The use of contextual information on a working memory span task

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ABSTRACT

While age-associated declines on working memory span tasks have been identified in previous studies, other studies of long-term memory have shown that older adults are able to rely on contextual, or gist, information. For the present investigation, healthy older adults completed two versions of a reading span task: a traditional version consisting of unrelated sets and a story version in which sentence sets were thematically related. Superior recall was observed for the story version, indicating that older adults can benefit from contextual support.

INTRODUCTION

Working Memory(Baddeley, 1986)

Working memory is a short-term, limited capacity memory system that allows people to simultaneously process and store information (Baddeley, 1986). Span tasks provide a metric to assess the amount of information a person is capable of sustaining in working memory by requiring participants to engage in one activity (i.e., processing) while simultaneously maintaining additional information (i.e., storage). The Daneman and Carpenter (1980) reading span tasks requires users to read sets of sentences out loud while concurrently holding the last word of each sentence in memory for subsequent recall.

Previous research has found age-related decline in older adults working memory span, relative to college-age samples (Bopp & Verhaeghen, 2005). One explanation for these findings is that older adults have greater difficulty suppressing irrelevant information, such as items from previous span task trials (Hasher & Zacks, 1988). Alternatively, Craik & Byrd (1982) posit that declines in available processing resources that accompany healthy aging may contribute to age-related differences in memory performance, but these deficiencies may be minimized when a given task provides sufficient contextual support.

If older adults benefit from greater contextual support on memory measures, then recall for span items that share similar thematic sentence content should be better than recall for unrelated sentence content items, because the thematic relations would produce stronger, higher level memory representations (Radvansky, Zwann, Curiel, & Copeland, 2001). Alternatively, previously learned thematic sentence content might lead to greater proactive interference and produce greater recall errors.

In this study we asked people to complete two versions of the reading span task: a traditional version consisting of unrelated sentence sets and a story span task consisting of related sentence sets. Sentence were arrange in six randomized span levels, each containing three trails. After reading each sentence in a given trial, participants were asked to recall the final word of each sentence they had read for the trial. A strict and lenient scoring criteria were used.

EXPERIMENT 1

Participants

23 English-speaking healthy older adults (65-85 years) recruited via posted flyers in the Las Vegas community.

Materials & Procedure:

People were presented with two span tasks: a traditional reading span tasks and a story span task with thematically related sentence sets. For both versions, sentences were 12-15 words long. Target words were 120 one-syllable nouns rated for frequency (50-100) and concreteness (400-700). Both tasks consisted of five span levels (2-6 items), each with three trials per level.

Two scoring procedures were used

- •Strict scoring criteria– credit was only awarded for the correct target items recalled in correct serial order.
- •Lenient scoring criteria– credit was awarded for correctly recalling a word from the current set regardless of order.

Instructions for both span tasks were identical. Participants were instructed to read each sentence out loud at their normal reading rate and recall the final word of each sentence from that set, when prompted. Responses were manually entered into a computer by trained research assistants.

Sample story span task item (set level 4)

The woman saw that the place was being renovated as she entered the bank.

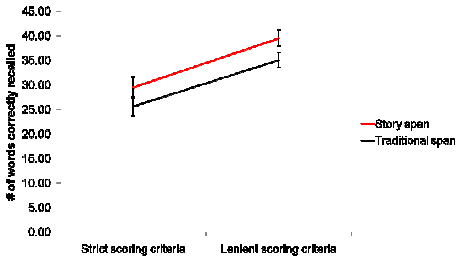
She needed to withdraw one hundred dollars so that she could buy a new dress.

Suddenly, out of the blue, she felt a small tickle in her throat.

As she began coughing, she noticed that most of the lobby was covered in dust.

[Correct serial recall: bank, dress, throat, dust]

Results



Span Main Effect: $F(1, 22) = 16.24$, $p < .001$, $\eta_p^2 = .43$

Scoring Main Effect: $F(1, 22) = 71.32$, $p < .001$, $\eta_p^2 = .76$

Interaction: $F(1, 22) = .38$, $p = .54$

EXPERIMENT 2

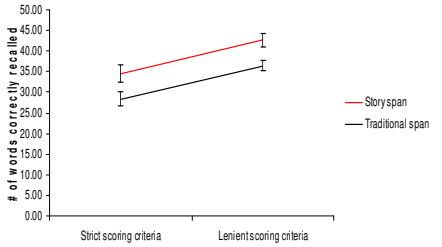
Participants

26 undergraduates (18-25 years) from the University of Nevada Las Vegas.

Materials & Procedure

Similar to Experiment 1, except story span was re-written so that all sentences comprised a single unified story. For the traditional span, each sentence was kept unique. Sentence length was constant for both conditions. As with Experiment 1, strict and lenient scoring criteria were used.

Results



Span Main Effect: $F(1, 27) = 22.78$, $p < .0001$, $\eta_p^2 = .46$

Scoring Main Effect: $F(1, 27) = 58.80$, $p < .0001$, $\eta_p^2 = .69$

Interaction: $F(1, 27) = .012$, $p = .91$

DISCUSSION

- Both experiments showed a recall advantage for the story span task, suggesting that people rely on contextual information during working memory processes.
- The observed variance in task performance was not simply due to the way in which the task was scored, as evidenced by the markedly higher scores for the story span task using both a strict and lenient scoring criteria. That is, superior recall for story span items was consistently higher, regardless of scoring procedure. However, it is recommended that future investigations rely on a strict scoring method.
- Future research will attempt to assess the performance of older adults on the unified version of the story span task.

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