

# Learning information the hard way may be best 'boot camp' for older brains

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Canadian researchers have found the first evidence that older brains get more benefit than younger brains from learning information the hard way - via trial-and-error learning.

The study was led by scientists at Baycrest's world-renowned Rotman Research Institute in Toronto and appears online Aug. 24, 2011 in the journal *Psychology and Aging*, ahead of the print edition.

The finding will surprise professional educators and cognitive rehabilitation clinicians as it challenges a large body of published science which has shown that making mistakes while learning information hurts memory performance for older adults, and that passive "errorless" learning (where the correct answer is provided) is better suited to older brains.

"The scientific literature has traditionally embraced errorless learning for older adults. However, our study has shown that if older adults are learning material that is very conceptual, where they can make a meaningful relationship between their errors and the correct information that they are supposed to remember, in those cases the errors can actually be quite beneficial for the learning process," said Andréé-Ann Cyr, the study's lead investigator.

Cyr conducted the research at Baycrest as a doctoral student in Psychology (University of Toronto), in collaboration with senior author and scientist Dr. Nicole Anderson of Baycrest's Rotman Research

Institute. Dr. Anderson specializes in cognitive rehabilitation research with older adults.

In two separate studies, researchers compared the memory benefits of trial-and-error learning (TEL) with errorless learning (EL) in memory exercises with groups of healthy young and older adults. The young adults were in their 20s; the older adults' average age was 70. TEL is considered a more effortful cognitive encoding process where the brain has to "scaffold" its way to making richer associations and linkages in order to reach the correct target information. Errorless learning (EL) is considered passive, or less taxing on the brain, because it provides the correct answer to be remembered during the learning process.

The researchers presented participants with a meaningful "cue" (e.g. type of tooth). The correct target word (e.g. molar) was shown to learners in the EL condition. In the TEL condition, the cue was presented alone, and participants made two guesses (such as canine, incisor) before the correct target "molar" was shown. After a short while, participants performed a memory test that required them to remember the context in which the words were learned (i.e. were they learned through trial-and-error or not).

In both studies, participants remembered the learning context of the target words better if they had been learned through trial-and-error, relative to the errorless condition. This was especially true for the older adults whose performance benefited approximately 2.5 times more relative to their younger peers.

The findings from the Baycrest study may have important implications for how information is taught to older adults in the classroom, and for rehabilitation procedures aimed at delaying cognitive decline - procedures which rely on knowledge of how to train an aging brain, said Cyr.

The authors say future studies are needed to determine how different study materials and memory tasks impact the effect of errors on memory in aging. This will help to clarify the learning contexts in which errors should be avoided or harnessed.

Provided by Baycrest Centre for Geriatric Care

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