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Dynamic Noun Generalization: Moment-To-Moment Interactions Shape Children's Naming Biases.

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Recent research on early word learning suggests that children's behavior when generalizing novel nouns integrates their prior vocabulary knowledge with the specifics of the task. The current study examines how these factors interact on the moment-to-moment timescale of the training children receive and the sequence of stimuli they are shown. In one condition, we used a combination of training and stimulus factors predicted to produce a bias to generalize nouns by shape similarity. We then reduced this shape bias and amplified a bias to generalize nouns by material similarity via manipulations of training and stimuli across three other conditions. Additional analyses suggest that children's generalizations on individual trials are influenced by what they have seen and done on previous trials. These results highlight the importance of the task and stimuli in bringing children's prior knowledge to bear in early word learning.

Previous research in word learning has demonstrated that young children's novel noun generalizations depend on their vocabulary knowledge (Samuelson & Smith, 1999), the specifics of the task (Diesendruck & Bloom, 2003), and the specific stimuli they are shown (Smith, Jones, & Landau, 1992). The present study takes these findings one step farther by showing that the task and stimuli also influence children's noun generalizations on a trial-to-trial timescale. We focus on two well documented biases—the material and shape biases.

We use *shape bias* and *material bias* to refer to patterns of behavior children demonstrate in laboratory novel noun generalization tasks. In these tasks, children are typically shown a novel solid object or nonsolid substance, told a novel name, and then asked to pick which of two test stimuli—one that matches the named exemplar in shape and one that matches in material—can be called by the same name. In such a task, young children are most likely to generalize novel names for solid objects to test stimuli that match the exemplar in shape (Landau, Smith, & Jones, 1988), and novel names for nonsolid substances to test stimuli that match the exemplar in material (Soja, Carey & Spelke, 1991; see also Imai & Gentner, 1997), although instances of generalization of names for nonsolids by shape have also been reported (Samuelson, 2002; Soja, Carey, & Spelke, 1992). The relation between these behavioral biases and children's possible conceptualizations of the ontological kinds *object* and *substance* is currently a matter of debate in the literature (c.f. Colunga & Smith, 2005; Soja, Carey, & Spelke, 1991). Accordingly, and because our goal is to examine the role of task and stimulus factors in generation of these kinds of behaviors, we will use "shape bias" to refer to generalizations based on similarity in shape, which we expect more in the case of solid objects, and "material bias" to refer to generalizations based on similarity in material substance, which we expect more with nonsolid substances. These particular behavioral biases provide an excellent entry point for this examination because the previous literature suggests some variability in their demonstration, yet they are also related to word learning outside the laboratory (e.g. Gershkoff-Stowe & Smith, 2004; Samuelson, 2002).

Past research has shown that the shape bias is quite robust with 2-year-old children, whereas, the material bias is more elusive. Soja, Carey, and Spelke (1991) found that 2- and 2.5-year-old children systematically generalized names for nonsolid substances by material. However, Samuelson and Smith (1999) found no evidence of a material bias in 17- to 33-month-old children. Imai and Gentner (1997) found evidence of a material bias in younger but not older 2-year-old children, and Subrahmanyam and colleagues (1999) found that neither 3- nor 4-year-old children attended to material when naming novel nonsolid substances. We argue that the fragility *and* robustness of children's behavior in these studies is indicative of how the task and stimuli, together with children's lexical and category knowledge, come together to influence novel noun generalization behaviors in a moment. Accordingly, we demonstrate how systematic task and stimulus changes influence children's tendency to attend to shape or material when generalizing novel names for novel solid objects and nonsolid substances.

An examination of the *training* used in previous studies reveals critical differences likely to influence how children's knowledge is brought to bear in noun generalization. Both Soja et al. (1991) and Samuelson and Smith (1999) used a forced-choice paradigm to ask 2-year-old children to extend novel names for novel solid and nonsolid exemplars to test stimuli that matched exemplars in either shape or material. Both studies included familiar stimuli training trials prior to test trials. Training trials in Soja et al. (1991) were identical to test trials and included both solid objects and nonsolid substances familiar to most 2-year-old children (e.g., cups and Play-Doh). Training trials in Samuelson and Smith (1999) included only solid objects and pitted a foil object that differed from the exemplar in all regards against an identity match that was the same shape, color, and material as the exemplar. Children in Samuelson and Smith were corrected if they chose the foil. Thus, both training approaches were designed not to bias children towards choices based on shape or material—Soja et al.'s because it included equal numbers of shape and material choices and Samuelson and Smith's because identity choices matched exemplas in both shape and material. Nevertheless, these training regimes may have prepared children to perform differently in the task: Samuelson and Smith's training explicitly encouraged children to choose objects that were the same as the exemplars and may have highlighted object solidity, pushing responding toward shape, while Soja et al.'s highlighted the difference between solid and nonsolid things, leading to differentiation of solid and nonsolid things.

Previous research also suggests that the overall similarity of test stimuli to named exemplars influences children's name generalizations (Graham, Kibreath, & Welder, 2004). Material matches in Soja et al. also matched the exemplar in color (see also Imai & Gentner, 1997). In contrast, material matches in Samuelson and Smith never matched the exemplar in color. Thus, performance differences across these studies may also be attributable to the fact that Soja et al.'s material matches were more similar overall (i.e. matched in material and color) to the named exemplars than were their shape matches (which only matched in shape).

If these aspects of the task context critically interact with children's knowledge of how nonsolid things are named, then we should be able to modulate children's tendency to demonstrate a material bias by manipulating the training they receive and the similarity between material-matches and exemplars. Likewise, if the shape bias is influenced by way the specifics of the task combine with children's category knowledge in a moment, we should be able to amplify or reduce it with training and stimulus manipulations. In particular, the robust shape bias should be susceptible to training that emphasizes material or radical manipulations that change solid stimuli to configurations more typical of nonsolids or disrupt perception of shape, such as, presenting exemplars as pieces. That is, if we break a solid exemplar into pieces—thus creating a collection rather than a single object—are children less likely to attend to shape even if the pieces are presented in a configuration that maintains the overall shape?

Thus, we manipulated three aspects of the noun generalization context: the training children received, the use of material+color or material-only-matching test stimuli, and whether exemplars were whole or in pieces. In one condition, we used a combination of training and stimulus factors that have resulted in a robust shape bias in previous studies—training that included only solid objects (S), exemplars presented as wholes (W), and material-only (M) matching test stimuli (Samuelson & Smith, 1999). We then systematically changed training and stimuli across three other conditions in ways predicted to reduce the shape bias and create a material bias. Specifically, to examine the effect of presenting solid exemplars in pieces we compared performance in the S+W+M condition to a condition that differed only in that solid exemplars were presented in pieces (S+P+M). To examine the effect of training with solid and nonsolid stimuli, we compared performance in the S+P+M condition to a condition that differed only in including solids and nonsolids in training (SN+P+M). Finally, to examine the effect of material-matching test stimuli that also matched the exemplar in color, we compared performance in the SN+P+M condition to a condition that differed only in that material+color-matching test stimuli were used (SN+P+MC). Note that vocabulary knowledge was equated across all conditions; thus, differences across conditions illustrate the influence of training and stimuli on novel noun generalizations.

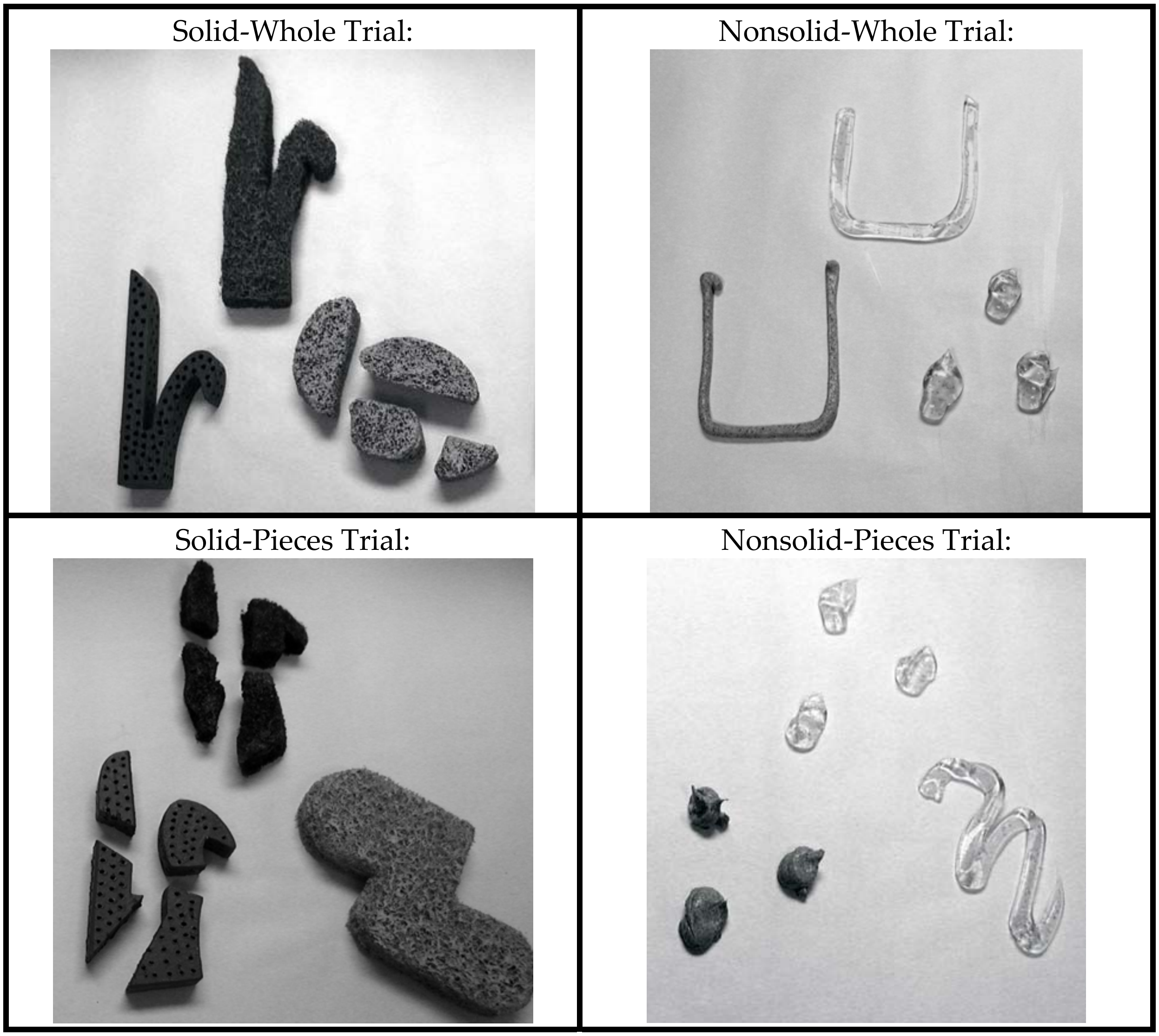
Method

Participants. Forty-eight monolingual children (range = 23m,24d – 26m24d, *M* = 24m13d) were randomly assigned to one of four conditions. All children produced at least 150 nouns (*M* = 227, range 159-305) according to parental report via the CDI (Fenson et al., 1994). Vocabulary level did not differ between conditions, *F*(3,44) = .73, *ns*. Data from 12 additional children were not analyzed due to fussiness (2), failure to respond (1), a side bias (1) or experimenter error (8).

Design. Children in the S+W+M condition were given solids-only training, solid exemplars presented as whole objects, and material-only-matching test stimuli. Children in the S+P+M condition were given solids-only training, solid exemplars in pieces and wholes, and material-only-matching test stimuli. Children in the SN+P+M condition were given solid-nonsolid training, solid exemplars in pieces and wholes, and material-only-matching test stimuli. Children in the SN+P+MC condition were given solid-nonsolid training, solid exemplars in pieces and wholes, and material+color-matching test stimuli.

Stimuli. For Solids-Only training (see Samuelson & Smith, 1999) two balls (exemplar and identity match) were paired with a cup on one trial, and two combs (exemplar and identity match) were paired with a horse on the other. For Solid-Nonsolid training (see Soja et al. 1991) a Styrofoam cup (exemplar), a blue plastic cup (shape match) and Styrofoam pieces (material match) were used on one trial and play-doh® (exemplar and material match) and crunchy peanut butter (shape match) on the other. Whether the play-doh exemplar was presented as a whole patty or in three piles was counterbalanced across children in the Solid-Nonsolid training condition.

Each of the four solid and four nonsolid test sets contained an exemplar, a shape match and a material match. Children in the S+W+M condition saw four solid-exemplar-whole and four nonsolid-exemplar-whole trials. All other children saw the exemplars in pieces on half of the trials. Thus, these children saw two of each of the following trials: solid-exemplar-whole, solid-exemplar-in-pieces, nonsolid-exemplar-whole, and nonsolid-exemplar-in-piles (see Figure 1). Children in the SN+P+MC condition saw material+color-matching test stimuli. All other children saw material-only-matching test stimuli (see Table 1). Exemplars and shape matches always matched in number of pieces.



Solid-Whole Trial:

Nonsolid-Whole Trial:

Solid-Pieces Trial:

Nonsolid-Pieces Trial:

Figure 1. Examples of the four kinds of trials (solid-exemplar-whole, solid-exemplar-in-pieces, nonsolid-exemplar-whole and nonsolid-exemplar-in-piles).

Table 1. Complete list of test stimuli.

	Exemplar	Shape Match Test stimuli	Material Match Test stimuli	
	All conditions	All conditions	Material-Only condition	Material+Color condition
Solid Set 1	Red clay sphere with pegs	Blue yarn sphere with pegs	Plum clay spiral pieces	Red clay spiral pieces
Solid Set 2	Natural wood Pac Man	White Styrofoam Pac Man	Pink wood clothes pin pieces	Natural wood clothes pin pieces
Solid Set 3	Navy Styrofoam sphere with handle	Yellow mesh sphere with handle	Red Styrofoam phone receiver pieces	Navy Styrofoam phone receiver pieces
Solid Set 4	Slate scrubber sponge petal	Green wood w/ holes petal	Lavender scrubber sponge	Slate scrubber sponge Z pieces
Nonsolid Set 1	Pink hair gel U	Apricot scrub U	Purple hair gel blobs	Pink hair gel blobs
Nonsolid Set 2	Yellow Noxema w/sand figure 8	Green masque figure 8	Blue Noxema w/sand blobs	Yellow Noxema w/sand blobs
Nonsolid Set 3	Blue wax flakes lamda	Natural coconut flakes lamda	Yellow wax flakes blobs	Blue wax flakes blobs
Nonsolid Set 4	Natural Wheatena tulip	Turquoise shaving cream tulip	Red Wheatena blobs	Natural Wheatena blobs

Note: Only children in the Solid-Nonsolid training+Pieces+Material+Color Match (SN+P+MC) condition saw material+color matches. Children in all of the other conditions saw the material-only matches. On pieces trials, the exemplar and shape match were presented in several pieces while the material matches were presented in whole, single portions.

Solid pieces stimuli were created by cutting up a whole version of that stimulus. When a solid exemplar was presented in pieces the shape-matching test stimulus, also in pieces, was presented in the same overall configuration. All stimuli were presented on white paper plates which were placed on a tray.

Procedure. Children sat next to their parents across from the experimenter. All trials, training and test, began with a familiarization phase. Children were given a stimulus set to explore for one minute. The experimenter used neutral language without naming the stimuli to encourage children to touch the stimuli. The experimenter touched all the stimuli to demonstrate that some were nonsolid.

After familiarization, the experimenter collected all three items, placed the test stimuli on a tray, held the exemplar up, said, “See this? This is my play-doh. See my play-doh? Can you get your play-doh? Get your play-doh!” and slid the tray towards the child. The experimenter encouraged the child to choose, but continued if the child did not after four prompts. Children in the Solids-Only condition were corrected if they chose the foil and praised otherwise (see Samuelson & Smith, 1999). Only one child chose a foil on one trial of the Solids-Only training. Children in Solid-Nonsolid training conditions were praised for either choice (see Soja et al. 1991). Children overwhelmingly generalized the names correctly in Solid-Nonsolid training. Test trials proceeded in the same manner as training trials, but without any praise. Thus, children were given an exemplar and two test stimuli to explore for one minute. The experimenter then collected all three items, placed the test stimuli on a tray, held the exemplar up, said, for example, "See this? This is my blicket. See my blicket? Can you get your blicket? Get your blicket!" and slid the tray towards the child.

Whether children saw a solid or nonsolid set first, which exemplars were presented in pieces, and left/right position of test stimuli were counterbalanced across children in each condition. Children never saw three trials of the same type (solid, nonsolid) or two trials from the same subcategory (e.g., solid-exemplar-in-pieces) in succession. No child saw any set twice. The novel names used for the exemplars were blicket, coodle, doff, fitch, mell, stad, tannin, and tulver (Soja et. al., 1991). The pairing of names to exemplars was randomly determined for each child. Sessions were videotaped and coded by naïve observers.

Results

We calculated the proportion of shape choices out of each child's total responses. Analyses focused on two key issues. First, we examined whether children demonstrated significant biases to generalize novel names by shape and material in each condition. In particular, we compared the mean proportion of shape choices with solid and nonsolid exemplars to levels expected by chance (.50). These tests were all two-tailed with the exception of the two cases that were specific replications of prior effects—a shape bias with solid-whole exemplars (Samuelson & Smith, 1999) and a material bias with nonsolid exemplars and material+color-matching test stimuli (Soja et al., 1991). The second issue was how changes to the training and stimuli across conditions influenced children's generalizations. Here, we analyzed the data via three pre-planned mixed-design ANOVAs each with Set (solid, nonsolid) as a repeated-measure and Condition as a between-subjects factor. Whether exemplars were presented whole or in pieces was not included because preliminary analyses found no effect of this factor (though we will return to this issue later in the results).

Mean proportions of shape choices in each of the four conditions are depicted in Figure 2. Our first question was whether the combination of solids-only training (S), whole exemplars (W), and material-only-matching (M) test stimuli produced a significant shape bias on solid object trials but no systematic bias on nonsolid substance trials, as reported by Samuelson and Smith (1999). T-tests on the proportion of shape choices in the S+W+M condition confirmed the expected pattern of responding: children generalized names for solid objects to test stimuli that matched exemplars in shape, $t(11) = 2.00$, $p < .05$, $d = .58$, and performed at chance levels on nonsolid substance trials, $t(11) = -.65$, *ns.* Thus, children demonstrated a significant shape bias in this condition but no material bias.

Our next question was whether including solid exemplars in pieces disrupted the shape bias. T-tests revealed a significant shape bias on solid exemplar trials in the S+P+M condition, $t(11) = 2.24$, $p < .05$, $d = .65$, but no significant bias on nonsolid substance trials, $t(11) = -1.16$, *ns*. An ANOVA comparing data from the S+W+M and S+P+M conditions revealed only a main effect of set, $F(1, 22) = 9.99$, $p < .01$, $\eta^2 = .31$; again showing significantly greater shape responding to solid versus nonsolid exemplars. Thus, when we presented solid exemplars in pieces, children still generalized novel names for solid objects by shape similarity.

The fact that children who saw solid exemplars presented in pieces still chose shape-matching test stimuli most often

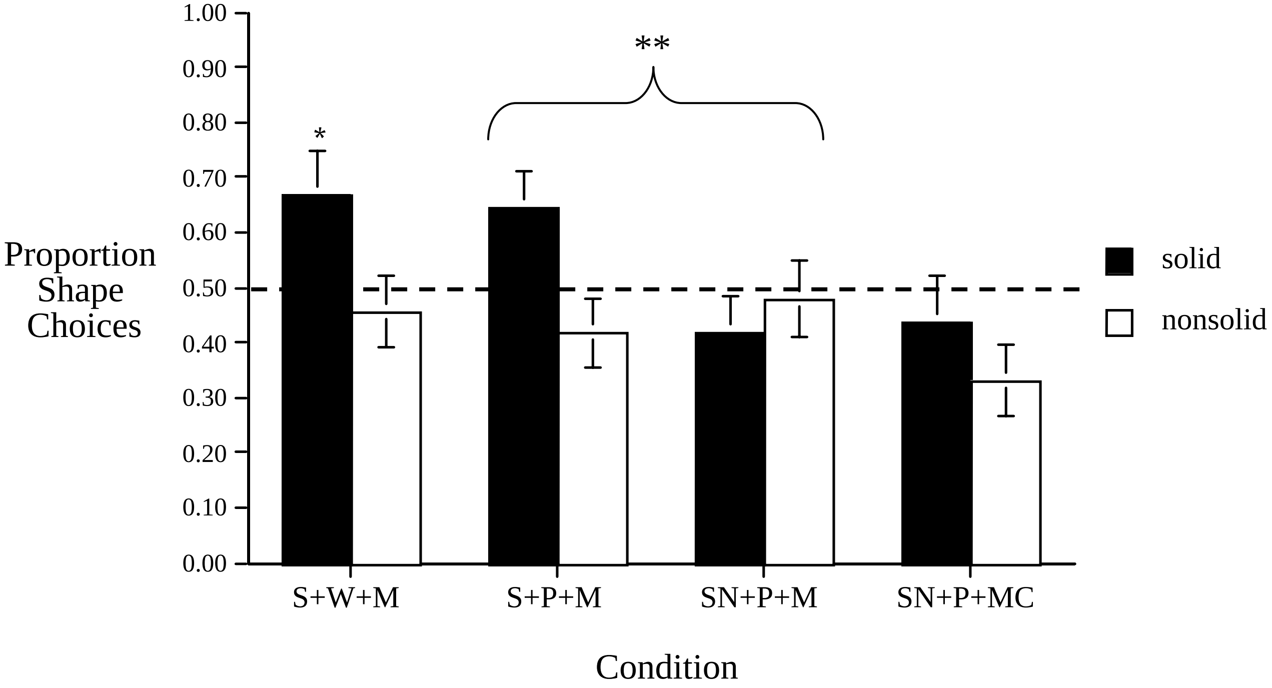


Figure 2. Proportion shape choices on trials with solid and nonsolid exemplars for children in each of the four experimental conditions. Proportions greater than 50% indicate children are extending names on the basis of shape similarity and less than 50% indicate children are extending names on the basis of material similarity. The dotted line indicates chance responding; *= performance different from chance at the $p < .05$ level. **= significant interaction between condition and solid/nonsolid, $p < .05$.

suggests this manipulation was not enough to disrupt the shape bias. It is possible, however, that the training children received contributed to their shape-based name generalizations. This idea was supported by the results of the SN+P+M condition: when children saw both solid and nonsolid things in training, they did not generalize names for solid objects systematically, $t(11) = -1.48$, *ns*. These children also did not generalize novel names for nonsolid substances systematically, $t(11) = -.36$, *ns*. An ANOVA comparing data from the S+P+M and SN+P+M conditions yielded a significant Set x Condition interaction, $F(1, 22) = 7.76$, $p < .05$, $\eta^2 = .24$. Simple effects tests demonstrated significant differences between the two conditions in children's generalizations of names for solid objects, $t(22) = - 2.688$, $p < .01$, $d = 1.09$, but not nonsolid substances, $t(22) =.73$, *ns*. Thus, relative to another group of children who also saw solid objects presented in pieces, children who saw familiar nonsolid substances in training did not demonstrate a shape bias. Note, however, that seeing solid objects in pieces and nonsolid substances in training did not support a material bias.

The fact that children in the S+P+M condition failed to demonstrate a material bias suggests that the material+color-matching test stimuli used by Soja et al. (1991) were critical to eliciting a material bias at this age. This was confirmed by t-tests on data from the SN+P+MC condition which revealed significant generalization of names for nonsolid substances to material-matching test stimuli, $t(11) = -2.35$, $p < .05$, $d = .68$. These children did not generalize names for solid objects systematically, $t(11) = -1.48$, *ns*. An ANOVA comparing data from the SN+P+M and SN+P+MC conditions did not yield any significant main effects or interactions, however. Thus, 2-year-old children only generalized names for nonsolids by material at levels significantly different from chance when material-matching test stimuli also matched the exemplar in color, but this bias toward material was not so strong as to yield a significant Set x Condition interaction in the ANOVA. This fits the pattern in the literature showing that the material bias is generally less robust than the shape bias.

The data in Figure 2 show that both the particulars of the stimuli and the training children receive matter in novel noun generalization tasks; and importantly, the training effect demonstrates that what children did in the early trials of the experiment influenced what they did later. The effect of the early training trials on later performance is more subtle than it first appears, however. The significant Set x Condition interaction in Figure 2 suggests that the presence of nonsolid substances in training—not the inclusion of solid exemplars in pieces—disrupted the shape bias. However, Soja et al. (1991) found a significant shape bias with solid-nonsolid training and whole solid exemplars (essentially a SN+W+M condition for the solid trials). This suggests that solid-nonsolid training alone is not enough to disrupt the shape bias. Considered together, these findings suggest that it is the combination of what children saw early in our experiment and the presentation of solid exemplars in pieces that disrupted the shape bias in the present experiment. Why is the combination of Solid-Nonsolid training and solid-pieces exemplars so key? Half of the children in the Solid-Nonsolid training condition saw the nonsolid exemplar in pieces, and when they did they overwhelmingly generalized the novel name by material. This may have biased them to pick material over shape when they later saw another exemplar—even a solid one—presented in pieces and would have resulted in lack of a shape bias on *solid-pieces* trials. Recall however, that in our preliminary analysis we found no significant effect of whether exemplars were presented as wholes or pieces. Thus, the early experience of a nonsolid in pieces, combined with later seeing solids in pieces was enough to disrupt the shape bias on even the most canonical trials—those with solid whole exemplars. This then suggests a more generalized influence of seeing pieces early in the experiment. An exploratory analysis demonstrates this effect across all conditions that included exemplars in pieces—be they solid or nonsolid and shows that this effect unfolds over the same trial-to-trial time scale clearly evident in the training effect.

The left panel of Figure 3 presents the percentage of children in the three conditions that included exemplars presented in pieces who chose shape on their first solid-whole-exemplar trial (SW1) as a function of how many exemplars (solid and nonsolid) in pieces they had previously seen. Figure 3 also distinguishes children who had their one prior trial with an exemplar in pieces in training or on an experimental trial. Children generalized a novel name for a solid-whole exemplar to shape-matching test stimuli if they had not previously seen any exemplars in pieces, but as children saw more exemplars in pieces over the course of training and test trials, they were less likely to generalize novel names for solid-whole exemplars by shape similarity, $r_{bp}(34) =$

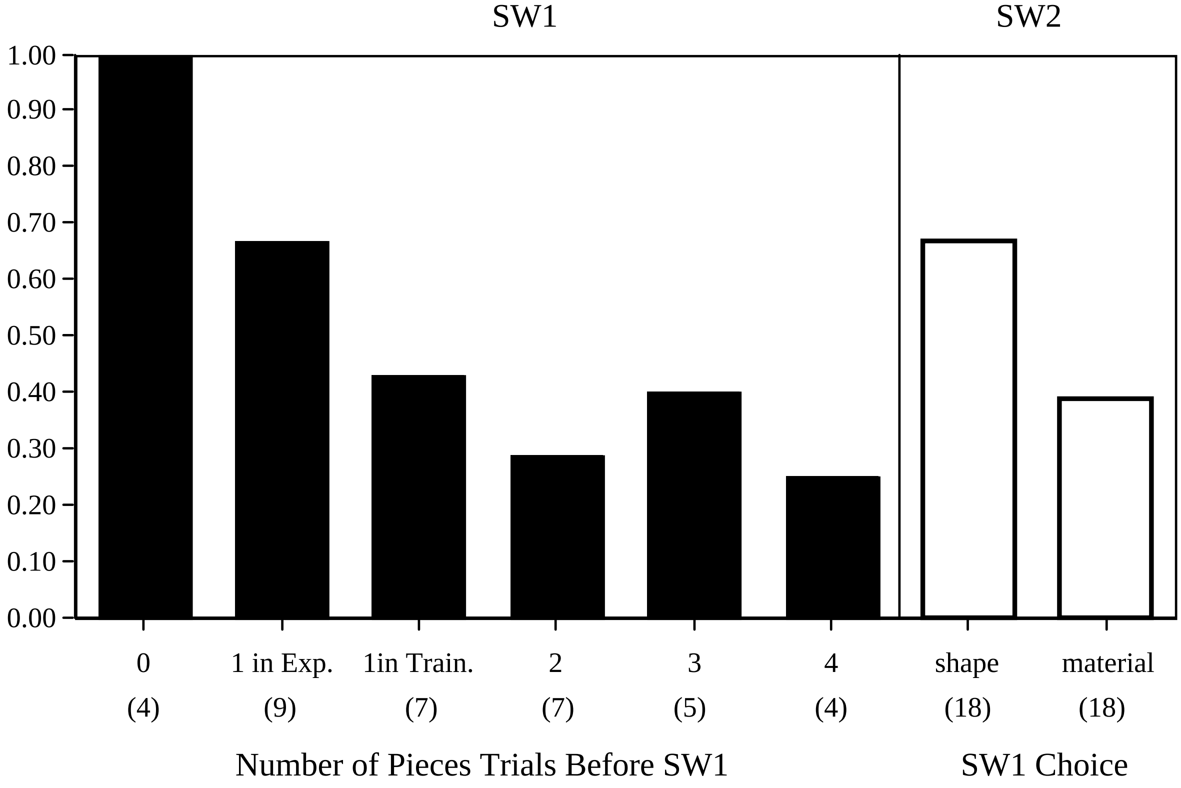


Figure 3. The left panel shows the percentage of children from the conditions that included exemplars presented in pieces (all but S+W+M), who chose shape-matching test stimuli on their first solid-whole-exemplar trial (SW1) as a function of how many trials with exemplars (solid or nonsolid) in pieces they had previously seen. The right panel shows children's performance on their second solid-whole-exemplar trial (SW2) as a function of whether they picked the shape- or material-matching test stimulus on SW1. N's are in parentheses.

-.38, $p < .05$, $d = .70$. This effect is most evident when comparing children who did not see any exemplars in pieces before SW1 to those that saw one exemplar in pieces. In fact, seeing just one exemplar in pieces on a previous trial substantially reduced shape responding on SW1, particularly if that pieces trial occurred during training.

Further, children's first generalization of a name for a solid-whole-exemplar influenced their subsequent generalizations. The right panel of Figure 3 presents children's performance on the second solid-whole-exemplar trial (SW2) as a function of whether individual children had generalized the novel name on SW1 by shape or material. As is clear, children's generalizations on SW2 depended on what they did on SW1; children who generalized the novel name by shape on SW1 were more likely to also generalize the novel name on SW2 by shape, binomial $p = .066$. We acknowledge that these analyses consider relatively small numbers of data points in each cell. Nevertheless, considered in conjunction with the significant training effects in Figure 2, these trial-by-trial findings further demonstrate that children's name generalizations are influenced by the order in which they see stimuli in the experiment and their own previous performance, thereby highlighting the dynamic nature of children's novel noun generalizations.

Discussion

Results of this experiment suggest a dynamic view of behavior in novel noun generalization tasks. Our findings show that even the robust shape bias is sensitive to on-line processes. Children's tendency to generalize novel names for solid exemplars on the basis of shape was affected by the training children received and by presenting solid exemplars in pieces. Moreover, exploratory analyses suggested the strength of the shape bias was influenced by how many other exemplars in pieces children had seen, and by children's previous generalizations of a name for a solid exemplar in the experiment. These findings all point toward a cascade of effects that emerge over the course of the session as children at tempt to make sense of the experimental task. Within this context, even innocuous "warm-up" trials influence later performance by encouraging children to attend to particular stimulus dimensions or to compare test stimuli to each other or the exemplar. An important question for future research is exactly how these early trials influence children's perceptions of the task and subsequent stimuli.

Across conditions, 2-year-old children were less likely to demonstrate a material bias, only doing so when material-matching test stimuli also matched the exemplar in color. This suggests that prior demonstrations of a material bias in 2-year-old children may *not* have been based on knowledge about how categories of nonsolid things are organized and named, as previously concluded (Soja et al.,1991). Rather, children's choice of material-matching test stimuli might have been the on-line product of knowing words link to categories of similar things and material+color-matching test stimuli that were more similar to exemplars than shape-matching test stimuli. Thus, these data fit with prior work suggesting that children have difficulty reasoning about material substances until they are quite a bit older than the children studied here (c.f. Gathercole & Whitfield, 2001). These data also fit with prior suggestions that the material bias may be less robust than the shape bias because there is less support for the link between nonsolidty and categories organized by similarity in material in the early noun vocabulary (Colunga & Smith, 2005; Samuelson, 2002; Samuelson & Smith, 1999) or because of differences in the ontological status of solids and nonsolids (Dickinson, 1988). Importantly, however, the view presented here goes beyond saying the material bias is fragile and suggests other ways to create and destroy the bias—by presenting a series of nonsolid exemplars in piles, for example, or by using imperfect shape-matches so that material-matches appear more similar to the exemplar overall (see Prasada, Ferenz, & Haskell, 2002 for a similar suggestion).

Taken together, our results support an interpretation of the shape and material biases as dynamic, flexible adaptations that combine what children know about how names link to categories with the specifics of what they have just previously seen or done in the experiment, and what they are currently seeing on a particular trial. These results thus build on previous work showing, for example, that infants distinguish between things that are countable and those that are not (Huntley-Fenner, Carey, & Solimando, 2002), in that such prior knowledge could be what the presentation of nonsolids in training or solid stimuli in pieces taps into. These results also fit with dynamic systems theories of development which view change as the emergent product of multiple interactions between and individual and the environment over multiple timescales

(Smith & Thelen, 2003). In this respect, the current work builds on extant studies showing that giving young children experience with biased short-term statistics can lead to the development of a precocious shape bias and accelerated vocabulary development (Samuelson, 2002; Smith, Jones, Landau, Gershkoff-Stowe, & Samuelson, 2002). An important step for future research will be to investigate the link between these two timescales. That is, to examine how the real-time decisions children make about the meaning of novel nouns lead to changes in the statistics of the vocabulary and the subsequent development of word learning biases.

We end by acknowledging that the present findings are only a first step toward a more dynamic, real-time view of children's noun generalizations. As such, they do not overturn other views that suggest word learning biases are based on global changes in conceptual understanding of ontological categories or kinds (Booth, Waxman, & Huang, 2005; Diesendruck & Bloom, 2003). That said, we contend that such conceptual or ontologically-based accounts must provide an explanation of our findings given that, within the course of a single experimental session, we can create or destroy the very behaviors all accounts of word learning biases attempt to explain.

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