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Reduced recognition and priming in older relative to young adults for incidental and intentional information☆

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ABSTRACT

Older adults often show greater implicit/unconscious memory than young adults for incidental information that was task-irrelevant during its acquisition. Shallow/perceptual encoding by older adults may boost performance on implicit tasks that reinstate this type of processing, whereas deeper/conceptual encoding by young adults may support greater explicit/conscious memory. To test this, young and older participants were exposed to incidental words in a text color identification task before the trial-by-trial capture of priming and recognition. In Experiments 1–3 priming and recognition were significantly greater in young than older adults, providing evidence against age differences in encoding style. In Experiments 2–3 older adults were more liberal than young adults in making positive recognition judgments to incidental relative to intentional items, even though source memory was poor in both groups. Findings pinpoint age differences in the utilization of previously incidental versus intentional information on different types of task.

1. Introduction

There are many situations in which we intentionally try to learn new information for later use, but equally important is our ability to draw upon information learned unintentionally. Age-related declines in the ability to consciously learn and retain new information are well documented, but there are surprising age differences in memory for incidental information that was task irrelevant during its initial acquisition. Older adults show similar or greater implicit (unconscious, nondeclarative) memory for such information compared to young adults, while young adults show greater explicit (conscious, declarative) memory (e.g., Gopie, Craik, & Hasher, 2011; Rowe, Valderrama, Hasher, & Lenartowicz, 2006; Thomas & Hasher, 2012; Ward, de Mornay Davies, & Politimou, 2015). For example, in Gopie et al. (2011), participants indicated the text color of words while ignoring the words themselves. They then performed a word-fragment completion (WFC) task with either indirect memory instructions to complete fragments with the first word that came to mind (implicit task), or direct instructions to complete fragments with words from the previous phase (explicit task). The use of words from the previous phase as solutions was greater in older than young adults in the implicit task, but young adults retrieved more words than older adults in the explicit task.

This pattern of age differences may be caused by qualitatively distinct initial processing of incidental information by young and older adults. Older adults may encode this information at a shallower level than young adults (see Craik, 1983, 1986, for an explanation of how depleted encoding resources with age results in a reduction in the ability to engage in elaborative memorial processing), and since implicit memory tasks generally rely on shallow (typically perceptual) processing, this may explain the superior performance of older adults on this type of task (see Craik, Moscovitch, & McDowd, 1994; Jacoby, 1983; Roediger & Blaxton,

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1987). That is, older adults' perceptual encoding style may lead to greater performance on implicit tasks that reinstate this type of processing at retrieval, known as transfer-appropriate processing (Morris, Bransford, & Franks, 1977; Roediger, Weldon, & Challis, 1989). In contrast, deeper encoding by young adults may lead to greater performance on explicit tasks that draw upon this type of processing at retrieval. Indeed, when young participants' in Gopie et al. (2011, Experiment 3) were given a second simultaneous task during the encoding phase to reduce their available processing resources, their performance on the subsequent implicit and explicit WFC tests mirrored that in the older adult group: they showed greater output of the previously presented incidental items on the implicit than the explicit task.

Another possible explanation concerns age differences in retrieval. It is well established that young adults are better than older adults at constraining their retrieval to relevant sources of information (e.g., Jacoby, Shimizu, Velanova, & Rhodes, 2005), as well as suppressing no-longer-relevant information (e.g., Biss, Ngo, Hasher, Campbell, & Rowe, 2013). Greater control over retrieval may mean that young adults suppress previously incidental information that is not deemed relevant on traditional tasks with indirect memory instructions (i.e., tasks in which participants are not instructed to remember/use previously presented information). For example, in WFC, participants are required to complete fragments with the first word that comes to mind, but it is possible that young participants do generate previously encountered items as solutions, but opt for alternatives because the task is framed as unrelated to the prior phase in which the information was presented, and/or because they are concerned that they are supposed to have previously ignored such items. By contrast, older adults may not be as good at suppressing previously presented items, meaning that they output more of them. Of course, this implies that participants may not strictly follow instructions to complete fragments with the first word that comes to mind, but this issue and the fact that tasks such as this allow considerable flexibility in terms of response strategy has been raised in the past (e.g., Buchner & Wippich, 2000; MacLeod, 2008; Ward, Berry, & Shanks, 2013a, 2013b).

Recent studies have provided evidence that young adults do indeed suppress previously presented incidental information (sometimes termed previously irrelevant or distracting information) on tasks with indirect memory instructions. For example, Thomas and Hasher (2012) exposed young and older adults to irrelevant words interspersed within short stories, which they were asked to ignore while reading the stories aloud. Participants then studied a list of words, which was half comprised of previously irrelevant items, for free recall. When participants were not made aware that the study list contained items from the initial phase (indirect instruction), the two groups' level of recall was equivalent (Experiment 1). However, when participants were informed that the study list contained words that had appeared earlier in the experiment (direct instruction), young adults' recall exceeded that of older adults' (Experiments 2 and 3). The authors suggested that young adults in the indirect condition limited their retrieval solely to the studied list of words, deeming this to be the only relevant source of information, but when the task instructions pointed to the stories as another relevant source of information (direct condition), they were able to relax their constraint on retrieval in order to access more previously irrelevant items (see also Ward et al., 2015).

The present study aimed to shed greater light on whether the pattern of age differences in memory for incidental information is due to qualitatively distinct encoding by young and older adults, or age differences in retrieval. Participants were presented with words in an initial text color identification task closely modelled on Gopie et al. (2011). Encoding of the words was incidental as participants were required to rapidly identify text color and were unaware that the words themselves would later become relevant. Indices of explicit and implicit memory were subsequently taken using the continuous identification with recognition (CID-R) task (e.g., Conroy, Hopkins, & Squire, 2005; Stark & McClelland, 2000; Ward et al., 2013b), which involves the concurrent capture of perceptual identification (priming) of a previously presented or new word, and a recognition judgment. This paradigm involves a highly perceptual implicit task, and a traditional recognition task requiring the more effortful judgment of whether or not presented items had been shown previously in the experiment. Thus, if young and older adults engage in deep and shallow encoding of incidental information, respectively, then one would expect young adults to outperform older adults on the recognition task and vice versa on the identification task, due to transfer-appropriate processing.

A key feature of the identification task is that it has a single, well-defined goal to identify words as quickly as possible, meaning that participants do not have flexibility in their performance strategy (see Buchner & Wippich, 2000, for a review of the immunity of perceptual identification tasks to intentional memory strategies). Thus, the task is immune to the sort of suppression that, as explained above, may occur on other implicit tasks such as WFC. Hence, the alternative prediction is that if young adults typically engage in greater suppression of incidental items on traditional implicit tasks, they will show greater priming for such items on the present identification task in which the possibility of suppression is eliminated.

2. Experiment 1

2.1. Method

2.1.1. Participants

Forty young (eighteen male) and 40 older (twelve male) adults took part (Table 1). Young participants were students from Middlesex University, London, who participated in exchange for course credit. Older participants were members of the University of the Third Age (U3A), who responded to an advertisement. All participants were fluent in English language with good vision, no color blindness, and good self-reported health. The study was approved by Middlesex University Research Ethics Committee.

2.1.2. Stimuli

Two 60-item lists of 30 common nouns and 30 random letter strings were rotated between participants. In this and subsequent experiments, words were concrete nouns taken from the MRC Psycholinguistics Database (Coltheart, 1981), and lists were matched in