



Contents lists available at ScienceDirect

Journal of Experimental Child Psychology

journal homepage: www.elsevier.com/locate/jecp



Brief Report

One of these things is not like the other: Distinctiveness and executive function in preschoolers



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ARTICLE INFO

Article history:

Received 19 June 2013

Revised 28 September 2013

Available online 7 November 2013

Keywords:

Cognitive flexibility

Distinctiveness in memory

Executive function

Isolation effect

Organizational processing

Working memory

ABSTRACT

There is scant evidence that children younger than 7 years show a memory advantage for distinct information, a memory phenomenon termed the isolation effect (*Journal of Experimental Psychology: Learning, Memory, and Cognition*, 2001, Vol. 27, pp. 1359–1366). We investigated whether 4-, 5-, and 6-year-olds' developing organizational processing and executive function contributed to the isolation effect, demonstrated when recall was better for a semantically unique target (e.g., sheep, pig, *watermelon*, duck) rather than a semantically common target (e.g., apple, banana, *watermelon*, strawberry). To encourage organizational processing, children were asked to categorize each item presented. Children also completed working memory and cognitive flexibility tasks, and only children who scored high in cognitive flexibility demonstrated the isolation effect.

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Introduction

Memory advantages for distinct information are clearly demonstrated in the isolation paradigm, where adults remember items better when unique in context (e.g., apple, *watermelon*, *elephant*, strawberry) rather than common in context (e.g., dog, horse, *elephant*, cat). This robust effect in adults is termed the isolation or the von Restorff effect (see Hunt, 1995), and it occurs regardless of the type of isolated item (e.g., perceptually or numerically distinct), location of the isolate (e.g., early or late in the list), or delay between presentation and recall (Hunt, 1995, 2009). In children, however, the

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effect is mercurial. [Howe, Courage, Vernescu, and Hunt \(2000\)](#) demonstrated that 7-year-olds displayed an isolation effect for numerical isolates (i.e., number in a list of words), whereas 5-year-olds showed no memory advantage for distinct numerical information. In a study examining a semantic isolation effect in preschoolers (i.e., item from a different category in a categorized list), 5- and 6-year-olds failed to show an isolation effect, whereas 4-year-olds actually showed impaired memory for semantically isolated items ([Miller, Marcovitch, & McConnell Rogers, 2011](#)). Furthermore, when perceptual, semantic, and numeric isolates were presented in a list, 7-year-olds had better memory for perceptual and semantic isolates, whereas 5-year-olds primarily showed a memory benefit for perceptual isolates ([Howe et al., 2000](#)). These inconsistencies suggest that the isolation effect for conceptually distinct information is emerging during preschool. The purpose of the current study was to examine what developing cognitive processes contribute to this memory phenomenon.

[Hunt and Lamb \(2001\)](#) hypothesized that organizational processes related to encoding similarities between items (e.g., forming categories) are necessary to set the context for distinctive processing (e.g., considering differences) against this background of similarity. A unique item is better remembered because it benefits from both organizational and distinctive processing, whereas the same item results in inferior memory when typical in context because it would be processed like other background items (e.g., only organizationally; [Hunt & Lamb, 2001](#)). Although adults typically organize and process category information spontaneously for list items (e.g., [Mandler, 1967](#)), recognizing and clustering items by category is effortful in young children. [Schwenck, Bjorklund, and Schneider \(2009\)](#) provided evidence for development in 4- to 8-year-olds' clustering (i.e., recalling items together by category) and sorting strategies (i.e., arranging items by category). Although 4-, 5-, and 6-year-olds typically failed to use sorting strategies during study and displayed below-chance performance of clustering, children used more organizational strategies when they were trained. [Schwenck and colleagues](#) suggested that this pattern was indicative of a production deficiency—failure to produce the strategy even though capable of using it. Production deficiencies in organizational strategies likely impede an isolation effect in preschoolers because they would be unable to appreciate the similarity between background items necessary to process the isolate's distinctiveness. Thus, encouraging organizational processing may elicit the isolation effect in younger preschoolers.

Executive function (EF), the processes involved in the conscious control of thought and behavior, develops dramatically during the preschool years ([Garon, Bryson, & Smith, 2008](#); [Jacques & Marcovitch, 2010](#)). EF abilities are hypothesized to play a role in encoding and retrieving information from long-term memory (e.g., [Baddeley, 1996](#)), and several researchers have demonstrated that individual differences in EF contribute to age-related changes in memory (e.g., [Picard, Cousin, Guillery-Girard, Eustache, & Piolino, 2012](#)). A popular conceptualization of EF is that several components contribute to EF (e.g., [Garon et al., 2008](#)): working memory (i.e., holding and manipulating information in mind), inhibition (i.e., suppressing prepotent responses), and cognitive flexibility (i.e., modifying thought and behavior according to changes in situational context). Furthermore, EF components differentially contribute to memory. For instance, [Ruffman, Rustin, Garnham, and Parkin \(2001\)](#) demonstrated that reduced inhibition was related to false memory and poor source monitoring, whereas better working memory was related to all types of memory measured (i.e., less false memory, better source monitoring, and higher accuracy). Given EF's role in memory and the dramatic improvements during preschool, it is likely that this developing cognitive function is associated with the isolation effect. Cognitive flexibility may be particularly important because remembering distinctive information requires one to consider information in multiple contexts (e.g., the isolate of a different context relative to the background context).

In the current study, we examined the emerging isolation effect for semantically distinct information. Although preschoolers may better remember salient information at the perceptual level ([Howe et al., 2000](#)), it is likely that preschoolers' inability to produce a robust semantic isolation effect is related to a production deficiency in organizational processing ([Schwenck et al., 2009](#)). Therefore, we provided preschoolers with cues for organization (i.e., naming the category of each list item) to elicit an early isolation effect. We also examined how individual differences in EF were related to distinctiveness and total list recall, with a specific emphasis on cognitive flexibility (because the isolation effect requires flexibly switching between categories) and working memory (because of its central role in memory).

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