

Improving memories: Neuroscientists show the effectiveness of multisensory teaching methods.

Imagine you and your friend, Jack, witness a robbery. Will the fact that one of the robbers spoke whereas the other did not say a word affect your and Jack's abilities to identify them in a police line-up? It seems that auditory-visual multisensory events yield stronger memories, even when recalling exclusively visual aspects such as faces. Will you or Jack be a more reliable witness? This may depend on which of you is naturally better at integrating multisensory information.

Neuroscientists at the University Hospital Center and University of Lausanne (CHUV-UNIL), Switzerland have shown that your memory abilities can be predicted by how easily you put together auditory and visual information. This aptitude can be used to not only improve current teaching methods, but also enhance training and rehabilitation strategies.

The researchers were able to measure individual differences in multisensory processes in healthy adults by non-invasively recording brain activity with electroencephalography (EEG) while participants performed a task that required them to indicate whether or not a given stimulus was new or had already been presented (similar to identifying robbers in a police line-up). The later memory performance of some individuals was improved for objects previously presented in the multisensory context, while for others such context impaired their memory performance. This was predictable exclusively by how a person's brain responded to the multisensory information when it was first presented.

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Lead researcher Prof. Micah Murray, director of the Laboratory for Investigative Neurophysiology (The LINE) within the Departments of Radiology and Clinical Neurosciences at CHUV-UNIL and director of the EEG Brain Mapping Core of the Centre for Biomedical Imaging (CIBM), said: "We provided the first evidence for a direct link between brain activity in response to multisensory information at one point in time and later visual object discrimination abilities. These findings show the behavioural relevance and the ethological value of multisensory processes. Multisensory information may therefore constitute a particularly effective strategy for learning; something already suggested over 100 years ago by Maria Montessori but hitherto not neuroscientifically demonstrated."

By showing that a single-trial exposure to a new visual object accompanied by a meaningless sound (or vice versa) can help some individuals to recognize this object more easily in the future, the study dispels long-held beliefs within the field of psychology that changing the context between learning and remembering is disadvantageous for memory.

The contexts in which learning and retrieval of memories occur can refer to external or internal states (e.g., being in a particular room inebriated) or alternatively to fine-grained stimulus features (e.g., their colour or position). Traditionally, it was contended that memory works best when the contexts in which learning and recall occur do not change. “Our new work shows that single-trial exposures to multisensory contexts are sufficient to improve recognition performance relative to purely unisensory contexts. We show for the first time that this performance can be predicted by how a person integrates multisensory information,” explains Prof. Murray.

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The study, entitled ‘Multisensory Context Portends Object Memory’ is published in the journal *Current Biology*, and was authored by Antonia Thelen, Pawel Matusz, and Micah Murray.