Neuropsychology
2002, Vol. 16, No. 4, 472–480

0894-4105/−1900/$5.00 DOI: 10.1037//0894-4105.16.4.472

# Memory for Famous People in Patients With Unilateral Temporal Lobe Epilepsy and Excisions

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Memory for famous individuals was assessed by the use of a recognition test in which participants first made familiarity judgments, followed by forced-choice decisions to specific probes for identity. Patients with temporal lobe epilepsy (TLE) or excisions, 12 left hemisphere and 12 right hemisphere, and 18 control participants identified famous figures across 3 decades (1970s–1990s). Only patients with right TLE were impaired at familiarity judgments of faces; this deficit was evident only for the most recent decades. Both groups of patients, however, were impaired at naming famous faces and at providing semantic information about famous people. These findings suggest the integrity of temporal structures in both hemispheres is critical for retrieval of detailed semantic information about famous individuals.

Identification of faces and names of famous people has long been used as a measure of remote semantic memory. The use of memory probes based on individuals who were prominent in the public domain at different time periods permits an examination of the temporal gradient of remote memory impairments due to brain damage or dysfunction. One of the earliest such studies examined face recognition in patients with unilateral cerebral damage (Warrington & James, 1967). Patients with right temporal (RT) lobe damage produced the most errors in recognizing famous faces, whereas those with left temporal (LT) damage produced the most naming errors. In another study, amnesic patients failed to identify many of the faces, even those from 4 decades prior to the test (Sanders & Warrington, 1971), leading the authors to conclude that the remote memory deficits were of very long duration. Many subsequent investigations of retrograde amnesia have used identification of famous persons as the criterion task, occasionally in conjunction with tests of other remote semantic information, such as television programs and public events (Barr, Goldberg, Wasserstein, & Novelly, 1990; Cohen & Squire, 1981; Warrington & McCarthy, 1988). Most of these studies require the individual to provide, by either free recall or recognition, the name of the famous person, instead of asking for an initial decision as to whether the target individual is famous (Barr et al., 1990; Warrington & James, 1967; Warrington & McCarthy, 1988). An issue that has not been addressed fully in this literature is whether there are important differences in the recognition process (e.g., knowledge that the person is familiar) and the retrieval of specific semantic information about the individual (i.e., what they are famous for).

One model for the processing of familiar faces that takes these different aspects of famous face recognition into account was proposed originally by Bruce and Young (1986) and expanded to include proper-name processing by Valentine, Bredart, Lawson, and Ward (1991). This model proposes that separate systems are responsible for the initial recognition of faces and names as familiar, whereas a single conceptual system represents identity-specific semantic information (Valentine et al., 1991). Initial recognition processes are presumed to be lateralized, as indicated by evidence that proper-name anomia is largely associated with LT lobe damage (Fukatsu, Fujii, Tsukiura, Yamadori, & Otsuki, 1999; Luchelli & De Renzi, 1992; Verstichel, Cohen, & Crochet, 1996), whereas deficits in judging faces as familiar are associated with damage to the RT lobe (Evans, Heggs, Antoun, & Hodges, 1995; Warrington & James, 1967; for review, see Benton, 1980; Kanwisher & Moscovitch, 2000). Specific semantic information about the person's identity may be preserved, because both the anomic patient and the patient with impaired face recogni-

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This research was completed in partial fulfillment of requirements for Indre V. Viskontas's undergraduate thesis at the University of Toronto, Toronto, Ontario, Canada. This work was supported by Natural Sciences and Engineering Research Council of Canada Grant A8347 to Morris Moscovitch and by the Clinical Neuroscience Research Fund of the University Health Network. For their contribution and time, we thank the patients and control participants.

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tion may be able to provide considerable semantic details about the nonrecognized individual when provided with the name (Warrington & McCarthy, 1988). These findings suggest that although initial recognition processes may be lateralized, other identity-specific semantic information may be represented in both hemispheres.

To evaluate this idea, we administered the famous-people test to patients with unilateral temporal lobe epilepsy (TLE). Our patients had damage to the medial temporal lobe of one hemisphere characterized by medial temporal sclerosis or other structural lesions in this region or because of surgical excision for treatment of intractable seizures. Postexcision patients also had damage to lateral temporal cortex. From the model described above, it follows that right-TLE patients might be impaired differentially at recognizing famous faces as familiar, whereas those with left TLE might be impaired specifically at recognizing famous names. Different predictions can be made as to the effect of unilateral TLE on retrieval of semantic identity information. We hypothesized that if this is redundantly represented in both hemispheres, no deficit should be found for either TLE group. We also believed that if different aspects are represented in each hemisphere, an impairment might be expected with damage to either hemisphere. To examine these possibilities, we investigated both face and name recognition as well as semantic knowledge associated with the identity of the individual in question.

There is considerable evidence of material-specific impairments in learning and retention in patients with unilateral TLE or excisions but relatively little research on remote memory functioning in these patients. Barr and colleagues reported that TLE patients with damage to the LT lobe were impaired on a famous-faces test whereas those with RT lobe damage were not (Barr et al., 1990). In their study, a naming response was required, either given spontaneously or following phonemic cues. This reliance on naming could pose a problem because LT damage (from anterior temporal lobectomy) causes an impairment in word retrieval (Bell, Davies, Hermann, & Walters, 2000; Davies et al., 1998), and thus any deficit may be secondary to a more general retrieval failure rather than an impairment of identification. A more recent study of remote memory in patients with epilepsy, using a forced-choice questionnaire regarding remote public events, demonstrated that individuals with TLE were impaired compared with those with other epileptic foci (primary generalized, extratemporal) and healthy controls (Bergin, Thompson, Baxendale, Fish, & Shorvon, 2000). In that study there was no effect of laterality; patients with both left and right foci were poor at retrieving remote facts. Although the semantic information required to answer questions about the public events is not equivalent to identity information for famous people, these findings can be construed as support for a common conceptual system without full redundancy of representation in each hemisphere.

The purpose of our study was to add to the literature on remote memory in TLE and, more specifically, to evaluate the Bruce and Young (1986) and Valentine et al. (1991) models of person identification (i.e., that recognition processes are lateralized, and semantic information is represented in both hemispheres). Participants made initial familiarity judgments to name and face cues. For those judged famous, the participants were asked to recognize a specific identifying fact about the individual and, for face cues, the name of the person. The recognition format allowed us to examine memory without more general name or word retrieval deficits confounding our results.

Beyond the issues of person identification, our study also has implications for a more general set of questions regarding the role of the medial temporal lobes in retrieval of remote episodic and semantic information (e.g., Viskontas, McAndrews, & Moscovitch, 2000). In particular, the temporal gradient of remote memory loss has been a central consideration in the debate as to whether this region participates in consolidation or retrieval of information (for reviews, see Fujii, Moscovitch, & Nadel, 2000; Nadel & Moscovtich, 1997; Reed & Squire, 1998). Accordingly, our test was constructed so that we could examine the effects of medial temporal lobe damage on recognition memory for semantic information across three decades (1970s–1990s).

Kapur, Thompson, Kartsounis, and Abbott (1999) noted that the degree of exposure to media is closely related to performance on tests of memory for news events. Because there may be a difference in media exposure between controls and patients with a chronic illness, we elected to assess this potential confound using a short questionnaire designed by Kapur et al. (1999).

## Method

### *Participants*

Twenty-four patients with temporal lobe epilepsy or excisions participated in the study. Twelve patients had seizures originating in the RT lobe, and 12 had seizures originating in the LT lobe. In each group, 7 patients were being assessed for surgery, and 5 had already undergone surgery. All patients had documented structural damage involving the medial temporal region. In the preoperative group there was 1 case with a tumor, 2 with cavernomas, 1 with an arteriovenous malformation, and 10 with radiological evidence of medial temporal sclerosis. Cases with surgical resections involved excision of the amygdala and 1–2 cm of the hippocampus as well as a 5–7-cm excision along the lateral convexity of the temporal lobe. Three patients had pathology in additional areas independent of their seizure focus; 1 with a small region of encephalomalacia in the left occipital pole, 1 with atrophy of the right thalamus, and 1 with cavernomas in the left thalamus and insula. All patients that had undergone surgery were either seizure free postoperatively or had a 75% reduction in seizure frequency. Those tested postoperatively were seen at least 5 months and at most 8 months after surgery.

Eighteen nonneurologically impaired controls matched with the patients for age and education also participated. All participants gave informed consent in accordance with a protocol approved by the research ethics board of the University Health Network, Toronto, Ontario, Canada. Control participants had no history of epilepsy or other neurological disease. Patients and controls were all right-handed, with the exception of 1 control (L.S.). There were 12 female (7 LT) and 12 (5 LT) male patients and 9 female and 9 male controls.

Demographic information for participants, mean scores on the media exposure questionnaire, and duration of epilepsy for patients are presented in Table 1. Table 2 displays relevant psychometric data for patients including Full-Scale IQ (Wechsler Adult Intelligence Scale—Revised [WAIS–R; Wechsler, 1981] or Wechsler Adult Intelligence Scale—Third Edition [WAIS–III; Wechsler, 1997])[1] and standardized scores (*z* scores) representing delayed recall from Wechsler Memory Scale (WMS) measures of paragraph recall and visual reproduction. Because different versions of the WMS (WMS–R [Wechsler, 1981] and WMS–III [Wechsler, 1997]) were used across patients, *z* scores were calculated on the basis of normative reference data provided in test manuals.

## Materials and Design

Sixty pictures of famous people and 15 lures were collected (see Appendix A).[2] The choice of famous people was limited to those who were mainly prominent in only one decade. The stimulus set used comprised 20 famous people per decade (10 faces and 10 names; 1970s–1990s). Thus each data set for analysis contained 30 famous faces and 30 famous names, counterbalanced across participants.

Participants were shown 30 black-and-white pictures of famous people, interspersed with 15 pictures of nonfamous people, and participants heard 30 famous names interspersed with 15 nonfamous names. Pictures, names, and order of presentation (faces or names first) were counterbalanced across participants. Lures were chosen for their similarity (as judged by the investigators) to famous people in clothing style and picture quality.

Assessment of memory for each famous person involved three levels: (a) an initial judgment of familiarity ("Is this person familiar to you? Yes/No"), followed by (b) a probe for specific semantic information (in the form of a forced-choice question, if the participant did not volunteer the information), and (c) a naming probe for the faces (again, forced-choice if the person did not volunteer the name). Alternatives for the two-alternative forced-choice questions were designed so that participants had to know relatively specific information about the person in question. For example, in identifying an actor or athlete, the participant was required to provide (or discriminate in forced-choice) signature roles or sports. The name alternatives were of equally famous people, usually in a similar profession and from the same era. In the analyses of semantic information and naming performance, only those faces and names that were initially judged as familiar were used. Participants also answered six questions about their general media exposure, as described by Kapur et al. (1999; see Appendix B of the present study).

# Results

## Participants

The groups did not differ statistically in age or education (see Table 1). Scores for media exposure were similar across groups, $F(2, 39) = 0.202$, $p = .818$ (see Table 1). There were no significant differences between the groups of patients (left TLE and right TLE) in seizure duration, $t(22) = 0.483$, $p = .713$.

Table 1
*Participant Characteristics*

| Demographic information | Controls | | L-TLE | | R-TLE | |
|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| Age (in years) | 35.78 | ±8.6 | 37.58 | ±8.4 | 40.08 | ±11.4 |
| Education (in years) | 13.28 | ±3.0 | 13.33 | ±1.8 | 12.92 | ±4.8 |
| Media exposure score | 41.83 | ±12.5 | 40.00 | ±12.7 | 38.58 | ±16.9 |
| Duration of seizures (in years) | | | 26.58 | ±11.9 | 23.00 | ±12.7 |

*Note.* For controls, $n = 18$; for both left temporal lobe epilepsy (L-TLE) and right temporal lobe epilepsy (R-TLE), $n = 12$.

Table 2
*Psychometric Data for Patients*

| Psychometric tests | L-TLE | | R-TLE | |
|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* |
| WAIS–R/III Full-Scale IQ | 91.53 | ±7.28 | 94.91 | ±15.38 |
| Delayed recall stories (*z*) | −0.676 | ±0.520 | −0.469 | ±1.11 |
| Delayed recall figures (*z*) | 0.735 | ±0.756 | −0.561 | ±1.26 |

*Note.* L-TLE = left temporal lobe epilepsy; R-TLE = right temporal lobe epilepsy; WAIS–R/III = Wechsler Adult Intelligence Scale—Revised/Wechsler Adult Intelligence Scale—Third Edition.

Table 2 contains intelligence ratings and relevant anterograde memory data from the patients. The memory measures are delayed recall of stories and figures from the WMS, which were included as part of the standard clinical test battery. One should note that the mean ratings for each group fall within one standard deviation of reference values, with only 4 of 52 scores falling below a cutoff of two standard deviation units. Thus, anterograde memory function was not dramatically impaired in the TLE patients, despite evidence of medial temporal damage in virtually all cases.

## Public Figures Test

A Group (left TLE, right TLE, controls) × Decade (1970s, 1980s, 1990s) ANOVA was conducted separately for each type of information (faces or names) for the familiarity-judgment data and for the semantic questions. Naming responses were, of course, available only for targets initially presented as faces. For the semantic and name scores, an arcsine transformation was used to ensure that the variances between groups were approximately equal.

## Familiarity Judgment: Famous Faces

An analysis of familiarity responses ("Yes"–"No") revealed a significant main effect of group, $F(2, 39) = 10.786$,

[1] Across the study cohort, patients in the postoperative group were administered the WAIS–R to facilitate comparison to preoperative scores, whereas those in the preoperative group were administered the newer version (WAIS–III). Information provided in the technical manual indicates that these forms are very similar, with a correlation of .93 for the Full-Scale IQ index; the average WAIS–III Full-Scale IQ is 2.9 points lower than the average WAIS–R Full-Scale IQ. Because this information is used here strictly for demographic purposes, and it is not used in any analyses, we elected to collapse across variants without adjustment in reporting these scores.

[2] Test items were embedded in a larger set of faces and names: 40 additional famous individuals and 20 additional lures. We had originally intended to sample two earlier decades (1950s and 1960s), but the majority of the study cohort was too young to be sampling information from personal experience for those earlier decades.

$p < .001$; a significant main effect of decade, $F(2, 78) = 21.411$, $p < .001$; and a Group × Decade interaction, $F(4, 78) = 2.302$, $p < .066$, that approached significance. These results are depicted in Figure 1. With only half as many lures as targets, chance performance for each decade varies around 2.5. For the 1980s and 1990s, all groups performed significantly better than chance. For the 1970s, however, the right-TLE group did not perform significantly better than chance, $t(11) = 1.587$, $p = .141$. In light of the trend toward an interaction, post hoc tests (Tukey's honestly significant difference [HSD]) were conducted on groups for each decade. There were no significant differences between groups for the 1970s. For the 1980s and the 1990s, the test revealed a significant difference between right-TLE and left-TLE patients ($p < .025$ and $p < .001$, respectively) and between right-TLE patients and controls ($p < .002$ and $p < .001$, respectively).

### Familiarity Judgment: Famous Names

An analysis of familiarity responses ("Yes"–"No") revealed no significant main effect of group, $F(2, 39) = 1.657$, $p = .204$, but a significant main effect of decade, $F(2, 78) = 14.824$, $p < .001$. There was no significant Group × Decade interaction, $F(4, 78) = 1.010$, $p = .407$. Post hoc tests (Tukey's HSD) indicated that recall for the 1970s was lower than for the 1980s ($p < .022$) and 1990s ($p < .012$). There was no significant difference between the 1980s and the 1990s ($p = .970$). These results are shown in Figure 2.

### Semantic Questions: Famous Faces

An analysis of semantic questions for faces revealed a trend toward a significant main effect of group, $F(2, 39) = 2.720$, $p = .078$, and no other significant main effects or interactions. Post hoc tests (Tukey's HSD) indicated that there was no significant difference between any of the groups (control vs. RT, $p = .165$; control vs. LT, $p = .122$; LT vs. RT, $p = .988$). These results are shown in Figure 3.

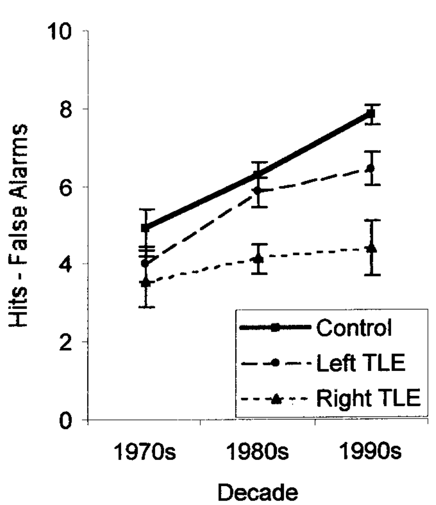


*Figure 1.* Familiarity judgment of faces. Mean scores (hits minus false alarms) for controls ($n = 18$), left temporal ($n = 12$), and right temporal ($n = 12$) patients. Note that chance score is 2.5, because there were only half as many lures as famous faces. Maximum score is 10. Error bars depict standard error of the mean values. TLE = temporal lobe epilepsy.

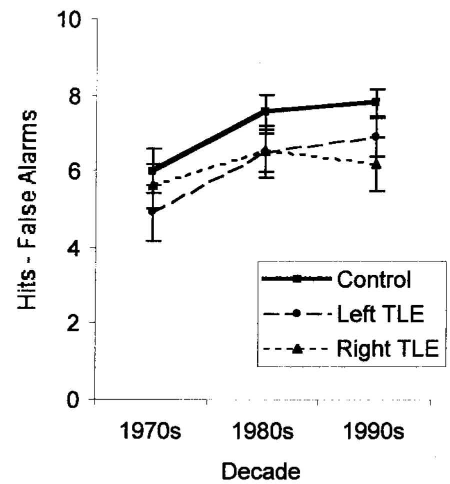


*Figure 2.* Familiarity judgment of names. Mean scores (hits minus false alarms) for controls ($n = 18$), left temporal ($n = 12$), and right temporal ($n = 12$) patients. Note that chance score is 2.5, because there were only half as many lures as famous names. Maximum score is 10. Error bars depict standard error of the mean values. TLE = temporal lobe epilepsy.

### Semantic Questions: Famous Names

An analysis of semantic questions for names revealed a significant main effect of group, $F(2, 39) = 10.100$, $p < .0001$, and no other significant main effects or interactions. Post hoc tests indicated that controls differed from RT patients ($p < .0001$) and from LT patients ($p < .017$), but LT patients did not differ significantly from RT patients ($p < .386$). These results are shown in Figure 4.

### Name Identification of Famous Faces

An analysis of name recall or forced-choice recognition revealed a significant main effect of group, $F(2, 39) = 4.544$, $p < .017$, and no other significant main effects or interaction (see Figure 5). Post hoc tests revealed no significant differences between groups in either the 1970s or the 1980s but revealed that both right-TLE and left-TLE patients were impaired for the 1990s (Tukey's HSD $p$ values were $p < .0001$ and $p < .011$, respectively).

### Additional Analyses

Although not a primary focus of this article, possible differences between pre- and postsurgical cohorts can shed light on the anatomic substrate of recognition and identification processes within the temporal lobe. Given our small sample size, we elected to investigate this issue by conducting nonparametic tests (Mann–Whitney) for those instances

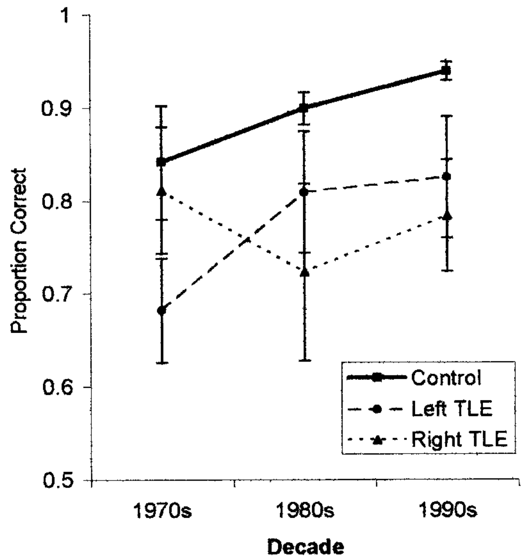


*Figure 3.* Semantic–identity information performance for faces. Mean proportion correct for controls ($n$ = 18), left temporal ($n$ = 12), and right temporal ($n$ = 12) patients. Note that only those items that were initially judged famous are included. Error bars depict standard error of the mean values. TLE = temporal lobe epilepsy.

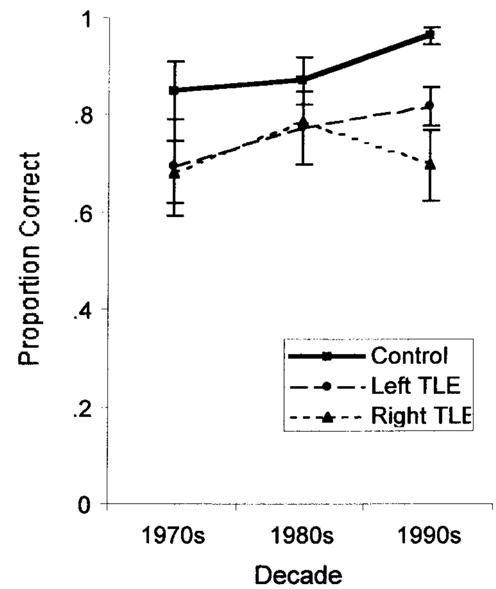


*Figure 5.* Name identification performance for faces. Mean proportion correct for controls ($n$ = 18), left temporal ($n$ = 12), and right temporal ($n$ = 12) patients. Note that only those items that were initially judged famous are included. Error bars depict standard error of the mean values. TLE = temporal lobe epilepsy.

in which there was a clear impairment in the TLE patients. The first of these concerns face-recognition data for the RT group in the 1980s and 1990s. For the earlier decade, there was no significant difference between preoperative ($M$ = 3.97, $SD$ = 1.58) and postoperative ($M$ = 4.40, $SD$ = 2.30) groups ($U$ = 21.5, $p$ > .51). For the 1990s, the same pattern was observed for the preoperative ($M$ = 4.40, $SD$ = 2.61) and postoperative ($M$ = 4.40, $SD$ = 2.47) groups ($U$ = 16.5, $p$ > .87). A similar analysis for semantic information to name cues, collapsed across decade and patient group, yielded no effect of operative group (preoperative $M$ = 2.36, $SD$ = 0.45; postoperative $M$ = 2.21, $SD$ = 0.38; $U$ = 58.5, $p$ > .50). Finally, naming of famous personalities from the 1990s, combining patient groups, again provided no indication of a significant difference between preoperative ($M$ = 2.30, $SD$ = 0.63) and postoperative ($M$ = 2.18, $SD$ = 0.61) groups ($U$ = 64.5, $p$ > .75).

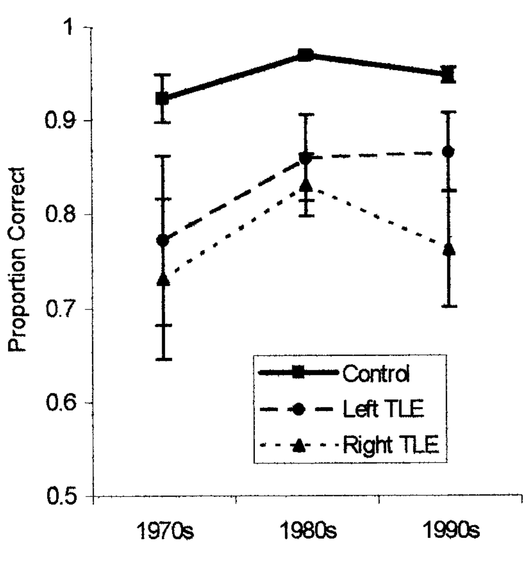


*Figure 4.* Semantic–identity information performance for names. Mean proportion correct for controls ($n$ = 18), left temporal ($n$ = 12), and right temporal ($n$ = 12) patients. Note that only those items that were initially judged famous are included. Error bars depict standard error of the mean values. TLE = temporal lobe epilepsy.

## Discussion

Two main conclusions can be drawn from these results. First, patients with RT lobe damage are impaired at recognizing famous individuals by their faces but not by their names. Second, patients with damage to either temporal lobe are impaired at remembering semantic details and names of famous people. The absence of any significant differences between groups on the media exposure questionnaire suggests that these impairments are not attributable to differential exposure to public information.

The most prominent models of how we recognize and identify people from faces and names suggest multiple stages (Bruce & Young, 1986; Valentine et al., 1991; Young & Bruce, 1991). These models specify that the initial recognition stage (familiarity), which precedes access to identity information, depends on material-specific processing and thus may be differentially affected by lesion laterality

(Milner, 1978; Poldrack & Gabrieli, 1998). The selectivity of the RT region for face recognition is supported by findings from studies of prosopagnosia and neuroimaging (Tempini et al., 1998; for reviews see Behrmann & Moscovitch, 2001; Kanwisher & Moscovitch, 2000). Our finding that patients with RT lesions are impaired on familiarity judgments based on faces but not names is compatible with this model.

We did not, as we had expected, find the reverse dissociation, that is, left-TLE patients showing selective impairment for name familiarity. A ceiling effect may account for the absence of a detectable difference. Inspection of the data indicated that identification failures seemed to be confined to the same few famous individuals across decades, presumably those with whom participants were least familiar. If those famous people are eliminated, what remains is a cohort of relatively easily recognized names. It is not expected that even intact individuals would recognize every person, which suggests that most of the patients may have reached a functional ceiling in our task.

Following the material-specific familiarity stage, processing continues to a single identity-specific semantic module that contains biographical information such as names, occupations, and other information that uniquely specifies an individual. Because this semantic system is shared, it can be conceived of as distributed in both RT and LT lobes. Thus, either left or right TLE might be expected to have a negative impact on retrieval of identity information, and this is precisely what we found. There are some parallel findings from other studies of patients with unilateral temporal lobe pathology. Two studies have reported impairments in patients with left and right TLE for retrieval of specific semantic information regarding famous people and events (Bergin et al., 2000; Kapur, 1999). In addition, two cases of temporal lobe damage caused by herpes encephalitis (largely unilateral involving both medial and lateral neocortical areas) have been described by Eslinger, Easton, Gratten, and Van Hoesen (1996). The patient with primarily LT damage was impaired at both recognition and identity decisions for familiar names, whereas the patient with RT damage showed a similar pattern for famous faces. In contrast, Barr et al. (1990) found consistent impairment only in LT lobectomy patients; patients having undergone RT lobectomy were unimpaired. Barr et al. used naming as the criterion of identification, which may have emphasized LT lobe processes, whereas we (and other recent studies) relied on recognition. This could have exacerbated the identification deficit Barr et al. found in left-TLE patients, but there is no clear explanation for the lack of impairment in right-TLE patients in their study.

These results suggest that structures in the medial temporal lobe are needed to support remote memory even of information that is not strictly episodic, such as that pertaining to famous people. With respect to this point, Westmacott, Leach, Freedman, and Moscovitch (2001) distinguished between two types of knowledge of famous people: One type is episodic and concerns personal experiences associated with a famous individual (e.g., personal experiences associated with the assassination of a political leader, such as John F. Kennedy), and the other is more purely semantic without an autobiographical component. They suggest that the former may be more dependent on medial temporal integrity. Both types may contribute to performance on our tasks. An alternative interpretation is that the deficits observed in our patients are related to damage in regions adjacent to the medial temporal lobe, such as the anterior temporal neocortex, which has been implicated in the representation of knowledge about people (Tranel, Damasio, & Damasio, 1997). All of our postoperative patients had this area excised, and we cannot rule out the possibility of dysfunction in this region in the preoperative cases. Nonetheless, the primary site of seizure focus in our group was the medial region and, furthermore, we were unable to detect differences in performance between pre- and postoperative cases. Similarly, a previous study of remote autobiographical memory with the same patients revealed no differences attributable to operative status (Viskontas et al., 2000). Thus, the data suggest that it is the typical pathology in the medial regions that is more responsible for remote memory impairments in TLE patients.

Both patients and control participants are more likely to recognize famous people in the more recent decades than in earlier ones. This is to be expected for a number of reasons: Memories from earlier decades fade with time, as is typical of forgetting; also, most participants were in their teenage years during the 1970s and therefore may not have been exposed to the media as much at that time as they would be in later decades. Alternatively, it is possible that advances in media and technology have made famous people in the 1990s, and to some extent the 1980s, much more visible to the majority of North Americans. It is interesting to note that both right- and left-TLE patients showed greater deficits in name identification for individuals who came to be famous in the 1990s than those in previous decades. The greater effect seen in this decade may be a function of the low variance in the control group for the 1990s. Alternatively, memory for recently acquired knowledge may be more dependent on episodic memory mediated by the hippocampus and related medial temporal lobe structures, whereas remotely acquired knowledge may be more dependent on semantic memory, which is mediated by the neocortex (see Nadel & Moscovitch, 1997).

In this regard, it is interesting to compare the results of the present study on semantic memory with the results of our previous study (Viskontas et al., 2000) on episodic memory for autobiographical events conducted on the same patients. Memory for autobiographical episodes was impaired throughout life, extending as far back as early childhood, whereas deficits in semantic memory often have a distinct temporal gradient, most noticeably evident in this study in familiarity judgments for faces in the RT-lobe group and name identification in both groups. These findings are consistent with past studies on recognition memory for faces in amnesia associated with medial temporal lobe lesions (see review in Fujii et al., 2000) and with more recent neuroimaging studies on faces (Haist, Bowden, & Mao, 2001; Leveroni et al., 2000). Taken together, the results speak to a fundamental distinction between remote memory episodic and semantic information. Whereas detailed memory for autobiographical episodes is dependent on the medial temporal lobes for as long as the memory exists, memory for semantic information, such as famous people, is dependent on the medial temporal lobes (hippocampus and entorhinal cortex) only until the information is consolidated elsewhere, a process than can take as long as a decade in humans (Haist et al., 2001; Rosenbaum, Winocur, & Moscovitch, 2001; Westmacott et al., 2001).

One possible limitation of our study is the inclusion of both pre- and postoperative patients as one group. As noted above, we were unable to discern reliable differences between pre- and postoperative groups in cases in which there was a clear difference from controls. Nonetheless, the sample size was too small to include this as a general variable in analysis. The majority of preoperative patients in our sample (10 of 14) had hippocampal sclerosis evidence on magnetic resonance imaging; the others had obvious structural lesions in the medial temporal region. Patients with medial temporal sclerosis and epilepsy do demonstrate significant impairments on memory and language tasks prior to surgery, and there may be little postoperative decline in such patients (Davies et al., 1998; Hermann et al., 1994; Miller, Munoz, & Finmore, 1993). For these reasons, it is not surprising that a significant difference between groups was not seen. Nonetheless, we cannot rule out the possibility of different contributions of lateral and medial temporal structures to the remote memory impairments observed here.

In summary, this study has shown that patients with unilateral TLE have difficulty remembering details about famous people, and patients with right TLE have difficulty recognizing famous faces. These findings support the Valentine et al. (1991) and Bruce and Young (1986) models of face and name processing. They also contribute to the growing literature on remote memory deficits associated with medial temporal lobe damage.

## References


Barr, W. B., Goldberg, E., Wasserstein, J., & Novelly, R. A. (1990). Retrograde amnesia following unilateral temporal lobectomy. *Neuropsychologia, 28,* 243–255.

Behrmann, M., & Moscovitch, M. (2001). Face recognition: Evidence from intact and impaired performance. In F. Boller & J. Grafman (Series Eds.) & M. Behrmann (Vol. Ed.), *Handbook of neuropsychology* (2nd ed., pp. 181–207). Amsterdam: Elsevier Science.

Bell, B. C., Davies, K. G., Hermann, B. P., & Walters, G. (2000). Confrontation naming after anterior temporal lobectomy is related to age of acquisition of the object names. *Neuropsychologia, 38,* 83–92.

Benton, A. L. (1980). The neuropsychology of facial recognition. *American Psychologist, 35,* 176–186.

Bergin, P. S., Thompson, P. J., Baxendale, S. A., Fish, D. R., & Shorvon S. D. (2000). Remote memory in epilepsy. *Epilepsia, 41,* 231–239.

Bruce V., & Young, A. (1986). Understanding face recognition. *British Journal of Psychology, 77,* 305–327.

Cohen, N. J., & Squire, L. R. (1981). Retrograde amnesia and remote memory impairment. *Neuropsychologia, 19,* 337–356.

Davies, K. G., Bell, B. D., Bush, A. J., Hermann, B. P., Dohan F. C., Jr., & Jaap, A. S. (1998). Naming decline after left anterior temporal lobectomy correlates with pathological status of resected hippocampus. *Epilepsia, 39,* 407–419.

Eslinger, P. J., Easton, A., Gratten, L., & Van Hoesen, G. (1996). Distinctive forms of partial retrograde amnesia after asymmetric temporal lobe lesions: Possible role of occipitotemporal gyri in memory. *Cerebral Cortex, 6,* 530–539.

Evans, J. J., Heggs, A. J., Antoun, N., & Hodges, J. R. (1995). Progressive prosopagnosia with selective right temporal lobe atrophy. A new syndrome? *Brain, 118,* 1–13.

Fujii, T., Moscovitch, M., & Nadel, L. (2000). Consolidation, retrograde amnesia, and the temporal lobe. In F. Boller & J. Grafman (Eds.), *The handbook of neuropsychology* (Vol. 4, pp. 223–250). Amsterdam: Elsevier.

Fukatsu, R., Fujii, T., Tsukiura, T., Yamadori, A., & Otsuki, T. (1999). Proper name anomia after left temporal lobectomy: A patient study. *Neurology, 52,* 1096–1099.

Haist, F., Bowden G. J., & Mao H. (2001). Consolidation of human memory over decades revealed by functional magnetic resonance imaging. *Nature Neuroscience, 4,* 1139–1145.

Hermann B. P., Wyler A. R., Somes G., Duhan C., Berry A. D., & Clement L. (1994). Declarative memory following anterior temporal lobectomy in humans. *Behavioral Neuroscience, 108,* 3–10.

Kanwisher, N., & Moscovitch, M. (2000). The cognitive neuropsychology of face processing: An introduction. *Cognitive Neuropsychology, 17,* 1–12.

Kapur, N. (1999). Syndromes of retrograde amnesia: A conceptual and empirical synthesis. *Psychological Bulletin, 125,* 800–825.

Kapur, N., Thompson, P., Kartsounis, L. D., & Abbott, P. (1999). Retrograde amnesia: Clinical and methodological caveats. *Neuropsychologia, 37,* 27–230.

Leveroni, C. L., Seidenberg, M., Mayer, A. R., Mead, L. A., Binder, J. R., & Rao, S. M. (2000). Neural systems underlying the recognition of familiar and newly learned faces. *Journal of Neuroscience, 20,* 878–886.

Luchelli, F., & De Renzi, E. (1992). Proper name anomia. *Cortex, 28,* 221–230.

Miller, L. A., Munoz, D. G., & Finmore, M. (1993). Hippocampal sclerosis and human memory. *Archives of Neurology, 50,* 391–394.

Milner, B. (1978). Clues to the cerebral organization of memory. In P. A. Bluser & A. Rougeul-Buser (Eds.), *Cerebral correlates of conscious experience* (pp. 139–153). Amsterdam: Elsevier.

Nadel, L., & Moscovitch, M. (1997). Memory consolidation, retrograde amnesia and the hippocampal complex. *Current Opinion in Neurobiology, 7,* 217–227.

Poldrack, R., & Gabrieli, J. D. E. (1998). Memory and the brain: What's right and what's left? *Cell, 93,* 1091–1093.

Reed, J. M., & Squire, L. R. (1998). Retrograde amnesia for facts and events: Findings from four new cases. *The Journal of Neuroscience, 18,* 3943–3954.

Rosenbaum, R. S., Winocur, G., & Moscovitch, M. (2001). New views on old memories: Re-evaluating the role of the hippocampal complex. *Behavioural Brain Research, 127,* 183–197.

Sanders, H. I., & Warrington, E. K. (1971). Memory for remote events in amnesic patients. *Brain, 94,* 661–668.

Tempini, M. L., Price, C. J., Josephs, O., Vandenberghe, R., Cappa, S. F., Kapur, N., & Frackowiak, R. S. (1998). The neural

systems sustaining face and proper-name processing. *Brain, 121,* 2103–2118.
Tranel, D., Damasio, H., & Damasio, A. R. (1997). A neural basis for the retrieval of conceptual knowledge. *Neuropsychologia, 35,* 1319–1327.
Valentine, T., Bredart, S., Lawson, R., & Ward, G. (1991). What's in a name? Access to information from people's names. *European Journal of Cognitive Psychology, 3,* 690–696.
Verstichel, P., Cohen, L., & Crochet, G. (1996). Associated production and comprehension deficits for people's names following left temporal lesion. *Neurocase, 2,* 221–234.
Viskontas, I. V., McAndrews, M. P., & Moscovitch, M. (2000). Remote episodic memory deficits in patients with unilateral temporal lobe epilepsy and excisions. *Journal of Neuroscience, 20,* 5853–5857.
Warrington, E. K., & James, M. (1967). An experimental investigation of facial recognition in patients with unilateral cerebral lesions. *Cortex, 3,* 317–326.
Warrington, E. K., & McCarthy, R. (1988). The fractionation of retrograde amnesia. *Brain and Cognition, 7,* 184–200.
Wechsler, D. (1981). *Wechsler Adult Intelligence Scale—Revised.* London and New York: Psychological Corporation.
Wechsler, D. (1997). *Wechsler Adult Intelligence Scale—Third Edition.* London and New York: Psychological Corporation/Harcourt Brace.
Westmacott, R., Leach, L., Freedman, M., & Moscovitch, M. (2001). Different patterns of autobiographical memory loss in semantic dementia and medial temporal lobe amnesia: A challenge to consolidation theory. *Neurocase, 7,* 37–55.
Young, A. W., & Bruce, V. (1991). Perceptual categories and the computation of "grandmother." *European Journal of Cognitive Psychology, 3,* 5–49.

## Appendix A

### Famous People Used in Test

| Set 1 | Decade | Set 2 | Decade |
|---|---|---|---|
| Peter Trueman | 70 | Anne Murray | 70 |
| Robert L. Stanfield | 70 | Gordon Pinsent | 70 |
| Patty Hearst | 70 | Ed Broadbent | 70 |
| Marc Lalonde | 70 | Burton Cummings | 70 |
| John Turner | 70 | Greg Joy | 70 |
| Anwar Sadat | 70 | Menachem Begin | 70 |
| Tom Connors | 70 | Margaret Trudeau | 70 |
| Toller Cranston | 70 | Nadia Comaneci | 70 |
| Allan MacEachren | 70 | Hughes LaPointe | 70 |
| Peter Loughead | 70 | Pauline McGibbon | 70 |
| Lech Walesa | 80 | Joe Clark | 80 |
| Boy George | 80 | David Peterson | 80 |
| Francois Mitterand | 80 | Elizabeth Manley | 80 |
| William G. Davis | 80 | Robert Bourassa | 80 |
| Rene Levesque | 80 | Margaret Thatcher | 80 |
| Jeanne Sauve | 80 | Brian Boitano | 80 |
| Pope John Paul II | 80 | Molly Ringwald | 80 |
| Ted Kaczynski | 80 | Ollie North | 80 |
| Terry Fox | 80 | Brooke Shields | 80 |
| Ayatollah Khomeini | 80 | Wayne Gretzky | 80 |
| Ellen DeGeneres | 90 | Sheila Copps | 90 |
| Paul Reiser | 90 | Gillian Anderson | 90 |
| Jennifer Aniston | 90 | Paul Bernardo | 90 |
| Mike Harris | 90 | Nicole Simpson | 90 |
| David Duchovny | 90 | Tiger Woods | 90 |
| Sarah McLachlan | 90 | Elvis Stojko | 90 |
| Dr. Jack Kevorkian | 90 | Noah Wyle | 90 |
| Hillary Clinton | 90 | Monica Lewinsky | 90 |
| Jerry Seinfeld | 90 | Jacques Villeneuve | 90 |
| Lance Ito | 90 | Kenneth Starr | 90 |

(*Appendixes continue*)

## Appendix B

### Media Exposure Questions

1. Do you generally read a newspaper? (seldom, once a week, several times a week, or every day)
2. Which one(s)? (Scoring weighted according to news content)
3. Do you watch the news on television?
4. Do you listen to the news on the radio?
5. Do you read books which contain historical facts or details?
6. Do you watch films, videos, or TV programs about historical events?
7. Has the above trend always been the case? (Note any differences)

Received April 25, 2001
Revision received November 1, 2001
Accepted February 26, 2002 ■