

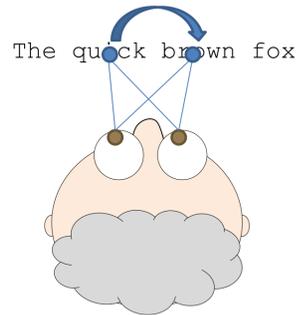
Introduction

Eye movements during reading

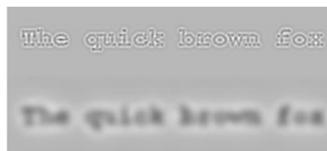
- As you read, your eyes move in a sequence of jerky movements called saccades, separated by brief pauses (fixations) during which visual information is acquired.
- Studying the pattern of a reader's eye movements is a valuable method for gaining a detailed understanding of the reading process (Rayner, 2009).

Older adult readers

- Older adults (65+ years) typically read more slowly than young adults (18-30 years), and have a different pattern of eye movement behaviour.
- Healthy adult aging is also associated with changes in the eye and brain which lead to a decline in visual functioning.
- In particular, older adults experience a loss in sensitivity to fine detail which may lead them to be more reliant on coarse scale detail within a text.
- Advanced age is also associated with greater disruptive effects of crowding (increased difficulties in identifying letters when surrounded by other letters).



Example of fine and coarse scale detail



Older adults have reduced sensitivity to fine detail (top) but intact sensitivity to coarse scale detail (bottom).

Example of crowding

B + KBT
R + NRE

When looking at the cross you can see that letters are easier to identify when in isolation. These effects are greater in older adults.

- These changes may mean that older adults are affected differently to young adults by the visual properties of a text. Confirming this may be key to the successful development of practical solutions to alleviate reading difficulties in older age.
- As the spaces between words are a coarse-scale cue to word boundaries which reduce crowding of the exterior letters of a word, they may be particularly important for older readers.
- This was examined in two eye movement experiments.



Experiment 1

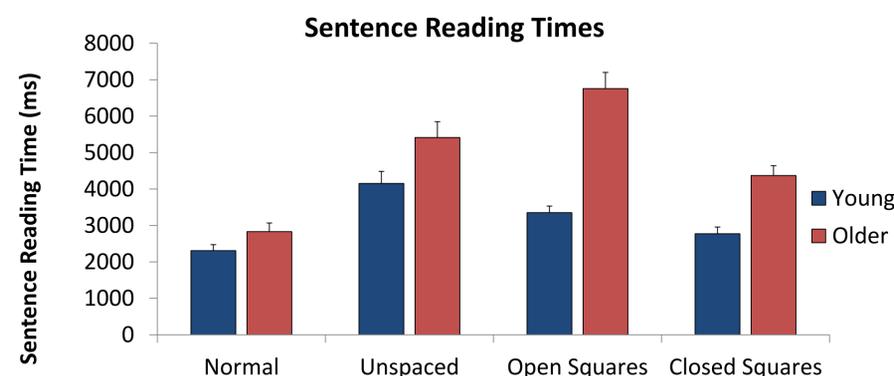
- Experiment 1 aimed to reveal (1) whether older adults are more disrupted by removing or filling the spaces in between words than young adults, and (2) which aspect of these spaces may be particularly beneficial to older readers.

Method

- Young and older adults read sentences in which spacing was normal, the spaces were removed, or the spaces were filled with closed (■) squares, which provide a coarse scale cue for word segmentation, or open (□) squares which provide a fine scale cue and include features that may contribute to crowding.

Results

- The reading and eye movement behaviour of older readers was more disrupted than that of young readers by removing or filling spaces. This was particularly the case in the open squares condition, where the text lacked coarse scale cues for word segmentation.



Experiment 2

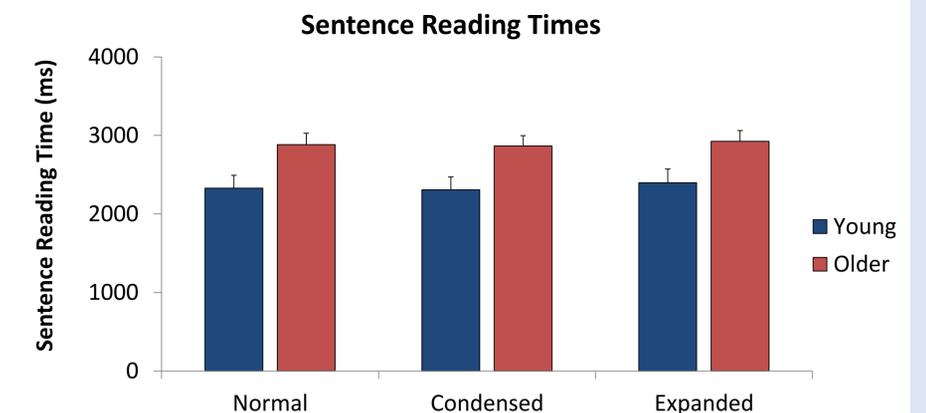
- Experiment 2 aimed to reveal whether older adults are more sensitive to changes in the size of the spaces between words than young adults.

Method

- Young and older adults read sentences in which spaces were normal, were condensed so that they were half their normal size, or expanded so that they were 1.5x their normal size.

Results

- Changing the size of the spaces between words did not affect young and older adult differently.



Conclusions

- The reading of older adults was more disrupted by removing or filling the spaces between words than young adults.
- In particular, older adults benefitted more than young adults from the reduction in crowding and the provision of a coarse scale cue for word segmentation that these spaces provide.
- These findings indicate that older adults may benefit from spaces where they are not normally available, e.g. in compound words, or in languages which don't use spaces, such as Chinese.
- However, subtle increases or decreases in the size of the spaces between words did not affect young and older adults differently, indicating that older adults are able to read normally as long as some space information is available.

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