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Preschool Children's Use of Trait Labels to Make Inductive Inferences

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One hundred one preschool children (ages 3 years 5 months to 4 years 10 months) participated in 3 studies examining the tendency to use verbal labels versus appearance information in making novel inductive inferences. A triad task analogous to that of S. A. Gelman and E. M. Markman (1986) was devised. Participants learned a different property for each of 2 children, and were asked which of the properties was true of a third child. One of the first 2 children was identified with the same label as the third child (e.g., both were labeled as shy) but looked different, and the other was identified with a different label than the third child but looked very similar. Results of Study 1 revealed that participants tended to use the trait labels, rather than superficial resemblance, in making psychological inferences. Studies 2 and 3 suggest that these results cannot be attributed to biases on the task. Study 4 provided a replication of the results of Study 1 in a context in which appearance information was explicitly pointed out and in which different trait labels were used.

Key Words: traits; induction; preschoolers.

Even for young children, some words are more than simple labels: They convey rich conceptual information (Baldwin, Markman, & Melartin, 1993; Gelman & Markman, 1986, 1987; Mandler, 1988, 1992). For example, in the biological domain, Gelman and Markman (1986, 1987) found that 3- and 4-year-olds tended to make nonobvious inferences based upon category labels,

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even when the labels conflicted with visible resemblance. There is growing evidence that preschool children use certain social categories, such as race and gender, to make such inferences (Gelman, Collman, & Maccoby, 1986; Hirschfeld, 1995). The present study investigates whether preschool children might also use trait labels to make novel inferences.

The development of trait conceptions has been a topic of substantial interest (see Rholes, Newman, & Ruble, 1990). Children's trait conceptions are thought to have a wide range of implications for achievement motivation (Cain & Dweck, 1995; Heyman & Dweck, 1998; Heyman, Dweck, & Cain, 1992; Miller, 1985; Rholes, Jones, & Wade, 1988) and interpersonal interaction (Camhy & Ruble, 1994; Erdley & Dweck, 1993; Grusec & Redler, 1980).

Research investigating the development of trait concepts has suggested that there may be important differences between young children (5- and 6-year-olds) and older children (9- and 10-year-olds) in their production and use of trait concepts. Compared to older children, younger children rarely use traits when describing people (Livesley & Bromley, 1973; Peevers & Secord, 1973). Similar age differences have been found by researchers who have used a prediction paradigm. In this paradigm, characters are depicted as engaging in trait-relevant behavior, and participants are asked to indicate whether the character is likely to exhibit another behavior that is consistent with the trait in question. Rholes and Ruble (1984) found that 9- to 10-year-old children, but not 5- to 6-year-old children, used the behavior to make trait-consistent inferences.

However, there is also some evidence that children younger than age 7 do have some understanding of traits or traitlike concepts. Children as young as 2 years of age begin to use words that could be interpreted as referring to traits (e.g., "nice" and "naughty"; Bretherton & Beeghly, 1982). In addition, some studies using the prediction paradigm have found that 4- to 6-year-old children do expect individuals to behave in a trait-consistent fashion (Cain, Heyman, & Walker, 1997; Dozier, 1991; Droege & Stipek, 1993; Heller & Berndt, 1981).

These and related studies have raised many questions about the nature of young children's trait concepts (Gelman, 1992; Ruble & Dweck, 1995; Yuill, 1992). There are several plausible interpretations of the evidence. One possibility is that young children sometimes make responses that superficially resemble those of older individuals, but that are not derived from a similar understanding of traits. A preschooler who describes someone as "nice" may be expressing positive feelings about the person or describing a specific action, rather than expressing a notion of what the individual is generally like. Similarly, when a young child predicts that someone who shares an apple will also share a banana, he or she may be using a simple matching strategy (reasoning that sharing an apple is a lot like sharing a banana) rather than relying on an underlying conception of the person as generally prosocial.

Another possibility is that young children do have trait concepts, but that these concepts are highly superficial. Young children may believe that some people tend to act in a more prosocial manner than others, but not see any link between

the person's behavior and his or her mental life. Individuals with such an understanding would view traits as descriptive summaries of overt information such as behaviors and outcomes.

In contrast, it is possible that young children view traits as providing a deeper underlying account of behavior (Yuill, 1992). Individuals with such an account of traits would not assume a direct correspondence between traits and behaviors, because they would understand that the expression of traits is mediated by mental states and processes. This distinction between a superficial versus a deeper understanding of traits can be viewed in relation to Quine's (1977) distinction between theoretical kinds and similarity-based groupings, and Gopnik and Wellman's (1994) distinction between theories and empirical generalizations. Only with this deeper understanding are traits viewed as "theory-based" constructs that allow for a wide range of nonobvious inferences about people. For example, an individual who understands traits in this way might use the information that a person is "mean" to make a range of inferences about the person's behavior (e.g., that he or she is unlikely to offer help), and about unseen psychological processes such as intentions (e.g., that he or she acted with malicious intent) or emotions (e.g., that the he or she does not share your joy in your success).

Several researchers have addressed the distinction between a superficial versus a deeper understanding of traits. One such approach involves comparing trait information to perceptual information as the basis for inductive inference (Hoffner & Cantor, 1985). Presumably, once individuals understand traits in a nonsuperficial way, they will view trait information as having important inductive potential, at times even overriding perceptual information. Hoffner and Cantor (1985) showed videotapes in which a character's appearance (the perceptual information) was factorially varied with the character's behavior (the trait information). The character was presented as ugly and resembling the common stereotype of a witch, or as attractive and resembling the common stereotype of a kindly grandmother. The character was shown treating a cat either kindly or cruelly. A group of 3- to 5-year-olds relied more on the perceptual information than on the trait-relevant behavior, which was the reverse of the pattern seen in a group of 6- to 7-year-olds and a group of 9- to 10-year-olds.

Another approach that can provide insight into the nature of children's trait concepts was proposed by Yuill (1992). She suggested that children could be asked to reason about traits in relation to mental states. Consistent with this approach, some researchers have examined whether information about a character's intentions or motives is viewed as having implications for his or her trait-relevant behavior (Bennett, 1985–86; Heyman & Gelman, 1998; Rotenberg, 1980). For example, does knowing that someone did something harmful intentionally or with an antisocial motive increase the expectation that the individual will engage in antisocial behavior in the future?

Also consistent with Yuill's (1992) approach, some researchers have examined whether information about a character's trait-relevant behavior is viewed as having implications for his or her emotional response to particular events (Gnepp

& Chilamkurti, 1988; Yuill & Pearson, 1998). For example, does knowing that a child engaged in prosocial actions lead to a decreased expectation that the child will be sad when asked to clean his or her room?

Most of these studies investigating children's trait concepts in relation to mental states (Bennett, 1985–86; Gnepp & Chilamkurti, 1988; Heyman & Gelman, 1998; Yuill & Pearson, 1998) have shown that children as young as 5 to 6 years old do have some capacity to reason about traits in relation to mental states (but see Rotenberg, 1980). These studies have also shown substantial developmental increases in reasoning about traits in relation to mental states, with the exception of Heyman and Gelman (1998), in which developmental changes were relatively small (see Heyman & Gelman, 1999, for a discussions of these and related results).

Heyman and Gelman (1999) suggested that directly presenting children with trait information and then asking them to make mental state inferences would be an especially sensitive test of children's trait reasoning. They argued that traits can be viewed as categories with associated properties, such as behaviors and mental states. From this perspective, much of the research examining children's trait concepts, including prior research examining traits in relation to mental states, required the use of property information to make inferences about other properties (presumably by using the property information to infer the trait category, and then using the trait category to make inferences about the property in question). It may be that with this methodology, children fail to make the appropriate inference because they do not infer the trait category in question, rather than because they do not consider the trait category to be an important source of inference. For example, one kindergartner in the Heyman and Gelman (1998) study argued that someone who "just did one mean thing" is not necessarily a mean person, and consequently predicted that a character who performed an action in order to upset another character would not act in an antisocial manner. A related point is made by Aloise (1993), who suggests that individuals may differ in how much evidence they require before they are willing to make trait inferences. The claim that young children may have difficulty making inferences when they must initially infer the trait in question is especially plausible in light of evidence that it is more difficult for young children to make property-to-category than category-to-property inferences (Gelman, Collman, & Maccoby, 1986; Imai, 1995).

Following this line of reasoning, Heyman and Gelman (1999) devised a test of children's trait reasoning in which trait information was directly provided to children as young as 4 years of age, an age younger than is typically studied in the trait concepts literature. A series of stories were presented, each of which involved two children, an *agent* and a *patient.* In each story the agent, who was identified with one of several trait labels, performs an action that causes a positive or a negative emotional reaction from the patient. For example, in one story an agent who is labeled as either "nice" or "mean" gets the patient wet with a hose, which makes the patient upset. After hearing each story, participants were

asked to make inferences and predictions about the agent's mental states, including his or her motivation and emotion.

Even 4-year-olds showed some ability to use trait labels to make mental state inferences, although this tendency was not as systematic as was seen among individuals age 5 and older. For example, 4-year-olds judged a "mean" agent who performed an action that resulted in a negative consequence for the patient as more likely to have anticipated the outcome than a "nice" agent who performed the same action with the same outcome. Thus, this work demonstrates that young children see a link between trait labels and mental states.

The present work seeks to build on the findings of Heyman and Gelman (1999) in two ways. First, it examines whether children will use trait information to draw nonobvious inferences, even when it is in conflict with highly salient perceptual information. Second, the present work examines the scope of young children's trait inferences. One possibility is that young children's trait-relevant inferences are limited to highly familiar contexts. For example, one might infer that a "mean" agent will perform actions with intended negative consequences, based on extensive prior experience with the word "mean" and the contexts of its use. However, an alternative possibility is that young children's trait-relevant inferences are broader in scope, and extend even to unfamiliar properties.

In the present work, preschool children were asked to make inferences about novel psychological properties, such as the type of game a child likes to play, in a context in which trait label information was pitted against physical appearance information. The methodology borrows features from several other studies. As in Heyman and Gelman (1999), we examined reasoning in a context in which trait labels were directly provided. Consistent with Yuill's (1992) framework, individuals were asked to reason about traits in relation to the minds of individuals. As in Hoffner and Cantor (1985), the study compares the inductive potential of trait information with that of superficial perceptual information. However, unlike other methodologies, the method makes use of novel psychological properties. By using novel properties, we sought to minimize the chance that participants would base their answers on previously learned associations between a name and a property (e.g., shy people like computer games, and outgoing people like team sports) and maximize the chance that results could be interpreted with reference to inductions that are based on the information provided.

The method is a variation of a procedure developed by Gelman and Markman (1986). Gelman and Markman presented preschool children with sets of drawings depicting three different creatures, such as a flamingo, a blackbird, and a bat. Two of the creatures looked similar to each other (the blackbird and the bat). Children were told about the category membership of two of the creatures (for example, that the blackbird and the flamingo are both birds). They were then told a property of one creature (such as that the flamingo feeds its young mashed-up food) and a different property of another creature (such as that the bat feeds its young milk). Children were then asked which property the third creature possesses (i.e., whether the blackbird feeds its young mashed-up food or milk).

Children tended to respond with the property that was possessed by the creature that looked different but shared its category membership (i.e., that the blackbird feeds its young mashed-up food).

In the present set of studies, as in Gelman and Markman (1986), preschool children were presented with sets of three pictures in which an appearance match was pitted against a label match. In contrast to their procedure, the pictures were line drawings of faces, and the labels were contrasting trait descriptions rather than category labels. For example, in the first and second studies, participants were asked whether a "nice" child would share the properties of a "mean" child having a similar appearance, or of another "nice" child having a dissimilar appearance. In each of the studies, participants answered a series of questions, and each response was scored as to whether a label match or an appearance match was selected. The dependent variable was the number of label matches each participant selected.

Study 1 addresses a key question: Do trait labels guide novel psychological inferences to a greater extent than does appearance information? Studies 2 and 3 are designed to rule out the possibility that the results of Study 1 can be explained in terms of biases in the task. Study 4 was conducted to determine whether the results of Study 1 could be replicated with a slightly modified task that emphasized the appearance information verbally.

In short, this article introduces a new method for examining the nature of young children's trait concepts, by examining the way in which trait labels serve as a basis for making novel inductive inferences about mental life. If young children do indeed use labels in this way, it would suggest that trait labels can do more than describe empirical realities for young children; rather, trait labels can actually serve as tools for learning new information about people.

STUDY 1

Method

Participants. There were 16 participants total in the main study (8 boys, 8 girls). Ages ranged from 3 years 6 months to 4 years 10 months, with a mean of 4 years 2 months. In addition, 11 adults participated in pilot testing of the materials.

Design and procedure. Study 1 consisted of a series of eight *test questions.* For each test question, participants were shown one of eight possible sets of line drawings depicting three characters: a *test* character, an *appearance match* character who strongly resembled the test character, and a *label match* character who looked quite dissimilar from the test character. An example test question is presented in Fig. 1. Each test question began with a *label information* phase, in which trait information was presented about all three characters (see Items A, B, and C in the top row of Fig. 1). In the *property information* phase, property information was presented about the appearance match and the label match characters (Items D and E, respectively, in the middle row of Fig. 1). Note that different properties were ascribed to the appearance match and the label match

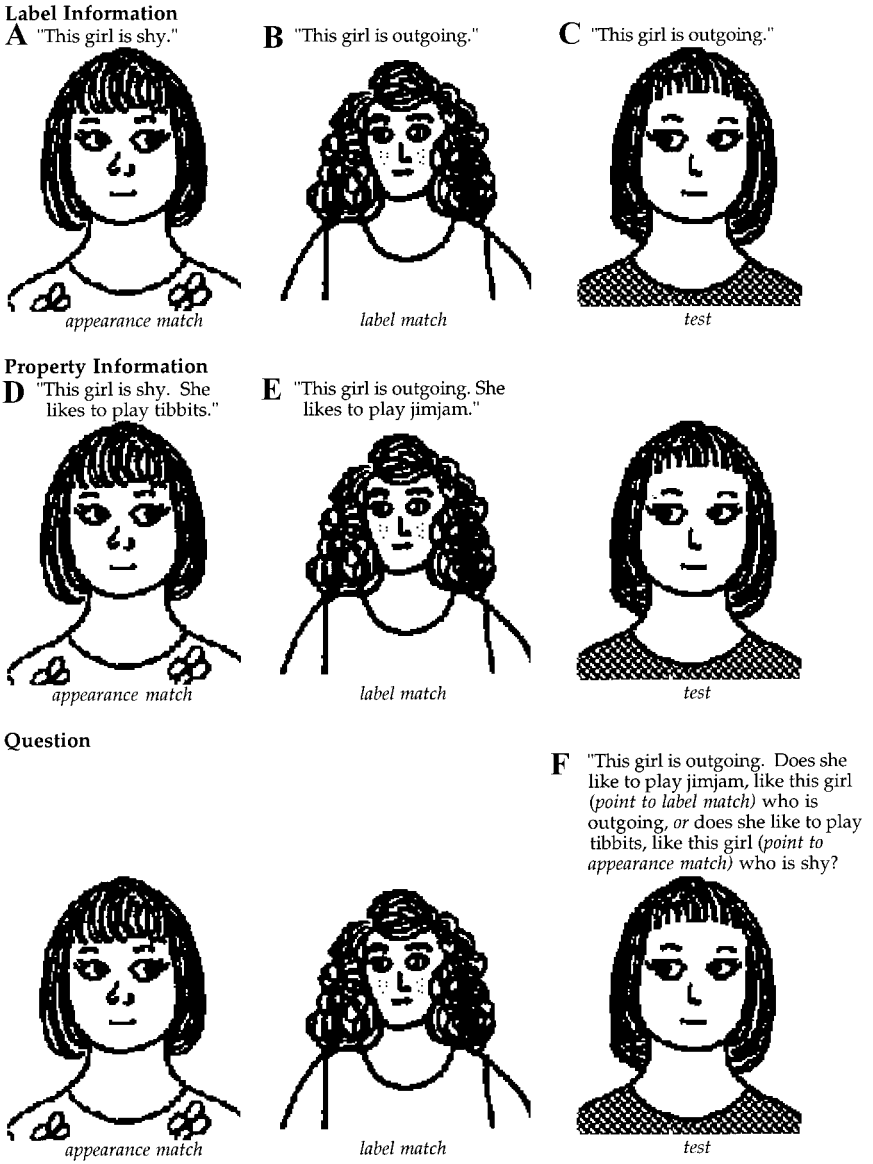

FIG. 1. Example procedure for a single test question in Study 1. Experimenter asked questions (A) through (F) in sequence, pointing to the appropriate characters as they were mentioned. Layout is schematic; in the actual protocol, the *test* drawing appeared centered below the *appearance match* and *label match* drawings.

characters. Finally, a forced-choice question was asked about the test character: Does the test character (Item F in the bottom row of Fig. 1) share the property of the appearance match character, or of the label match character?

TABLE 1
The Label Pair and Property Pairs That Made Up Item Set 1 within Each of the Four Studies

Study	Label pair	Property pairs
Study 1	is shy [outgoing]	likes to play jimjam [tibbits] likes to spend time at villing [kranoot]
Study 2		
Looks like	is shy [outgoing]	likes to play jimjam [tibbits] likes to spend time at villing [kranoot]
Arbitrary property	is shy [outgoing]	likes to play jimjam [tibbits] likes to spend time at villing [kranoot]
Study 3		
Preference	likes the color orange [red]	likes to play jimjam [tibbits] likes to spend time at villing [kranoot]
Name	is Anna [Beth] is Sam [Noah]	likes to play jimjam [tibbits] likes to spend time at villing [kranoot]
Study 4	is artistic [not artistic]	likes to play jimjam [tibbits]

Note. The label pair used in the *name* condition of Study 3 differed depending on whether it was applied to drawings of boys or of girls. Study 4 used only a single property pair.

The traits and properties for each of the eight test questions were assigned with reference to the trait of the test character. The trait of each test character was drawn from one of four *item sets.* Each item set consisted of two contrastive trait labels, and two pairs of properties, for use with two different test questions. Within each item set, one of the labels was ascribed to the test character on one trial, and the other label was ascribed to a different test character on another trial. For example, in one item set the test character was identified as "outgoing," and the appearance match and the label match characters were identified as "shy" and "outgoing," respectively. For a second test question drawn from this item set, a different test character was identified as "shy," and appeared with an "outgoing" appearance match character and a "shy" label match character.

Table 1 presents the labels and properties that constituted Item Set 1 for each of the studies in this paper. In Study 1, the label pair for Item Set 2 was "is nice [mean]" and the property pairs were "likes to play with Chris [Pat]" and "likes to zerber [tukal] after school." For Item Set 3, the label pair was "is silly [serious]" and the property pairs were "favorite t.v. show is 'Scanton and Scanton' ['The Three Aces']" and "favorite teacher is Mrs. Apperton [Mrs. Birch]." For Item Set 4, the label pair was "is smart [not smart]" and the property pairs were "needs help with his/her Jarrow [Reipish] homework" and "wants to erkin [towket] when he/she is grown up."

The contrastive trait pairs were chosen as trait concepts that were likely to be familiar to young children, as suggested by our previous work. Novel properties were chosen to be the sort of psychological inferences adults might make from the traits, and to be the sort of inferences children have made from social-

categorical information in previous work (Taylor & Gelman, 1993). The properties included preferences, desires, and needs. For example, participants might be asked to predict whether a "shy" child would want to play "tibbits" or "jimjam." The appropriateness of the novel properties was evaluated by 11 adults in pilot testing. Ten of 11 adults used the trait label, as opposed to the physical appearance information, to make inferences about the novel properties on at least 75% of the trials. (The one participant who did not said he inferred that individuals who looked similar were siblings, and made his inferences based on these presumed relationships.)

The eight sets of pictures (four sets depicting girls, four depicting boys) were presented in one of four possible orders. The position (left or right) of the label match and appearance match drawings (and thus the order in which they were mentioned) was semirandom, as was the mapping between characters and labels within each contrastive trait pair. This was done using a computer program that generated a set of protocol sheets in which these factors were counterbalanced across participants.

All appearance match responses were scored as "0" and all label match responses were scored as "1." Total scores were then summed, leading to a score range of 0 to 8, with 0 indicating that the child selected the appearance match on all trials, and 8 indicating that the child selected the label match on all trials.

Results and Discussion

In Study 1, as in the other studies in the present paper, a two-tailed *t* test against chance was conducted to test for patterns of systematic response. As predicted, children used the trait label significantly more often than expected by chance, on an average of 5.75 ($SD = 1.73$) out of 8 possible trials, $t(15) = 4.04$, $p < .005$. Scores were not significantly correlated with age ($r = -.06$, *ns*) and there were no effects of Item Set ($F(3, 45) = 1.44$, $MSE = 0.38$, *ns*).

Individual patterns of response were also characterized. Participants scoring 6 or greater were classified as using a *label-based* strategy and participants scoring 2 or less were classified as using an *appearance-based* strategy. (The probability of an individual making six or more *trait* responses when responding randomly is 14%, as is the probability of making or six or more *appearance* responses when responding randomly.) By this criterion, 68.75% of participants used label-based strategies and 6.25% used appearance-based strategies. The remaining 25% of participants showed no clear strategy preference.

In short, results indicate that participants viewed the trait information as holding greater inductive potential than the appearance information in making novel psychological inferences. However, an alternative explanation is that children use trait labels whenever they make inferences, regardless of the nature of the inferences. This possibility is explored in Study 2. Another possibility is that children assume that labels of any kind provide a basis for inferences about psychological properties. This possibility is explored in Study 3.

STUDY 2

In Study 1, preschoolers used trait labels to make novel inductive inferences. We interpret these results as indicating that participants viewed trait labels as an important source of psychological inference. An alternative explanation is that the results are due to simple labeling biases (see Gelman & Coley, 1991). Study 2 examines one such type of bias: that preschool children might tend to use trait labels when making inferences whenever they are available, regardless of the nature of the inferences.

There were two conditions in Study 2. In the *looks like* condition, the procedure was identical to that of Study 1, except that all properties were preceded by the words "looks like my friend who." For example, one set of contrastive properties was "looks like my friend who likes to play tibbits" and "looks like my friend who likes to play jimjam." In the *arbitrary property* condition, the procedure was identical to that of Study 1, except that arbitrary properties were used (e.g., whether the child is feeling hungry versus thirsty). We predicted that participants would not systematically use trait labels to make these types of inferences. Results consistent with this prediction would rule out any simple bias toward using the trait labels.

Method

Participants. There were 32 participants (16 boys, 16 girls), with 16 participants in each of the two conditions. Ages ranged from 3 years 5 months to 4 years 10 months, with a mean of 4 years 2 months.

Design and procedure. The design and procedure were identical to those of Study 1 (see Fig. 1), except that different properties were used. The *looks like* condition was included to rule out a possible bias to choose label-based responses when properties are superficially similar, but appearance information would be more relevant than trait information as a basis for inference. As indicated above, the phrase "looks like my friend who" preceded each of the properties. The way in which this procedure differs from that of Study 1 can be seen with reference to the example shown in Fig. 1. For Study 2, the property information phase would read, "She looks like my friend who likes to play tibbits" (Item D) and "She looks like my friend who likes to play jimjam" (Item E). The test question phase (Item F) would read, "See this girl who is outgoing. Does she look like my friend who likes to play jimjam, like this girl who is outgoing, *or* does she look like my friend who likes to play tibbits, like this girl who is shy?"[1]

The *arbitrary property* condition was used to rule out simple trait label biases as an explanation for the results of Study 1. Properties were selected for which trait labels should have no special inductive potential. The example shown in Fig.

[1] Despite the advantages of the *looks like* condition, it cannot completely rule out the possibility that a trait label bias produced the results that were seen in Study 1. It is possible that trait label biases were present, but were not seen due to factors that were specific to the particular wording of the *looks like* condition. For example, a trait label bias might not appear because of the complexity of the question, or because the phrase "looks like" promotes responses that are based on appearance.

1 describes this procedure, except that the *property information* phase would read, "She is feeling hungry" (Item D) and "She is feeling thirsty" (Item E). The test question phase (Item F) would read, "See this girl who is outgoing. Is she feeling thirsty, like this girl who is outgoing, or is she feeling hungry like this girl who is shy?"

In both the *looks like* and the *arbitrary property* conditions, the label pairs were the same as those used in Study 1. The property pairs for Item Set 1 were presented in Table 1. For the *looks like* condition, the property pairs for Item Sets 2, 3, and 4, respectively, were as follows: "looks like my friend who likes to play with Chris [Pat]" and "looks like my friend who likes to zerber [tukal] after school"; "looks like my friend whose favorite t.v. show is 'Scanton and Scanton' ['The Three Aces']" and "looks like my friend whose favorite teacher is Mrs. Apperton [Mrs. Birch]"; "looks like my friend who needs help with his/her Jarrow [Reipish] homework" and "looks like my friend who wants to erkin [towket] when he/she is grown up." For the *arbitrary property* condition, the property pairs for Item Sets 2, 3, and 4, respectively, were as follows: "lives near Elm Street [Pine Street]" and "goes to swim lessons on Monday [Tuesday]"; "eats popcorn at 7:00 [8:00]" and "saw a bird [squirrel] at the park"; "has a G [K] in his/her name" and "has tape [a sticker] on the bottom of his/her shoe."

Results and Discussion

Participants in the *looks like* condition did not treat the trait labels as more informative than appearance information when making inferences about who a person looks like. They appropriately gave much more weight to the appearance information, $t(15) = 4.67$, $p < .001$. They made trait inferences on an average of only 1.87 out of 8 trials ($SD = 1.73$). Scores were not significantly correlated with age ($r = -.32$, *ns*) and there were no significant effects of Item Set ($F(3, 45) = 1.40$, $MSE = 0.19$, *ns*).

Individual response patterns were identified in the same manner as in Study 1, with participants scoring 6 or higher classified as using a label-based strategy, and participants scoring 2 or lower classified as using an appearance-based strategy. A label-based strategy was used by 6.25% of participants and an appearance-based strategy was used by 68.75% of participants. The remaining 25% showed no clear strategy preference. These results suggest there was no general bias to make inferences based on trait labels. In addition, the results indicate that participants did indeed judge test pictures to be more similar to appearance match pictures than to label match pictures.

Participants in the *arbitrary property* condition did not use the label information to a greater extent than would be expected by chance ($p > .2$). This indicates that they did not treat the trait labels as more informative than appearance information when making inferences about arbitrary properties such as whether someone is feeling hungry or thirsty. They made trait inferences on an average of 4.56 out of 8 trials ($SD = 2.10$). Scores were not significantly correlated with age ($r = .08$, *ns*) and there were no significant effects of Item

Set ($F(3, 45) = .08$, $MSE = 0.53$, *ns*). A label-based strategy was used by 37.5% of participants and an appearance-based strategy was used by 18.75% of participants. The remaining 43.75% showed no clear strategy preference.

The results of these two conditions stand in contrast to the results of Study 1, in which participants had a significant preference for the trait label match responses, and the majority of participants made label match responses on at least 75% of the trials. Thus, these conditions rule out the possibility that the Study 1 results can be attributed to a simple bias to use trait labels.

STUDY 3

As with Study 2, the goal of Study 3 was to rule out potential biases as an explanation for the results of Study 1. For Study 3, the question is whether preschoolers might have a simple bias to assume that labels of any sort are predictive of psychological properties.

Two conditions were included. In the *preference* condition, the procedure was identical to that of Study 1 except that trait labels were replaced with a description of color preferences (e.g., "likes the color green"). In the *name* condition, the procedure was identical that of Study 1 except that trait labels were replaced with proper name labels (e.g., "Anna" or "Sam"). If participants do not use these types of labels to make psychological inferences, then the results of Study 1 are unlikely to have resulted from a general tendency to use labels when making psychological inferences.

Method

Participants. There were 32 participants (16 boys, 16 girls), with 16 participants in each of the two conditions. Ages ranged from 3 years 6 months to 4 years 10 months, with a mean of 4 years 2 months.

Design and procedure. The design and procedure of each condition were identical to those of Study 1 (see Fig. 1) except that different verbal labels were used.

In both the *preference* and the *name* conditions, the property pairs were the same as those used in Study 1. The label pairs for Item Set 1 were presented in Table 1. For the *preference* condition, the label pairs for Item Sets 2, 3, and 4, respectively, were as follows: "likes the color yellow [purple]," "likes the color silver [gold]," and "likes the color green [blue]." The label pairs for Item Set 1 were presented in Table 1. For the *name* condition, the label pairs for Item Sets 2, 3, and 4, respectively, were as follows: "is Becky [Sara]" for female triads and "is Robert [Tom]" for male triads; "is Katie [Jessica]" for female triads and "is Christopher [John]" for male triads; and "is Jane [Emily]" for female triads and "is Alex [Michael]" for male triads.

Results and Discussion

Participants in the *preference* condition did not use the label information to a greater extent than would be expected by chance ($p > .2$). This indicates that

they did not view the color preference descriptions as more informative than the appearance information. They made trait inferences on an average of 4.63 out of 8 trials ($SD = 2.03$). Scores were not significantly correlated with age ($r = -.03$, *ns*), and there were no effects of Item Set ($F(3, 45) = .33$, $MSE = 0.30$, *ns*).

As in Studies 1 and 2, individuals were classified as having used a label-based strategy, an appearance-based strategy, or neither. Slightly more participants (37.5%) used a label-based strategy than used an appearance-based strategy (25%). The remaining 37.5% showed no clear strategy preference.

Similar results were seen in the *name* condition: Participants did not use the label information to a greater extent than would be expected by chance ($p > .2$). They made trait inferences on an average of 4.19 out of 8 trials ($SD = 1.38$). Scores were not significantly correlated with age ($r = .13$, *ns*), and there were no effects of Item Set ($F(3, 45) = 21$, $MSE = 0.50$, *ns*).

Only 12.5% of participants used a label-based strategy and 6.25% used an appearance-based strategy. The remaining 81.25% showed no clear strategy preference. It is notable that participants showed no preference for the label information in this case, even though it was presented in the same sentence frame as the trait information in Study 1 (i.e., the frame "this girl [boy] is X" was used to describe traits and names in both cases). However, it should be pointed out that proper names are sometimes viewed as important sources of inference for young children: Bauer and Coyne (1997) found that $3\frac{1}{2}$-year-old children used the gendered nature of common proper names to make inferences about a child's preferences.

In short, participants showed no systematic pattern of emphasis on labels or appearance information as a basis for inference. This suggests that participants did not assume that verbal descriptions are always more informative than appearance information for making psychological inferences. Consequently, the findings help to rule out the possibility that the results from Study 1 can be explained in terms of a general bias to use verbal descriptions to make inferences of this type.

STUDY 4

Study 4 was designed to replicate Study 1, with two procedural differences. First, an entirely new set of contrasts was created, which were presented on only a single occasion, rather than being presented twice, as in Study 1. This allowed us to rule out the possibility that the results depended on a particular set of trait words, or on hearing particular sets of trait words repeated. Second, in Study 4 the similarity of the appearance match characters was explicitly pointed out to participants. Although it is clear that the participants in the *looks like* condition of Study 2 were capable of using appearance information to make inferences, it is possible that some participants might not notice it if they are not asked a question about appearance.

Method

Participants. There were 21 participants total (7 boys, 14 girls). Ages ranged from 3 years 5 months to 4 years 9 months, with a mean of 4 years 2 months.

Design and procedure. The procedure was similar to that of Study 1, with two key differences. First, before being presented with any other information, participants were informed that the appearance match characters "look kind of alike." The other difference is that four new contrastive trait pairs were used. The label and property pairs for Item Set 1 were presented in Table 1. In Study 4, the label pair for Item Set 2 was "brave [not brave]" and the property pair was "likes to spend time at villing [kranoot]." The label pair for Item Set 3 was "is friendly [not friendly]" and the property pair was "likes to play with Chris [Pat]." The label pair for Item Set 4 was "is selfish [is not selfish]" and the property pair was "likes to zerber [tukal] after school."

Results and Discussion

As predicted, children used the trait label significantly more often than the appearance information, on an average of 2.62 ($SD = 1.25$) out of 4 possible trials, $t(20) = 2.21$, $p < .05$. Scores were not significantly correlated with age ($r = .07$, *ns*) and there were no effects of Item Set ($F(3, 60) = .08$, $MSE = 0.53$, *ns*).

Individual patterns of response were also characterized. In this study, 66.67% of children selected a trait match on at least three trials, and 28.57% selected a trait match no more than once. One child chose each response two times. The probability of an individual making three or more *trait* responses by chance is 31%. (The probability of an individual making three or more *appearance* responses by chance is also 31%.)

In short, results of Study 4 provided further evidence that participants viewed the trait information as holding special inductive potential for making novel psychological inferences.

GENERAL DISCUSSION

Results from Study 1 indicate that 3- and 4-year-olds used trait label information to make novel psychological inferences, even when it conflicted with visible resemblance. Studies 2 and 3 suggest that these results cannot be explained in terms of simple biases in the task. Study 2 helped to rule out the possibility that the results of Study 1 can be explained in terms of a trait label response bias. Participants did not show a systematic tendency to use the trait label information when asked to make inferences about whom someone looks like, or to make predictions about arbitrary properties such as whether someone is feeling hungry or thirsty. Study 3 helped rule out the possibility that the results of Study 1 can be explained in terms of a bias to assume that all verbal descriptions are predictive of psychological properties. Participants did not show a systematic emphasis on verbal information when the information described

color preferences or proper names. Study 4 replicated the results of Study 1 with a new set of trait labels in a context where appearance information was explicitly pointed out to participants.

If children do not conceptualize traits as referring to what individuals are generally like, or if they view traits as merely describing superficial patterns of behavior, there is no reason to expect that they would have placed emphasis on the trait information that was presented in Study 1. Consequently, these findings are consistent with other research suggesting that children as young as preschool age have some capacity to reason about traits in a theory-based manner (Heyman & Gelman, 1999; Yuill & Pearson, 1998). In other words, preschoolers appear to have some understanding that trait labels can have implications for the mental lives of others. The present results also build on previous work by providing information about the scope of young children's trait inferences. The use of novel properties allows for an investigation of whether children's trait-relevant inferences go beyond previously learned associations between labels and properties. Results suggest that preschool children can indeed make trait inferences that are more than a small conceptual step away from their prior knowledge.

Results of the present research suggest that trait categories may serve a function similar to that of categories outside the social domain. Just as preschoolers can use information about biological categories instead of perceptual similarity to make inferences about unseen properties (Gelman & Markman, 1986, 1987), they can use trait category information to make inferences about unseen properties. This is consistent with Rothbart and Taylor's (1992) suggestion that social categories are sometimes thought to share important features with natural kind categories.

The finding that children used trait information, rather than perceptual information, to make trait-relevant inferences is in apparent contrast to the results of Hoffner and Cantor (1985), who found that 3- to 5-year-old children placed strong emphasis on appearance information when making inferences about trait-relevant properties. However, there are procedural differences between the two studies that may account for the differences in findings.

One key difference between the studies is that in the present study, trait information was directly provided to children in the form of trait labels. In contrast, the trait information provided by Hoffner and Cantor (1985) can be described as a set of behavioral properties associated with the trait categories of interest. As noted previously, it may be more difficult for young children to make property-to-category than category-to-property inferences (Gelman et al., 1986; Imai, 1995). Making trait inferences from behaviors may be especially difficult given the indirect relationship between behaviors and traits (see Heyman & Gelman, 1998; Yuill, 1992).

Another key difference between the two studies concerns the nature of the perceptual information that was presented. In the present research, the relation between characters' appearance and the trait of interest was arbitrary. In contrast, in the Hoffner and Cantor (1985) study, the appearance information conveyed

highly familiar trait-relevant stereotypes (i.e., a witch and a kindly grandmother) and was presented in opposition to other trait-relevant information (i.e., behavior). There is evidence that presenting young children with trait-relevant information of contrasting valence can result in a failure to encode, interpret, or remember some of the relevant information in the expected way (Heyman & Gelman, 1999, Study 2; see also Signorella, 1987, regarding similar findings with regard to gender concepts). It may have been that the young children in the Hoffner and Cantor (1985) study used the appearance information to make a trait inference, and then reinterpreted the behavior so as to be consistent with that inference. For example, they may have concluded that the ugly woman who looked like a witch really was a mean witch, and subsequently inferred that her seemingly kind actions were part of a mean trick. Because children often watch videos or movies in which characters' appearance is highly correlated with their psychological characteristics, it seems reasonable to assume that the video presentation of scenarios in Hoffner and Cantor (1985) might have increased such appearance-based inferences.

There remains the broader question of how the present findings can be reconciled with evidence that young children sometimes fail to use trait concepts in their reasoning about people (see Rholes et al., 1990). One possibility is that the development of trait thinking includes learning how to make a wide range of inferences about people, and that the types of inferences examined in the present study are ones that tend to be made even by relatively young children. As argued previously, children may show a tendency to use traits to make inferences about trait-relevant properties before they show a tendency to use trait-relevant properties to infer traits. Until now, we have presented this as a methodological issue. However, it may also have broader implications. For example, it may be that much of the development in trait understanding during the preschool years involves learning a range of culturally appropriate inference rules for inferring trait categories from properties.

A related point is that, in contrast to other studies, the present research does not require children to have highly elaborated models of specific traits in order to show evidence of competence. It is likely that the competence exhibited in the present study reflects a general assumption that trait labels can be used as tools to carve up the social world and make inferences.[2] This assumption may motivate and guide social learning in a way that promotes the development of detailed

[2] Trait labels may be recognized based on previous experience with the label in question, or based on contextual cues such as linguistic factors. For example, Gelman and Heyman (1999) provide evidence that 5- and 7-year-old children view human characteristics as more traitlike when the characteristics are lexicalized (e.g., when someone is described as a "carrot-eater," as opposed to simply someone who "eats carrots"). However, it is important to note that the present research does not address whether traits are viewed as stable (see Heyman & Gelman, 1999, for a related discussion). In addition, the relative inductive potential of trait labels versus other types of category information, such as gender, was not assessed but could be assessed using this type of method (see Taylor & Gelman, 1993).

beliefs about the nature of traits and trait inference rules (see Sperber, 1996, regarding the ways in which partially understood concepts can serve as a basis for further learning).

Conclusion

The present research provides evidence that trait labels provide a set of conceptual tools that allow preschool-age children to make nonobvious inferences. This evidence is consistent with the view that young children's trait concepts are not limited to superficial descriptions of people, and it suggests that even children of this age may view traits as a relevant source of information for learning about the mental lives of people.

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