

How Do Different Types of Concrete Objects Affect Children's Developing Counting Skill?

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Abstract

Salient objects may make poor symbolic devices for representing abstract concepts (Uttal et al., 2007; DeLoache, 2000). At least two factors may affect an object's salience and potential to be used symbolically: (a) the superficial appearance of the object in terms of its perceptual richness and (b) whether or not children already have an established representation of the object that differs from the intended referent. This study examines how these factors affect children's understanding of *counters*, which are objects used by preschool teachers to represent number. Children (M age = 3;5) participate in two counting tasks. They are randomly assigned to one of four counter conditions in a 2 (perceptually rich or not) x 2 (established representation or not) factorial design. Preliminary results indicate a trend for the main effect of having an established representation. Specifically, children may perform better on the counting tasks when they do not already have an established representation of the objects used to represent number than when they do have an established representation of the objects. Results will contribute to our understanding of the factors that influence children's ability to use concrete objects to represent number.

Background

Many theories assume that children need experience with concrete objects to develop an understanding of abstract concepts (e.g., Piaget, 1953; Bruner, 1964).

However, recent work suggests that it is difficult for children to use concrete objects to represent abstract concepts because concrete objects require *dual representation*-- they must be represented both as objects themselves, and as the abstract concept they are intended to represent (DeLoache, 2000; Uttal et al., 2002).

The dual representation account suggests that the more salient an object is in its own right, the less likely a child will be able to use it symbolically. This hypothesis conflicts with many educators' intuitions, which suggest that objects used in the classroom should be as engaging to children as possible.

Question: Do all factors that contribute to an object's "salience" affect symbolic representation in the same way?

Background (cont.)

Previous research offers at least two factors that may affect an object's salience and its potential to be used symbolically:

- The superficial appearance of the object in terms of its perceptual richness (Sloutsky et al., 2005).
- Whether or not children have an established representation of the object that differs from the intended referent (DeLoache, 2000; Uttal et al., 2007; McNeil & Jarvin, 2007).

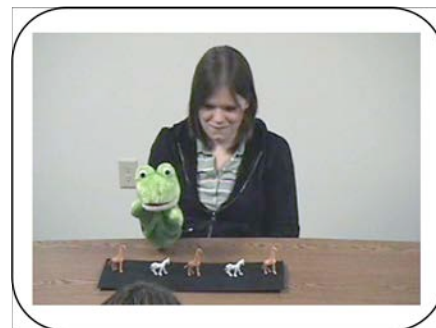
Current experiment – Tests how these two factors (perceptual richness and having an established representation) affect young children's ability to use objects symbolically as *counters*, which are concrete objects used to represent number.

Method

Participants – 13 three & four yr olds (M age = 3;5)

Tasks – Two tasks that have been used widely to assess children's understanding of counting:

Puppet counting task – (adapted from Siegler & Briars [1984]): Puppet counts arrays of 5, 7, or 9 objects (random) in one of three ways: correct (5 trials), incorrect (5 trials), and unusual but correct (5 trials).



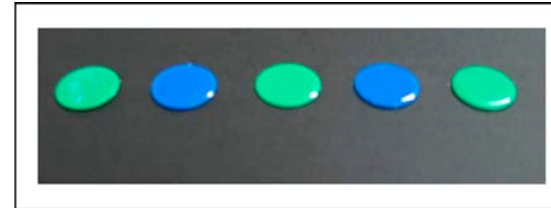
Give-a-number task – (adapted from Wynn [1990]): Child is asked to give a number of items (1-6) to a puppet. Child is credited as being a "knower" of the highest numerosity they can give correctly twice.

Method (cont.)

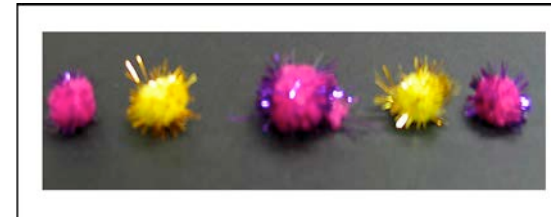
Design – Children randomly assigned to counter conditions in a 2 (perceptually rich or not) x 2 (established representation or not) factorial design

Conditions

Control – Solid-colored plastic disks



Perceptually rich – Sparkly pom poms



Established representation – Popsicle sticks



Perceptually rich + Established representation – Detailed, realistic-looking plastic animals

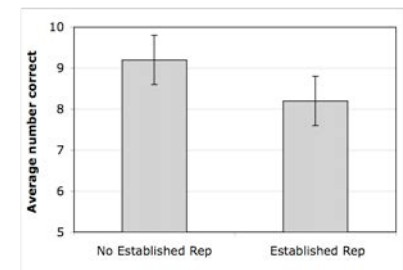


Preliminary Results

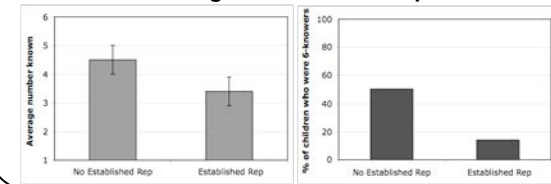
Results thus far suggest that children may perform better when they do not already have an established representation of the objects than when they do have an established rep. (see graphs).

At this point, there is no evidence of a trend for the main effect of perceptual richness, and we still have too few Pps to interpret the sig interaction.

Performance on the puppet counting task as a function of having an established representation



Performance on the give-a-number task as a function of having an established representation



Summary and Next Steps

Consistent w/ dual representation account, our prelim results suggest that children may be better able to treat an object as a symbolic rep of number when they do not already have an established rep of the object.

We (obviously) need to see if results hold w/ more Pps and w/ different concrete objects in each condition.

Ultimately, we hope results will inform theories of children's symbolic understanding, as well as help preschool teachers choose counters for their classrooms.