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Thinking in Categories or Along a Continuum: Consequences for Children's Social Judgments

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Can young children, forming expectations about the social world, capture differences among people without falling into the pitfalls of categorization? Categorization often leads to exaggerating differences between groups and minimizing differences within groups, resulting in stereotyping. Six studies with 4-year-old children (N = 214) characterized schematic faces or photographs as falling along a continuum (*really mean* to *really nice*) or divided into categories (*mean* vs. *nice*). Using materials that children naturally group into categories (Study 3), the continuum framing prevented the signature pattern of categorization for similarity judgments (Study 1), inferences about behavior and deservingness (Studies 2 and 5), personal liking and play preferences (Study 4), and stable and internal attributions for behavior (Study 6). When children recognize people as members of continua, they may avoid stereotypes.

> There may be said to be two classes of people in the world; those who constantly divide the people of the world into two classes, and those who do not. (Robert Benchley, 1921, p. 187)

Many dimensions that we consider on a daily basis can be looked at in one of two ways. On the regular, everyday level, dimensions may seem dichotomous or categorical but, upon closer consideration, are often actually continuous (Gonzales, Zosuls, & Ruble, 2010; Quellar, Schell, & Mason, 2006; Zerubavel, 1996). Conceptualizing properties as clustered into categories or as spread out along a full continuum may have implications for the expectations we form and the judgments we make. The goal of this research is to examine the effects of imposing an explicit continuum on social dimensions with preschool children who are first forming their expectations about the social world.

Categorization has many well-explored and well-documented consequences. These consequences can be traced to a particular pattern of inferences associated with categorization, characterized by the exaggeration of differences *between* categories and the exaggeration of similarity *within* categories (Goldstone, Lippa, & Shiffrin, 2001; Rothbart & Taylor, 1992). While categorization has many benefits, this pattern of inferences is also responsible for many undesirable consequences, especially in the social domain, where the inferences driven by categorization can result in stereotyping and prejudice (Allport, 1954). In contrast, conceptualizing social properties or traits as falling on a continuum may help prevent these categorical distortions. By depicting a continuum, even for a dimension with a perceptually salient midpoint, can we prevent the signature pattern of inferences from categorization?

Consequences of Categorization

We turn now to laying out in more detail the consequences of categorization. Categorization has well-known benefits for organizing information in economical, coherent, and powerful ways, thereby supporting inductive inferences (Allport, 1954). However, as noted, it may also result in a loss or distortion of information. One important consequence of categorization is that category boundaries tend to be perceived as stronger than they objectively are, while differences within categories tend to be perceived as smaller than they actually are (Goldstone et al., 2001; Rothbart & Taylor, 1992).

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In the social domain, research on categorization has examined these effects using several types of judgments, including judgments of similarity, inductive inferences, and interpersonal attitudes and behavior (Billig & Tajfel, 1973; Goldstone et al., 2001; McGarty & Turner, 1992; Tajfel, Billig, Bundy, & Flament, 1971; Taylor, Fiske, Etcoff, & Ruderman, 1978; ter Doest, Semin, & Sherman, 2002; Walton & Banaji, 2004). These effects of social categorization are seen even among children (Bigler, Jones, & Lobliner, 1997; Gelman & Heyman, 1999; Heyman & Gelman, 1999; Levy & Dweck, 1999), and the next sections will describe previous research on each of these effects.

Similarity Judgments

Overall, people tend to assume, at least for natural kinds, that categories reflect some underlying property that causes members of each category to be alike (Gelman, 2003), leading to judgments of increased similarity within categories, and decreased similarity between categories (Goldstone et al., 2001; Krueger & DiDonato, 2008; McGarty & Turner, 1992). Previous experiments have shown that the act of placing objects (such as faces) into the same or different categories causes changes in similarity ratings (Barsalou, 1982; Goldstone et al., 2001). These effects are also seen in children's social judgments. For example, when teachers highlighted groups based on t-shirt color during classroom activities, elementary school children perceived less similarity between groups and more similarity within groups (Bigler et al., 1997). Similarly, sixth-graders who believed that personalities were fixed and who categorized other people in rigid ways also perceived greater between-group differences and within-group similarity (Levy & Dweck, 1999). These effects on similarity judgments may be driven, at least in part, by category labels (Sloutsky & Lo, 1999).

Inductive Inferences

When we assume that category members share an underlying similarity, features and behaviors of one category member are often assumed to be true of other members of that category as well (Birnbaum, Deeb, Segall, Ben-Eliyahu, & Diesendruck, 2010; Diesendruck & haLevi, 2006; Rothbart & Taylor, 1992). Indeed, a category label can outweigh perceptual similarity when children are making inductive inferences (e.g., Gelman & Markman, 1986). Previous research has also shown that different ways of using language (either to categorize or to describe behavior) can affect conceptualization and thus affect inferences about factors such as immutability. For example, people can be described in terms of noun labels such as ''She is a *carrot-eater*'' or verbal predicates such as ''She *eats carrots whenever she can*'' (Gelman & Heyman, 1999). The noun label establishes the category ''*carrot-eater*'' (in contrast to the category ''*not a carrot-eater*''), while the predicate ''*eats carrots whenever she can*'' perhaps places individuals along an implicit continuum from rare carrot eating to frequent carrot eating. Children who heard characteristics described by a category label inferred that those characteristics were more stable over time and across different contexts than the characteristics described by a predicate (Gelman & Heyman, 1999; see also Carnaghi et al., 2008; Reynaert & Gelman, 2007; Walton & Banaji, 2004). Thus, using nouns to group people into categories can strengthen the inferences that people are willing to make about that characteristic, leading them to believe that traits are less likely to change.

While nouns are highly likely to lead to strong inferences, adjectives can also lead to strong inductive inferences if they imply stable traits (ter Doest et al., 2002). Even young children are able to use trait adjectives (such as *nice* and *mean*) to make a variety of inferences about individuals' motives and beliefs about the outcomes of behavior (Heyman & Gelman, 1999).

Interpersonal Attitudes and Behavior

Finally, the signature pattern of categorization goes beyond inferences about properties to affect individuals' interpersonal attitudes and behavior toward other groups, including stereotyping and prejudiced behavior (Bigler & Liben, 2007; McGarty & Turner, 1992; Rothbart & Taylor, 1992; Taylor et al., 1978). Research on minimal groups has found that the simple act of categorizing people into groups, even on the basis of an arbitrary dimension, frequently leads to in-group favoritism and out-group discrimination (Billig & Tajfel, 1973; Tajfel et al., 1971; Zerubavel, 1996). Category labels may reinforce the belief that these groups are real and distinct, serving to heighten unfair treatment of others.

Several studies have linked social categorization to stereotyping and discrimination even among children. For example, when teachers made functional use of groups based on t-shirt color during classroom activities, 4-year-old children were more likely to prefer members of their own group to

members of the other group (Patterson & Bigler, 2006). Children also use limited information (such as whether someone is lucky or unlucky) in forming preferences, and extend those preferences to people who share an arbitrary grouping (again, such as t-shirt color) with a lucky or unlucky person (Olson, Banaji, Dweck, & Spelke, 2006). Similarly, sixth-grade students who categorized others rigidly were also more likely to stereotype and make generalizations about unfamiliar children based solely on group membership (Levy & Dweck, 1999). These effects even extended to their willingness to interact with another group. Thus, when children hear people described as fitting into categories, they may use that information as the basis for forming stereotypes and developing feelings of prejudice.

Effects of Noncategorical Frameworks

While much research has examined the effects of categorization, less research has examined other ways of conceptualizing group membership. In particular, less research has explicitly contrasted categories with a continuum. Why might a continuum prevent categorical distortions? Both the use of categories and the use of a continuum may highlight differences and define a dimension on which people can be discriminated (indeed, a continuum may also be evaluative in that it may be used to rank order people). However, the continuum emphasizes differences based on degree, rather than kind, and thereby allows finer-grained distinctions to be preserved. Framing a dimension as a continuum may also help strengthen the process of individuation. When viewed as falling along a continuum, individuals may more easily be recognized as possessing differentiated characteristics, rather than being grouped together and categorized as ''the same'' (Katz & Zalk, 1978; Wilder, 1978). That is, individuals on a continuum may appear more distinct from each other, allowing the perceiver to judge each person more as an individual rather than using stereotypes about that individual's group to make judgments. Some earlier studies suggest that even an implicit or unemphasized continuum may help to prevent the effects of categorization (Ensari & Miller, 2001; Gelman & Heyman, 1999; Gonzales et al., 2010). However, it is important to systematically contrast categories with a more explicit continuum.

One study with adults has used an explicit continuum, in the form of numerical scores to represent degrees of political conservatism. Rothbart, Davis-Stitt, and Hill (1997) examined the effects of imposing category labels (''conservative,'' ''moderate conservative,'' ''moderate liberal,'' and ''liberal'') onto a numerical continuum of political conservatism to liberalism for well-known celebrities. Some participants made judgments based on an undivided numerical continuum, while others made judgments with the continuum divided into categories. When the continuum was divided into discrete categories, celebrities who fell into the same category were rated as more similar, and celebrities from different sides of a category boundary were rated as more different, compared to ratings based on an undivided continuum. The results of that study showed that for adults, utilizing a numerical continuum for a trait instead of categories helped prevent distortions due to categorization. However, the continuum in that study used numerical scores, which created a situation that was extremely overt and unambiguous. In the real world, social situations involving precise numerical continua are uncommon. It remains an open question to explore whether non-numeric continua also help prevent the signature effects of categorization.

Thus, although the effects of categorization are well documented, the effects of imposing a clear continuum on social dimensions have yet to be fully explored, especially in children. We focus on young children because they are in the process of actively creating theories about how the social world is organized (Cameron, Alvarez, Ruble, & Fuligni, 2001; Hilliard & Liben, 2010). As they begin to divide the people around them into social categories, they then become susceptible to forming stereotypes and biases about the members of those categories (Bigler & Liben, 2007). In many cases, these stereotypes can have profound effects on their expectations (of themselves and others) and their behavior (Patterson & Bigler, 2006; Rhodes & Brickman, 2008). For example, when gender categories were made more salient, preschool children showed an increase in gender stereotypes and a decrease in willingness to play with children of the opposite gender (Hilliard & Liben, 2010). If the continuum framing can prevent young children from forming these stereotypes in the first place, then this framing may have many benefits for their interactions with others in the years to come.

The goal of this research is to begin to explore whether young children are sensitive to these category or continuum framings in the social dimension of nice versus mean. We first explore how the framings influence children's judgments about similarity (Study 1) and their inferences about the behavior and deservingness of others (Study 2) using schematic stimuli with a natural ordering

and clear perceptual boundary between the categories. We then examine how children respond to our stimuli in the absence of either framing and find that the continuum condition is responsible for driving our effects and preventing the signature pattern of categorization (Study 3). We then explore how the framings affect children's inferences about their own attitudes toward and willingness to interact with others (Study 4). We establish in a control study that labeling effects alone are not responsible for these findings (Study 5). Finally, we extend these findings to more naturalistic stimuli (lacking in perceptual cues as to ordering or boundaries) to look at how these framings affect children's stable and internal attributions about the motives of novel individuals (Study 6).

Study 1

The goal of Study 1 was to examine how a category versus continuum framing would affect children's assessments about similarities. We used the social dimension ''mean'' to ''nice'' to examine effects on an explicitly social characteristic that young children find important and are familiar with (Cain, Heyman, & Walker, 1997), and we did so by presenting children with a set of schematic faces that varied systematically in the size of the smile and angle of eyebrows (see Figure 1). In making judgments about which ones were most similar to a target, children could choose on the basis of perceptual categories (smiling vs. frowning) or on the basis of closeness along the smiling to frowning dimension. We predicted that children who had heard the individuals described as members of categories would be more likely to choose only same-category members as similar than children who had heard the individuals described as falling along a continuum. We also predicted that compared to children hearing categorical descriptions, children hearing continua descriptions would be more likely to choose individuals immediately adjacent to each other as similar, despite being on opposite sides of the perceptually salient category boundary between smiling and frowning.

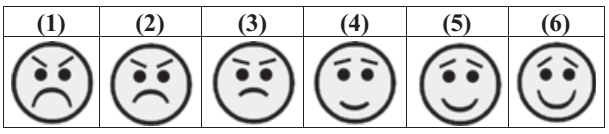

Figure 1. Mean–nice faces, Studies 1–5.
Note. Numbers used in the text are indicated here for reference.

Method

Participants

Participants were forty 4-year-old children at a research nursery school (20 male, 20 female; M_{age} = 4 years 7 months). Twenty were Caucasian, 11 were Asian American, 4 were Latino or Latina, 3 were African American, and 2 were Middle Eastern. Children in all studies attended the same school but did not participate in more than one study. The majority of them came from middle- to upper-middle-class homes. Children were randomly assigned to the category or the continuum condition.

Materials

All children saw the same three sets of pictures (two practice sets and one test set, with the order of practice sets counterbalanced). The two practice sets involved pictures of a tadpole transforming into a frog, and a white square becoming gradually darker. Children heard descriptions of the six items in the practice sets but did not make any judgments about them. Children then heard descriptions of the six items in the test set and answered questions about them. The test set of pictures involved faces that began with a large frown and transformed gradually to a large smile (see Figure 1), with angled eyebrows to enhance and distinguish ''niceness'' and ''meanness'' (Ekman, 2003). Thus, both mouths and eyebrows changed direction at the halfway point, creating a perceptual boundary.

Procedure

All children saw the same sets of six pictures, but children in different conditions heard different descriptions. To ensure that they registered the descriptions, we first described the dimension in general terms and then pointed to and described each individual picture. To begin with, children in the category condition heard categorical descriptions of the practice sets (e.g., ''tadpole,'' ''tadpole,'' ''tadpole,'' ''frog,'' ''frog,'' ''frog''). After two practice sets, they saw the test set of pictures and heard,

> Some people are mean, some people are nice. Some are mean, some are nice. [Pointing to each picture.] This is one that's mean. This is another one that's mean. This is another one that's mean. This is one that's nice. This is another one that's nice. This is another one that's nice.

In contrast, children in the continuum condition heard continuous descriptions of the practice sets

(e.g., ''little baby tadpole,'' ''grown a little more,'' ''grown a little more,'' ''grown a little more,'' ''grown a little more,'' ''full-grown frog''). Thereafter, they heard the test set of pictures described on a continuum:

> Some people are really mean, some are a little nicer, some are a little nicer, some are a little nicer, and some people are really nice. [Pointing to each picture.] This is one that's really mean. This is one that's a little nicer. This is one that's a little nicer. This is one that's a little nicer. This is one that's a little nicer. This is one that's really nice.

Children's descriptions. Children were then shown the endpoint pictures and the pictures on either side of the perceptual boundary (in other words, #1, #3, #4, and #6; see Figure 1 for correspondence between numbers and pictures) one at a time, and asked to describe each of the four target pictures (''Tell me about this one''). This served as a manipulation check. If children gave descriptions consistent with those they had just heard (e.g., ''nice'' or ''mean'' in the category condition and ''a little nicer'' or ''really mean'' in the continuum condition), we could conclude that children had successfully registered the different descriptions in each condition.

Similarity. Finally, the similarity rating involved the two pictures flanking the perceptual ''category boundary'' (the target pictures, i.e., positions #3 and #4 in the set of six pictures). For each of the two target pictures, we asked children, ''Can you show me another one like this one? And can you show me *another* one like this?'' so that each child selected two pictures as most similar to each target picture. We could then examine whether their similarity choices appeared to be driven by category boundaries (i.e., two positions away from the target but within the same perceptual category) or by relative positions along a continuum (i.e., next to each other).

This type of concrete similarity task is easier for preschool-aged children than a more abstract rating scale (see also Sloutsky & Lo, 1999; Smith, Jones, & Landau, 1996), and may be less prone to task demands than a rating scale (Goldstone et al., 2001).

Results

As expected, the continuum framework affected children's descriptions and led to fewer same-category similarity choices. (In all analyses, there were no significant effects of gender or counterbalancing order except where noted.)

Descriptions

In the manipulation check, the descriptions for each item were coded as to whether they were *category labels* (e.g., ''nice,'' ''mean,'' ''angry'') or whether they were *continuum labels* modified with an adjective as if on a continuum (e.g., ''really nice,'' ''a little nicer,'' ''very mean''). Category labels were significantly more likely to be given by children in the category condition ($M = 3.10$ of 4, $SD = 1.37$) than children in the continuum condition ($M = 1.00$, $SD = 1.30$), $t(38) = -4.97$, $p < .001$. Similarly, continuum labels were significantly more likely to be given by children in the continuum condition ($M = 2.50$, $SD = 1.50$) than children in the category condition ($M = 0.30$, $SD = 0.92$), $t(38) = 5.57$, $p < .001$. This suggests that our manipulation was effective, and that children in each condition registered the descriptions they heard.

Similarity Ratings

The similarity choices were coded based on the pair of individuals chosen as similar to each target picture. We analyzed whether the children picked two individuals that remained within the ''category'' (as defined by the smilers or frowners: #1 and #2 as similar to #3, and #5 and #6 as similar to #4) or whether the children picked the two individuals on either side of the target picture (#2 and #4 as similar to #3, and #3 and #5 as similar to #4), thus crossing the perceptual boundary in choosing a similar one. We analyzed these data in terms of the number of children in each condition who selected same-category pairs for both targets (see Figure 1 for the correspondence between numbers and pictures).

As predicted, children in the category condition were significantly more likely to choose only same-category pairs (category condition: 19 of 20 children; continuum condition: 10 of 20), according to a chi-square test with continuity correction, $\chi^2(1, N = 40) = 8.03$, $p = .005$. Alternatively, an analysis based on whether children selected at least one pair of adjacent individuals also yielded a significant effect, $\chi^2(1, N = 40) = 5.16$, $p = .023$ (category condition: 1 of 20; continuum condition: 8 of 20). This suggests that the category and continuum framings affected the way children saw similarities between the pictures.

In a pilot study with $N = 40$, we also found the same pattern of results for same-category pair choices with other social stimuli, happy to sad faces (similar to the nice to mean stimuli, but without eyebrows) and drawings of children to grown-ups, indicating that this effect is not limited to the

particular stimuli used in these studies; for happy to sad (category condition 11 of 20, continuum condition 2 of 20), $\chi^2(1, N = 40) = 7.29$, $p = .007$; for child to adult (category condition: 5 of 20), continuum condition: 0 of 20), $\chi^2(1, N = 40) = 3.67$, $p = .056$.

Analyses of Potential Labeling Effects

It is worth noting that our procedure involved giving children a categorical or continuum framework while explicitly pointing to and labeling each picture individually. In the category condition, children were given one label for pictures #1–#3 and a different label for pictures #4–#6, while children in the continuum condition were given identical labels for pictures #2–#5. Thus, the effects on similarity judgments may be due to the general frameworks (as we argue) or the labeling of specific locations along the dimension. Therefore, we examined whether similarity of the labels that children heard might have affected their responses. Specifically, children in the continuum condition were given labels that were more similar for #4 and #6 (''a little nicer'' and ''really nice'') and less similar for #1 and #3 (''really mean'' and ''a little nicer''). Were children in the continuum condition more likely to choose same-category members as similar when the *labels* were more similar?

In support of our framework explanation, it was not the case that greater similarity in labels led children in the continuum condition to choose more same-category members as similar. Indeed, there was a marginal effect in the opposite direction (same-category choices for #4: 11 of 20 children in the continuum condition; same-category choices for #3: 15 of 20 children in the continuum condition), $\chi^2(1, N = 20) = 3.30$, $p = .069$. This suggests that within the continuum condition, there was no evidence of labeling effects on children's similarity judgments (see Studies 2, 4, and 5 for further discussion of this issue).

Discussion

As expected, leading children to conceptualize people either as falling along a continuum or divided into categories affected the similarities that children saw between the individuals. As predicted, children who viewed the individuals as members of categories were more likely than children in the continuum condition to choose category members as most similar to each other (almost always selecting an individual two steps away as similar instead of crossing the category boundary to select an adjacent individual). In contrast, children who saw the individuals as falling along a continuum were more likely than those in the category condition (and, as we will see, more likely than those in a no-label baseline comparison group in Study 3) to choose adjacent individuals as most similar. This occurred despite the fact that children in the continuum condition had to cross a perceptually salient boundary in which the mouth (and eyebrows) changed from a smile to a frown. These results suggest that children were thinking about the individuals in different ways, depending on the framing that they heard.

Study 2

It is one thing to make overall similarity judgments, but it is another thing to make overt assumptions about specific behaviors or attributes that other people might have. In Study 2, we wondered whether category or continuum descriptions of nice versus mean characters would affect children's judgments of how likely each character would be to share and to hit. We also examined children's inferences about deservingness, in terms of how many presents each character should get. Considering our previous findings, would children in the continuum condition make inferences about behavior and deservingness governed more by adjacencies along the continuum and less by perceptual groupings?

Method

Participants

Participants were forty 4-year-old children (20 male, 20 female; M_{age} = 4 years 5 months). Twenty-one were Caucasian; nine were Asian American; six were African American; two were Latino or Latina; and two were Native American. Children were randomly assigned to either the category or continuum condition.

Materials and Procedure

The practice sets (tadpoles to frogs; light to dark squares) and the test set of mean versus nice pictures were the same as those used in Study 1. The procedure was also similar to that of Study 1, and children heard the pictures described using either categorical or continuous descriptions.

Children's descriptions. As in Study 1, children gave open-ended descriptions of the four target pictures as a manipulation check.

Inferences about behavior. Children were then shown the endpoint pictures and the pictures on either side of the category boundary (in other words, #1, #3, #4, and #6) one at a time, and were asked, ''Some children share. Would this one share? [Yes or no?]'' Depending on the child's answer, this was followed by: ''How much would this one share [not share], just a little bit, kind of, or a lot?'' This created a 6-point scale. The same procedure was followed with questions about hitting, and the order of the share and hit questions was counterbalanced.

Inferences about deservingness. Finally, children were shown the same four target pictures used above one at a time, and told, ''We have a bunch of presents for you to give. You can do it any way you want. Should this one get none, one, two, or three presents?'' For each one, children were shown three small individual pictures of a wrapped present. The number of presents selected by the child was placed with each face.

Results

As expected, children in the continuum condition rated larger differences between categories and smaller differences within categories for both behavior and deservingness, compared to children in the category condition.

Children's Descriptions

Once again, as a manipulation check, children in the category condition were more likely to give unqualified category descriptions than children in the continuum condition (category $M = 3.30$, $SD = 1.38$; continuum $M = 0.65$, $SD = 0.75$), $t(38) = -7.56$, $p < .001$, and children in the continuum condition were more likely to give qualified or relative descriptions than children in the category condition (category $M = 0.65$, $SD = 1.27$; continuum $M = 3.15$, $SD = 1.04$), $t(38) = 6.82$, $p < .001$.

There was an effect of gender for continuum descriptions. Across both conditions, males gave more continuum descriptions than females, $t(38) = -1.78$, $p = .04$ (male $M = 2.45$, $SD = 1.61$; female $M = 1.35$, $SD = 1.66$). However, within each gender separately, males and females both showed the predicted main effect of condition ($ps < .01$).

Inferences About Behavior: Judgments of Differences Between and Within Categories

There were no differences between responses to sharing and hitting in this or subsequent studies, so all analyses were collapsed across question type. Our first question was whether children in the continuum condition would infer that individuals from different ''categories'' (the slightly mean character and the slightly nice one; in other words, #3 and #4) would behave more similarly than children in the category condition. Thus, we calculated the difference score between children's ratings for #3 and #4. When inferring how likely each character would be to share or hit, children in the continuum condition showed a significantly smaller difference (compared to children in the category condition) between ratings of the boundary characters, the slightly mean one and slightly nice one, $t(37) = 2.40$, $p = .021$ (category $M = 3.66$, $SD = 1.61$; continuum $M = 2.30$, $SD = 1.90$; see Figure 2a). This suggests that children in the continuum condition were less likely to infer large differences between members of different ''categories.''

We also asked whether children in the continuum condition would show greater differences (compared to children in the category condition) in their inferences about the behavior of characters within the same ''category.'' For this measure, we averaged the difference scores between ratings of the very mean one and the slightly mean one, and the very nice one and the slightly nice one (in other words, we averaged #1 minus #3, and #4 minus #6). Children in the continuum condition showed a significantly greater difference than children in the category condition for inferences about sharing and hitting for within-category individuals, $t(37) = -2.63$, $p = .012$ (category $M = 0.63$, $SD = 0.71$; continuum $M = 1.38$, $SD = 1.01$; see Figure 2a). Thus, children in the continuum condition were more likely to differentiate between members of the same ''category.''

Inferences About Deservingness: Judgments of Differences Between and Within Categories

In terms of between-category differences, the difference between the number of presents given to the slightly mean character and the slightly nice character was marginally smaller for children in the continuum condition than children in the category condition, $t(38) = -1.79$, $p = .082$ (category $M = 1.50$, $SD = 1.43$; continuum $M = 0.80$, $SD = 1.01$; see Figure 2b). Together with the findings for children's inferences, this suggests that children in the continuum condition differentiated less between members of different categories in terms of how many presents each deserved.

To measure within-category differences, we took the average of the difference scores between the

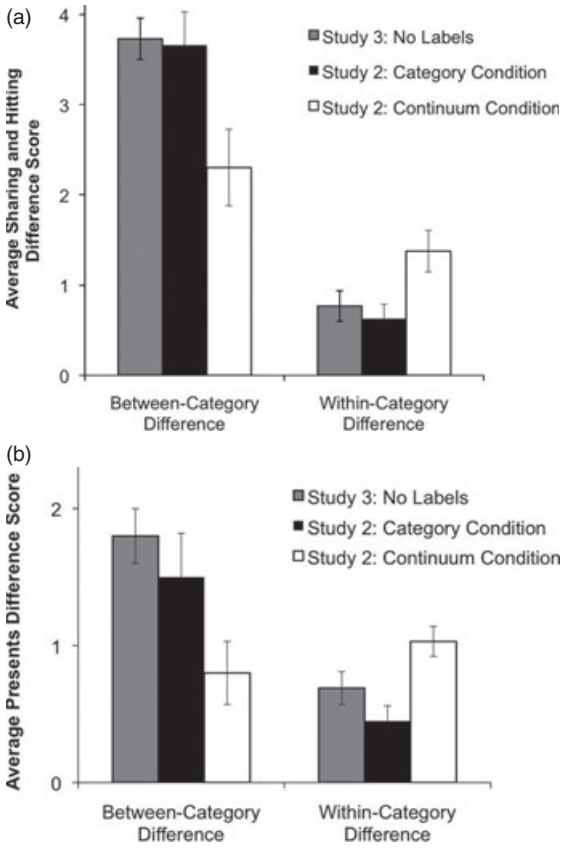

Figure 2. (a) Differences in ''sharing and hitting'' ratings of characters who fell into different categories (between categories) and those who fell within the same category, Studies 2 and 3. (b) Differences in the number of presents given to characters who fell into different categories (between categories) and those who fell within the same category, Studies 2 and 3.

number of presents given to the very mean one and the slightly mean one, and between the very nice one and the slightly nice one. Children in the continuum condition showed a significantly greater difference between the number of presents given to characters within the same category, $t(38) = 3.70$, $p = .001$ (category $M = 0.45$, $SD = 0.51$; continuum $M = 1.03$, $SD = 0.47$), compared to children in the category condition (see Figure 2b). Here too, then, children in the continuum condition were more likely to differentiate among members of the same category, in this case, in terms of how many presents each deserved.

Analyses of Potential Labeling Effects

As in Study 1, we conducted further analyses to argue against the idea that labeling might be responsible for these effects. We first examined difference scores for ratings of sharing and hitting behavior. As expected, there were no differences for children in the continuum condition between the ratings of #4–#6 and #1–#3 (difference for #4–#6: $M = 1.48$, $SD = 1.12$; difference for #1–#3: $M = 1.28$, $SD = 1.30$), paired samples $t(19) = 0.68$, $p = .51$. We also examined difference scores for deservingness in terms of the number of presents given. Again, as expected, there were no differences for children in the continuum condition between differences in the number of presents given to #4–#6 and #1–#3 (difference for #4–#6: $M = 1.15$, $SD = 0.75$; difference for #1–#3: $M = 0.90$, $SD = 0.85$), paired samples $t(19) = 0.87$, $p = .40$. Thus, the differences in labels within the continuum condition did not correspond to differences in children's inferences about the behavior and deservingness of those characters.

Discussion

The continuum framework affected the inferences that children made. When predicting how likely each character would be to share and hit, children showed a smaller distinction between different ''categories'' when thinking in terms of a continuous framework than when thinking in terms of a categorical framework. Children in the continuum condition also inferred bigger differences than children in the category condition when predicting sharing and hitting for characters within the same ''category.'' These differences also emerged for assessing a character's deservingness, in terms of how many presents should be allocated to that character. Thus, children extrapolated beyond the information given in forming their expectations of how each character would act. This pattern of results shows both the inductive power of categories and the attenuation of categorical distortions when thinking in terms of a continuum.

Study 3

Studies 1 and 2 showed that the continuum condition led to differences in how children perceived similarity and the kinds of inferences they made about behavior and deservingness. However, it is not clear from these studies which condition was driving the effect. Was the categorical framework increasing the perception of within-category similarities and between-category differences, or was the continuum framework decreasing these perceptions? The goal of Study 3 was to create a comparison group to see how children respond to our stimuli in the absence of a categorical or con-

tinuum framing, examining both similarity judgments and inferences. We first establish how children evaluate these stimuli based solely on perceptual features. We then compare these results with the results of Studies 1 and 2 to indicate whether the continuum or category framing is responsible for changing children's judgments. As children were not randomly assigned to study, note that it is not optimal to compare children across studies. However, all children were sampled from the same population as the children in Studies 1 and 2 and did not differ in demographic characteristics.

Method

Participants

Participants were thirty-two 4-year-old children (16 male, 16 female; M_{age} = 4 years 5 months). Twenty-one were Caucasian, 7 were Asian American, 2 were African American, 1 was Latina, and 1 was Native American.

Materials

There were no practice sets of pictures. (In the previous studies, the purpose of the practice sets was to reinforce children's thinking about dimensions as either categorical or continuous. As the current study was designed to assess their judgments about our test stimuli in the absence of categorical or continuous descriptions, we omitted the practice sets.) All children saw the same test set of pictures used in Studies 1 and 2 (see Figure 1). Again, both mouths and eyebrows changed direction at the halfway point, creating a perceptual boundary.

Procedure

The pictures were set out one at a time without descriptions, and then children were asked to respond to three types of measures—similarity ratings, inferences about behavior (likelihood of sharing and hitting), and inferences about deservingness (how many presents each one should get). The order of similarity versus inference questions was counterbalanced, as was the order of sharing and hitting questions.

Similarity. As in Study 1, the similarity rating involved the two pictures flanking the perceptual ''category boundary.'' For each of the two target pictures (#3 and #4), children were asked to choose two other pictures that were ''like this one.''

Inferences about behavior and deservingness. As in Study 2, children were shown the endpoint pictures and the pictures on either side of the perceptual boundary (in other words, #1, #3, #4, and #6) one at a time, and were asked the same questions about sharing, hitting, and allocation of presents as in Study 2.

Results

Children's responses to the similarity judgments and inferences in the baseline condition indicated a categorical bias in their evaluations of the stimuli that differed from the pattern elicited by the continuum framework in Studies 1 and 2.

Before elaborating the main results, we note that there were significant effects of task order for several measures, perhaps because the similarity task drew children's attention to the perceptual boundary. Children who completed the similarity task before the inference task rated smaller differences within ''categories'' for sharing and hitting, $t(30) = 2.50$, $p = .018$ (similarity task first $M = 0.38$, $SD = 0.56$, vs. inferences first $M = 1.17$, $SD = 1.15$), made a bigger distinction between ''categories'' for presents, $t(30) = -2.95$, $p = .006$ (similarity task first $M = 2.38$, $SD = 1.02$, vs. inferences first $M = 1.31$, $SD = 1.01$), and made smaller distinctions within ''categories'' for presents, $t(30) = 2.30$, $p = .029$ (similarity task first $M = 0.44$, $SD = 0.57$, vs. inferences first $M = 0.94$, $SD = 0.66$). We believe, as noted, that these order effects were due to the fact that children who completed the similarity task first were more likely to attend to the perceptual categories and use them during the subsequent inference tasks. Subsequent analyses were collapsed across task order.

Similarity Judgments: No-Label Judgments Compared to Category and Continuum Frameworks

Within the baseline condition, children were significantly more like to give two same-category responses (29 of 32 children) than any adjacent-pair responses (2 of 32), sign test $Z = -5.20$, $p < .001$. This pattern of baseline similarity judgments was significantly different from the similarity judgments of children in the continuum condition in Study 1, but not of children in the category condition in Study 1. There were no significant differences in the similarity judgments made by children in the category condition of Study 1 compared to the no-label condition of Study 3 in terms of the proportion of children who chose only same-category

pairs, $\chi^2(1, N = 52) = 0.002$, $p = .97$. However, the *continuum* condition in Study 1 was significantly different from the no-label baseline in Study 3 in terms of proportion of children who chose only same-category pairs, $\chi^2(1, N = 52) = 8.78$, $p = .003$. This pattern of results suggests that the perceptual categories were very salient for children in the baseline condition, who used the perceptual categories to guide their selection of similar pictures.

Inferences About Behavior: No-Label Judgments Compared to Category and Continuum Frameworks

Our next question was what kind of inferences children would make about characters on different sides of a perceptual boundary when no framing was provided. For purposes of comparison, children in the baseline condition showed an average difference score of $M = 3.73$ (out of 5) and $SD = 1.33$ for the difference between their ratings of #3 and #4 (see Figure 2a). We also asked what kind of inferences children who received no framing would make about the behavior of characters within the same perceptual ''category'' (in other words, #1 minus #3, and #4 minus #6). Children in the baseline condition showed an average difference score of $M = 0.77$ and $SD = 0.98$.

This pattern of baseline difference scores was significantly different from the ratings of children in the continuum condition in Study 2, but not different from the ratings of children in the category condition in Study 2 (see Figure 2a). Children in the category framing condition in Study 2 did not significantly differ from the no-label baseline in Study 3 in ratings of between-category difference scores, $t(49) = 0.17$, $p = .87$, or within-category difference scores, $t(49) = 0.55$, $p = .59$. However, children in the continuum condition in Study 2 were significantly different from the no-label baseline in Study 3 for ratings of both between-category difference scores, $t(50) = 3.19$, $p = .002$, and within-category difference scores, $t(50) = 2.12$, $p = .039$. These results suggest again that children in the baseline condition were influenced by the perceptual categories and used them in making inferences about behavior.

Inferences About Deservingness: No-Label Judgments Compared to Category and Continuum Frameworks

As explained previously, to find the baseline between-category difference, we calculated the difference in the number of presents given to characters on different sides of the perceptual boundary (#3 and #4), baseline $M = 1.84$ (out of 3) and $SD = 1.14$ (see Figure 2b). We also calculated within-category differences in presents given to characters that were not on different sides of a boundary (#1 vs. #3, and #4 vs. #6), average $M = 0.69$ and $SD = 0.66$ for the baseline condition.

Children in the category condition in Study 2 did not significantly differ from children in the no-label baseline in Study 3 (see Figure 2b) for between-category differences in the number of presents, $t(49) = 0.85$, $p = .40$, or within-category differences, $t(49) = 1.44$, $p = .16$. However, children in the continuum condition in Study 2 were significantly different from children in the no-label baseline in Study 3 for between-category differences, $t(50) = 3.30$, $p = .002$, and marginally different for within-category differences, $t(50) = 1.91$, $p = .06$. Like the results of children's inferences about behavior, these results suggest that children in the baseline condition were influenced by the perceptual categories in making inferences about deservingness.

Discussion

Study 3 examined the types of similarity judgments and inferences that children would make based on the perceptual features of our stimuli, without any additional framing. The results indicated that there was a salient perceptual boundary for these stimuli and that, overall, children in this comparison group seemed to impose a categorical structure on the stimuli. They strongly resembled children in the category condition in Studies 1 and 2 in their similarity judgments and in the inferences they made about sharing, hitting, and deserving presents—and they consistently differed from children in the continuum condition in those studies.

This categorical pattern of results in the baseline group may be due to the particular stimuli we used, or to children's general drive to categorize the world around them to help them make sense of their environment (Hilliard & Liben, 2010). Regardless, this study demonstrated that our continuum manipulation was responsible for changing children's judgments about these stimuli.

Study 4

Will thinking in terms of categories or continua have consequences for more personal social attitudes? Will it affect how much children think they would like other individuals, and want to play with them? Previous research suggests that social categories can have strong effects on children's social attitudes and

preferences (Erdley & Dweck, 1993; Patterson & Bigler, 2006). For example, children who perceive high homogeneity in the members of out-groups are more likely to show biased attitudes against members of those groups (Aboud, 2003).

Method

Participants

Participants were forty 4-year-old children (22 male, 18 female; M_{age} = 4 years 7 months). Eighteen were Caucasian, 9 were Asian American, 6 were African American, and 7 were Latino or Latina. Children were randomly assigned to the category or continuum condition.

Procedure

The practice and test sets of pictures were the same as those in previous studies and the procedure was similar to that of Study 2.

Children's descriptions. Again, children gave open-ended descriptions of the pictures.

Children's attitudes. Children were shown one at a time the endpoint pictures and the pictures on either side of the category boundary, and were asked, ''Do you like this one? [Yes or no?] How much do you [not] like this one, just a little bit, kind of, or really?'' Similar questions were asked about wanting to play with each: ''Would you like to play with this one? [Yes or no?] How much would you [not] like to play with this one, just a little bit, kind of, or really?'' Again, answers were coded on a 6-point scale, and the like and play questions were counterbalanced.

Results

As expected, children in the continuum condition rated smaller differences between categories and larger differences within categories, in terms of how much they liked and wanted to play with the characters.

Children's Descriptions

Once again, our manipulation was effective. Children in the category condition were more likely to give categorical descriptions without modifiers compared to children in the continuum condition (category M = 3.00, SD = 1.45; continuum M = 0.40, SD = 0.68), $t(38) = -7.26$, $p < .001$, and children in the continuum condition were more likely to give continuous descriptions in relative terms compared to children in the category condition (category M = 0.70, SD = 1.26; continuum M = 3.40, SD = 1.05), $t(38) = 7.37$, $p < .001$.

Children's Attitudes: Judgments of Differences Between and Within Categories

Children readily answered these questions regarding schematic faces, indicating that this was a natural situation for children, much like engaging in fantasy play or talking about characters in a storybook. Many children's open-ended responses suggested they could easily imagine social interactions in this context (e.g., ''that one would share you candy and Popsicles'' or ''come over for a playdate'').

There were no significant differences between answers to the ''play'' and ''like'' questions, so analyses were collapsed across question type. For between-category differences, the difference between liking or playing ratings for the slightly mean one and the slightly nice one was marginally smaller for children in the continuum condition, $t(38) = -1.95$, $p = .059$ (category M = 3.08, SD = 1.57; continuum M = 2.08, SD = 1.68), compared to children in the category condition (see Figure 3). This suggests that children in the continuum condition tended to differentiate less between members of different categories in their social judgments.

There was an effect of order: Across both conditions, children who heard the ''like'' questions first inferred a larger difference between categories

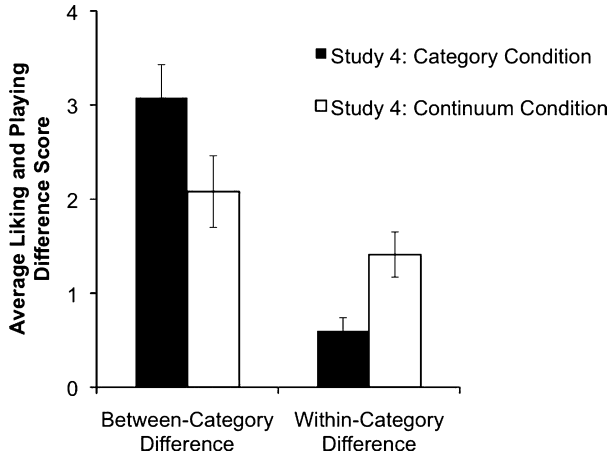

Figure 3. Differences in ''liking and playing'' ratings of characters who fell into different categories (between categories) and those who fell within the same category, Study 4.

(compared to children who heard the ''play'' questions first), $t(38) = 2.39$, $p = .022$ (''like'' first $M = 3.18$, $SD = 1.58$; ''play'' first $M = 1.98$, $SD = 1.60$). However, when examined separately, both children who heard the ''like'' questions first and children who heard the ''play'' questions first showed the predicted pattern of means for both conditions. Controlling for task order in an analysis of covariance, there was a significant main effect of condition, $F(1, 36) = 4.20$, $p = .048$, and there was no evidence of an interaction between condition and task order. We know of no theoretical reason for this order effect.

We also asked whether children in the continuum condition would show greater variation in their feelings toward characters within the same category. Indeed, they showed a significantly greater difference (compared to children in the category condition) in ''like'' and ''play'' ratings for individuals within the same category (the average of the difference scores between ratings of the very mean one and the slightly mean one, and the very nice one and the slightly nice one; in other words, the average of #1 minus #3, and #4 minus #6), $t(38) = 2.91$, $p = .006$ (category $M = 0.60$, $SD = 0.61$; continuum $M = 1.41$, $SD = 1.09$). This suggests that children in the continuum condition were more likely to differentiate between members of the same category when making social judgments.

Analyses of Potential Labeling Effects

As in Studies 1 and 2, we conducted further analyses to examine the extent to which labeling might be responsible for these effects. Again, we expected that there would be no difference in these comparisons.

As expected, there were no differences for children in the continuum condition between preference ratings (across ''like'' and ''play'') for #4–#6 and #1–#3 (difference for #4–#6: $M = 1.23$, $SD = 1.02$; difference for #1–#3: $M = 1.60$, $SD = 1.76$), paired samples $t(19) = .90$, $p = .38$. Again, the differences in labels within the continuum condition did not correspond to differences in children's inferences about how much they might like or want to play with those characters.

Discussion

The continuum condition again reduced the categorical effects, this time in terms of children's judgments about their own preferences and desire to interact with characters. These results went beyond basic similarity judgments and inferences about others' behavior, to affect children's inferences about how much they themselves would like and want to play with others.

Study 5

The results of Studies 1, 2, and 4 indicate that children's judgments, inferences, and preferences are sensitive to categorical or continuum framings. As noted, in all of these studies, we gave children a categorical or continuum framework while explicitly pointing to and labeling each picture individually. Thus, we cannot distinguish how much of these effects are due to the general frameworks rather than the labeling of specific locations along the dimension. Indeed, in the category condition children were given identical labels for pictures #1–#3 (''mean'') and #4–#6 (''nice''), while children in the continuum condition were given identical labels for pictures #2–#5 (''a little nicer''), and mapping these identical labels directly onto the pictures might be responsible for these effects. Our previous analyses within the continuum condition in Studies 1, 2, and 4 suggested labeling was not likely to be responsible for these effects; however, it would be beneficial to demonstrate that providing the general frameworks without explicit labels would also lead to differences based on condition. Therefore, in Study 5, we gave children a categorical or continuum framework but did not directly map the labels onto individual pictures.

Method

Participants

Participants were thirty-two 4-year-olds (16 male, 16 female; M_{age} = 4 years 6 months). Seventeen were Caucasian, 6 were Asian American, 5 were African American, 3 were Latino or Latina, and 1 was Middle Eastern. They were randomly assigned to condition.

Procedure

The practice and test sets of pictures were the same as those in Studies 1–4, and children saw these sets of pictures with the usual category or continuum descriptions. However, instead of pointing to each picture and labeling it individually, the

researcher gestured generally to the row of pictures. For the test set of pictures, children in the category condition were told, ''Some people are mean, some people are nice. Some are mean, some are nice.'' Children in the continuum condition were told, ''Some people are really mean, some are a little nicer, some are a little nicer, and some people are really nice. Some people are really mean, some are a little nicer, some are a little nicer, and some people are really nice.''

For our dependent measures, we returned to our initial measures of similarity, inferences about behavior and deservingness, and descriptions (evaluated as a manipulation check, as in Studies 1, 2, and 4). The order of similarity and inference questions was counterbalanced, as was the order of sharing and hitting questions.

Results

Overall, without labeling specific pictures, we replicated the most important effects of the continuum framework on children's inferences about behavior and deservingness. The major exception was for children's similarity judgments, as we found here that children in both the category and continuum conditions chose based on perceptual categories. We believe this suggests that without overt mapping of labels to pictures, perceptual similarity loomed large in simple similarity judgments but was not critical for the effects on children's inferences.

Similarity Ratings

There was no difference between conditions in the number of children who chose only same-category pairs (category: 14 of 16 children; continuum: 13 of 16), $\chi^2(1, N = 32) = 0.24$, $p = .63$. This suggests that the general framework as expressed by the descriptions children were given was not powerful enough to override the perceptual categories when children made similarity judgments.

Inferences About Behavior: Judgments of Differences Between and Within Categories

In terms of between-category differences, when inferring how likely each character would be to share or hit, children in the continuum condition showed a significantly smaller difference (compared to children in the category condition) between ratings of the boundary characters, $t(30) = -2.92$, $p = .008$ (category $M = 3.59$, $SD = 1.46$; continuum $M = 2.22$, $SD = 1.29$; see Figure 4a). This suggests that even in the absence of overt mapping of labels to pictures, children in the continuum condition differentiated less between members of different categories.

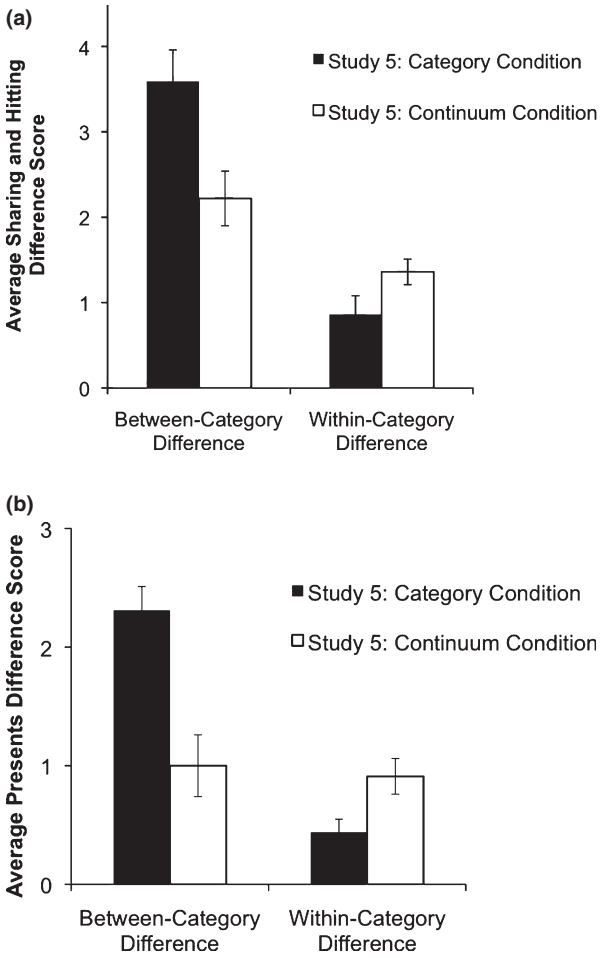

Figure 4. (a) Differences in ''sharing and hitting'' ratings of characters who fell into different categories (between categories) and those who fell within the same category, Study 5. (b) Differences in the number of presents given to characters who fell into different categories (between categories) and those who fell within the same category, Study 5.

In terms of within-category judgments, children in the continuum condition showed a marginally greater difference than children in the category condition in their inferences about sharing and hitting for within-category individuals, $t(30) = 1.85$, $p = .074$ (category $M = 0.86$, $SD = 0.89$; continuum $M = 1.36$, $SD = 0.61$; see Figure 4a). Thus, children in the continuum condition tended to differentiate more between members of the same category in their inferences.

Inferences About Deservingness: Judgments of Differences Between and Within Categories

In terms of between-category differences, the difference between the number of presents given to the slightly mean character and the slightly nice character was significantly smaller for children in the continuum condition compared to children in the category condition, $t(30) = -4.03$, $p < .001$ (category $M = 2.31$, $SD = 0.79$; continuum $M = 1.00$, $SD = 1.03$; see Figure 4b). Even without overt labels, children in the continuum condition were less likely to differentiate between members of different categories when determining deservingness.

In terms of within-category differences, children in the continuum condition showed a significantly greater difference between the number of presents given to characters within the same category, compared to children in the category condition, $t(30) = 2.48$, $p = .019$ (category $M = 0.44$, $SD = 0.44$; continuum $M = 0.91$, $SD = 0.61$). With the results of children's inferences about behavior, this suggests that children in the continuum condition were more likely to differentiate between members of the same category.

Children's Descriptions

Once again, confirming the effectiveness of the manipulation, category labels were significantly more likely to be given by children in the category condition ($M = 3.53$, $SD = 1.09$) compared to children in the continuum condition ($M = 1.75$, $SD = 1.73$), $t(30) = -3.48$, $p = .002$. Similarly, continuum labels were significantly more likely to be given by children in the continuum condition ($M = 1.50$, $SD = 1.83$) compared to children in the category condition ($M = 0.22$, $SD = 0.55$), $t(30) = 2.69$, $p = .012$.

Discussion

These results help to clarify the findings of Studies 1–4. In this study, when individual pictures were not explicitly labeled, children in both the category and continuum conditions made simple similarity judgments driven by perceptual similarity. This is in contrast to Study 1, when the experimenter explicitly identified each individual (e.g., as ''a little nicer''), and children in the continuum condition were more likely to override perceptual similarity per se. Nevertheless, in Study 5, even with the absence of specific identifying information for any given character, all of the inferential questions about a character's positive behavior, negative behavior, and deservingness still differed as predicted according to the general framework provided. These findings indicate that the effects of the continuum framework, especially the signature pattern of children's inferences, do not require affixing labels to specific individuals along the continuum. Instead, they are explained by providing a general continuum rubric that overrides categorical and perceptual representations.

While we did not explicitly map individual labels to each picture, we cannot rule out the possibility that children did so themselves implicitly. However, coding of children's descriptions revealed that 14 of 16 children in the continuum condition (and 16 of 16 children in the category condition) gave different labels to pictures #3 and #4 in their descriptions. Thus, it seems highly unlikely that the effect on children's inferences was driven by identical labels in the continuum condition for pictures #3 and #4. Moreover, if children in the continuum condition themselves had labeled pictures #3 and #4 as ''a little nicer,'' we would expect to find the same pattern of responses to the similarity question as seen in Study 1. As we did not find this pattern of results, we interpret the data to suggest that the continuum manipulation in Study 5, without causing children to adopt similar labels for characters across the perceptual boundary, still affected children's representations of the characters sufficiently to change their inferences. To offer further converging evidence that our manipulation affected children's social judgments, we created new test stimuli in Study 6 that were never explicitly labeled.

Study 6

Studies 1–5 suggest that these conceptual frameworks can play a key role in children's social judgments and inferences, even about fairly abstract stimuli. However, it is less clear how these frameworks might play out in the real world when an individual's category membership or position on a continuum may not be perceptually evident. Unlike our stimuli, most people in the real world do not wear their niceness on their sleeves (or their faces). Will these frameworks still influence children when they have to make judgments about real individuals, when they cannot tell by inspection which category they might belong to or where they might fall along a continuum? Further, will these frameworks have effects that generalize beyond people that were labeled,

to novel individuals? If we can show that the effects generalize to novel individuals, this will provide even stronger support for our argument that the categorical or continuous *conceptualization* is responsible for our effects rather than categorical or continuous *labels*. Thus, the first goal of Study 6 was to use stimuli that did not depict the relevant dimension, and to use novel test stimuli that were never labeled.

A further step was to examine whether the category and continuum frameworks lead children to make inferences not only about the behavior and deservingness of others but also about the *psychology* of others, specifically, the motives underlying someone else's behavior. Do children assume that someone's behavior is due to a stable and internal factor (e.g., a trait such as niceness), or do children acknowledge that behavior could be caused by unstable factors (e.g., transitory factors such as emotions or external situational pressures)?

Many previous studies have found links between categorization, stereotyping, and a failure to take the social situation into account when making attributions (Levy & Dweck, 1999; Moskowitz, 1993; Schaller, Boyd, Yohannes, & O'Brien, 1995). Social groups are often linked to particular attributes, particularly social groups that have been essentialized or assumed to share important qualities (Bigler & Liben, 2007). For example, Yzerbyt, Rogier, and Fiske (1998) found that college students were more likely to make dispositional attributions for an individual's behavior when told that the individual was part of a highly coherent group, compared to when they were told that the individual was part of an aggregate of unrelated individuals. In terms of young children, Boseovski and Lee (2006, p. 501) argue that, to the extent that traits are seen as social categories, it is ''reasonable to expect preschoolers to make personality attributions. . . . when given trait-relevant information.'' Thus, we expected that children in the category condition would be more likely to turn to traits and other stable, internal factors as explanations for behavior than children in the continuum condition.

In Study 6 we explored the effects of category and continuum frameworks in a completely different type of task (attributions), to see whether children in the continuum condition would be less likely to employ trait-like explanations for behavior. We used novel test stimuli that were not present during the framework descriptions and were never labeled. We also removed all perceptual cues to the social dimension, which made the task even more challenging.

Method

Participants

Participants were thirty 4-year-old children (11 male, 19 female; M_{age} = 4 years 6 months). Eighteen were Caucasian, 5 were Asian American, 5 were Latino or Latina, and 2 were African American. Children were randomly assigned to condition.

Procedure

Children saw three practice sets of pictures, with six pictures in each set, described either with category labels or continuum labels. The first practice set was a white square becoming darker. The second and third sets were composed of photographs of real children and went from quiet to loud and from mean to nice, respectively. For the third set of pictures, children in the category condition were told, ''Some people are mean, some people are nice. Some are mean, some are nice. . . . This is a mean child. This is another mean child. This is another mean child. This is a nice child. This is another nice child. This is another nice child.'' Children in the continuum condition were told, ''Some people are really mean, some are a little nicer, some are a little nicer, and some people are really nice. . . . This is a really mean child. This is a little nicer child. This is a little nicer child. This is a little nicer child. This is a little nicer child. This is a really nice child.'' Each condition saw photographs of the same children (three boys and three girls interspersed in each set), and almost all the pictured children were Caucasian. All children in the pictures had neutral facial expressions, and were selected from the Internet or from pictures of children who had attended this school in the past.

The test questions examined whether training on categories versus continua would affect children's inferences about the motives of a novel child. For the test questions, children were shown a new photograph of a boy or girl said to have committed a prosocial act (''Here's someone you haven't seen. This is Sam [Sally]. Today, he [she] shared his [her] toy with another child.'') or antisocial act (''Here's someone else you haven't seen. This is Sally [Sam]. Today, she [he] grabbed another child's toy and broke it.''). Target gender and valence order were counterbalanced. First, children responded to the open-ended question, ''Why do you think [she] he did that?'' Second, children were given a forced-choice question that attributed the behavior either to an internal source (''wanted to'' or ''did it on purpose'') or to an external source (''was made to'' or ''was by accident'').

Results

The open-ended question was coded as to whether children attributed the behavior to an unstable factor (such as ''because she wanted to play with her friend'') rather than a stable factor (including traits such as ''because she's nice''). The forced choice question was coded as to whether children attributed the behavior to an external factor rather than an internal factor. The two questions were significantly correlated, $r(28) = .36$, $p = .05$.

Because we had repeated measures and a binary outcome variable, we used a logistic mixed-effects model (Baayen, Davidson, & Bates, 2008; Bates & Sarkar, 2007). This type of analysis is an alternative to the use of analysis of variance models for categorical dependent measures, and has been argued to be less problematic (e.g., when confidence intervals exceed interpretable results) and less likely to lead to spurious null results or spurious significances (Jaeger, 2008). Allowing the main effects to differ based on question type (stable or unstable vs. internal or external) did not improve the model, $\chi^2(6, N = 30) < 1$, *ns*, and therefore we analyzed the two types of questions together. There was a significant effect of scenario, such that children across both conditions were more likely to make unstable/external attributions for the antisocial scenario than for the prosocial scenario (prosocial $M = 0.80$, $SD = 0.76$; antisocial $M = 1.13$, $SD = 0.78$), $z = -1.96$, $p = .05$. However, there was no interaction between condition and type of scenario. Importantly, as predicted, children in the continuum condition were significantly more likely than children in the category condition to attribute behavior to unstable and external factors (category $M = 1.44$, $SD = 0.81$, continuum $M = 2.50$, $SD = 1.29$), $z = -2.78$, $p = .005$.

Discussion

The results of Study 6 indicate that the categorical and continuum frameworks have effects on judgments about real-world people, even when they are novel and have no physical cues that place them in a category or along a continuum. The category framework led children to be more likely to attribute a novel child's behavior to stable and internal motives. In contrast, children in the continuum condition were significantly more likely to explain behavior with unstable and external attributions.

It could be argued that there is an alternative explanation for our findings on children's attributions to stable or unstable characteristics. Children in the category condition, who were significantly more likely to give stable attributions (e.g., traits such as ''nice'' and ''mean''), could be considered to be simply repeating what they had been told earlier. Thus, rather than affecting their conceptualization and reliance on traits as explanations, they could simply be more likely to think that trait labels are the expected way to talk about individuals. However, this alternative explanation would still not explain why children in the continuum condition, who also heard person labels during the practice sets, were less likely to rely on traits or person labels as explanations. Thus, children in the category condition used the category labels to understand the reasons for behavior, while children in the continuum condition did not see the continuous trait labels as a compelling explanation for behavior.

Stable and internal attributions can lead to many negative consequences. In social judgments about others, internal, stable attributions can lead to increased blame and punishment in the case of negative actions (Sanderson, Zanna, & Darley, 2000). In terms of children's own self-perceptions, these attributions can have negative motivational consequences, as attributing failure to stable and internal characteristics is related to self-blame, negative affect, and lack of persistence in the face of challenge (Diener & Dweck, 1978). Seeing personal attributes in terms of continua may help to prevent these negative outcomes.

General Discussion

Categories are often cited as *the* way in which we organize groups. In a world filled with a constant stream of new people, objects, and ideas, categories can indeed help to streamline cognition and guide expectations (Macrae & Bodenhausen, 2000; Mervis & Rosch, 1981; Moskowitz, 1993). However, as noted at the outset, while categories are necessary and often useful, they may also have drawbacks by ''deafening us to all finer discriminations'' (Allport, 1954, p. 179). Previous research has found that categorization leads to the intensification of boundaries and decreased salience of differences within each category, and we indeed found that in our studies. However, the present research demonstrates that framing a social group as falling along a continuum can help to prevent categorical distortions. In the first five studies, 4-year-olds all saw an identical array of pictures with a clear perceptual boundary. Yet, describing the pictures as falling into categories or falling along a continuum had different effects on a variety of social judgments.

First, the framework children heard affected their similarity judgments (Study 1). Children hearing category labels used category membership to guide similarity choices by choosing others from the same category as most similar, while children hearing continuum labels were more likely to use adjacencies among the characters to choose the most similar. Critically, this led children in the continuum condition to be more likely to override perceptual differences (as established by the no-label baseline comparison in Study 3) and claim that the character most similar to a smiling one could be a frowning one instead of another smiling one.

The effects of the two frameworks extended to children's inferences about the characters' sharing and hitting, to children's attitudes toward the characters, and to children's desire to play with them. The frameworks affected children's inferences about how positively or negatively characters would act, with children in the continuum condition expecting smaller differences in sharing and hitting across boundaries and greater differences within groups (Study 2). It similarly affected how children judged deservingness, in terms of how many presents they gave to the characters (Study 2), as well as their liking and desire to interact with the characters (Study 4). In these cases too, children in the continuum condition felt more similarly toward characters from different groups and showed more variation in how they felt toward members of the same group. Interestingly, these effects on children's inferences lasted even when pictures were not individually labeled. It appears that the effects of these frameworks on children's inferences transcended the still-salient perceptual boundary (Study 5). Indeed, the effects of the continuum framework extended even to judgments about new individuals without perceptual cues as to their niceness, leading to fewer internal and stable attributions about their motives (Study 6).

Categorization can be a useful and readily available heuristic and so we may tend to default to it. Organizing the world into groups (such as ''us'' vs. ''them'') and having clear guidelines for knowing what to expect from each group can be a reassuring way to see the world, particularly in uncertain or unfamiliar contexts (Corneille, Klein, Lambert, & Judd, 2002). It is more effortful to see the world as complex, to wait to judge individuals on the basis of their own particular behavior, and to keep track of numerous subtle differences in degree. But by emphasizing continua, we may be able to prevent unwanted consequences of categorization.

Of course, overuse of a continuum is not ideal either. We do not want to teach children to rank order people on every possible dimension or to constantly evaluate others. In particular, it may lead children to rank themselves in comparison to others, which can have negative consequences (e.g., for motivation; Nicholls, 1984). However, ranking people is frequently unavoidable in our society (e.g., college admissions, high-stakes testing, athletic competitions), and in most cases, a continuum may be preferable by leading to more differentiated, and perhaps more nuanced, evaluations than oversimplified categorizations such as ''good'' or ''not good.''

Our results suggest that there may be many social benefits of preserving continua. When children think about other people in dichotomous ways, as in the category condition, it may contribute to the formation of stereotypes (Levy, Stroessner, & Dweck, 1998). Categorizing others in rigid ways, and using only the limited information of category membership to make assumptions and inferences about other characteristics, can have negative real-world consequences. Even beyond the results discussed here, a dichotomy (as opposed to a continuum) may more easily lend itself to thinking in fixed ways and believing that characteristics are stable inherent traits of each group. For example, reification of opposing categories (e.g., some people are nice and some are mean) might lead more into fixed ways of thinking than the comparative (e.g., some people are nicer). The continuum, on the other hand, with its small gradations, may lead to more dynamic thinking of the dimension as something that people can move along. This remains an interesting question for future research. If it is indeed the case that continuum framing causes a property to seem more malleable, then inducing individuals to think about people in terms of a continuum may serve in the future as an intervention to reduce stereotyping.

These studies highlight the importance of conceptual framing in children's judgments about other people, which may be evoked by the linguistic cues that children hear from adults. If they hear adults frequently making generic categorical statements (e.g., ''boys are good at math''), children may become more likely to think categorically themselves (Patterson & Bigler, 2006). Previous research has shown that even young children are very sensitive to these kinds of subtle linguistic cues (Cimpian, Arce, Markman, & Dweck, 2007). How long these types of effects last may depend on how salient the categories are to children, and

whether they are used in functional ways (Bigler & Liben, 2007). If children regularly hear social dimensions described in terms of continua, this may help to prevent the formation and use of stereotypes. Over time, continuum framing may play a large role in terms of how easily children can look past people's labels to see them as individuals with qualities that can vary along any number of dimensions.

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