The Development of Children's Beliefs about Social and Biological Aspects of Gender Differences

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Scientists generally agree that both nature and nurture may contribute to differences between groups of people. In the case of gender, a wide range of factors are believed to contribute to differences, including socialization and biology (Archer & Lloyd, 1982; deaux, 1984) as well as differential access to opportunities and power (Thompson, 1981). The issue of which aspects of gender are biologically constrained and which are linked to social factors continues to be debated (see hyde, 1990, for a review of this literature). The present studies do not focus on gender differences themselves, but instead examine children's and adults' beliefs about how they develop. Specifically, these studies focus on two questions. First, what age-related changes are there in children's beliefs about the contributions of nature and nurture to the development of gender roles? Second, do children differentiate between aspects of gender roles that adults believe to be more biologically determined and those they believe to be more environmentally influenced?

Research with children and adolescents has suggested that there are age-related changes in beliefs about the causes of gender differences. Ullian (1976) interviewed 6-18-year-olds and found that causal beliefs shifted with age from a biological orientation (focus on innate physical differences), to a socialization orientation (focus on social roles and obligations), and finally to a psychological orientation (focus on requirements of individual and interpersonal functioning). Smith and Russell (1984) reported a similar shift from a biological to a societal orientation in their interviews with 7-15-year-olds, but found little evidence for a psychological orientation. By adult age, samples

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of parents (Antill, 1987) and college students (Martin & Parker, 1995) mentioned both biology and socialization in their explanations of gender differences. When asked which factor they saw as more important, both groups favored socialization (although a third of the parent sample saw both as equally important). Causal beliefs varied by domain, for example, parents viewed differences in interests as more socially determined than differences in personality traits.

These findings suggest that children initially attribute biological causes to differences between males and females and only later acknowledge the role of environmental factors. There is some disagreement as to when the shift occurs, although inconsistencies across studies could be due to methodological differences. Ullian (1976) reported that children did not begin to mention that gender roles are arbitrary, variable, and a function of social convention until age 12. Smith and Russell (1984) found that even by age 15, only 61% of girls and 26% of boys explained differences in terms of socialization.

These interview studies provide useful information about when children can produce biological or environmental explanations for gender differences, but they are limited in a number of ways. First, they have only looked at older children. Second, the open-ended tasks used in previous work have relied heavily on children’s linguistic competence, and may have underestimated children’s ability to reason about social and biological influences even when they could not spontaneously produce appropriate causal explanations. Specifically, the interview method may have biased children toward the sorts of explanations that were easy to produce verbally. If children have a biological view of gender differences, this bias should come out in a stronger test, where nature and nurture are pitted against one another. The present studies provide a more sensitive measure of children’s early understanding of gender differences and assess the relative strength of their beliefs concerning biological versus social influences.

Although previous studies have not directly examined young children’s beliefs about the origins of gender differences, a number of findings in a variety of domains are relevant for theorizing about how such beliefs might develop. I will briefly summarize evidence concerning children’s understanding in the following areas: gender roles as social conventions, biology, and biological versus adoptive influences on development in animals and humans.

Gender Roles as Social Conventions

Based on the literature concerning the development of children’s social conventional knowledge, one might expect that children would not begin to think of conformity to gender roles as a social obligation, as opposed to a biological necessity, until middle childhood. Understanding that the social environment can contribute to gender-role development involves accepting the idea that certain roles are flexible and open to modification. This seems to be a rather late-developing ability. According to Turiel (1978), children’s acquisition of gender-role knowledge is one facet of their developing understanding of social conventions. Preschool children do not seem to acknowledge the arbitrary nature of social conventions (e.g., etiquette, gender roles), which sets them apart from physical laws. By age 8, they begin to recognize that social conventions, unlike physical laws, are culturally relative and can be modified if all (or most) people in the relevant community are willing (Nucci & Turiel, 1978).

Recent empirical evidence has suggested that older children’s beliefs about gender roles and social conventions (e.g., etiquette), but not physical laws (e.g., the law of gravity), are more flexible than those of younger children. Carter and Patterson (1982) found that 14-year-olds were more aware than 5-year-olds of exceptions to gender-role stereotypes and better understood that gender roles are culturally relative. Changes in children’s gender-role flexibility were related to flexibility in beliefs about social conventions but not physical laws. Similarly, Levy, Taylor, and Gelman (1995) found that 4-year-olds were less likely than 8-year-olds and adults to recognize that gender-role behavior—as well as moral and social conventional behavior—could vary, even though they understood that physical laws could not be broken.

Other evidence has suggested that gender stereotypes, once formed, become less rigid and more probabilistic as children get older (Leach & Shirk, 1984; Martin, 1989). With age, children come to understand that the sexes may have characteristics in common (e.g., some girls play football), even when the behaviors may be more representative of one group (boys, in this case). They also come to recognize variability within a
category (e.g., not all boys play football). Some researchers have argued for increased flexibility with age (Archer, 1984; Garrett, Ein, & Tremaine, 1977; Shepard & Hess, 1975). Others have found a U-shaped function (Emmerich, 1982; Stoddart & Turiel, 1985). For example, Trautner, Helbring, Sahm, and Lohaus (1989) found that rigid gender stereotyping reached its peak at age 6 and then decreased with age.

The finding that certain gender roles come to be viewed as social conventions (i.e., as arbitrary and variable) does not imply that all gender differences should be viewed this way. A social-conventional view is clearly inadequate for roles constrained by physical differences. It is a biological fact, not a social construct, that women and not men have the potential to bear children. Such biologically constrained differences are probably better understood as physical laws than as social conventions, and children’s beliefs should reflect this distinction (Carter & Patterson, 1982). Thus, children must learn which aspects of gender roles adults attribute to social factors and which they attribute to biological factors. If gender categories have aspects of both biological and social categories, how and when do children come to appreciate this dual status?

**Children’s Social and Biological Knowledge**

There has been considerable disagreement as to whether children’s conceptions of the biological and social worlds develop independently or whether their knowledge of one domain derives from the other. Some have argued that even preschoolers possess specifically biological beliefs and recognize a basic distinction between biological and social phenomena (Keil, 1989). Springer (1982) found that 4- and 5-year-olds do not expect social relationships (e.g., friendship) to imply shared biological characteristics, and they do not expect biological relationships (e.g., kinship) to imply nontypical or social properties. By contrast, Carey (1985) has argued that young children think about biological phenomena in terms of human behavior or intention, and do not understand biology as an autonomous domain until 10 years of age.

Specifically, Carey (1985) has asserted that children initially think of gender as a social construct and only later come to construe it in multiple ways (e.g., as social, biological, or psychological). She stated that for children below age 7, “gender is not a basic biological fact about people. Rather, its meaning to children is social: what they wear, how they cut their hair, what they like to play with, and how other people react to these choices. Coming to see gender as a biological given is part of the emergence of biology as a separate domain of intuitive theorizing that occurs during the first decade of life” (p. 54). Although there has been little direct empirical evidence to support this position, the fact that preschoolers commonly fail on verbal or perceptual measures of gender constancy has been taken as an indication that they do not yet view gender as biological (i.e., as immutable and essential to identity).

Some gender constancy research has been consistent with Carey’s position and has suggested that preschoolers readily judge appearance changes as sufficient to change a person’s sex (Emmerich, Goldman, Kirsch, & Sharabany, 1977; Kohlberg, 1966; Slaby & Frey, 1975). However, more recently, researchers have shown that using more naturalistic conditions (Leonard & Archer, 1989) or asking for “real” versus pretend responses to gender constancy questions (Martin & Halverson, 1983) is likely to improve performance even in children as young as 3. Others have argued that the task underestimates one important aspect of young children’s biological knowledge about gender, namely, an understanding that gender category labels go beyond outward appearances and capture deep similarities among members (Bem, 1989; Gelman, Callahan, & Maccoby, 1986).

**Children’s Expectations about Category Membership**

One area of research that might be informative with respect to the debate about whether children view gender as social or biological is the literature on children’s understanding of social categories (e.g., race; Hirschfeld, 1995) and natural kind categories (Gelman & Wellman, 1991; Markman, 1989). Recent findings have converged on the idea that children and adults tend to view categories of natural kinds (e.g., cats, gold, trees) as less arbitrary than those of artifact kinds (e.g., chairs, houses, cars), and they seem to act as if natural kinds have underlying essences or true natures that make members of a category similar to one another and members of different categories different (Gelman & Wellman, 1991; Medin & Ortony, 1989). Furthermore, children and adults may have a tendency to treat social categories as more similar to natural kind
categories than artifact categories (Rothbart & Taylor, 1992).

One piece of evidence for a child’s belief in a category essence is an expectation that animals and people have the potential to develop in certain ways (i.e., consistent with their inborn category membership) in spite of environmental influences. For example, Hirschfeld (1995) found that 5-year-olds expected infants switched at birth and raised with parents of a different race to resemble their biological parents physically. Similarly, Springer (1995, March) found that 4- and 5-year-olds expected an adopted infant to share physical properties, but not beliefs and preferences, with its biological rather than adoptive parents. In addition, Gelman and Wellman (1991) found that 4-year-olds expected a baby animal raised from birth with another species to have the properties associated with its category membership rather than its environment. Thus, there has been converging evidence that preschool children believe that members of some social and nonsocial categories will develop in similar ways even in varied environments (but cf. Solomon, Johnson, Zaitchik, & Carey, 1996). It remains an empirical question whether children have similar beliefs about members of gender categories.

**The Present Studies**

It is unclear from the existing literature on these related issues what the developmental course would be for children’s understanding of the biological and social aspects of gender. One possibility is that preschool children might initially treat members of gender categories, like other categories of living things, as having essential, underlying similarities, even before they can articulate their beliefs as a specifically biological perspective. Later, children may overcome their initial essentialist bias and begin to acknowledge the role of environmental influences in shaping gender roles development. Thus, older children may allow for more variation with each gender category and more similarities between gender categories than do younger children. However, in order to have an adult understanding of gender roles, children need to acknowledge that the environment can influence certain gender roles (e.g., activity and occupation preferences) but not others (e.g., capacity to bear children).

Two studies were conducted to examine age-related changes in children’s beliefs about the development of gender-stereotyped and biological properties. In Study 1, children and adults were told about a baby who was raised from birth on an island with only members of the opposite sex (opposite-sex environment condition) or with only members of the same sex (same-sex environment condition). They were asked what properties the infant would have at age 10; for example, would a girl raised with all boys have the properties stereotypically associated with members of her gender category or those associated with the children and adults in her environment? What distinguishes this method from past methods is that it does not simply get at children’s explanations of gender differences in the typical case, but rather pushes them to see how strongly they adhere to an essentialist explanation when nature and nurture are in conflict. Study 2 was a control study to ensure that participants were attending to the task and not simply making associations between the gender category labels and stereotypical properties.

Participants were 4-10-year-olds and adults. Fourteen- and five-year-olds were included to represent a group that has typically participated in previous research on children’s expectations about natural and social categories but that has been excluded from interview studies concerning the origins of gender differences. Older children were included to examine the point at which children begin to recognize the role of environmental influences, and adults to provide a comparison group.

Several questions were addressed. First, to what extent do children believe that an infant’s inborn gender category membership and environment of upbringing contribute to that infant’s development? Specifically, which factor do children view as a more powerful influence on the acquisition of stereotyped and biological properties, and how does this change with age? In addition, do children differentiate between properties that adults believe to be constrained by category membership and those they believe to be influenced by the environment? When asked about infants raised on an opposite-sex island, older children and adults were expected to be more likely than younger children to recognize the role of the social environment and less likely to respond based on the infant’s gender category alone. I expected this to be the case for stereotyped properties but not for biological properties. That is, stereotyped properties, which may apply to *some* but not necessarily all mem-
bers of a category, should be more open to environmental influences than biological properties, which are less variable.

Study 1

METHOD

Participants

One hundred sixty children participated. Eighty children were randomly assigned to the opposite-sex environment condition, including eight girls and eight boys in each of five age groups: 4 years (M = 4.4), 5 years (M = 5.7), 8 years (M = 8.1), 9 years (M = 9.5), and 10 years (M = 10.5). Eighty children were assigned to the same-sex environment condition, including eight girls and eight boys per age group: 4 years (M = 4.7), 5 years (M = 5.5), 8 years (M = 8.0), 9 years (M = 9.5), and 10 years (M = 10.4). Children were recruited from private preschools and elementary schools and were primarily white and of middle socioeconomic status. In addition, 32 college students (eight males, eight females per condition) participated to fulfill a requirement in an introductory psychology course.\(^1\)

Materials

Two picture sets were used, each consisting of three colored drawings. One set included pictures of (a) an island with girls and women, (b) a woman, and (c) a baby boy (opposite-sex environment condition) or girl (same-sex environment condition). The other set included pictures of (a) an island with boys and men, (b) a man, and (c) a baby girl (opposite-sex environment condition) or boy (same-sex environment condition).

Procedures

Children were tested individually by a female experimenter. Undergraduates completed a questionnaire on their own. Each child heard two stories, one with a female character and one with a male character. The order of presentation of the stories was counterbalanced across participants.

Opposite-sex environment condition.—Children first saw a picture of a baby with no distinguishing gender characteristics. The baby had very little hair, wore a gender-neutral outfit (pajamas), and was labeled with a gender-neutral name (Chris or Pat). The experimenter told the child that the baby had been brought up with only members of the opposite sex. For example, for the story with the female character, children heard the following: "Once there was a baby girl named Chris. When Chris was a tiny baby, she went to live with her uncle on a beautiful island. On this island there were only boys and men; Chris was the only girl. Chris lived a very happy life on the island, but she never saw another girl or woman." Children were shown pictures of the opposite-sex relative and the island when they were mentioned. All three pictures were left in view.

Children pointed to all of the men and boys on the island and then answered a series of questions which served as a memory check: (a) "Is Chris a girl or a boy?" (b) "Does Chris live with girls and women on the island?" (c) "Does Chris live with boys and men on the island?" and (d) "Are there any girls or women [boys or men] on the island?" Two children initially missed one of these questions, but answered correctly after hearing the story again.

Next, children were told about a fourth picture which showed the baby when she or he had grown to be 10 years old. This picture was presented behind a cardboard door so it was out of view until the end of the testing session. This procedure was followed so that children would have something on which to focus (i.e., the picture behind the door) but would not be influenced by the details of the drawing. Children were asked a series of questions concerning what properties the story character would have when she or he was 10 years old. The gender-neutral name (Chris or Pat) was used for all questions rather than the pronoun she or he, in order to reduce the likelihood of children simply reporting links between the pronouns and familiar stereotyped properties.

Children were asked about 20 properties. Twelve questions focused on stereotyped properties (six feminine, six masculine), including two personality traits, two toy preferences, four occupational aspirations, two physical appearance characteristics, and two abilities (see Table 1). Four questions focused on biological properties (has a body like a: girl's, boy's; grows up to be a: mommy, daddy). In addition, children

\(^1\) Twenty items (10 masculine, 10 feminine) were pretested or a sample of 32 undergraduates, using the task from the same-sex environment condition. The six masculine and six feminine items with the most stereotypical ratings were chosen for use in the present study. All of the items chosen had been given stereotypical ratings by at least 85% of participants.
were asked about four environmental control items constrained by the character’s environment (e.g., “Does Chris go to school with girls/boys on the island?” “Does Chris play with girls/boys on the island?”). Questions were presented in a separate random order for each child. The procedure was repeated for the second story character.

Same-sex environment condition.—This condition was included to provide a baseline level of responding and to ensure that the properties used were ones that children of this age found to be stereotypically feminine or masculine. Children were shown pictures of a baby girl or boy, a same-sex relative (i.e., an aunt or uncle), and an island with only same-sex children and adults. The remaining procedure was similar to that in the opposite-sex environment condition, but children were told that the infant was raised in a same-sex environment.

Scoring

Stereotyped and biological properties.—The results are discussed in terms of same-sex and opposite-sex items. These terms are used in reference to the story character, for example, for a female character, same-sex refers to the feminine items and opposite-sex refers to the masculine items. Participants received 1 point for answers based on the gender category of the infant (rather than the environment). These are referred to as category-based responses. For example, a participant who was asked about a baby girl raised with all boys would make a category-based response by saying “yes” for the same-sex (feminine) items or by saying “no” for the opposite-sex (masculine) items. Thus, the opposite-sex items are reverse-coded, and a high number of category-based responses indicates that the participant believed the character would not acquire these properties.

Each participant received two sets of scores, one for each story character. Each set included four scores, corresponding to the number of category-based responses for the same-sex stereotyped properties, opposite-sex stereotyped properties, same-sex biological properties, and opposite-sex biological properties. Scores could range from 0 to 6 for the stereotyped properties, and from 0 to 2 for the biological properties.

Environmental control items.—These items assessed children’s memory for the stories. Children received two scores, one for each story character, indicating the number of correct responses. Scores could range from 0 to 4.

RESULTS

Preliminary Analyses

Children at all ages were highly accurate on the environmental control items, suggesting that they were able to retain information about the story and that the task was suitable for even the youngest children in
the sample. Mean scores for the 4-10-year-olds ranged from 3.84 (96%) to 4.00 (100%) out of 4. The overall mean was 3.93 (98%), which is significantly above a chance expectation of 50% or 2, $t(159) = 68.46, p < .0001$.

Children and adults in the same-sex environment condition endorsed feminine items more often for the female character than the male character and masculine items more often for the male character than the female character (see Table 1). It was critical to determine that they did so to the same extent for the two characters in order to ensure that the items were comparable. Two scores were entered for each of the 12 items, referring to the total number of "yes" responses across participants in the same-sex environment condition ($n = 96$) for the female and male characters, respectively. A 2 (item type: same-sex, opposite-sex) $\times$ 2 (character sex: female, male) ANOVA revealed a significant main effect for item type, $F(1, 10) = 90.85, p < .0001$, with participants attributing significantly more same-sex items than opposite-sex items to the story characters. However, there was no main effect for character sex and no interaction, suggesting that the feminine and masculine items were comparable.

Finally, preliminary ANOVAs revealed no differences based on participant sex or character sex, and these variables were dropped from subsequent analyses.

The Acquisition of Stereotyped and Biological Properties

Whether children and adults believe that an infant exposed to an opposite-sex environment would acquire gender-stereotyped properties depends on whether they believe these properties to be fixed at birth or open to environmental influences. However, if children understand the biological aspects of gender, they should say that an infant would acquire same-sex but not opposite-sex biological properties, regardless of the environment of upbringing. Thus, it was predicted that, with increasing age, there would be a decrease in the percentage of category-based responses but only for participants in the opposite-sex environment condition and only for the stereotyped properties. It was also predicted that there would be more category-based responses for biological properties than stereotyped properties, for children and adults in both conditions.

Figure 1 shows the mean percentages of category-based responses for the gender-stereotyped and biological properties (collapsing across same- and opposite-sex items). For this analysis, scores were totaled for the male and female characters, converted to percentages, and then averaged across same- and opposite-sex items. A 6 (age: 4, 5, 8, 9, 10, adult) $\times$ 2 (condition: same-sex environment, opposite-sex environment) $\times$ 2 (property type: stereotyped, biological) repeated-measures ANOVA revealed significant main effects for age, $F(5, 180) = 7.46, p < .0001$, condition, $F(1, 180) = 23.87, p < .0001$, and property type, $F(1, 180) = 373.44, p < .0001$, as well as significant interactions between age and property type, $F(5, 180) = 3.25, p < .008$, and condition and property type, $F(1, 180) = 56.40, p < .0001$. As predicted, these effects and interactions were subsumed under a significant age $\times$ condition $\times$ property type interaction, $F(5, 180) = 6.49, p < .0001$.

As expected, there was a decrease with age in the percentage of category-based responses for the stereotyped properties, but only for participants in the opposite-sex environment condition. Post hoc Scheffé $F$ tests revealed that 10-year-olds in the opposite-sex environment condition made significantly fewer category-based responses than 5- or 8-year-olds, and that adults made fewer than the 4-, 5-, or 8-year-olds. In addition, although there were no significant condition differences for the three youngest age groups, older children and adults in the opposite-sex environment condition made significantly fewer category-based responses for the stereotyped properties than their counterparts in the same-sex environment condition ($p < .008$). There were no significant age or condition differences for the biological properties.

Post hoc Scheffé $F$ tests also indicated that children and adults in both conditions made significantly more category-based responses for biological properties than for stereotyped properties, at each age ($p < .02$).\(^8\)

\(^8\) There was one exception to this pattern. There were no significant difference in category-based responses for the stereotyped versus biological properties for the 10-year-olds in the same-sex environment condition. These children made fewer category-based responses for the biological properties than any other age group. These results can be explained by the nature of the questions about the biological properties. Participants in the same-sex environment condition
Same-Sex versus Opposite-Sex Items

The following analysis provides a breakdown of data from the same- and opposite-sex items that had been collapsed in the previous analysis. There is another way to look at the data from the opposite-sex environment condition. Recall that children were asked about feminine and masculine items in separate questions rather than in a forced-choice format (e.g., "Does Chris like to play

were asked whether an infant raised on a same-sex island would grow up to be a mommy or a daddy. Older children were aware of the constraints of a same-sex environment and often pointed out that the story character could not have any children because they would have no opposite-sex partners available to them. Eleven of the 16 10-year-olds gave a sophisticated response (e.g., that the character could not be a parent) for at least one of the characters. Six children gave such a response for both characters. Several children provided spontaneous justifications for their responses. One boy said that the girl would not grow up to be a mommy because “it’s quite hard with no boys.” A girl said that the boy would not grow up to be a daddy “unless he moves.” These examples indicate that older children not only understood the biological implications of the properties, but also acknowledged the physical limitations of the same-sex environment.
with dolls or trucks?”). Thus, children could endorse both sets of items, one set of items more than the other, or neither set. This enables us to assess the influences of category membership and environment separately. An examination of responses for the same-sex items allows us to see whether the influence of gender category membership (or innate potential) is strong enough to overcome environmental forces. If children endorsed a high percentage of same-sex items, it would suggest that they believe that a baby girl, for example, would still develop feminine characteristics even when exposed only to males. Conversely, an examination of children’s responses for the opposite-sex items allows us to determine whether the influence of the social environment is powerful enough to overcome innate potential and allow children to develop properties that are atypical for members of their gender category. The following analysis focuses on children's beliefs about these two separate influences on gender-role development: (a) To what extent does a child’s gender category influence how that child develops? and (b) To what extent does a child’s environment influence how that child develops?

Responses for the same-sex and opposite-sex items were compared in two separate (age: 4, 5, 8, 9, 10, adult) × 2 (condition: same-sex environment, opposite-sex environment) × 2 (item type: same-sex, opposite-sex) repeated-measures ANOVAs, one for the stereotyped properties and one for the biological properties. Table 2 shows the mean number of category-based responses for the stereotyped and biological properties, averaged for the female and male characters. Recall that category-based responses represent the number of “yes” responses for same-sex items and the number of “no” responses for the opposite-sex items.

Table 2

<table>
<thead>
<tr>
<th>AGE/CONDITION</th>
<th>STEREOTYPED PROPERTIES</th>
<th>BIOLOGICAL PROPERTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Same-Sex</td>
<td>Opposite-Sex</td>
</tr>
<tr>
<td>4 years:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opposite-sex environment</td>
<td>4.88 (81)*</td>
<td>3.03 (51)</td>
</tr>
<tr>
<td>Same-sex environment</td>
<td>4.75 (79)*</td>
<td>3.97 (66)*</td>
</tr>
<tr>
<td>5 years:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opposite-sex environment</td>
<td>4.38 (73)*</td>
<td>4.44 (74)*</td>
</tr>
<tr>
<td>Same-sex environment</td>
<td>4.94 (82)*</td>
<td>4.22 (70)*</td>
</tr>
<tr>
<td>8 years:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opposite-sex environment</td>
<td>4.50 (75)**</td>
<td>4.50 (75)**</td>
</tr>
<tr>
<td>Same-sex environment</td>
<td>4.72 (79)**</td>
<td>5.38 (90)**</td>
</tr>
<tr>
<td>9 years:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opposite-sex environment</td>
<td>2.94 (49)</td>
<td>3.19 (53)</td>
</tr>
<tr>
<td>Same-sex environment</td>
<td>4.25 (71)**</td>
<td>4.91 (82)**</td>
</tr>
<tr>
<td>10 years:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opposite-sex environment</td>
<td>2.53 (42)</td>
<td>2.66 (44)</td>
</tr>
<tr>
<td>Same-sex environment</td>
<td>4.13 (69)**</td>
<td>5.28 (88)**</td>
</tr>
<tr>
<td>Adult:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opposite-sex environment</td>
<td>2.34 (39)</td>
<td>2.31 (38)*</td>
</tr>
<tr>
<td>Same-sex environment</td>
<td>4.75 (79)*</td>
<td>4.34 (72)*</td>
</tr>
</tbody>
</table>

Note.—Scores reported represent the number of category-based responses (i.e., the number of “yes” responses for same-sex items and “no” responses for opposite-sex items). Percentages are indicated in parentheses in order to facilitate comparisons between the stereotyped and biological properties.

* Means are out of 6 for the stereotyped properties.

b Means are out of 2 for the biological properties.

* Significantly different from chance expectation (50%), p < .01

** Significantly different from chance expectation (50%), p < .001.
I will first present results concerning the same-sex items, and then the opposite-sex items. Post hoc Scheffé F tests revealed that the findings for the same-sex items were similar to those in the previous analysis (collapsing across item type). For participants in the same-sex environment condition, there were no significant age differences in category-based responses. At all ages, participants in the same-sex environment condition said that the story characters would acquire a higher percentage of same-sex properties than would be expected by chance. However, there were age differences for participants in the opposite-sex environment condition, with 10-year-olds and adults making significantly fewer category-based responses for the same-sex items than 4-, 5-, or 8-year-olds, and 9-year-olds making fewer than 4-year-olds, ps < .05. In addition, as in the previous analysis, there were no significant condition differences for the 4-, 5-, and 8-year-olds. Children in these three age groups nearly always based their answers on gender category rather than the environment, for example, they said that a baby girl would acquire feminine properties whether she was raised with all boys or all girls. In contrast, 9-year-olds, 10-year-olds, and adults in the opposite-sex environment condition made fewer category-based responses for the same-sex properties than their counterparts in the same-sex environment condition (all ps < .02), for example, they said that a girl raised with boys would have fewer feminine properties than a girl raised with girls.

Post hoc Scheffé F tests indicated that when opposite-sex items (i.e., feminine items for a male character, masculine items for a female character) were examined separately, there were subtle differences from the patterns reported in the previous analysis. First, there were significant age differences for participants in the same-sex environment condition: 4-year-olds made significantly fewer category-based responses (i.e., "no" responses) for the opposite-sex items than 8- or 10-year-olds. In addition, 4-year-olds in the opposite-sex environment condition did not differ from 10-year-olds or adults in the number of category-based responses they made for the opposite-sex properties. That is, 4-year-olds, but not 5- or 8-year-olds, were just as likely as 10-year-olds and adults to say that an infant raised in an opposite-sex environment would acquire opposite-sex properties. However, recall that they were significantly more likely than 10-year-olds or adults to say that the same infant would acquire same-sex properties. There were significant condition differences for the 4-year-olds (p < .05), as well as the 8-year-olds through adults (ps < .01).

**Biological properties.**—These properties served as a control; there should have been no differences by age or condition in participants' responses. However, the analysis revealed significant main effects for age, F(5, 180) = 3.63, p < .004, and item type, F(1, 180) = 13.52, p < .0003, as well as significant interactions between age and item type, F(5, 180) = 5.32, p < .0001, condition and item type, F(1, 190) = 15.52, p < .0001, and age, condition, and item type interaction, F(5, 180) = 3.19, p < .009. Post hoc Scheffé F tests revealed that 9- and 10-year-olds in the same-sex environment condition had a lower percentage of category-based responses for the same-sex properties than for the opposite-sex properties, p < .05. In addition, 10-year-olds in the same-sex environment condition made significantly fewer category-based responses than those in the opposite-sex environment condition, p < .05. These findings are consistent with the proposition that older children are giving more sophisticated responses than younger children for the same-sex biological items (see footnote 2).

**Discussion**

These results suggest that by age 9 or 10 children begin to recognize that environmental factors may influence gender-role development. Prior to age 9, children seem to believe that members of a gender category share something like an intrinsic potential that is not yet obvious but will become manifest over time. They assume that a male will develop to be similar to other males, even when he is raised in an environment with only females. Thus, the findings from Study 1 provide evidence that young children have essentialist beliefs about members of gender categories.

The task used in the present study provided children with more environmental information than previous tasks (cf. Gelman & Wellman, 1991; Hirschfeld, 1995) and provided a check to ensure that children were able to understand and remember details about the environment. Nonetheless, children between the ages of 5 and 9 did not acknowledge the role of the environment in shaping gender-role development. They seemed to assume that an opposite-sex environment would have little impact on development: a girl would acquire many feminine
and few masculine properties whether she was raised with all girls or all boys.

Four-year-olds had a slightly different pattern of performance than either 5- and 8-year-olds or older children and adults. Like the 5- and 8-year-olds, they seemed to assume that members of gender categories share the potential to develop in similar ways in spite of environmental influences. That is, they responded that infants would develop properties associated with their category membership (same-sex), regardless of the environment of upbringing. At the same time, 4-year-olds in the opposite-sex environment condition were as likely as 10-year-olds and adults to say that a member of a gender category would develop some environment-linked (opposite-sex) properties as well. Thus, they were willing to allow that the environment also contributed something to development. These findings are consistent with previous results that gender-role flexibility may have a U-shaped developmental pattern (Emmerich, 1982; Stoddart & Turiel, 1985; Trautner et al., 1989).

In contrast to younger children, the 9-year-olds, 10-year-olds, and adults acknowledged that the environment may play more of a role than category membership in shaping a child’s gender-role development. As expected, older children and adults in the opposite-sex environment condition believed that gender-related biological properties would develop regardless of the environment of upbringing, but that stereotyped properties would develop in accordance with the story character’s environment rather than category membership. Although children were not asked to justify their responses, several children provided spontaneous explanations. For example, when asked about a boy raised with all girls, one girl (age 10-1) said, “he can’t play football because none of the girls play.” A boy (age 10-3) who was asked about a girl raised with all boys said she would play baseball because “well, she lives with all boys and men and only does boy and men things.” Another boy (age 9-5) said that a boy raised with all girls would have a boy’s body “because when you’re around different people you act different, but your body doesn’t change.”

In sum, although younger children’s judgments about the development of gender roles differed in some way from those of adults, their beliefs are nonetheless principled. That is, their responses seem to reflect a bias to use category membership rather than another dimension (i.e., environmental information) in making inferences about the development of gender-stereotyped properties. An alternative interpretation of the present findings is that children’s responses simply reflect associations between the category label and stereotypical gender-role properties (e.g., because the character was labeled a girl, she must like to play with dolls). One piece of evidence against this explanation is that children’s answers differed according to the property type (stereotyped or biological). If children were simply reporting category associations or stereotypes, they should have done so for both the gender-stereotyped and biological properties, but they did not. Children had a higher percentage of category-based responses for the biological properties than the stereotypical properties. This suggests that children considered each question separately and did not assume that the characters would have the properties stereotypically associated with their gender categories. Study 2 serves as a control study to provide further evidence against this alternative explanation.

### Study 2

In Study 2, children were either given a task similar to the one in Study 1 (opposite-sex environment condition) but using a new set of properties, or they were asked which of the new properties an infant had. If children tend to presume that infants do not yet have the gender-stereotyped features they will have at age 10, that would support the evidence from the earlier study in two ways. First, it would provide converging evidence that children are not simply biased to report stereotypical associations with the gender label without considering information about the environment. Second, it would indicate that children had a belief in intrinsic category potential and expected stereotyped properties that were not present in infancy to develop over time.

Pilot work suggested that the stereotyped properties used in Study 1 failed to distinguish between infants and older children. Many properties were general enough to be relevant for both infants and children (e.g., likes to play with dolls, has short hair).

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3 These results do not seem to reflect a “yes” response bias on the part of the 4-year-olds. Even the 4-year-olds had near-ceiling levels of performance on the environmental control items, half of which require a “no” response. In addition, they said “no” 93% of the time for the opposite-sex biological properties.
Thus, for Study 2, new properties were selected that were likely to be associated with older children but not infants. One group of children was given a task similar to the one in Study 1 but with a new set of properties (opposite-sex environment condition). Another group of children was asked about which of the new properties an infant had (infant condition).

**METHOD**

**Participants**

Twenty-four 4-year-olds participated (M = 4-5), six girls and six boys in each of two conditions (opposite-sex environment and infant). The sample was limited to children who were approximately the same age as the youngest children in Study 1, based on the assumption that if these children could succeed on the control task then the older children would be able to as well.

**Materials**

For the opposite-sex environment condition, the pictures used were identical to those from Study 1. For the infant condition, only the pictures of the baby girl and baby boy were used.

**Procedures**

Opposite-sex environment condition.— The procedure was identical to the one used in the opposite-sex environment condition of Study 1, but included a different set of stereotyped properties. There were eight stereotyped properties adapted from Hort (1988)4 (four feminine: wears eye makeup, puts on lipstick, carries a purse, wants to be a nursery school teacher; four masculine: goes fishing every Sunday, collects nails and tools, likes big trucks, wants to be a soldier). The biological and environmental control properties were identical to those in Study 1.

In addition, several new types of properties were included to ensure that children did not have a positive or negative response bias. They included: four gender-neutral properties (adapted from Hort, 1988) that apply to both infants and 10-year-olds (lives in a house, drinks water, wears shoes, is sleeping); four infant properties that apply to infants but not 10-year-olds (sucks its thumb, sleeps in a crib, wears a diaper, likes to chew on a rattle); two inherent properties that humans generally have from birth (has legs, has eyes); and two impossible properties that humans never have (has wings, has a tail).

Infant condition.—Children were asked about two infant story characters, one of each sex. The properties were the same as those used in the opposite-sex environment condition, excluding the environmental control items. For each item, the experimenter showed the child the picture of the infant and specified the infant’s name and gender category. Children were asked to say whether the infant was a girl or boy (as a memory check), and were then asked whether the infant had each property. The order of questions was randomly determined for each participant.

**Scoring**

Each participant received eight scores, referring to the number of ”yes” responses for the same-sex stereotyped, same-sex biological, opposite-sex stereotyped, opposite-sex biological, gender-neutral, infant, inherent, and impossible properties (for the two characters combined). Scores ranged from 0 to 8 for the same- and opposite-sex stereotyped, gender-neutral, and infant properties, and from 0 to 4 for the same- and opposite-sex biological, inherent, and impossible properties. All scores were converted to percentages to allow for comparisons by property type.

**RESULTS AND DISCUSSION**

Children in the infant condition attributed same-sex biological properties to infant characters 96% of the time; they attributed same-sex stereotyped properties only 47% of the time. Both kinds of properties were attributed more often than the impossible ones (M = 0%), or the opposite-sex stereotyped and biological properties (Ms = 21% and 10%, respectively), all ps < .002. However, only the stereotyped properties were attributed significantly less than the inherent ones (M = 100%), t(11) = -7.90, p < .0001, or the gender-neutral ones (M = 89%), t(11) = -4.42, p < .001. Impossible and opposite-sex properties were rarely attributed to the infants, suggesting that children were not biased to answer “yes.”

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4 Hort (1988) presented 4-, 9-, and 19-year-old participants with 120 behaviors (40 feminine, 40 masculine, and 40 neutral) that could be displayed by both children and adults. Participants learned the behavior that each of 120 imaginary individuals was displaying and guessed that individual’s gender. The four feminine items used in the present study had an average gender guess of 1.94 (very diagnostic of females), and the four masculine items used had an average gender guess of 1.19 (very diagnostic of males). See Hort (1988) for ratings of individual items.
If 4-year-olds expect gender-stereotyped properties to develop even when they are not present at birth, there should be a condition × property type interaction. Children in the opposite-sex environment condition should attribute stereotyped properties (e.g., goes fishing) to the 10-year-old character according to traditional gender roles, but should not attribute infant properties (e.g., sleeps in a crib) to 10-year-olds of either sex. In contrast, children in the infant condition should attribute infant properties but not stereotyped properties to the infant characters. Children in both conditions should attribute same-sex biological properties to the infants and 10-year-olds.

A 2 (condition: opposite-sex environment, infant) × 3 (property type: infant, same-sex stereotyped, same-sex biological) ANOVA indicated significant main effects for condition, F(1, 22) = 19.31, p < .0002, and item type, F(1, 22) = 52.26, p < .0001, as well as the predicted condition × item type interaction, F(1, 22) = 62.09, p < .0001 (see Fig. 2). Post hoc Scheffé F tests revealed that children in both conditions had a higher percentage of “yes” responses for biological than for stereotyped properties, ps < .05. However, as predicted, children in the opposite-sex environment condition had a higher percentage of “yes” responses for the same-sex stereotyped properties than did children in the infant condition. Children in the infant condition attributed same-sex stereotyped properties to infant characters only 47% of the time, whereas children in the opposite-sex environment condition attributed these features to 10-year-old characters 73% of the time, p < .05. Children in the infant condition attributed infant properties to infant characters 89% of the time, whereas children in the opposite-sex environment condition attributed these same properties to 10-year-old characters only 7% of the time, p < .05. There was no difference by condition for the same-sex biological properties.

These results provide critical evidence that children are not just reporting stereotypical category associations. Stereotyped properties that were typically attributed to the 10-year-old characters were typically not attributed to the infants. Thus, young children seem to anticipate that properties not currently possessed by the infants will inevitably develop even in an environment of upbringing encompassing very different roles. This is precisely the sort of belief that is consistent with an intrinsic potential or category essence.

General Discussion

The present findings reveal that 4–8-year-olds judge gender category membership to be more important in shaping how males and females develop than the social environment in which they are raised. By age 9 or 10, children become aware that the social context in which a person develops can influence the kinds of interests, activities, and roles he or she pursues, but not his or her biology. Children’s beliefs about the role of environmental factors may develop well before children can express them verbally. Previous findings have suggested that it is not until age 12 or later that children’s causal explanations for gender differences include the role of socialization or social rules governing appropriate behavior for males and females (e.g., Smith & Russell, 1984; Ullian, 1976). The present findings suggest that children acknowledge that the social context influences gender-role development as early as age 9, even before they can spontaneously formulate causal explana-

![Fig. 2.—Study 2, percentage of “yes” responses, by condition and property type](image-url)
tions for gender differences that include environmental factors.

An important finding from these studies is that prior to age 9 children viewed gender-stereotyped properties as relatively impervious to environmental influences, that is, they said that stereotyped properties would develop in an infant regardless of the environment of upbringing. The findings from Study 2 argue against the possibility that children were simply making a link between the gender category label and the properties stereotypically associated with that label (e.g., because the experimenter labeled the character a boy, the child assumed that he must like to play football). In Study 2, children attributed stereotyped properties to a 10-year-old character but not to an infant character, suggesting that they were not automatically reporting category associations, but rather that they believed that stereotyped properties that were not present in infancy would become manifest over development.

Overall, these studies reveal some parallel developments in young children’s understanding of gender categories and other categories of living things. However, they also indicate that children’s understandings may diverge in the middle elementary school years. Consistent with findings from studies on social categories (see Hirschfeld, 1995), the present findings suggest that preschool children expect category members to share underlying similarities. With age, children come to differentiate their understanding of social rules as arbitrary and flexible from their early bias to view categories as predictive of deeper commonalities between members. Thus, there seem to be two aspects to the emergence of children’s beliefs about gender categories. I will consider each of these separately.

Children’s Essentialist Beliefs about Gender Categories

Children’s appreciation of intrinsic properties of categories of people and other living things (e.g., animals and plants) could be considered to reflect an emerging understanding of biology; however, this content is currently under debate (Carey, 1985, 1995). Although the present findings do not test the possibility that children have specifically biological beliefs about gender, they are consistent with such a possibility. Children have some knowledge about gender categories and the properties associated with them, but they may not have specific knowledge about reproductive differences between females and males. Nonetheless, they seem to grasp that members of a gender category share an intrinsic potential to develop in a certain way. Children also seem to view gender categories as relatively immutable; they said that gender-related properties would develop in a child even when she or he was put in a dramatically different social environment. These findings are at odds with a view that children initially understand gender roles as social constructs (e.g., as arbitrary and changeable). For example, children do not seem to think that exposure to opposite-sex role models is sufficient to induce changes in gender-role behavior or category membership.

The similarities between the present results and those reported by Gelman and Wellman (1991) raise the possibility that there may be similar processes operating for social and nonsocial categories. Gelman and Wellman (1991) have proposed that preschool children may have an essentialist bias that propels knowledge acquisition and shapes concept representation early in development. This might be the case for gender categories as well. Children’s early understanding of social categories may be linked to the essentialist bias they show for other natural categories. Atran (1990) has argued that “children might initially borrow from their presumptions of the underlying natures of living things in order to better organize their knowledge of humans and merge this knowledge with that of other living things” (p. 74). However, it is still an open question as to whether this essentialist bias is a general one applied to all domains of knowledge (Medin, 1989), or whether it is specific to a particular domain, such as biology (Atran, 1990), and extended or transferred to other domains (for discussions of these possibilities, see Carey, 1985, 1995; Gelman, Coley, & Gottfried, 1994; Hirschfeld, 1994). Further research is needed to examine which explanation, if any, best accounts for the empirical evidence collected thus far.

One point that needs to be considered in examining whether there are similarities between children’s essentialist thinking about gender categories and categories of nonhuman living things is that there are important developmental differences predicted in middle childhood for the two domains. Children’s understanding of gender concepts (and possibly other social categories) may diverge from their understanding of categories of living things as they get older. In order to have an adult conception of gender, children must learn to distinguish
between those properties that adults link to biological factors (e.g., capacity to bear children) and those that they link more to social factors (e.g., preferences for certain activities). In the present studies, older children demonstrated an ability to distinguish between these kinds of gender-related properties in the case of humans. However, it is unlikely that older children would say that an animal’s properties would change given a different environment of upbringing. Thus, children’s task is to refine their beliefs about the kinds of inferences social categories can and cannot promote, and to differentiate these beliefs from their beliefs about nonsocial categories of living things.

Further research is needed to understand fully the nature of children’s causal beliefs about gender differences. This work should assess when children begin to differentiate between specific properties adults attribute more to biological factors than socialization and those they attribute more to socialization than biology. For example, do children attribute physical differences (in size or strength) more to innate causes and differences in activity preferences more to environmental factors? A finding that young children distinguish between different aspects of gender roles might suggest that they are not just biased to apply an essentialist tendency in a general way.

Emergence of Gender as a Social Category

Turiel and his colleagues (1978; Davidson, Turiel, & Black, 1983) have proposed that in the course of cognitive development, children’s knowledge about physical laws, moral rules, and social conventions gives rise to distinct forms of thought and becomes organized into different conceptual domains. One criterion that has been used to determine whether children can differentiate social conventions from physical laws and moral rules is whether they believe that rules in one domain can be altered under certain circumstances, but that rules from another domain do not change under similar conditions. A number of studies have compared children’s social conventional knowledge with their understanding of physical laws, and have found that it is not until age 9 or 10 that children begin to believe that social rules are relative to a specific social context and are subject to change, but that physical laws are not alterable, even by unanimous consent (Lockhart, Abrahams, & Osherson, 1977) or in another world (Komatsu & Galotti, 1986).

In the case of the youngest children in the present study, it is unclear whether they think that the infant will develop same-sex characteristics because it is a physical necessity or because it is a moral imperative. Prior to age 9, children do not seem to differentiate between physical and moral laws, at least in terms of whether it is possible to violate these rules. However, even 4-year-olds distinguish between these types of rules in terms of their affective reactions to rule violations (Levy et al., 1995). Children seem to start out with a bias to view categories of male or female as having an essence. They initially view rules governing gender-appropriate behavior in the way that they view physical laws or moral rules (e.g., as immutable or inflexible). Later, they may acquire knowledge that gender roles are more like social conventions (e.g., they are flexible and subject to change). Children are able to coordinate these separate understandings of gender by the time they reach the age of 9 or 10.

What is occurring at this point in children’s cognitive development that might account for the fact that older children acknowledge the causal role of the environment and younger children do not? Gelman and Coley (1991) have proposed that two aspects of categorization are fundamentally late-developing: refinement of inductive inferences, and flexibility. Refinement entails narrowing down the range of generalizations made on the basis of learning a new fact. Flexibility involves realizing that one’s initial classification may be wrong, and then incorporating new information to reconstruct the category. Both refinement and flexibility are necessary in order for children to begin to acknowledge that other causal mechanisms (e.g., the social environment) may explain gender role differences. That is, understanding that some aspects of gender roles are socially determined requires that children refine the scope of their gender-based inferences (e.g., all girls will grow up to be women, but only some girls will grow up to be nurses). Likewise, in order to recognize that environmental factors can influence development, children must be able to allow for some variation within a gender category (e.g., some boys like to play with dolls). Both of these developments are at odds with an early-developing essentialist bias to assume that categories capture important, underlying similarities between members.

The origins of these developmental trends toward refinement and flexibility are unclear. The refinement of children’s beliefs may be linked to the acquisition of domain-specific knowledge about gender. Chil-
Children's experiences in the social world should influence the types of associations they learn. Social experience should have an impact not only on children's understanding of which things co-occur (e.g., being a boy is sometimes linked to playing football, but it can also be linked to having long hair), but also on their knowledge of which things do not co-occur (e.g., being a man is never linked with bearing a child). In addition, children's developing knowledge about biology should also influence the kinds of causal mechanisms they associate with particular types of properties. The timing of these developmental trends may also depend on the nature of the information. Concrete and observable characteristics (e.g., activities or appearances) may be learned more quickly than nonobvious or abstract characteristics (e.g., traits).

In order to determine why developmental changes occur, it will be necessary to examine children's beliefs about and knowledge of a variety of social categories. This will allow us to determine how general children's developing understanding of the social world is, and how closely linked to social and biological knowledge of a particular category. An increased focus on biological factors for explaining one kind of social difference over another may be linked to specific knowledge about the category. Although it may not be necessary for children to possess specific knowledge about biological differences in order to have a biological explanation for differences, if children possess relatively more biological knowledge for one category than another, they may be particularly likely to view that category as having a biological basis. Future research on children's reasoning about social categories will be useful for determining how children structure social information and whether the structure is comparable to that found in other domains of knowledge.

References


