



Visual Working Memory

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Abstract

The ability to recall items presented visually requires a complex system that involves the associational cortices of the parietal and temporal lobes. The purpose of this study was to determine whether students' ability to recall items presented visually increased over three trials. Results from two sections of an Introduction to Neurology for Communication Disorders course in the Department of Communication Sciences and Disorders at Valdosta State University will be reported.

Background Information

Visual memory can be defined most simply as the information that has been previously seen and can later be recalled. It causes the brain to go through the three major steps of encoding, storage, and retrieval. It "is crucial to [...] many [of] [the] basic actions and processes that guide behavior" (Blacker, Curby, Klobusicky, & Chein, 2014, p.1992) and is used in everyday life to help individuals assess their environment. Being able to label stimuli uses multiple brain systems; it adds meaning to the representation, making it easier to recall (Cowan, AuBuchon, Gilchrist, Ricker, & Saults, 2011, p.1066). The path to item recall across multiple trials is quite complex; the "prefrontal, parietal, and occipital areas play an important role in encoding and maintenance of objects in visual memory" (Ling & Tao, 2011, p.1). The eyes capture the sensory information of the visual stimuli. This information travels through neural pathways to be perceived by the occipital lobe of the brain, and the parietal and prefrontal cortices work to store the information into working memory—which can only be retrieved for a limited time. The length of time for which items stored in working memory can be recalled varies among individuals and is closely linked to the strategy the individual used to memorize the information. With working memory, there is no set number of items that will or will not be retained; however, the way in which the information was learned will determine the information's strength and correspondingly whether or not it will be forgotten (Endress & Potter 2014). One learning strategy in particular suggests that generalized shape bias could result from already known names of categories (Vales & Smith, 2015, p.76). This shows that "once a child has learned the names of a sufficient number of basic-level categories, naming may lead to the biased encoding of shape and more active visual working memory representations" (Vales & Smith, 2015, p.76).

Research Question

Does recall of pictures presented visually increase over three consecutive trials?

Methodology

Materials: The short term memory picture game from the Neuroscience for Kids website was used as stimulus items

(<https://faculty.washington.edu/chudler/puzmatch.html>).

Participants: A total of 41 students participated in the study. Students participating were from two sections of an Introduction to Neurology for Communication Disorders course in the Department of Communication Sciences and Disorders at Valdosta State University.

Procedures: Twenty pictures were presented for a period of 30 seconds each trial over three trials. After each 30 second trial, participants were given two minutes to write down all of the pictures that they recalled seeing. Participants totaled the number of pictures recalled for each trial. After three trials, an average was taken of how many pictures were recalled each trial. Participants also totaled the number

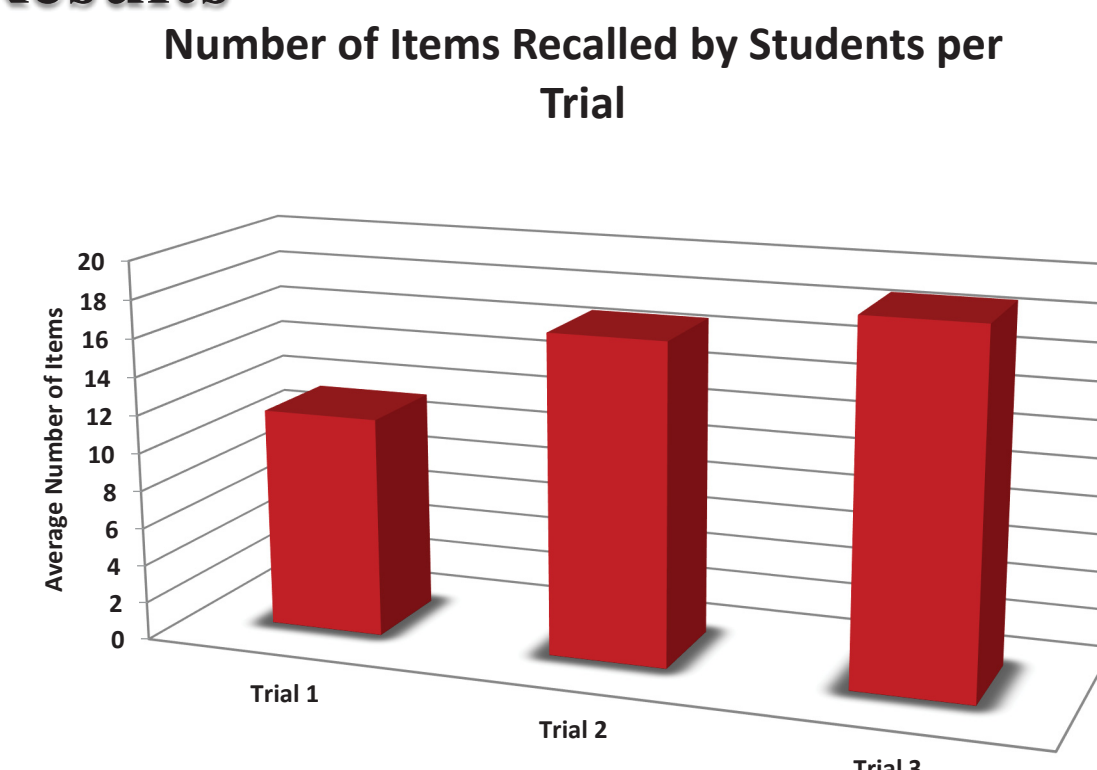
Conclusion and Implications

Findings from the current research show that overall recall of pictures presented visually increases over three trials. It can be concluded that visual working memory is a constructive entity. This means that the number of times a visual stimulus is presented to an individual positively correlates with the likelihood of recall of said stimulus. This can have profound implications on individuals who have cognitive-perceptual (CP) deficits; this may include but is not limited to individuals who have CP due to strokes, traumatic brain injuries, and neoplasm. Although more research is needed, one could infer—based on the current findings—that a client will be more likely to recall visual stimuli (e.g., flash cards, modeling) the higher the number of times the stimuli are presented. Visual working memory also plays an important role in activities of daily living. For instance, one has to use visual memory when following route directions when driving or walking.

Results

The average number of items recalled in Trial 1 was 11.61. The average number of items recalled in Trial 2 was 16.85. The average number of items recalled in Trial 3 was 18.80. The number of items recalled increased, on average, by 3.60 between each trial. A one-way repeated measures ANOVA

revealed that the participants' ability to remember items significantly increased with each trial, $F(2, 80) = 178.82, p < .001, \eta^2 = 0.92$.



Descriptive Statistics					
	N	Minimum	Maximum	Mean	Standard Deviation
Trial 1	41	6.00	18.00	11.61	2.75
Trial 2	41	7.00	20.00	16.85	2.75
Trial 3	41	15.00	20.00	18.80	1.45
Valid N (Listwise)	41				

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