Back to the Future: Past and Future Era-Based Schematic Support and Associative Memory for Prices in Younger and Older Adults

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Older adults typically display various associative memory deficits, but these deficits can be reduced when conditions allow for the use of prior knowledge or schematic support. To determine how era-specific schematic support and future simulation might influence associative memory, we examined how younger and older adults remember prices from the past as well as the future. Younger and older adults were asked to imagine the past or future, and then studied items and prices from approximately 40 years ago (market value prices from the 1970s) or 40 years in the future. In Experiment 1, all items were common items (e.g., movie ticket, coffee) and the associated prices reflected the era in question, whereas in Experiment 2, some item–price pairs were specific to the time period (e.g., typewriter, robot maid), to test different degrees of schematic support. After studying the pairs, participants were shown each item and asked to recall the associated price. In both experiments, older adults showed similar performance as younger adults in the past condition for the common items, whereas age-related differences were greater in the future condition and for the era-specific items. The findings suggest that in order for schematic support to be effective, recent (and not simply remote) experience is needed in order to enhance memory. Thus, whereas older adults can benefit from "turning back the clock," younger adults better remember future-oriented information compared with older adults, outlining age-related similarities and differences in associative memory and the efficient use of past and future-based schematic support.

K *:* memory, aging, schematic support, associative memory, past and future prices

Older adults often exhibit a variety of memory impairments relative to younger adults (for a review, see McDaniel, Einstein, & Jacoby, 2008; Zacks & Hasher, 2006). Many of the more pronounced deficits occur when binding or linking items of information together to form new associations (e.g., Chalfonte & Johnson, 1996; Naveh-Benjamin, 2000). This associative deficit is often characterized by poorer performance by older adults on tasks that involve remembering names and faces (James, 2006; Naveh-Benjamin, Guez, Kilb, & Reedy, 2004), face–face pairs (Rhodes, Castel, & Jacoby, 2008), and unrelated word pairs (Castel & Craik, 2003; Naveh-Benjamin, Hussain, Guez, & Bar-On, 2003). Although the associative deficit is observed in a number of tasks and settings, there are some factors that can lead to a reduction in this deficit. For example, tests that involve related word pairs show less, or no, associative deficit relative to unrelated word pairs (Naveh-Benjamin, 2000). In addition, tests that involve remembering conceptual and important information, rather than more perceptual information, show a reduction or even an elimination of the associative deficit (Rahhal, May, & Hasher, 2002). These studies suggest that although the associative deficit is often observed, there are some factors that can reduce this deficit in older adults.

One important factor that can influence the presence or absence of the associative deficit is the degree to which older adults can rely on prior knowledge and schema-based processing. For example, Hess and Slaughter (1990) found that older adults benefited from scene organization when trying to remember the location of objects that varied in terms of the likelihood of occurrence in a particular scene. In addition, a word-frequency cohort effect has been shown, in that relative to younger adults, older adults are more likely to recall more words that were common during a past

deficit in old age. It may be that in order for prior knowledge to be facilitative, it needs to be based on current and active bodies of knowledge and not based on infrequent use or more remote memory. We were interested in testing this possibility in the present studies.

The type or form of schematic support may be particularly important to consider in order for older adults to use the support to organize and remember items and relevant associations. Craik and Bosman (1992) defined schematic support as the use of prior knowledge or semantic memory to process new information that can be stored as episodic memory (see also Craik, 2002). Based on this notion, Castel (2005) found that older adults, compared with younger adults, were equally able to remember associations between items and prices for realistic "market value" item–price pairs (e.g., pickles $3.29) but were impaired for unrealistic pairings (e.g., ice cream $17.59). This finding suggests that when information is consistent with past and current experience, and has some relevance to frequent real-world behavior, older adults perform as well as younger adults (see also Hess, 2005). However, it remains unclear how experience-based schematic support, based on a current knowledge set versus more remote knowledge from the past, may influence older adults' memory performance. Older adults may also only benefit if they have had sufficient experience with the specific objects and prices during the time period in question. In general, it is useful to better understand how older adults can rely on accumulated knowledge from the past to remember, and whether this knowledge base can enhance the encoding and retrieval of new episodic information.

To better understand how specific forms of schematic support can influence associative memory, we examined to what degree "era-based" schemas could influence how people remember prices. For example, some older adults may express that they can remember when a movie cost $1.50, reflecting the ability to remember prices for things that have been experienced in the remote past. Building on this notion, we tested to what degree older adults could remember item–price pairs that reflected prices from both the past and the future, relative to younger adults. We hypothesized that if older adults have had sufficient experience with item–price information from the remote past, then age-related differences for this information would be reduced or eliminated. In addition, the past prices, although now outdated, may have more realistic value for older adults, given they have had some experience with these items and the associated price range. This process may reflect a reliance on a specific form of personal schematic support—one that older adults have experienced and may remember purchasing these items at those prices years ago, whereas younger adults likely do not have this personal form of schematic

prices would be small or negligible for the past condition, but present or magnified for the future condition.

Method

Participants.

.14. Importantly, there was an Age Group × Condition interaction, $F(1, 58) = 4.35$, $MSE = 3.71$, $< .05$, $\eta_p^2 = .08$. In order to explore the nature of the interaction, post hoc tests were conducted. For the items in the past, both younger and older adults correctly recalled a similar number of prices, $(58) = 1.34$, $= .18$. However, younger adults recalled significantly more of the future prices compared with older adults, $(58) = 4.03$, $< .001$. In addition, older adults recalled more of the past compared with future prices, $(29) = 4.64$, $< .001$, whereas younger adults recalled a similar number of item prices in both the past and future conditions, $(29) = 1.49$, $= .15$. This pattern of results persisted even with a less stringent measure of recall (i.e., recall within ±15% of the actual price).

The postrecall test difficulty ratings (i.e., "How difficult it was to imagine it was 40 years in the past/future?") were analyzed. Older adults rated the future condition as more difficult than the past ($M = 4.4$, $SD = 1.8$ and $M = 2.7$, $SD = 1.8$, respectively), $(29) = 5.37$, $< .001$. However, despite recalling a similar number of past and future item prices, younger adults also rated the future as more difficult than the past ($M = 4.3$, $SD = 1.4$ and $M = 3.1$, $SD = 1.2$, respectively), $(29) = 3.36$, $< .01$. Furthermore, controlling for the difficulty ratings did not reduce the overall effect of age on the number of items recalled.

Lastly, an Age Group × Block (first blocked condition vs. second blocked condition) ANOVA was conducted in order to examine any potential effects of interference. There was an effect of block, such that recall for item prices was higher on the initial block compared with the second block, *FM*

widely available for purchase (i.e., typewriter, Ford station wagon, record player). The future items and prices were selected after researching Web sites that projected likely future inventions, such as the site http://toptrends.nowandnext.com/2008/10/31/future-inventions/ and http://science.howstuffworks.com/innovation/inventions/5-future-inventions-everyones-been-

may be the items themselves attracted additional attention and

support when considering retirement and financial planning and imaging the future self (see also Hershfield et al., 2011).

The present study provides some initial evidence that older adults can remember past item–price information by relying on both remote and more generalized forms of schematic support, as well as future-based information if the objects are common and thus are familiar. Some limitations of the study include the relatively small sample size of participants in each experiment, and the number and type of items. In addition, we did not directly or subjectively assess the commonality or familiarity of each item on an individual-by-individual basis, and this might influence how people remember the item–price information. For example, personal relevance of information (see also

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