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Comments and Controversies

Letter to the Editor

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Dear Editor,

In the current issue of NeuroImage, two Event-Related Potential (ERP) studies of recognition memory for faces are published back-to-back (Curran and Hancock, and MacKenzie and Donaldson). Both studies suggest that qualitatively distinct retrieval processes support recognition, consistent with "dual-process" models of recognition memory. However, the studies do so on the basis of apparently different results, a discrepancy that is surprising given the similarity of their designs. Here we place the studies in context, and highlight potential reasons for the discrepancy.

Dual-process theories of recognition memory postulate two qualitatively different processes: recollection, which is associated with the retrieval of contextual information that accompanied prior exposure to a stimulus, and familiarity, which is an impression of oldness engendered by a stimulus that does not include the retrieval of contextual information about its prior exposure. A common example is the "Butcher-on-the-Bus" phenomenon, where someone's face on a bus can seem highly familiar (because they are, for example, your local butcher), yet you cannot recollect who they are, or when you last saw them. Many previous ERP studies of recognition memory, using a variety of stimuli, have provided evidence supporting dissociable neural correlates of recollection and familiarity. A mid-frontal effect occurs circa 300–500 ms post stimulus (the "FN400") and is thought to reflect familiarity, whereas a left parietal effect occurs later, circa 500–700 ms, and is thought to reflect recollection. The findings of Yovel and Paller (2004), also published in NeuroImage (21: 789–800) called this view into question, based on the demonstration of a single posterior ERP difference between correctly recognised "old" (previously seen) faces and correctly rejected "new" (previously unseen) faces, regardless of whether or not contextual information (that was explicitly paired with the old faces) was retrieved. In other words, no neural evidence was found to support the phenomenological distinction between whether you do or do not recollect that a face belongs to your butcher. By this view, familiarity and recollection do not reflect qualitatively distinct processes, at least for faces. Instead, consistent with a single process model, Yovel Paller argued that the neural processes supporting familiarity and recollection are the same (i.e., differing only in degree, rather than kind).

In all three studies reported to date (Yovel and Paller, 2004, and Curran and Hancock and MacKenzie and Donaldson, this issue), participants studied a series of faces, each paired with a specific piece of contextual information. In a subsequent recognition test, participants discriminated old from new faces, and if faces were recognised, were required to report accompanying contextual information if possible. Curran and Hancock report results that are consistent with the traditional view, in which the mid-frontal ERP effect was observed for recognized faces regardless of whether or not associated contextual details were recalled, whereas the parietal effect was present only when contextual details were recalled. By contrast, MacKenzie and Donaldson found that faces recognised without retrieval of contextual information elicited a posterior old/new effect, and this posterior effect was larger when contextual detail was reported, but in this case, was accompanied by an additional anterior old/new effect. The latter study replicates the pattern of effects shown by Yovel and Paller over posterior scalp, but the additional anterior effect associated with recollection is new. Thus the two studies in the current issue stand together in rejecting the single-process view of recognition memory for faces, but do so on the basis of divergent findings within what are, prima facie, very similar paradigms.

What then are the differences between the two current studies that might explain the discrepant results? A number of experimental differences are unlikely to be important. For example, the studies vary in the requirement to recall names versus occupations, and in the use of 24 versus 12 stimuli in each study list, neither of which would appear to be important on the basis of comparison across the three studies. Similarly, Curran and Hancock were concerned about differences in response demands across 'new', 'familiar' and 'recollected' conditions, but showed that this does not provide an explanation of the qualitative changes in activity across conditions.

There are three differences between the studies that might be important. First, is the fact that behavioural performance differs considerably; compared to both MacKenzie and Donaldson and Yovel and Paller, participants in the Curran and Hancock study were better able to discriminate old from new items overall. This difference in performance may relate to the discrepant ERP effects. However, rather than providing a direct causal explanation, differences in discriminability are probably better viewed as a by-product of other experimental variables that are critical.

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A second potentially important difference is the heterogeneity of the faces used; both MacKenzie and Donaldson and Yovel and Paller employed stimuli that were relatively homogenous (with the intention of carefully matching and controlling for unwanted variability), whereas Curran and Hancock employed a more heterogeneous stimulus set (with the intention of maximizing familiarity-based discrimination because familiarity is well known to provide limited discrimination between studied items and similar lures). Unfortunately however, it is not immediately clear what effect this heterogeneity should have: from a dual-process perspective, making faces more homogenous has been argued to reduce the extent to which familiarity serves as an effective basis for performance. By this account, only in Curran and Hancock's study could participants employ familiarity as a basis for discriminating between old and new faces. Alternatively, increasing heterogeneity might increase the ability to recollect information (in addition to study context), suggesting the opposite bias, with participants in MacKenzie and Donaldson's study relying more on familiarity-based retrieval. Direct experimental manipulation of stimulus heterogeneity will be important for future studies.

The third difference between the studies concerns the modality of the contextual information. MacKenzie and Donaldson (and Yovel and Paller) paired faces with auditory information, whereas Hancock and Curran paired faces with visual information. This suggests that the nature of the representations of the study episodes may differ, which could explain the differences in the neural correlates that each set of authors associated with recollection. However, the more important difference between the studies concerns the pattern of effects evoked by the putative 'familiarity' conditions, in which participants were unable to report the associated contextual information, so it is not immediately clear why the modality of that information is relevant.

While the above procedural differences between the two studies would normally be considered minor, they may offer important clues to new variables that are critical for recognition memory. This is ultimately an empirical question. It is an important question nonetheless because, while the debate between single- and dual-process models of recognition memory has been raging for several decades, mainly on the basis of behavioural data, the neural data from ERP studies has provided the clearest evidence in support of dual-process models (arguably clearer than data from fMRI). The present studies bolster this evidence, but also illustrate that we have more to learn about the factors that affect the neural correlates of recollection and familiarity.