Beyond early linguistic competence : development of children's ability to interpret adjectives flexibly

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Beyond Early Linguistic Competence:

Development of Children's Ability to Interpret Adjectives Flexibly

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FLEXIBLE INTERPRETATION OF ADJECTIVES

Abstract

This study investigated the circumstances in which 3- to 5-year-old children can and cannot interpret adjectives flexibly. In Exp. 1, children were required to interpret *big* and *little* both in reference to a basic level kind (e.g., “This is a big marble”) and in reference to a superordinate kind (e.g., “This is a little toy”). Exp. 2 examined 3-year-olds’ flexible interpretation of *big* and *little* with respect to a medium-sized stimulus that was alternately compared with a smaller stimulus and a larger stimulus (e.g., “Which one of these 2 circles is the big one?”). Even the youngest children switched between interpretations when the switch was accompanied by a change in the stimulus display. When the stimulus display remained constant, however, younger children typically perseverated on a single interpretation. Results replicate the roots of flexible adjective interpretation but also show protracted development of the ability to coordinate two incompatible interpretations of a single situation.

Keywords: cognitive development, cognitive flexibility, interference, linguistic flexibility, metalinguistic understanding

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Beyond Early Linguistic Competence:

The Development of Children's Ability to Interpret Adjectives Flexibly

1. Introduction

Understanding adjectives such as *big* and *little* in an adult-like manner requires an appreciation of the multiple ways in which adjectives can be interpreted, as well as the ability to switch flexibly between different interpretations (e.g., Ebeling & Gelman, 1994). One can, for example, judge a hat to be big for a hat, but at the same time recognize that it is little compared to another hat. Ebeling and Gelman (e.g., 1988, 1994) discussed flexible adjective interpretation in terms of sensitivity to context. They noted, for example, that *normative* contexts require comparison with a stored mental representation of a given kind, whereas *perceptual* contexts require comparison with a physically present object. In a series of studies, they presented children with the same objects in different contexts. For example, in a typical test, children were shown a normatively small hat and asked whether it was big or little. They were then shown the same small hat alongside a tiny hat and asked again whether the first hat was big or little. Even 2-year-olds generally called the same hat first “little” (normatively) and then “big” (perceptually), which Ebeling and Gelman (1994) interpreted as evidence that young children can switch flexibly from one context of interpretation to another (see also Sera & Smith, 1987).

This evidence of flexibility is somewhat surprising in light of research indicating that young children often have difficulty switching between different perspectives on a single stimulus—they persevere in representing stimuli in a particular way even when it is no longer appropriate to do so. In tasks assessing understanding of appearance and reality, for example, children are shown a deceptive object such as a sponge rock and asked about its appearance

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(“What does it look like?”) and its true nature or function (“What is it really?”). Three-year-olds are much more likely than 5-year-olds to give the same answer to both questions (Flavell, Green & Flavell, 1986). Similarly, in the Dimensional Change Card Sort (DCCS), children are asked to sort a series of pictures (e.g., red rabbits and blue cars) first according to one dimension (e.g., color) and then according to another (e.g., shape). Regardless of which dimension is presented first, 3-year-olds typically continue to sort the cards by that dimension despite being told the new rules on every trial (e.g., Zelazo, Müller, Frye, & Marcovitch, 2003). Inflexibility has also been observed in preschoolers’ understanding of false beliefs (see Wellman, Cross, & Watson, 2001, for a meta-analysis), reasoning about physical causality (e.g., Das Gupta & Bryant, 1989), moral reasoning (e.g., Zelazo, Helwig, & Lau, 1996), reasoning about external representations (e.g., DeLoache, Pierroutsakos, & Troseth, 1996), inferring word meanings (Deák, 2000), and generating multiple labels for a single object (e.g., Doherty & Perner, 1998; Markman, 1989; but see Deák & Maratsos, 1998). Findings like these are consistent with traditional characterizations of young children as relatively inflexible (DeLoache, 1987; Flavell, Flavell, & Green, 1983; Piaget, 1954; Piaget & Inhelder, 1959; Zelazo, Frye, & Rapus, 1996). In each case, younger preschoolers seem to have difficulty switching between conflicting representations, and there are age-related increases in flexibility that continue beyond the preschool years. Even young school-aged children, for example, rigidly focus on the content of what a speaker says (versus the tone of the speaker’s voice) when asked to infer the speaker’s emotion, despite being instructed to attend to the tone (Morton, Trehub, & Zelazo, 2003).

There is, therefore, a discrepancy in the literature; young children appear to exhibit more flexibility when understanding and using adjectives than they do when reasoning in many other situations. It is possible that children demonstrate flexibility earlier in the context of adjective

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interpretation than in other contexts (e.g., in the DCCS), but it is also possible that children's flexible adjective interpretation may be scaffolded by aspects of the circumstances in which it has been assessed. The experiments described in this article were designed to determine more precisely the circumstances in which children at different ages interpret adjectives flexibly.

Characterization of these circumstances may inform our understanding not only of the development of children's flexible interpretation of adjectives, but also of the way in which this development interacts with other aspects of cognitive development, such as children's developing attentional control and cognitive flexibility.

1.1. Children's Use of Context in Interpreting Adjectives

How might one reconcile the early flexibility noted by Ebeling and Gelman (e.g., 1994) with demonstrations of rigidity in young children's reasoning? Work by Deák (2000; Deák, Ray, & Pick, 2002) points to one possibility. Deák (2000) examined 3- to 6-year-olds' use of different predicates ("looks like a . . .", "is made of. . .", or "has a . . .") to infer the meanings of novel words. He found that 3-year-olds typically used the first predicate appropriately to infer the meaning of the first novel word in a series, but then proceeded to use that same predicate to infer the meanings of subsequent words. In contrast, older children used the most recent predicate as a cue to constrain their inference about word meaning. Deák (2000) suggested that age-related changes in the flexible use of predicate cues can be understood in part in terms of age-related increases in sensitivity to inter-trial differences. That is, younger children fail to attend to the cues (i.e., the predicate cues) that indicate that the inductive problem has changed. The cues in this case are purely linguistic, whereas, as Deák notes, the cues in the work by Ebeling and Gelman (1994) are physical contextual cues; objects are added or removed from trial to trial.

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This change in the physical context may be sufficient to signal the presence of a new problem; it may scaffold the flexible deployment of attention to the relevant interpretive context. Indeed, it may even be the case that this change effectively eliminates interference from previous trials, breaking any “set” that the children may have, and obviating the need for attentional control. If this were the case, then young children may be capable of using adjectives flexibly when given changed stimulus displays, as shown by Ebeling and Gelman (1994), but may nonetheless have difficulty switching interpretations in a situation where the change in context is purely linguistic and not accompanied by a change in the stimulus display. Under these circumstances, young children may have difficulty grasping, for example, that a particular marble might be simultaneously big for a marble but little for a toy.

It is possible that age-related changes in flexible metalinguistic understanding are brought about in part by the same neurodevelopmental processes that underlie the development of attention and cognitive flexibility more broadly. For example, according to Zelazo et al. (2003), the development of the prefrontal cortical networks that support the iterative reprocessing of information results in increases in the likelihood that children reflect on their construal of stimuli, and consider alternatives to their construal. Other accounts emphasize different cognitive processes such as active (working) memory (Morton & Munakata; 2002), inhibition of attention (Kirkham et al., 2003), and redescription (the conceptual understanding that a stimulus can be redescribed from a different perspective; Kloo & Perner, 2003).

To explore the circumstances in which young children do and do not show flexible adjective interpretation, we tested young children’s ability to coordinate conflicting interpretations of adjectives both when the interpretive contexts were differentiated by physical changes, and when children had to rely solely on linguistic cues presented verbally. We

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hypothesized that 3-year-olds would fail to interpret adjectives flexibly when required to rely solely on linguistic cues.

Linguistically, *big* and *little* are an antonymous pair of adjectives that carry the same conceptual meanings as *large* and *small*. Both pairs are common lexical terms and *big* and *little* are among the first 100 words acquired by infants in their second year of life. Thus, we decided to use *big* and *little* as the contrastive pairs for this study.

To make sure that children understand the adjective pair and their flexible interpretations under various comparative contexts with the help of linguistic cues, we designed Experiment 1 as a pre-test to explore how children would respond linguistically to stimuli that could be interpreted as *big* or *little* in the context of a basic level kind, such as *marble* or *hockey stick*, or in the context of the superordinate category *toy*. A basic-level kind such as *marble* or *hockey stick* is associated with a typical perceptual prototype, whereas a superordinate level kind such as *toy* is more abstract in the sense that it is not associated with a typical perceptual prototype; crucially for our purposes here, however, a given stimulus might alternately be compared to different kinds simply by changing the linguistic or conceptual cue—e.g., so that a given stimulus might alternately be understood to be *a big marble* but *a little toy*, or *a little hockey stick* but *a big toy*. Two different conditions were provided: The stimuli were changed in location (stimulus-change) or remained in the same location (stimulus-constant) when paired items were compared. Thus, Experiment 1 was designed to explore age differences and variability in preschoolers' coordination of conflicting interpretations of adjectives both when the interpretive contexts were differentiated by physical changes, and when children had to rely solely on linguistic cues. In Experiment 2, we tested children with a greater variety of stimuli (e.g., 12 sets of pictures of different items) that were displayed in various ways on a computer screen (e.g.,

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three pictures placed in a vertical line, horizontal line, etc.). With each test trial, we asked children to interpret *big* and *little* with respect to a medium-sized stimulus that was alternately compared with a smaller stimulus and a larger stimulus.

2 Experiment 1

To assess the circumstances in which young children switch between different adjective interpretations, we asked 3- to 5-year-old children to make perceptual comparisons regarding *big* and *little* both within basic level kinds of toys (i.e., “pairwise” sorts; e.g., a big vs. a little *marble*) and within the superordinate category *toy* (e.g., a big toy vs. a little toy), where a big marble may be a little toy. These comparisons required children to adopt one adjective interpretation and then switch to a different, incompatible one. Switching between interpretive contexts (basic and superordinate) was assessed both when the change in context was accompanied by a change in the stimulus sets, and when it was not marked by a change in stimulus items along with the change in lexical cues (i.e., the presence of the superordinate vs. the basic level term).

Based on previous research, we predicted that most children (even 3-year-olds) would switch flexibly and perform at ceiling when the change in interpretive context was accompanied by a change in the stimulus sets. Consequently, flexible adjective interpretation was first assessed under these circumstances. A subsequent stimulus-constant phase assessed switching when the change in context was not marked by a change in stimulus items along with the change in lexical cues. Age-related changes between 3 and 5 years were expected in the stimulus-constant (flexible-sorting) phase, even for those children who were at ceiling on the stimulus-change (pair-interference) phase. Confirmation of these predictions would support the suggestion that although 3-year-olds can understand the multiple interpretations of an adjective such as *big*,

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their ability to switch flexibly between different adjective interpretations does indeed undergo developmental changes analogous to those that have been well documented in other domains.

2.1 Method

2.1.1 Participants

Fifty preschool-age children, from middle SES families with parents who were native speakers of English, were recruited from local daycare centers and through a database of parents who had expressed an interest in participating in research. An additional 14 children ($M = 40.0$ months; range = 36.4 to 49.6 months; 9 boys, 5 girls) were recruited and tested. Their family and language backgrounds were similar to the other children, but their data were not included in the final sample. Thirteen of them failed to complete the experiment because they were distracted by the items, carrying them around or playing with them instead of following the experimenter's instructions. One remaining child could not be included due to experimental error. Two children (one 35-month-old boy and one 55-month-old boy, see below) performed poorly on the initial stimulus-change (pair-interference) phase and were dropped for the purpose of analysis on the subsequent stimulus-constant (flexible-sorting) phase. Thus Experiment 1 eventually included 48 children divided according to a median split into 24 younger ($M = 47.8$ months; range = 38.5 to 53.9 months; 12 girls, 12 boys) and 24 older children ($M = 63.7$ months; range = 54.1 to 78.4 months; 13 girls, 11 boys). The two age groups were also subdivided into three subgroups each, with approximately 6 months between the subgroups ($M = 41.8$ months, 48.0 months, 53.7 months; and $M = 54.5$ months, 62.9 months, 73.7 months). Informed consent was obtained from all parents of children who participated in the experiment.

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2.1.2 Stimuli

There were two stimulus sets (see Table 1). One set contained waternoodles, hockey sticks, crayons, and marbles (the first set), whereas the other contained baseball bats, golf clubs, chalk, and jacks (the second set). Each set comprised two pairs of normatively big toys (e.g., a pair of waternoodles and a pair of hockey sticks) and two pairs of normatively little toys (e.g., a pair of crayons and a pair of marbles). Within each set, the two members of each pair were noticeably different in size (e.g., there was a smaller waternoodle and a larger one). Thus, each set contained two Big-Big toys (i.e., big instances of big toys; e.g., a big waternoodle), two Little-Little toys (i.e., little instances of little toys; e.g., a little crayon), and four toys that were either Little-Big (e.g., a little waternoodle) or Big-Little (e.g., a big marble). If we call the Big-Big and Little-Little toys in each set *non-conflict* toys, and the Big-Little and Little-Big toys *conflict* toys, then each set contained 4 conflict and 4 non-conflict toys. The dimensions and colors of the toys are presented in Table 1.

2.1.3 Design and Overview

The design was a 2 (age: younger, older) x 2 (stimulus sets: the first set and the second set) x 2 (test sort order: superordinate-basic-superordinate, basic-superordinate-basic) between-subjects design in which the variables were fully crossed. Each cell contained six randomly selected participants, including no fewer than two members of each sex.

All participants received a stimulus-change (pair-interference) phase and a stimulus-constant (flexible-sorting) phase. The stimulus-change (pair-interference) phase was designed to confirm previous reports that children were able to interpret the adjectives *big* and *little* in both toy contexts (basic level vs. superordinate), and switch between interpretations when the change

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in context was accompanied by a change in the stimulus display. In the new stimulus-change (pair-interference) phase, eight pairs of stimuli were presented in one of four orders (2 per stimulus set). The side (left or right) on which the big items were supposed to be placed in the stimulus-change (pair-interference) phase was varied between participants) according to one of two pseudorandom schedules for each stimulus set (left (L) and right (R) side ordering: R-L-L-L-R-R-R-L and L-R-R-R-L-L-L-R for the first set, and L-L-R-L-L-R-R-R and R-R-L-R-R-L-L-L for the second set).

The stimulus-constant (flexible-sorting) phase involved three test sorts (trials corresponding to the "superordinate-basic-superordinate" categories) designed to assess switching between adjective interpretations when the change in context was not marked by a change in stimulus items along with the change in lexical cues. The side on which the big items were supposed to be placed during the stimulus-constant (flexible-sorting) phase was chosen randomly and remained constant across all three test trials.

2.1.4 Procedure

Each child was tested individually by a male experimenter in a single 10-15 minute session. When the child was comfortable with the situation and the experimenter, he or she was seated on the floor and introduced to the procedure.

2.1.4.1 Stimulus-change (pair-interference) phase. The child was presented with eight pairs of toys, one pair per trial, and asked to sort the toys according to size into locations designated by the experimenter. Each pair consisted either of the big and little version of the same toy type (e.g., the big and little hockey sticks) or a Little-Big toy together with a Big-Little toy (e.g., the little hockey stick and the big crayon; see Figure 1). From trial to trial, one conflict

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item (e.g., a Big-Little toy) was held-over. For example, on one stimulus-change (pair-interference) trial the child might be presented with the little hockey stick (a big toy) and the big crayon (a little toy), and then told, “Please put the big *toy* there [with the experimenter pointing to one side as determined by the pseudorandom counterbalancing schedule] and the little *toy* there [pointing to the other side].” On the next stimulus-change (pair-interference) trial, the child might be presented the little hockey stick and the big hockey stick, and told, “Please put the big *hockey stick* there [pointing to one side] and the little *hockey stick* there [pointing to the other side].” Thus, the little hockey stick, which was the “big” item on the first trial, became the “little” item in the second. In all cases, the toys were presented with the smaller one in front of the larger one so that both could be seen. This made both toys equally close to the sides designated “big” and “little” by the experimenter on each trial (locations counterbalanced).

2.1.4.2 Stimulus-constant (flexible-sorting) phase. In each of the three sorts comprising the stimulus-constant (flexible-sorting) phase, the child was shown the full array of all eight items and asked to complete a basic-level (pairwise) sort or a superordinate sort (see Figure 2). The toys were first arranged in front of the child according to size, with the largest toy being furthest from the child (e.g., for the first set, the array included the big and little waternoodles, the big and little hockey sticks, the big and little crayons, and the big and little marbles, in that order). In the toy sort, the child was told,

Here is a way we can sort these using ‘big’ and ‘little.’ We can put all the *big toys* [indicating the waternoodles and hockey sticks with both hands] there [pointing to one side], and put all the *little toys* [indicating the crayons and marbles with both hands] there [pointing to the other side]. So, for example, these [taking both hockey sticks] go there

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[placing them on “big” side] and these [crayons] go there [placing them on the “little” side].

The toys sorted by the experimenter were always the middle four (hockey sticks and crayons in the first set, golf clubs and chalk in the second set). The child was then told, “Now, please put *the other big toys* there [pointing] and put the *other little toys* there [pointing].” If a child refused to respond, the request was repeated up to three times. On each superordinate level sort, correct responding involved separating two remaining big toys (e.g., two waternoodles) from two remaining little toys (e.g., two marbles).

After the first sort in the stimulus-constant (flexible-sorting) phase, the child was told, “But there's a different way we can sort these using ‘big’ and ‘little.’” If the child had received a toy sort on the first trial, he or she was then given a basic sort. After the first two sorts (one toy sort at the superordinate level and one basic sort at the basic level), the child was told, “Now let’s sort them the other way. Remember we can put...” and the instructions for the first sort were repeated. In the basic sort (with the first stimulus set), the child was told,

We can put the *big waternoodle, big hockey stick, big crayon, and big marble* [pointing to each item in turn] over there [pointing to one side] and the *little waternoodle, little hockey stick, little crayon, and little marble* over there [pointing to the other side]. So, for example, these [taking the big hockey stick and big crayon] go there [placing them on “big” side] and these [taking the little hockey stick and little crayon] go there [placing them on “little” side]. Now, please put the *big waternoodle and big marble* there [pointing] and put the *little waternoodle and little marble* there [pointing].

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Each child thus was tested for switching in both directions: from toy sort to basic sort and vice versa.

2.2 Results

The sorts with and without conflict items in both phases were analyzed separately. The stimulus-change (pair-interference) phase was scored out of 8, with 1 point awarded for each trial on which the child sorted correctly. Scores on the stimulus-change (pair-interference) phase were subjected to an Age (younger vs. older) x Stimulus set (the first set vs. the second set) analysis of variance (ANOVA). This ANOVA yielded no main effects and no interaction (age: $F(1, 46) = 0.05$; stimulus set: $F(1, 46) = 0.92$; Age x Stimulus set: $F(1, 46) = 0.17$). As expected based on Ebeling and Gelman's (1988, 1994) findings, nearly all children performed well on the stimulus-change (pair-interference) phase. Indeed, only two children scored less than 6 out of 8. To facilitate interpretation of performance on the stimulus-constant (flexible-sorting) phase, these children were dropped from the subsequent analyses.

For each of the three test sorts during the stimulus-constant (flexible-sorting) phase, there were two non-conflict items to be sorted and two conflict items, for a total of six non-conflict and six conflict items. All but three children correctly sorted all of the non-conflict items in all three test sorts during the stimulus-constant (flexible-sorting) phase (one boy in the older group missed one non-conflict item; one girl in the younger group missed three non-conflict items; another girl in the younger group missed one non-conflict item).

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The test order effect was not significant. Children did not show a tendency toward perseverating on actual size only. Those children who responded incorrectly performed in the same way: picking up the items with an incorrect size and moved them to the place pointed at by the experimenter. The children who failed to switch flexibly the first time showed consistency in the rest of the sorting. Most children were either consistently correct or consistently incorrect on all conflict items, so performance on these items was treated categorically, with children judged to interpret adjectives flexibly if they correctly sorted all 6 of the conflict items correctly. Neither stimulus set ($\chi^2 (1, N = 48) = 1.34$) nor test sort order (superordinate-basic-superordinate vs. basic-superordinate-basic; $\chi^2 (1, N = 48) = 1.34$) had a significant effect on the number of children interpreting adjectives flexibly during the stimulus-constant (flexible-sorting) phase, but there was a significant effect of age, $\chi^2 (1, N = 48) = 16.44, p < .001$. As shown in Table 2 (and further illustrated in Figure 4), 18 out of the 24 (75%) children in the younger group failed to interpret the adjectives flexibly and 11 of them were from the youngest subgroup ($M = 41.8$ months), whereas only 4 (17%) of the 24 children in the older group showed a similar difficulty and they were all the youngest from this older group ($M = 54.5$). Thus, there was an age-related increase in the flexible interpretation of the adjectives *big* and *little* when the change in context was not marked by a change in stimulus items along with the change in lexical cues. The same pattern of results was observed when only the first two trials were considered and 4 out of 4 correct trials were required to pass; again, the only significant effect was that of age ($\chi^2 (1, N = 48) = 7.11, p < .01$).

2.3 Discussion

Preschoolers' interpretation of *big* and *little* was assessed in two interpretive contexts—in reference to a basic level kind (e.g. “This is a big marble”) and in reference to a superordinate kind (e.g. “This is a little toy”). When the change in interpretive context was accompanied by a change in the stimulus display, even the youngest children tested had little difficulty switching from one interpretation of *big* and *little* to another. Results of the stimulus-change (pair-interference) phase are therefore consistent with the findings of Ebeling and Gelman (1988, 1994), and suggest that children's interpretation of adjectives is indeed sensitive to context from a young age. When the stimulus set remained constant, however, and the change in interpretive context was not marked by a change in stimulus items along with the change in lexical cues, there was a significant age-related improvement in performance. In contrast to the older children, the majority of younger children failed to switch, consistent with a large corpus of studies on cognitive flexibility in the preschool period (Zelazo et al., 2008). These younger children, all of whom passed the stimulus-change (pair-interference) phase, perseverated in interpreting the adjectives in a particular way, despite the fact that on all test trials they were provided with explicit linguistic cues (basic-level or superordinate terms) and told where to place the items, and despite the fact that the experimenter then demonstrated correct sorting by sorting half of the items himself.

The game-like task involving carrying items from one place to another made the children interested and excited. For example, 13 children became so interested that they carried the items around and failed to follow instructions correctly. The children who followed the instructions tended to repeat part of the experimenter's instructions while they were performing the task (e.g., “big toy”, “little toy,”, “little marble”, “there”, etc.). Their verbal responses showed that they

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used linguistic cues to override the rule of the previous task. No results showed that the size-based stimulus arrangement had a perceptual effect on the children's performance.

Clearly, the results are consistent with the suggestion that there are age-related increases in the flexible interpretation of adjectives, at least under some circumstances. In the stimulus-constant (flexible-sorting) task, the design of the comparing itself seemed to have made the task more complicated than that of the stimulus-change task, but we assumed that this type of difficulty alone should not have prevented the children from understanding the two adjectives at either the conceptual or the cognitive level. It is likely that three-year-olds may have difficulty attending selectively and/or flexibly to the relevant interpretive context, and this difficulty may be more likely to be manifested in the relative absence of support from the stimulus display. In contrast, older children may be better able to control their attention endogenously and/or may be more sensitive to the appropriate linguistic cues. The stimulus-change (pair-interference) phase differed in several ways from the stimulus-constant (flexible-sorting) phase, however, and there are multiple possible sources of younger children's difficulty during the stimulus-change (pair-interference) phase. For example, in addition to the difference in the constancy of the stimulus display (one possible source of visual support), children were only required to sort a pair of items on each trial in the stimulus-change (pair-interference) phase whereas they were required to sort two pairs of items on each trial in the stimulus-constant (flexible-sorting) phase.

Experiment 2 was designed to build on the findings from Experiment 1 to assess children's flexible interpretation of *big* and *little* in a different setting that allowed for a more controlled manipulation of the amount of stimulus support for the distinction between contexts.

3 Experiment 2

In Experiment 1, the distinction between interpretive contexts corresponded to whether a basic level kind or a superordinate kind was used as the standard for making size comparisons. When the linguistic cues to the distinction were accompanied by a change in the stimulus display, even 3-year-olds performed well. In contrast, a majority (75%) of children at this age had difficulty when there was no stimulus support for the distinction. In Experiment 2, children were asked to interpret the adjectives *big* and *little* with respect to a medium-sized stimulus that was compared either to a smaller stimulus or to a larger one. On each trial, children were presented with three stimuli that varied only in size, and the experimenter pointed to two of the stimuli, asking children to indicate which one was *big* or *little*. On interference trials, children were required to interpret the medium stimulus as either big or little despite interference from the presence of a bigger or littler stimulus, respectively. On switch trials, children were required to interpret the medium stimulus in a way that differed from the previous trial (e.g., they were required to interpret it as *big* on the switch trial when they had interpreted it as *little* on the previous trial). By examining performance on both interference and switch trials, it was possible to explore whether young children's difficulty in the absence of a change in the stimulus display was with switching *per se*, or whether children also had difficulty attending selectively to the interpretive context in the presence of interference from the stimulus display.

To examine further (and in a different way) the effect of stimulus support, children in Experiment 2 were assessed in one of two conditions, one in which there were black borders around the two stimuli in question, and one in which there were not. We assumed that the black borders would bias children's attention toward the relevant stimuli and away from a potentially interfering stimulus (Burack, 1994). Verbal feedback was provided if children failed to select

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one of the two relevant stimuli. Finally, because the older children in Experiment 1 (> 54 months of age) performed nearly at ceiling, Experiment 2 focused on children between the ages of 3 and 4 years, to attempt to characterize more precisely any age-related changes in adjective interpretation

3.1 Method

3.1.1 Participants

Eighty-three children from middle SES families with parents who were native speakers of English were recruited from local daycare centers. Recruitment procedures were the same as those for Experiment 1. The children were between the ages of 36 and 47 months. They were divided according to a median split into 47 younger ($M = 37.5$ months; range = 36 to 41 months; 20 boys, 27 girls) and 36 older children ($M = 45$ months; range = 42 to 47 months; 20 boys, 16 girls). An additional 5 children (3 girls and 2 boys) from the younger group and 2 children (1 girl and 1 boy) from the older group were tested but excluded from the final sample because (a) they refused to complete the procedure ($n = 3$; 2 girls and 1 boy), (b) English was not their primary language ($n = 2$; 1 boy and 1 girl), or (c) their parents interfered with the procedure ($n = 2$; 1 girl and 1 boy). Informed consent was obtained from all parents of children who participated in the experiment.

3.1.2 Stimuli

Trial sets were created using PowerPoint. We chose to display stimuli on a screen in Experiment 2 in order to avoid effects of other possible factors such as physical space, dynamic and visual input, and the distractions that the 13 children (see section 2.1.1) encountered in Experiment 1. Each set involved a different stimulus presented in three sizes (little, medium, and

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big), ranging from 1 cm x 1 cm to 11.01 cm x 6.14 cm. Photos of the 12 stimuli are shown in Figure 3.

Each trial set included two warm-up trials, a non-interference trial, an interference trial, and a switch trial. Each warm-up trial showed two instances of the stimulus that differed in size (e.g., a little square and a big square). On each of the next three trials, there were three instances of the stimulus that differed in size and that were displayed in one of 12 spatial configurations. For each child, the 12 stimulus types and the 12 spatial configurations were randomly paired, and the pairings were presented in one of 8 different orders. Order was counterbalanced across children and crossed with age and sex. (Figure 3 shows the types of stimuli used and different presentation types in Experiment 2).

3.1.3 Design

Each participant received 12 trial sets, with each set involving a different stimulus type. Each set had two warm-up trials, one interference trial and one non-interference trial presented in a counterbalanced order, and one switch trial. The two warm-up trials had only two different sizes of the stimuli involved, the intention of which was to make sure that the children had already acquired the concepts of BIG and LITTLE and that they could answer correctly when trials were presented in a simple setting. On a non-interference trial, there was no interference between two stimuli no matter which two of the three stimuli were pointed at and asked by the experimenter which one of the two was the big one. On an interference trial, the medium stimulus was the variable stimulus and the big and the small stimuli were the constant stimuli. When the experimenter pointed to the big and medium stimuli and asked which one was the little one, the medium one was to be interpreted as the little one; when the experimenter pointed to the

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medium and small stimulus and asked which the big one was, the medium one had to be interpreted as the big one. Such a switch required flexible interpretation of the medium stimulus, and at the same time, the non paired big or little stimuli on each trial was a source of potential interference. On any of the interference trials when the child failed to make a switch the first time, the experimenter would give verbal feedback and repeat the question one more time (e.g., “No, no, not that one. Which one of these two is the big one?”) to make sure that the child was focusing on the two stimuli the experimenter was pointing at.

For half of the trial sets, non-interference trials were presented before the interference ones, and for the other half of the trial sets, this order was reversed. Half of the children were tested with borders added to the two target stimuli in each trial (see Figure 3). The relations between (a) trial order and (b) condition order were counterbalanced between subjects across children’s two age groups.

3.1.4 Procedure

Each child was tested individually by a female experimenter in a single video-taped session lasting approximately 15 minutes.

3.1.4.1 Warm-up trials

Each trial set began with two warm-up trials, to verify children’s understanding of the conceptual meanings of BIG and LITTLE with respect to each stimulus type. On warm-up trials, only two stimuli of a same type were presented (e.g., a smaller star and a larger one), and children were asked: “Can you show me which ____ (e.g., star) is the big one?” If the child was correct, the experimenter pointed at the two stimuli again and asked: “Can you show me which star is the little one?” If the child’s answers were both correct, the experimenter proceeded to the test trials

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within that set, saying, “That's right. Now let's begin to play a game. In this game you are the one who is going to tell me something that I am not sure of.” If children failed to answer these basic questions correctly, the experimenter proceeded to the next trial set.

3.1.4.2 Test trials

Each child received three different types of test trial within each of the 12 trial sets: non-interference, interference, and switch trials. For each test trial, the experimenter showed children three stimuli of the type used in the corresponding warm-up trials, pointed with her finger at two of the three stimuli, and asked children a question. Children were told to use their finger to point at the correct one and to answer verbally. In an example where a non-interference trial was presented first, the experimenter pointed with her finger at two of the three stimuli (e.g., the big one and the medium one), and said to the child: “Which one of these two stars is the big one?”. The child was then expected to point at the big one as the correct one. Then, on the interference trial, the experimenter pointed again at the same two stimuli and asked, “Which one of these two stars is the little one?”. The child was then expected to point the medium one as the correct one. Finally, on the switch trial, the experimenter pointed to the medium one and the small one, and asked, “Which one of these is the big one?”. The experimenter's pointing remained visible throughout each trial, and if the child pointed at the third, remaining stimulus (i.e., not one of the two indicated by the experimenter), the experimenter would give verbal feedback: “No, no, not that one. Which one of THESE TWO (emphasizing verbally) is the little one?”. If the child still pointed at the remaining one, the experimenter proceeded to the next trial. The trials were not timed. The child was given enough time to respond.

3.2 Results

Successful performance on the warm-up trials was treated as a criterion for inclusion in the analysis of test trials. There were two warm-up trials in each of 12 trial sets, and the child was required to pass both warm-up trials in all trials set in order to meet the criterion. Only one child (a 37-month-old boy) failed to reach the criterion (he failed 7 pairs of warm-up trials on all 12 trial sets), and this child was replaced.

In contrast to Exp. 1, which involved fewer trials, most children were not either consistently correct or consistently incorrect on all trials, so the primary dependent measure for the test phase was the mean number of correct responses on the interference, non-interference, and switch trials.

3.2.1 Analysis

Preliminary analyses failed to reveal any effects of sex, condition order (interference or non-interference questions presented first), stimulus types, trial orders, and spatial configuration on children's performance, so data were collapsed across these variables and analyzed together. A 3 (trial type: non-interference, interference, switch) x 2 (age: younger [3.00 – 3.40 years old], older [3.50 – 3.90 years old]) x 2 (border type: without border, with border) split-plot design ANOVA was computed (see Table 3). A Greenhouse-Geisser correction was used for effects involving trial type because the sphericity assumption was violated ($p = .03$). First, there was a significant main effect of trial type, $F(1.84, 142) = 52.79$, $p < .001$, Partial $\eta^2 = .40$, showing that children performed better on the non-interference trials ($M = 11.42$, $SD = .16$, 95% CI : 11.10 – 11.72) than both interference ($M = 8.42$, $SD = .32$, 95% CI : 7.78 – 9.07) and switch ($M = 8.67$,

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$SD = .32$, 95% CI : 8.05 – 9.33) trials, with both pair-wise comparisons reaching significance using Bonferroni adjustment ($p < .001$). Second, there was a significant main effect of age, $F(1, 81) = 30.77$, $p < .001$, Partial $\eta^2 = .28$, indicating that older children ($M = 10.66$, $SD = .31$, 95% CI : 9.79 – 11.54) performed better than younger children ($M = 8.36$, $SD = .28$, 95% CI : 6.42 – 8.08). Third, there was also a significant main effect of border type, $F(1, 81) = 7.06$, $p < .01$, Partial $\eta^2 = .08$, indicating that children performed better with borders ($M = 10.06$, $SD = .28$, 95% CI : 9.50 – 10.62) than without borders ($M = 8.96$, $SD = .30$, 95% CI : 8.36 – 9.56). These main effects were qualified by two interactions involving age. First, there was an Age x Trial type interaction, $F(1.84, 146) = 15.65$, $p < .001$, Partial $\eta^2 = .17$, showing that younger children performed significantly better on non-interference ($M = 11.30$, $SD = .21$, 95% CI : 10.89 – 11.72) than both interference ($M = 6.85$, $SD = .43$, 95% CI : 6.00 – 7.70) and switch trials ($M = 6.93$, $SD = .43$, 95% CI : 6.08 – 7.78) but that older children performed equally well in all these three types of trials (see 95% confidence intervals). Second, there was also an Age x Border type interaction, $F(1, 139) = 7.29$, $p < .01$, Partial $\eta^2 = .09$, showing that younger children performed better with a border ($M = 9.47$, $SD = .36$, 95% CI : 8.76 – 10.18) than without a border ($M = 7.25$, $SD = .42$, 95% CI : 6.42 – 8.08) but that older children did not (see 95% confidence intervals).

Finally, all errors involved pointing to the third, remaining stimulus (i.e., not one of the two indicated by the experimenter), so the effect of verbal feedback on children's performance was examined by comparing the mean number correct before and after children were provided with feedback on the interference and switch trials (see Table 4 and Figure 5). Separate ANOVAs (Age x Border type x Feedback (before vs. after feedback) were conducted for interference trials and for switch trials. On interference trials, there was a significant main effect of feedback, $F(1, 228.62) = 98.35$, $p < .001$, Partial $\eta^2 = .55$, showing that children performed

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much better after verbal feedback ($M = 11.82$, $SD = 1.07$, 95% CI : 11.57 -12.04) than before ($M = 9.42$, $SD = 2.51$, 95% CI : 8.92 – 9.93). There was also a significant main effect of feedback on switch trials, $F(1, 475.28) = 110.91$, $p < .001$, Partial $\eta^2 = .58$; (after verbal feedback, $M = 11.69$, $SD = 1.68$, 95% CI : 11.30 -12.04, vs. before verbal feedback, $M = 8.18$, $SD = 3.38$, 95% CI : 7.58 – 8.90).

3.3 Discussion

Experiment 2 was designed to examine whether the pattern of results obtained in Experiment 1 would also be found when flexible adjective interpretation was assessed using adjectives with other forms of interpretive ambiguity. Whereas the ambiguity in interpreting *big* and *little* in Experiment 1 relied on the distinction between basic level and superordinate contexts, in Experiment 2 the ambiguity arose from the fact that a single stimulus could be interpreted as either *big* or *little* depending on the comparison set. Results of both the warm-up and test trials first verified that even the younger children were able to understand the conceptual meanings of BIG and LITTLE. When the ambiguous stimulus (the medium sized one) became the switching target in both the interference and switch conditions, however, children had to interpret this single stimulus as BIG in one sense (e.g., in relation to the small stimulus) and then as LITTLE in another sense (e.g., in relation to the big stimulus). Results of the interference and switch trials were consistent with the findings from Experiment 1. This again reveals an age-related improvement in flexible adjective interpretation during the preschool years. The large majority of the younger children failed to respond flexibly, although they performed better when stimuli were accompanied by borders excluding the interfering alternative. In contrast to the age-related improvements observed when stimuli were presented without borders, children who were

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tested with borders were generally successful. For older children, the linguistic cues given to the children were more likely to be sufficient to cue the appropriate interpretation, or to indicate that the problem has changed (cf. Alibali, Phillips, & Fischer, 2009; Deák, 2000).

When children responded incorrectly by pointing to the third, irrelevant stimulus on their first try on an interference or switch trial, the verbal feedback given by the experimenter (e.g., “No, no, not that one. Which one of these two is the big one?”) had made it possible for the children to focus on the two stimuli only, and thus their performance was greatly improved. The verbal feedback may have helped direct children’s attention to the relevant stimuli, or it may simply have prompted children to make a different selection. The latter interpretation is consistent with the results of Bohlmann and Fenson (2005), who found that corrective feedback helped children to switch flexibly on the DCCS, but these same children subsequently perseverated when the task was readministrated (using different shapes and colors).

4 General Discussion

Understanding adjectives provides a window on children’s developing sensitivity to different interpretive contexts, as well as their developing ability to switch flexibly between multiple interpretations. Research on children’s understanding of *big* and *little* has revealed that even children as young as 2 years of age interpret adjectives differently depending on the interpretive context (e.g., Ebeling & Gelman, 1988, 1994; Sera & Smith, 1987)—a finding that Ebeling and Gelman (1994) interpreted as evidence of flexible switching. This demonstration of flexibility is surprising in light of a large body of research indicating that preschool age (and older) children often perseverate in representing objects in a particular way despite explicit instructions to switch (see Zelazo et al., 2008).

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Two experiments were designed to determine more precisely the circumstances in which children at different ages interpret adjectives flexibly. Following Deák (2000; Deák et al., 2002), we considered the possibility that young children's flexible interpretation of adjectives may depend on changes in the stimulus display that effectively eliminate interference from previous trials, obviating the need for cognitive control. In contrast, on the measures of cognitive or representational flexibility on which young preschoolers perseverate (e.g., the appearance-reality task, the Dimensional Change Card Sort, Deák's (2000) Flexible Induction of Meaning task), the change in interpretive context is typically marked only by the presence of linguistic cues.

In Experiment 1, we examined children's ability to switch between interpretations of the adjectives *big* and *little* both when a change in the stimulus set accompanied the transition from one interpretive context to the next (as in Ebeling & Gelman, 1994), and when the stimulus set remained unchanged and the transition from one interpretive context to the next was marked solely by verbal cues. In both cases, children were asked to interpret the adjectives with respect to a basic level kind (e.g., "This is a big marble") and a superordinate level kind (e.g., "This is a little toy"). Consistent with the results obtained by Ebeling and Gelman (1994), even the youngest children tested switched between the two interpretations when the stimulus set changed. This finding confirms that children's adjective interpretations are sensitive to context from a young age. When the stimulus display was held constant, however, children in the younger age group were much more likely than the older children to perseverate on a particular interpretation. In this experiment, the younger children perseverated despite the fact that on all test trials, they were provided with explicit linguistic cues, and despite the fact that the experimenter then demonstrated correct sorting by sorting half of the items himself. This is a novel finding that reveals limitations on young children's flexible adjective interpretation.

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Experiment 2 was designed to examine flexible adjective interpretation further in 3-year-old children. In this experiment, children were tested with three stimuli (presented on a computer screen) that differed in size. The results of the warm-up trials showed that all 3-year-olds understood the basic concepts of BIG and LITTLE. On the non-interference trials, both the older and the younger 3-year-olds performed well. On the interference and switch trials, however, when medium sized stimulus had to be interpreted flexibly, most children at both ages failed to respond correctly, although there was an age-related improvement in performance.

Together with the results of previous research, the results of Experiments 1 and 2 provide converging evidence that even young preschoolers are sensitive to different interpretive contexts. At the same time, however, the current findings also reveal that children's ability to interpret adjectives flexibly undergoes an age-related change between 3 and 5 years and even between the first half and the second half of 3 years, which is analogous to that seen in many other areas of development (e.g., for reviews, see Perner & Lang, 1999; Zelazo et al., 2008). Indeed, the similarity between the current pattern of results and those found in many other areas raise the possibility that there may be a meaningful relation between certain aspects of semantic development—such as those that depend on metalinguistic understanding—and the development of attention and cognitive flexibility more broadly (e.g., Bialystok, 1999; de Villiers & de Villiers, 2000; Gao & Zelazo, 2008; Guajardo, Parker, & Turley-Ames, 2009; Kamawar & Olson, 2000; Ravid & Tolchinsky, 2002; Sharpe & Zelazo, 2002).

In the absence of reflection on the multiple interpretations of an adjective, for example, young children may have difficulty appreciating linguistic cues that the context has changed, just as they have difficulty using explicit verbal instructions to sort bivalent stimuli (cf. Deák, 2000; Gao & Zelazo, 2008). The constant stimulus display would then continue to elicit the same

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adjective interpretation. On this account, young children may (or may not) lack an explicit appreciation of the ambiguity—they may lack the metalinguistic understanding that (for example) a big marble is both “big” as a marble and “little” as a toy, even if they were able to appreciate each interpretation in turn when those interpretations were elicited by different stimulus displays. Future research might usefully assess meta-linguistic understanding directly.

Experiment 2 also revealed that children performed better when the relevant items were highlighted by black borders. Presumably, the non-relevant third stimulus in the interference trials of Experiment 2 distracted the children from comparing only two of the stimuli in question. This result might be predicted from any information-processing perspective (in which cues that scaffold children's selective attention and reduce interference from competing items will aid performance), but they further demonstrate the way in which adjective interpretation depends on more general aspects of attention and attentional control.

Although 3-year-olds are more likely to switch interpretations when there is a change in the physical context, this does not imply a saltatory developmental change from no flexible understanding to complete understanding. Rather, children's developing linguistic and meta-linguistic understanding likely interacts with their developing attentional control and flexibility and likely depends on the degree to which understanding is scaffolded by the situation. Deák and Maratsos (1998), for example, found that even 3-year-olds readily provided alternate names for objects (e.g., *dog* and *puppet*) when cued by sensible verbal prompts. These and other relevant findings suggest a more graded and task-specific transition to being able to use purely verbal cues to flexibly update representations.

It should be noted that even after receiving explicit verbal feedback, the younger children who failed to make switches in the first one or two sets of trials continued to make many errors

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on the later trials. It is possible that the limitations on their cognitive flexibility are rather severe, but it is also possible that children may not yet appreciate the relative significance of different inter- and intra-sentential cues to meanings, and therefore make errors of scope. As Deak (2003) notes, it is the integration of multiple linguistic and non-linguistic cues that preschoolers seem to be working out. Future research might usefully examine a broader range of linguistic cues, such as verbal instructions, corrective feedback, positive feedback, and explicit emphasis with tone changes, as well as the characteristics of incremental learning (Bransford, 2000) in relation to children's developmental stages of consciousness and capability in processing new information based on previously acquired information.

Children have a high ability in drawing inferences about other cases from one instance. Understanding the conceptual meanings of certain lexical terms such as *big* and *little* is an important part of early language development. The development of such concepts can only occur with the support of cognitive development. Therefore, we would not claim that the children in this study showed or failed to show a purely linguistic ability, nor would we claim that their proved ability in the successful switching is a by-product of improved cognitive flexibility. Language and cognitive abilities are in this case observed as being integrated, one supporting the other.

Although more research will be required in order to test predictions derived from particular theoretical accounts, it seems useful to consider adjective interpretation in the context of broader changes in cognitive flexibility. Moreover, it is clear from the current experiments that any adequate account of children's adjective interpretation will need to capture at least two things: evidence of early context sensitivity and evidence of age-related changes in the ability to switch flexibly between incompatible interpretations of a single stimulus display. This might be

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true to other adjective pairs (e.g., *high* and *low*, *wide* and *narrow*, etc.) that may have the similar flexible interpretations due to the contexts, and hence the study of the *big* and *little* phenomenon is of more general interest.

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Table 1

Stimuli Used in Experiment 1

Set		Size and Color	
The first set	Big TOYS	Waternoodles	Big 115 cm x 10 cm (diameter); Green
			*Little 102cm x 6.5 cm (diameter); Orange
		Hockey	Big 107 cm x 20 cm; Blue with some black
		Sticks	*Little 100 cm x 14 cm; Black with some purple
	Little TOYS	Crayon	*Big 10 cm x 1.3 cm (diameter); Brown
			Little 9 cm x 0.7 cm (diameter); Grey
		Marbles	*Big 3.2 cm (diameter); Yellow
			Little 1.3 cm (diameter); White
The second set	Big TOYS	Baseball Bats	Big 70 cm x 10 cm (max diameter); Red
			*Little 64 cm x 5 cm (max diameter); Beige
		Golf Clubs	Big 66 cm x 12 cm (head); Bluish green
			*Little 61 cm x 9 cm (head); Purple/Orange
	Little TOYS	Chalks	*Big 11 cm x 2.3 cm (diameter); Yellow
			Little 8 cm x 0.9 cm (diameter); Light blue
		Jacks	*Big 4 cm (diameter); Blue
			Little 2.3 cm (diameter); Pink

Note. Items marked with an asterisk are “conflict” items in that they are big under one interpretation but little under the other.

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Table 2

Number (and Percentage) of Children Who Did or Did Not Interpret the Adjectives *Big* and

Little Flexibly in Experiment 1, by Age Group ($N = 48$)

Age Group	Sub-age Group	Switched	Did Not Switch	Total
Younger (Mean=47.8; 38.5-53.9 months)	Mean=41.8; 38.5-42.0	0(0%)	11(46%)	24 (100%)
	Mean=48.0; 43.7-48.3	1(4%)	5(21%)	
	Mean=53.7; 50.8-53.9	5 (21%)	2(8%)	
Older (Mean=63.7; 54.1-78.4 months)	Mean=54.5; 54.1-60.4	6(25%)	4 (17%)	24 (100%)
	Mean=62.9; 61.5-65.8	9(37%)	0(0%)	
	Mean= 73.7; 66.6-78.4	5(21%)	0(0%)	
Total		26 (54%)	22 (46%)	48 (100%)

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Table 3

Mean Numbers (and Standard Deviations) of Correct Responses (out of 12) in Experiment 2, by

Age Group (Younger Group, $N = 47$; Older Group, $N = 36$)

Trial Age group	All (Mean=40.8; 36-47 months)	Younger (Mean= 37.5; 36-41 months)	Older (Mean=45.0; 42-47 months)
Non-interference	11.42 (0.16)	11.30 (0.21)	$p > .001$
Interference	8.42 (0.32)	6.85 (0.43)	$p > .001$
Switch	8.67 (0.32)	6.93 (0.43)	$p > .001$
Without Borders	8.96 (0.30)	7.25 (0.42)	$p > .01$
With Borders	10.06 (0.28)	9.47 (0.36)	$p > .01$
All	-	8.36 (0.28)	10.66 (0.31)

FLEXIBLE INTERPRETATION OF ADJECTIVES

Table 4

Mean Numbers (and Standard Deviations) of Correct Responses (out of 12) with the effect of verbal feedback in Experiment 2, by Age Group (Younger Group, $N = 47$; Older Group, $N = 36$)

Age Group	Non-interference		Interference		Switch	
	Before	After	Before	After	Before	After
	verbal feedback	verbal feedback	verbal feedback	verbal feedback	verbal feedback	verbal feedback
Younger (Mean= 37.5; 36-41 months)	11.23 (1.62)	12.02 (0.15)	8.81 (2.51)	11.77 (1.15)	7.06 (3.64)	11.55 (2.05)
Older (Mean=45.0; 42-47 months)	11.25 (2.22)	12.14 (1.12)	10.22 (2.31)	11.89 (0.98)	9.64 (2.33)	11.86 (1.02)
Total	11.24 (1.89)	12.07 (0.68)	9.42 (2.51)	11.82 (1.07)	8.18 (3.38)	11.69 (1.68)

FLEXIBLE INTERPRETATION OF ADJECTIVES

Figure Captions

Figure 1. Example of two consecutive stimulus-change phase trials in Experiment 1.

Note that on trial A, the little hockey stick should be placed on the *little* side, whereas on the next trial, A', it should be placed on the *big* side.

Figure 2. An illustration of the stimulus sets. Asterisks denote “conflict” items, whose correct positions change from one sort to the other.

Figure 3. Stimuli used and different presentation types in Experiment 2. The “LO” and “BO” at the right hand side corner of the photo indicate the s of questions given to the child on the particular trials (e.g., “LO” indicates that the question should be “Which one of the two stars is the little one?” and “BO” indicates the question should be “Which one of the two flowers is the big one?”)

Figure 4. Scatter plot of the number of children who did or did not interpret the adjectives Big and Little flexibly in Experiment 1 as shown in Table 2.

Figure 5. Scatter plot of the mean numbers of correct responses (out of 12) with the effect of verbal feedback in Experiment 2, by age group (Younger Group, M = 37.5, N = 47; Older Group, M = 45, N = 36) as shown in Table 4.

FLEXIBLE INTERPRETATION OF ADJECTIVES

Figure 1

Figure 2

FLEXIBLE INTERPRETATION OF ADJECTIVES

Figure 3

FLEXIBLE INTERPRETATION OF ADJECTIVES

Figure 4

FLEXIBLE INTERPRETATION OF ADJECTIVES

Figure 5