ($n = 48$) and novel ($n = 20$) people. The familiar names comprised: family members ($n = 10$), friends ($n = 18$) and famous people ($n = 20$, also used with face cues, with the exception of Queen Elizabeth II who was replaced with Elizabeth Taylor). Each of these names was matched to those of family members and friends on the basis of sex and syllable length (e.g. if the first name of a family member had two syllables then the novel first name also had two syllables). In addition,

several of the novel surnames were repeated as there were family members and friends who shared the same surname.

Procedure

There were two phases. In the first phase, knowledge about people was examined using name cues and in the second phase, knowledge was examined using face cues. A short break of 10 min was provided between the two phases of testing.

Four levels of knowledge were examined with name cues. The materials used to test knowledge at these levels were selected and prepared with the assistance of TG's husband. Names of people with the same surname and maiden name as TG were not included because judgements involving these names could be made on the basis of familiarity rather than on the basis of knowledge about the particular person in question. If the surname was the same as TG's, then she may have decided that the person is related to her without knowing anything about them. Questions were presented with each cue and these tapped a range of details from general to increasingly more specific. Specificity was determined on the basis of the amount of detailed knowledge required to answer the questions. The number of items presented at each level differed as did the category of name cue (i.e. whether the person was family, friend, famous or unknown). The questions asked at each level were as follows:

- level I: 'Is this person familiar?'
- level II: 'Is this person a family member/friend?'
- level III: 'Is this person family?'
- level IV: 'Is this person from (TG's husband's) side of the family?' 'Is this an old (> 10 years) friend?'

At the first level, TG was asked to make a judgement of familiarity. At level II, knowledge of general relationships was examined by asking TG to discriminate personally familiar from famous people. The discrimination at level III tested knowledge of basic relationships, and this involved differentiating family members from friends. At level IV, specific knowledge about family relationships and friendships was examined. Knowledge of family relationships was examined by asking TG to discriminate between names belonging to people from her side and her husband's side of the family. In the case of friendships, she was asked to discriminate old friends from new. All items at level I were presented before proceeding to level II and so on until knowledge at all levels had been examined.

After a short break (about 10 min), knowledge was tested with face cues. This time knowledge was examined at five levels. The questions at each level were as follows:

- level I: 'Is this person familiar?'
- level II: 'Is this person a family member/friend?'
- level III: 'Is this person family?'
- level IV: 'Is this person from (TG's husband's) side of the family?' 'Is this (X's) child?'
- level V: 'Is this person's name _____?'

The questions asked about people at levels I–III with name cues were the same as those presented with face cues. However, at level IV, a change in procedure was introduced to address the problem of insufficient materials. The number of items presented with the family relationship question was reduced and this represented only a minor modification. The most significant modification involved a change in the items and question presented to test knowledge of friendships. To test knowledge of specific friendships, TG was asked to discriminate between children on the basis of whether they belonged to a particular friend (i.e. X) or other friends. To answer this question correctly, TG would need to have knowledge of the parent–child relationships of her friends. Thus, although the question was not the same as that used with name cues, it nevertheless probed specific knowledge about friends. A final question was asked to elicit knowledge of face–name associations for family members and friends. Only real names were included but half were correctly paired with faces and half were incorrectly paired.

Results and discussion

Accuracy of memory performance at each level with each cue type is provided in Table 3. With name cues, TG's responses were significantly better than chance at all levels examined. That is, she was significantly better than chance in discriminating known from unknown names ($P < 0.001$), personally familiar from famous names ($P < 0.001$), and the names of family members from friends ($P < 0.01$). The responses to the two questions at level IV were combined and the results indicated that TG could identify the names of people from her husband's side of the family and the names of old friends ($P < 0.01$). Errors at the latter level were only made in response to questions eliciting knowledge about friends. Thus, TG's performance with name cues indicated that she had access to a range of knowledge about people known to her personally.

In contrast, performance with face cues was poor. TG was only accurate in discriminating faces at the first two levels. That is, she was significantly better than chance in discrimin-

Table 3. Hit rates (HR), false alarm rates (FAR) and P values^a for face and name cues at knowledge levels investigated for people known personally to TG

Level	Faces			Names		
	HR	FAR	P	HR	FAR	P
I	0.95	0.05	<0.001	1.0	0	<0.001
II	0.95	0.1	<0.001	1.0	0	<0.001
III	1.0	0.8	ns	1.0	0.2	<0.01
IV	0.8	0.3	ns	1.0	0.4	<0.01
V	0.6	0.2	ns	–	–	–

^a P value for Fisher's exact test provided except when the number of items exceeded 30, in which case the P value for χ^2 is provided. ns, not significant.

ating known from unknown faces ($P < 0.001$) and personally familiar from famous faces ($P < 0.001$). When making the latter judgement in response to famous faces, TG frequently stated that while she 'would like the person to be a family member/friend, they were not', suggesting that she had access to more detailed information about these people. The same statement was never provided in response to personally familiar faces. While this evidence is only anecdotal, it suggests that her level II judgements were based on more than mere familiarity. TG's performance with face cues broke down at level III and this result can be directly compared with that for name cues. Knowledge about the same people was examined at level III with name cues, and TG's performance in this case was significantly better than chance. This indicates that information available in one modality was not available in another. Performance at the remaining levels, examining knowledge about specific family relationships and friendships as well as face-name associations, was also no better than chance.

These results confirm the existence of a differentiation in TG's memory performance between face and name cues, but this time in the autobiographical domain. Performance with name cues was again clearly superior to that with face cues. In the context of understanding the breakdown in amnesia, one might ask whether TG's deficit in the case of faces is one of storage or retrieval. An answer to this question was provided, at least in the autobiographical domain by a supplementary experiment. In the case of face cues in experiment 2, TG failed to access sufficient knowledge on direct questioning to differentiate between family members and friends (i.e. at level III) and then to make more specific judgements. Using an indirect procedure (see Haslam *et al.*, 1998 for a description of the procedure) as a means of facilitating access to knowledge, we found that TG could make this discrimination with a high degree of accuracy. Specifically, she was asked to identify faces according to whether they were from her side of the family, from her husband's side of the family, an old friend or a new friend. This categorization enabled examination of knowledge at two levels—general and specific. The four-alternative forced choice judgement examined specific knowledge of these relationships. These four categories can also be classified at a more general, or higher level, of knowledge involving family members and friends. This latter discrimination was one that TG failed to make in experiment 2 when given direct instructions. However, under these conditions, knowledge of family and friends can be revealed indirectly in response confusions when categorizing faces in the lower level task. While TG failed to make the specific discrimination she rarely misclassified a family member as a friend or vice versa ($\chi^2_{(1)} = 22.3$, $P < 0.001$). In order to make this higher level discrimination, information concerning family members and friends must be available in storage. In other words, TG's knowledge about these people at least at the level investigated was not lost,

merely inaccessible (see Haslam, 1998, Chapter 8 for a more thorough description of this experiment).

General discussion

The two studies reported in this paper investigated residual biographical knowledge in a patient with retrograde amnesia. The distinctive feature in this patient's memory performance was the difference in the amount of biographical information she could access in response to face and name cues—a difference that cannot be explained by existing models of person recognition. This difference emerged in experiment 1, examining knowledge in the public domain, and was replicated in experiment 2, examining knowledge in the autobiographical domain.

In experiment 1, TG only accessed sufficient information to support fame judgements when cued with famous faces. Yet when presented with famous names, she accessed additional information to allow her to discriminate between people on the basis of their status as an entertainer (i.e. at level II) and their basic occupational category (i.e. at level III involving the actor/sports person discrimination). In each modality, TG's knowledge breaks down when attempting to access semantic information (i.e. at the level of semantic information units), but the level of biographical detail available differs. In the case of faces, accurate fame judgements require more than mere familiarity with a person's face and, hence, can only be supported by access to basic semantic information. In the case of name cues, TG accessed more detailed knowledge, sufficient to discriminate between people at the level of their basic occupational category. While this judgement also requires semantic knowledge, it represents a level of detail that arguably exceeds that available with face cues. If semantic information is common to all modalities, then TG's ability to access additional biographical details in response to name cues cannot be explained.

A similar difficulty was encountered in experiment 2 in which autobiographical knowledge was investigated. In this experiment, TG responded accurately to all questions posed with name cues (i.e. involving four levels of knowledge), but was only accurate at the first two levels with face cues. In other words, detailed semantic information was available in response to name cues, whereas superficial information only was available in response to face cues. Again the breakdown, at least in the case of faces, appears to involve semantic knowledge. TG was capable of accessing sufficient information to discriminate personally familiar from novel people at level I and personally familiar from famous people at level II. Clearly, the former judgement requires nothing more than access to the face recognition units. While the latter judgement may also have been based on familiarity (i.e. given the greater strength of familiarity with people known personally to TG), we would argue that in TG's case semantic knowledge was involved. For many of the famous items, TG indicated

that although she would like to be associated with the person in question, she knew they were neither family nor friend. This suggests that her judgement was based on more than familiarity with the person's face. Furthermore, if she based her judgement on some other superficial criterion, such as attractiveness, her performance at this level would have been far from perfect—many of the famous faces used in experiment 2 would not be considered attractive. In fact, TG made only three errors (misses and false alarms combined) at this level, where 40 items were presented. Of course it remains possible that TG did not utilize semantic knowledge when judging whether the person was a family member/friend. However, this seems unlikely when the accuracy of her performance is considered together with the comments she provided when making these judgements. If we accept the latter argument, that TG had access to some biographical information in relation to faces, then we encounter the same difficulty in explaining why semantic information available in one modality cannot be accessed by another. This time, though, the difficulty arises in the context of autobiographical knowledge.

TG's failure to access some biographical details in response to face cues is best explained by dysfunction at the level of the semantic information units and this is where the problem arises in relation to models of person recognition. In its present form, there is no distinction between modalities in access to biographical information—information available in one modality is available in all modalities. TG's superior performance with name cues relative to face cues challenges this assumption. On superficial analysis, it might be argued that the discrepancy arises because information associated with names is more readily accessible or less vulnerable than that associated with faces. If this was the case, then differences in processing complexity should be represented somehow in existing models. However, the suggestion is incompatible with evidence of the reverse pattern where knowledge associated with faces is superior to that associated with names. This occurred in Eslinger *et al.*'s (1996) patient, EK. Her evidence alone is sufficient to question the relevance of processing complexity arguments in the context of person recognition.

Another explanation for the presence of modality-based differences is offered by Eslinger *et al.* (1996). As noted in the introduction, these researchers raised the possibility that semantic information may be modality specific. Biographical information associated with names may be stored and processed separately from that associated with faces. Taken at face value, TG's data appear to support Eslinger *et al.*'s proposal. Nonetheless, there is limited appeal in this adaptation of the model, primarily due to the storage of redundant information. Information specific to faces would be repeated with names and this is not an efficient means of storage. Although the present findings do not provide an explanation for the differentiation in TG's performance, they raise questions about the accuracy

of current functional models of person recognition. The findings also bear on the broader question of the existence of modality-specific subsystems in semantic memory (see special issue on category-specific deficits, *Neurocase*, 1998, Volume 4, issue 4/5). Although this proposal appears to have fallen out of favour in the general semantic memory literature (see Caramazza, 1998), our findings seem to support a modality-specific structure in the case of biographical knowledge.

Despite TG's superior performance with name cues, her knowledge about people in this modality was not entirely preserved and this was demonstrated most clearly in our examination of knowledge about famous people in experiment 1. This is important to note for two reasons. First, it indicates that TG's pathology is best characterized by amnesia and not prosopagnosia. Were she prosopagnosic, then her knowledge about people in all other modalities apart from faces should be preserved. Second, her failure at particular knowledge levels with name cues highlights a pattern in memory performance—namely, that TG's remote public memory is characterized by preservation of general level knowledge and impairment of specific knowledge. TG was able to access more general facts about famous people in response to name cues, but was no better than chance at the most specific level examined (i.e. differentiating between comic and non-comic actors as well as between tennis players and all other sports people). Not only did this pattern emerge when testing knowledge about famous people in response to name cues, it also emerged with face cues in both public and autobiographical domains. A good example of the latter is provided in TG's performance in experiment 2 where she was only accurate in providing information at the first two levels of knowledge examined. This pattern of preserved high level relative to low level knowledge, or preservation of memory for generalities, is one that we have reported previously, but in the context of new learning (Haslam *et al.*, 1997 and unpublished thesis, 1998). Preservation of memory for generalities was found in the public domain with both cue types and replicated in the autobiographical domain with face cues. This indicates that preservation of memory for generalities occurs in retrograde amnesia as well as anterograde amnesia.

In conclusion, this paper adds to the existing evidence of modality-based differences in access to person-related knowledge in the public domain and elaborates upon this by providing evidence of the same phenomenon in the autobiographical domain. In doing so, it raises our awareness of a possible faulty assumption in models of person recognition—namely, that semantic information is accessed equally in all modalities. While an explanation for TG's results can be provided, it is important to note that it is not particularly appealing when considering efficiency of storage. This provides a challenge either to provide a reasonable explanation for storage of redundant

information or to develop alternative explanations for modality-based differences in accessing biographical details.

References

- Brédart S, Valentine T, Caldor A, Gassi L. An interactive activation model of face naming. *The Quarterly Journal of Experimental Psychology* 1995; 48: 466–86.
- Bruce V, Young AW. Understanding face recognition. *British Journal of Psychology* 1986; 77: 305–27.
- Burton AM, Bruce V. I recognize your face but I can't remember your name: A simple explanation? *British Journal of Psychology* 1992; 83: 45–60.
- Burton AM, Bruce V. Naming faces and naming names: Exploring an interactive activation model of person recognition. *Memory* 1993; 1: 457–80.
- Burton AM, Bruce V, Johnston RA. Understanding face recognition with an interactive activation model. *British Journal of Psychology* 1990; 81: 361–80.
- Caramazza A. The interpretation of semantic category-specific deficits: What do they reveal about the organization of conceptual knowledge in the brain? *Neurocase* 1998; 4: 265–72.
- Eslinger PJ, Easton A, Grattan LM, Van Hoesen GW. Distinctive forms of partial retrograde amnesia after asymmetric temporal lobe lesions: Possible role of the occipitotemporal gyri in memory. *Cerebral Cortex* 1996; 6: 530–9.
- Evans JJ, Heggs AJ, Antoun N, Hodges JR. Progressive prosopagnosia associated with selective right temporal lobe atrophy: A new syndrome? *Brain* 1995; 118: 1–13.
- Haslam C. Memory for generalities in amnesia. Canberra: The Australian National University. Thesis, 1998.
- Haslam C, Coltheart M, Cook M. Preserved category learning in amnesia. *Neurocase* 1997; 3: 337–47.
- Haslam C, Cook M, McKone E. Memory for generalities: Access to higher-level categorical relationships in amnesia. *Cognitive Neuropsychology* 1998; 15: 401–37.
- McCarthy RA, Warrington EK. Actors but not scripts: The dissociation of people and events in retrograde amnesia. *Neuropsychologia* 1992; 30: 633–44.
- Valentine T, Brédart S, Lawson R, Ward G. What's in a name? Access to information from people's names. *European Journal of Cognitive Psychology* 1991; 3: 147–76.

Received on 15 March, 1999; resubmitted on 12 April, 2000; accepted on 5 September, 2000

Appendix 1

List of famous people used in experiment 1, together with modified surnames

<i>Actors</i>	<i>Modified name (if used)</i>
Kim Basinger	Kim Basinford
Jodie Foster	–
Nicole Kidman	–
Michelle Pfeiffer	–
Meg Ryan	Meg Ryder
Bruce Willis	Bruce Williams
Mel Gibson	Mel Gibbons
Tom Hanks	–
Hugh Grant	–
Kevin Costner	Kevin Costin
<i>Sports people</i>	<i>Modified name (if used)</i>
Kathy Freeman	–
Steffi Graf	Steffi Grant
Conchita Martinez	–
Melinda Gainsford	Melinda Gainey
Monica Seles	–
André Agassi	–
Kieren Perkins	Kieren Perley
Pete Sampras	Pete Sampson
Laurie Daley	–
Greg Norman	Greg Norden

Appendix 2

List of famous people used in experiment 2

Flo Bjelke Peterson	Rowena Wallace
Jean Kitson	Andrew Lloyd-Webber
Queen Elizabeth II/Elizabeth Taylor	Rob de Castella
Barbara Stanwyck	Grant Kenny
Alicia Silverstone	Gene Hackman
Tony Pearen	Clint Eastwood
Kylie Minogue	James Richter
Susan Olsen	Deryn Hinch
Anna Paquin	Lloyd Bridges
Denise Roberts	Macauley Culkin

'I know your name but not your face': explaining modality-based differences in access to biographical knowledge in a patient with retrograde amnesia

C. Haslam, M. Cook and M. Coltheart

Abstract

In current functional models of person recognition it is proposed that there exists a single common body of semantic information concerning people accessible from all modalities (e.g. names, faces). In this paper, we present evidence that challenges this view. Two experiments are discussed investigating residual autobiographical and public knowledge in a patient suffering from retrograde amnesia. Knowledge about people was investigated in each case by asking a series of questions, ranging from the very general to the very specific. Experiment 1 examined knowledge about famous people. The results showed that the patient accessed more information about famous people when cued with names than when cued with faces. Experiment 2 examined knowledge about people known personally to the patient. Again, the same pattern of results emerged. While the patient responded accurately to all questions posed with name cues, her ability to recall the same information when prompted with face cues was clearly inferior. This modality-based difference in accessing biographical knowledge is discussed in relation to models of person recognition.

Journal

Neurocase 2001; 7: 189–99

Neurocase Reference Number:

O217

Primary diagnosis of interest

Herpes simplex encephalitis resulting in retrograde amnesia

Author's designation of case

TG

Key theoretical issue

- Impact of modality differences in accessing biographical knowledge on existing models of person recognition

Key words: person recognition; biographical knowledge; modality differences

Scan, EEG and related measures

MRI, EEG

Standardized assessment

Wechsler Adult Intelligence Scale-Revised (WAIS-R), Wechsler Memory Scale-Revised (WMS-R), Rey Auditory Verbal Learning Test (RAVLT), Rey figure, Autobiographical Memory Interview (AMI), modified Crovitz, letter and category fluency, picture naming, Token test, Benton's facial recognition, judgement of line orientation, visual retention tests

Other assessment

Autobiographical and public knowledge tests

Lesion location

- Bilateral temporal lobes, more extensive in right hemisphere

Lesion type

Consequence of herpes simplex encephalitis

Language

English