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Brief Report

Three-year-olds obey the sample size principle of induction: The influence of evidence presentation and sample size disparity on young children's generalizations



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ABSTRACT

Three experiments with 81 3-year-olds ($M = 3.62$ years) examined the conditions that enable young children to use the sample size principle (SSP) of induction—the inductive rule that facilitates generalizations from large rather than small samples of evidence. In Experiment 1, children exhibited the SSP when exemplars were presented sequentially but not when exemplars were presented simultaneously. Results from Experiment 3 suggest that the advantage of sequential presentation is not due to the additional time to process the available input from the two samples but instead may be linked to better memory for specific individuals in the large sample. In addition, findings from Experiments 1 and 2 suggest that adherence to the SSP is mediated by the disparity between presented samples. Overall, these results reveal that the SSP appears early in development and is guided by basic cognitive processes triggered during the acquisition of input.

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Introduction

Young children are remarkably gifted inductive reasoners insofar as they are able to generalize a single piece of evidence about an individual (e.g., “this rabbit has omat inside”) to an entire class of individuals (e.g., “rabbits have omat inside”) (for a review, see [Gelman, 2003](#)). However, early induction appears to be limited in important ways. For example, evidence indicates that several principles of induction emerge sometime after 7 years of age ([Gutheil & Gelman, 1997](#); [Li, Cao, Li, Li, & Deak,](#)

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2009; Lopez, Gelman, Gutheil, & Smith, 1992). The current studies examined the emergence of the *sample size principle* (SSP), which dictates that large samples of evidence provide better evidence from which to generalize than do small samples (Osherson, Smith, Wilkie, Lopez, & Shafir, 1990). Specifically, three experiments explored the possibility that the SSP is available early in development, but only under conditions that facilitate the detection of differences, rather than similarities, between samples of evidence.

The SSP is typically studied in sample comparison tasks in which participants are asked to generalize to a novel animal either a property associated with a large sample of animals (e.g., 5 mammals have “property y”) or a different property associated with a small sample of animals (e.g., 3 mammals have “property x”). Under such conditions, by around 8 years of age children exhibit a preference to generalize the property associated with the large sample (e.g., property y), whereas younger children show no preference to generalize from either sample (Lopez et al., 1992). In contrast, children younger than 6 years exhibit more robust generalizations for large samples than for small samples when sample size is manipulated between participants rather than within participants (Jacobs & Potenza, 2001; Lawson & Fisher, 2011). These mixed findings suggest that adherence to the SSP might be evidence dependent rather than age dependent.

The current studies examined two factors that can affect whether children incorporate sample size information into their inductive decisions. The first is the method of evidence presentation. At least one study showing early adherence to the SSP involved sequential presentation of items (e.g., Lawson & Fisher, 2011), whereas studies showing later development of the SSP involved simultaneous presentation of items (Gutheil & Gelman, 1997; Li et al., 2009; Lopez et al., 1992). Simultaneous presentation supports alignment of shared features (Gentner & Namy, 1999), whereas sequential presentation supports detection of differences between the presented items (Lappin & Bell, 1972; Quinn & Bhatt, 2010). Because comparison of differences, rather than similarities, between items is a necessary condition for the SSP, sequential presentation might better facilitate the SSP than simultaneous presentation. In addition, sequential presentation of exemplars might confer an information processing advantage for large samples of input. For example, sequential presentation supports consolidation of multiple items in visible short-term memory, whereas simultaneous presentation does not (Liu & Becker, 2013). Thus, sequential presentation of evidence facilitates another necessary condition of SSP—detection of multiple items in the larger sample. A primary goal of the current studies was to examine the potential impact of these different presentation formats on children's adherence to the SSP.

The preference to generalize from large samples may also be influenced by the size disparity between presented samples. Humans exhibit an early ability to detect differences between two samples by relying on the size disparity between samples (Brannon, 2002; Halberda & Feigenson, 2008; Lipton & Spelke, 2003). Evidence of later emergence of the SSP comes from studies that presented smaller and less disparate samples (e.g., 5 vs. 3 in Lopez et al., 1992) than studies showing early emergence of SSP (e.g., 30 vs. 1 in Jacobs & Narloch, 2001). Thus, a second goal of the current studies was to examine whether differences in use of the SSP can be linked to children's sensitivity to the size disparity between samples.

Finally, because there were no developmental predictions, these experiments used a single age group (3-year-olds).

Experiment 1

In this experiment participants were told about a property attributed to a small sample of animals (e.g., a cat with unti inside) and a different property attributed to a large sample of animals (e.g., several cats with omat inside) and then were asked to generalize one of the properties to a target (e.g., a cat). Presentation format (sequential and simultaneous) was manipulated between participants to test the prediction that sequential presentation would elicit a higher rate of generalizations from the large sample than would simultaneous presentation.

In addition, the number of items in each sample was manipulated such that the size of the large sample varied (e.g., 2, 3, 4, and 5 exemplars), whereas the small sample always had 1 exemplar.

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