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### **Proceedings of the Annual Meeting of the Cognitive Science Society**

#### **Title**

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#### **Permalink**

<https://escholarship.org/uc/item/9hk035kv>

#### **Journal**

Proceedings of the Annual Meeting of the Cognitive Science Society, 21(0)

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#### **Publication Date**

1999

Peer reviewed

# Implicit memory in children: Are there age-related improvements in a conceptual test of implicit memory?

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In recent years, implicit tests of memory have become very popular. In an implicit test, participants are not asked to report on memory for an event as they would in an explicit test; rather, they engage in some task that can indirectly reflect memory for the occurrence of that event. For instance, they are presented with category names and are asked to produce the first exemplars of that category that comes to mind. The finding is that prior presentation of a category exemplar increases the likelihood of that word being named as a category instance. This facilitation of performance is a phenomenon known as priming. Priming effects have attracted considerable interest because experimental manipulations (e.g., varying depth of processing) and subject variables can dissociate them from explicit test performance (for a review, see Roediger & McDermott, 1993). For instance, age-related dissociations have been found. Age-related differences between young and older children typically observed on explicit memory tests are largely reduced with implicit memory testings (for a review, see, e.g., Parkin, 1993). This conclusion, however, is based on relatively few studies that have mainly used picture identification tasks. Yet to draw conclusions about the developmental invariance of priming from findings on one single type of implicit memory test seems problematic because of dissociations observed between different implicit tests. These dissociations have led researchers to classify memory tasks according to the forms of information they access or the type of processing they require (see Roediger & McDermott, 1993). So-called perceptual tests are distinguished from so-called conceptual tests. Perceptual implicit tests tap the perceptual record of past experience. The perceptual similarity between study and test events affects performance, but manipulations of levels of encoding usually do not. The reverse is true for most conceptual tests (e.g., general knowledge questions or category production). These tests emphasize the semantic relationships between the studied and tested item. They require conceptually driven processing by relying on the encoded meaning of concepts, or on semantic processing, elaborative encoding, and the like.

Results from the few studies that examine developmental trends in priming using conceptual measures of implicit memory also usually indicate that priming is age-invariant (e.g., Anooshian, 1997). These findings are inconsistent with theoretical accounts of implicit memory and knowledge development. Developmental research has extensively demonstrated that existing semantic knowledge is a crucial factor in accounting for age-related differences in explicit memory performance (e.g., Bjorklund, 1987). We expect that the

developing knowledge base has similar effects on conceptual priming.

Two experiments examining the development of conceptual priming in childhood using a category-production task were conducted. Four- and 6-year-old preschoolers and 8- and 10-year-old elementary school children studied exemplars (pictures) of different categories and were required to spontaneously produce exemplars of studied and unstudied categories at test. In Experiment 1, a significant but rather small age-related improvement from preschool to school age was demonstrated which was neither affected by study tasks (with or without reference to category information) nor by category-exemplar typicality. However, both variables were important inasmuch as preschoolers only showed significant priming of atypical exemplars when the category names were available at study. In Experiment 2, when using a between-subjects manipulation of item typicality and giving the category names at study, reliable age-related improvement in priming of atypical exemplars could be observed. It is concluded that the notion of developmental invariance of priming should be modified. The important research question is not whether there is age constancy of conceptual priming in childhood. Rather, the conditions should be studied in which age-related differences can be observed as well as what kind of conceptual knowledge and conceptual processes are responsible for these differences. For the category-production task, (1) identifying the category names, (2) strengthening the associations between category and exemplar or, for atypical exemplars, forming new associations, and (3) organizing the exemplars according to conceptual categories all seem to be relevant processes at encoding.

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