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Expertise in unexpected places: Children's acceptance of information from gender counter-stereotypical experts

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ABSTRACT

The current study examined children's willingness to accept novel information from expert informants with nontraditional gender role interests. Four- to 8-year-olds heard conflicting information about traditionally feminine or masculine domains from a gender counter-stereotypical expert (e.g., a boy with expertise in ballet) and a layperson of the other gender (e.g., a girl with little knowledge about ballet). Participants were asked which informant was correct, who they would prefer to learn from in the future, and to rate their liking of each informant. Overall, participants selected the gender counter-stereotypical expert as correct. Four- to 5-year-olds reported a preference to learn from same-gender participants in the future irrespective of expertise, whereas 6- to 8-year-olds reported wanting to learn from counter-stereotypical experts. Boys showed relatively greater acceptance of information from a male counter-stereotypical expert than from a female counter-stereotypical expert. Although participants reported greater liking of same-gender informants, liking evaluations were largely positive irrespective of gender norm deviations. Implications for children's acceptance of gender nonconforming activities are discussed.

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Introduction

In the context of new learning opportunities, young children can distinguish between reliable and unreliable sources of information (see Robinson & Einav, 2014). This skill is evident in their sensitivity to the knowledge or expertise of informants (e.g., Boseovski & Thurman, 2014; Koenig & Jaswal, 2011; Landrum & Mills, 2015; Lutz & Keil, 2002). For example, given discrepant facts about a novel animal, children as young as 3 years of age endorsed those that originated from a zookeeper rather than a maternal figure (Boseovski & Thurman, 2014). On encountering an unknown dog breed, 3- and 4-year-olds endorsed facts from dog experts rather than laypersons but did not expect this expertise to generalize to unrelated domains (Koenig & Jaswal, 2011). By 4 years of age, children also seek help selectively from people with causal knowledge about items (i.e., ability to fix a broken toy) rather than conventional knowledge about items (i.e., knowing the name of the tool that could fix the toy) (Kushnir, Vredenburgh, & Schneider, 2013). Clearly, expertise is an important epistemic cue early in life.

In this study, we explored whether children prioritize expertise as an accurate source of information when it conflicts with their putative expectations about a potent social category cue—gender (Ruble, Martin, & Berenbaum, 2006). Specifically, we asked whether 4- to 8-year-olds would favor testimony from a peer who demonstrated gender counter-stereotypical expertise in particular domains (e.g., a girl with expertise in football, a boy with expertise in sewing) or endorse competing claims from a layperson of the other gender (e.g., a boy with no expertise in football, a girl with no expertise in sewing). Gender is a salient social category cue for children (e.g., Bigler & Liben, 2006; Ruble et al., 2006), and such categories offer rich inductive potential (see Diesendruck & HaLevi, 2006). This study enabled us to examine whether children's expectations about gender normative knowledge or preference for their own gender would interfere with their acceptance of information from an individual described as an expert in a potentially unexpected domain.

Impact of gender on social learning

Preschoolers have a strong sense of gender identity (i.e., classification as a boy or girl), and this knowledge becomes more sophisticated with age to include gender stability and consistency (Slaby & Frey, 1975). There are at least two ways in which gender might affect children's acceptance of novel information (see Ma & Woolley, 2013). First, children may simply prefer information provided by same-gender others. Children prefer to affiliate with same-gender peers (e.g., Maccoby & Jacklin, 1987) and view their gender favorably (e.g., Aboud, 1988). For example, in a study on gender differentiation, Yee and Brown (1994) asked participants what it felt like to be their gender and to describe "nice" and "not nice" aspects of boys and girls. They found that 5-, 7-, and 9-year-olds (but not 3-year-olds) made more positive comments about their own gender. Similarly, 8- to 10-year-olds were more likely to assign positive traits to their own gender as compared with the other gender (Powlishta, 1995).

Coupled with the finding that children prefer informants who are described as possessing positive traits (e.g., Landrum, Mills, & Johnston, 2013), this positive view of same-gender individuals can guide children's learning. In research by Shutts, Banaji, and Spelke (2010), 3-year-olds heard about the preferences (e.g., games) of unfamiliar informants who either differed from or matched them in gender and race (Experiment 1). Participants preferred objects or items endorsed by same-gender children irrespective of race. A second experiment replicated this finding and demonstrated that children were influenced by the choices of same-age peers rather than adults.

A second way in which gender might influence the acceptance of novel information concerns children's assumptions about the knowledge that is associated with gender (i.e., gender stereotypes; see Ma & Woolley, 2013). Young children are cognizant of gender norms and stereotypes (e.g., Martin, 1989). For example, preschoolers rely on gender stereotypes when deciding on divisions of household labor such as cooking, and this tendency increases until middle childhood (Schuette & Killen, 2009). Young children also associate specific traits (Reis & Wright, 1982), interests (Kuhn, Nash, & Brucken, 1978; Martin, Wood, & Little, 1990), and clothing items with males and females (e.g., suits vs. dresses; Weinraub et al., 1984).

In situations where traditional gender role expectations are violated, even toddlers show surprise (e.g., longer looking time at males vs. females who were putting on lipstick; Serbin, Poulin-Dubois, & Eichstedt, 2002). Notably, there is an increase in gender role flexibility with age (e.g., Blakemore, 2003; Conry-Murray & Turiel, 2012; Levy, Taylor, & Gelman, 1995). For example, 6- to 8-year-olds express greater acceptance than 4- to 6-year-olds of non-normative preferences (e.g., a boy who prefers a babysitting class over a computer class; Conry-Murray & Turiel, 2012). However, there is evidence that this acceptance is limited. In a study by Blakemore (2003), 3- to 11-year-olds were asked to rate how much they would like children who transgressed a gender norm (e.g., boys who wore girls' clothing and vice versa). Participants reported less liking of such children with age, and this negativity peaked in 6- to 8-year-olds.

There is evidence that both same-gender preference and stereotypes guide children's learning in novel domains. Ma and Woolley (2013) gave 4- and 6-year-olds conflicting ideas about functions of unfamiliar objects from a male versus female informant. Participants were asked to endorse one label. Objects varied in color such that they were gender-typed for males (blue) and females (pink) or were neutral. Across ages, a large proportion of participants endorsed information from the same-gender speaker irrespective of the color of the objects. In a second study, participants were instead given the opportunity to ask one informant for information. Here, a greater number of children chose the informant based on the color of the objects rather than directing questions to the same-gender informant (i.e., choosing to ask females about pink objects and males about blue objects). Thus, in different contexts, both speaker gender and gender stereotypical information (i.e., color) guide children's learning from others.

Expertise as a social learning cue

Although there are age-related improvements in children's use of expertise to guide learning (e.g., Aguiar, Stoess, & Taylor, 2012), expertise is a potent social learning cue early in life (e.g., Danovitch & Keil, 2004; Lutz & Keil, 2002). Of particular relevance to this study is research in which informant knowledge or expertise conflicts with putative gender preferences or expectations about knowledge in novel learning situations. In one study (Taylor, 2013), 4- to 7-year-olds heard male and female informants label familiar objects (e.g., rabbit). Conditions varied such that only the male or female informant was correct, they both provided correct labels, or they both provided incorrect labels. After this training phase, participants listened as the informants provided conflicting labels for novel objects during a test phase. Overall, participants deferred to reliable rather than unreliable informants irrespective of gender. However, when the informants were both reliable or both unreliable, participants tended to choose labels offered by the same-gender informant. These findings indicate that in language learning, a reliable knowledge history is prioritized over gender, but that information from same-gender individuals might be preferred by "default" when cues to expertise or knowledge are unavailable.

Shenouda and Danovitch (2013, Experiments 1 and 2) obtained compatible findings in a set of studies that examined whether preschoolers' judgments of expertise were influenced by gender stereotypical or counter-stereotypical characters (male puppet dressed as a mechanic and female puppet dressed as nurse or vice versa). In their experiments, 3- to 5-year-olds were asked which puppet had more knowledge or skill in gender stereotypical domains (e.g., cleaning the kitchen) and in relation to the puppets' professions (e.g., taking temperature). There were age-related improvements in expertise understanding, but participants generally relied on the puppet's profession, rather than gender, as an indicator of knowledge. Interestingly, in a third experiment conducted with Egyptian children, participants were swayed more by gender than by profession information, and this bias was particularly strong concerning female mechanics. Thus, cultural influences also play a role in learned associations between gender and expertise.

The current study

We examined whether children's expectations about gender normative knowledge would interfere with their acceptance of information from an informant described as an expert in a potentially

unexpected (i.e., counter-stereotypical) domain. Four- to 8-year-olds heard stories that included testimony from a child character who demonstrated gender counter-stereotypical factual knowledge (e.g., a girl with expertise in football, a boy with expertise in sewing) that conflicted with claims from a layperson of the other gender (e.g., a boy with no expertise in football, a girl with no expertise in sewing). After hearing the information, participants were asked which informant was correct, among other questions described below.

This research adds to extant literature in important ways. First, we broadened the age range used by Shenouda and Danovitch (2013) to include 6- to 8-year-olds, which enabled us to gain insight into how perceptions of gender affect social learning during middle childhood. Specifically, although recognition of expertise is much stronger in this age group as compared with younger children (Aguiar et al., 2012), older children think about gender norms in unique ways that might interfere with their ability to accept expertise. Dislike for gender counter-stereotypical individuals increases during middle childhood and peaks between 6 and 8 years of age (Blakemore, 2003) despite greater acceptance of gender counter-stereotypical preferences (e.g., Conry-Murray & Turiel, 2012) and disapproval of exclusion of others from activities based on gender (Killen, 2007; Killen & Stangor, 2001). The current study adds to our understanding of social learning by examining the acceptance of expertise during a developmental period in which there are conflicting feelings about deviations from gender norms.

Given discrepant findings across studies in the perception of gender counter-stereotypical individuals, we included questions that went beyond participants' judgments of correctness and also assessed their liking of each informant and their preference to learn from each informant. Inclusion of these questions in a single study enabled us to assess how different ideas that children might have about gender counter-stereotypicality are related and how these change with age. The correctness question was aimed directly at assessing children's recognition of expertise, as in previous research (e.g., Jaswal & Neely, 2006). The learning preference question was included based on previous research suggesting that children may approach these kinds of questions (i.e., where children actively seek information) by considering familiarity with (e.g., Corriveau & Harris, 2009) or trust (e.g., Corriveau et al., 2009) of the informant. Finally, the liking question examined whether children show biases toward gender counter-stereotypical characters.

On the one hand, we might expect children as a group to show high consistency in their responses to these questions (e.g., choose the expert as correct, show greater willingness to learn from the expert, and report strong liking of the expert). Indeed, research indicates that children engage in inappropriate generalization of positive traits that declines only during late childhood (e.g., intelligence and athletic ability; Stipek & Daniels, 1990). Moreover, preschoolers also report greater liking of informants who are intelligent (Lane, Wellman, & Gelman, 2013), which is how the gender counter-stereotypical informant was portrayed in the current study.

On the other hand, children as a group might exhibit low consistency in responses that could reveal differentiation between their theories about expertise and their attitude toward others. For example, older children may acknowledge expertise readily but still show dislike of, and lack of preference to learn from, a counter-stereotypical informant. It is also possible that children will treat the correctness and learning preference questions differently. Indeed, Ma and Woolley (2013) suggest that questions that involve more active decision making by children (i.e., thinking about who they would prefer to ask) may provoke greater reflection about knowledge as compared with a correctness question.

Second, in contrast to previous research (e.g., Ma & Woolley, 2013; Shenouda & Danovitch, 2013), we chose peer (i.e., same-age) informants rather than adult informants. Although it is unlikely that children would disregard same-age peers who are knowledgeable (i.e., as compared with adults; see Boseovski, 2012; Jaswal & Neely, 2006), it is unknown whether children will make allowances for peer expertise in these strong gender counter-stereotypical circumstances. Given the importance of peer relations to children's psychosocial well-being (e.g., Fink, Begeer, Peterson, Slaughter, & de Rosnay, 2015), it is essential to understand how children perceive peers who deviate from norms. Killen and Stangor (2001) reported that by seventh grade, children were clearly sensitive to peers' qualifications when making decisions about exclusion based on gender (e.g., choosing a well-qualified male rather than a poorly qualified female to join a ballet class). Here, we assess explicitly children's recognition about the knowledge levels of same-age, gender counter-stereotypical informants. Because reluctance to accept expertise information could be attributed to the age of the experts

or to the reluctance to accept gender counter-stereotypical information, we also assessed children's acceptance of information from a gender stereotypical expert.

Third, we asked children to choose between discrepant facts offered by the gender counter-stereotypical expert and the layperson and to indicate which person they would prefer to learn from in the future. This method contrasts with that of Shenouda and Danovitch (2013), who asked which informant "would know more" facts about a specific occupational category (e.g., nursing) and found that American children generally chose the expert as correct. The current study allowed us to examine whether children would endorse an expert consistently when this decision required explicit rejection of the facts offered by the layperson informant.

Given that the ability to recognize expertise increases during early to middle childhood (e.g., Aguiar et al., 2012), we expected that children would be more likely with age to choose the gender counter-stereotypical character as correct. However, we expected less liking of the counter-stereotypical expert with age on the liking question, consistent with previous research (Blakemore, 2003; Levy et al., 1995; Martin, 1989). We anticipated that this decreased liking would be particularly strong when the counter-stereotypical expert was male (see Blakemore, 2003; Levy et al., 1995; Martin, 1989) rather than female and that boys would report less liking than girls of counter-stereotypical experts. Older children were expected to report a preference to learn from the counter-stereotypical expert as opposed to the layperson irrespective of the gender of the expert. In contrast, it was expected that younger children would prefer to learn from the same-gender informant, consistent with previous demonstrations of in-group gender biases (Ma & Woolley, 2013; Shutts et al., 2010).

Method

Participants

There were 48 4- and 5-year-olds (24 boys and 24 girls; M_{age} = 60.16 months, SD = 7.12) and 48 6- to 8-year-olds (24 boys and 24 girls; M_{age} = 90.81 months, SD = 9.99) who participated as part of a larger study on children's social cognition. Participants were primarily from upper middle-class families and were ethnically diverse: 77.1% Caucasian, 12.5% African American, 4.2% Asian/Pacific Islander, 1.0% Hispanic, and 5.2% who chose not to disclose this information. Participants were recruited from schools and day-care facilities in a city in the southeastern United States.

Materials

There were eight pictures, each of which displayed one character on a neutral background. For each domain, there was one picture of a boy and one picture of a girl with a background related to the story domain. Each participant saw one girl character and one boy character for each story. Characters wore gender-neutral clothing (i.e., pants and shirts of a variety of colors that were counterbalanced across characters and stories) but differed in hair length (slightly longer hair or ponytails for girls; short hair for boys). The domains of each story (football and construction for expert girl characters; sewing and ballet for expert boy characters) were selected because they are similar to those used in previous research on children's perception of stereotype-conforming activities (see Mulvey & Killen, 2015). We also collected pilot data with a separate group of 4- to 8-year-olds that supported our choices of these activities. Sessions were videotaped.

Design

A mixed design was used, with two between-participants variables (participant age and gender) and one within-participant variable (gender of counter-stereotypical expert). Each participant heard three stories in total; two stories featured a gender counter-stereotypical expert, and a third comparison story featured a gender stereotype-consistent expert. For the gender counter-stereotypical stories, participants heard about a male character with expertise in a typically feminine domain

and about a female character with expertise in a typically masculine domain. Two story sets were used (sewing and construction; ballet and football), and these were counterbalanced across participants, as was the order of the stories within sets. In between story sets, participants completed an unrelated task.

For the stereotype-consistent comparison story, half of the participants heard about a male character with expertise in a typically masculine domain and half heard about a female character with expertise in a typically feminine domain. The same domains were used as described above, with the story assignments counterbalanced so that participants received three unique stories.

Procedure

Participants were seated at a table with a male or female experimenter (counterbalanced for participant gender). The experimenter presented the story information to participants verbally with accompanying illustrations. For example, for the sewing story, the experimenter said, "Today I am going to tell you about two kids your age, a boy named Jimmy and a girl named Sally. Sally and Jimmy are in a home economics class together where they learn how to do lots of things. Today, they are learning how to sew." The experimenter went on to introduce both characters in a randomized order. To convey the expertise of the boy character, participants were told that he "has taken many classes on sewing before" and also "knows the names of many different types of needles and when to use them." The girl character, or layperson, is taking her first sewing class and "knows the names of some needles but does not know how to use them." Participants were told that the two characters are working together on a class project and disagree about a critical aspect of the project (e.g., what type of needle should be used to make a shirt—a stretch needle or a wedge needle). Each story was structured in this same way, with the presentation of conflicting facts for each domain (construction of chair: hex or torx screwdriver; ballet pose: brise or jete; football play: sneak or pitch).

Following each story, participants were given a manipulation check to ensure that they understood which character was an expert and which was a layperson (e.g., "Does Jimmy know a little or lot about sewing?") and the testimony given (e.g., "What did Jimmy say?"). Participants who answered incorrectly were reminded of the character description or testimony and asked the question again. Afterward, participants were asked a series of questions. For the *correctness question*, participants were asked, "Who do you think is right? What needle should be used to make the shirt? Should they use a stretch needle like Sally said or a wedge needle like Jimmy said?" For the *learning preference question*, participants were asked, "If you wanted to learn to sew, would you rather learn from Sally or Jimmy?" The order in which these questions were presented was randomized, as was the order in which forced choice options were presented.

Next, liking of the characters was measured with an *evaluation question*: "How much do you like Jimmy/Sally?" Responses were rated on a 5-point Likert scale (1 = *I dislike him/her very much*, 2 = *I dislike the him/her a little*, 3 = *I don't like or dislike him/her*, 4 = *I like him/her a little*, 5 = *I like him/her a lot*).

Afterward, participants received one of four possible comparison stories in which they heard a stereotype-consistent story (e.g., a girl who is a sewing expert vs. a boy with little sewing experience). Participants heard about either a male or female expert, and this was counterbalanced with participant gender. Story domains were counterbalanced across participants to ensure that they did not overlap with the domains that were presented in the gender counter-stereotypical stories. However, due to experimenter error, one 7-year-old girl received two stories about ballet.

Results

Performance on comparison stories

All but three children in the sample chose the gender stereotypical expert for both the correctness question (i.e., "Who do you think is right?") and the learning preference question (i.e., "If you wanted to learn about [X], who would you rather learn from?"). Thus, participants readily acknowledged

expertise of a hypothetical peer when it conformed to gender role expectations, and these data were not analyzed further. Two of the exceptions were due to experimenter error, with one 4-year-old and one 8-year-old not being tested on this task. A third participant chose the expert as correct but indicated a preference to learn from the layperson. Data for these participants were retained because results did not change significantly when they were excluded from analyses.

Next, we assessed liking of the gender stereotypical experts ("How much do you like [character]?"). Preliminary analyses revealed no effect of story type on children's liking of these characters (*ps* > .10). Participants' liking of male and female experts was analyzed in two separate between-participants analyses of variance (ANOVAs) that included age (4- and 5-year-olds vs. 6- to 8-year-olds), participant gender (male vs. female), and experimenter gender (male vs. female). Boys reported greater liking than girls of a male stereotypical expert, $F(1,42) = 6.37$, $p = .01$, $\eta_p^2 = .13$. There were no other significant main effects or interactions (*ps* > .10). Although girls' mean liking of a female expert was higher than boys' mean liking of a female expert, this effect did not emerge as significant and there were no other significant main effects or interactions (all *ps* > .10).

Performance on gender counter-stereotypical stories

With the exception of one 4-year-old boy for whom the story was repeated twice, all participants in the sample answered the manipulation check correctly on the first attempt, indicating that they could identify the expert and remembered the testimony given by each of the characters. To assess children's acceptance of information from gender counter-stereotypical experts, we examined their choice between the two informants (i.e., the gender counter-stereotypical expert vs. the gender stereotypical layperson) on each of the two main dependent variables: correctness and learning preference. Participants who chose the layperson as correct received a score of 0, and those who chose the expert as correct received a score of 1.

These questions were analyzed through separate repeated measures logistic regression analyses as presented below. Each analysis examined how participant age (between participants, measured in months), participant gender (between participants), and expert gender (within participant given that participants heard both male and female counter-stereotypical expert stories) predicted participants' choice of informant (expert or layperson). *QICC* (the corrected quasi-likelihood under an independence model criterion) was used as a measure of goodness of fit to assess the best model predictors (Pan, 2001). There were no significant effects of experimenter gender on children's choice of informant in the correctness question, $\chi^2(1, N = 96) = 2.53$, $p = .62$, or the learning preference question, $\chi^2(1, N = 96) = 3.71$, $p = .16$. Story domain also did not have a significant effect on choice of informant in the correctness question, $\chi^2(1, N = 96) = 0.253$, $p = .62$, or the learning preference question, $\chi^2(1, N = 96) = 0.09$, $p = .77$. These variables were not analyzed further.

Correctness question

Table 1 presents the results of three models examining how age, participant gender, and expert gender predicted children's choice of the informant when asked to choose the counter-stereotypical expert or layperson as correct. The best fitting model (*QICC* = 167.54) captured lower level effects in a three-way interaction among participant age, participant gender, and expert gender, $\beta = 0.17$, Wald $\chi^2(1) = 4.54$, $p = .03$.

Follow-up chi-square analyses were conducted for each age group. First, we examined whether there were gender differences in the proportion of participants who chose male and female counter-stereotypical experts as correct. For 4- and 5-year-olds, there was no significant evidence that boys were more likely to choose the male expert as correct, $\chi^2(1, N = 48) = 1.06$, $p = .30$, or that girls were more likely to choose the female expert as correct, $\chi^2(1, N = 48) = 0.87$, $p = .35$. Furthermore, all choices of the counter-stereotypical expert were significantly greater than what would be expected by chance, *ts*$(23) > 2.18$, $p < .05$, with the exception 4- and 5-year-old boys' selection of a female expert, which did not differ significantly from chance, $t(23) = 1.24$, $p = .23$. For 6- to 8-year-olds, there were no gender differences in the likelihood of choosing a male counter-stereotypical expert as correct, $\chi^2(1, N = 48) = 1.09$, $p = .29$, but girls were more likely than boys to choose a female counter-stereotypical expert as correct, $\chi^2(1, N = 48) = 5.58$, $p = .02$, which is reflected in girls' 100%

Table 1
Logistic regression analysis on participants' choice of informant (expert or layperson) for the correctness question.

Predictor	Parameter estimates					Goodness-of-fit statistic (QICC)
	β	*SE* β	Wald χ^2	*df*	*p*	
Model 1						171.06
Intercept	−2.26	0.93	5.85	1	.02	
Age	0.05	0.01	15.73	1	.00	
Gender	−0.21	0.35	0.34	1	.56	
Expert	0.43	0.40	1.12	1	.29	
Model 2						169.59
Intercept	−3.50	1.85	3.57	1	.06	
Age	0.08	0.03	9.18	1	.00	
Gender	0.91	1.99	0.21	1	.65	
Expert	0.24	1.96	0.02	1	.90	
Age * Expert	−0.02	0.03	0.28	1	.59	
Gender * Expert	2.12	0.84	6.45	1	.01	
Age * Gender	−0.03	0.03	0.02	1	.26	
Model 3						167.54
Intercept	−9.99	3.88	6.64	1	.01	
Age	0.19	0.06	8.78	1	.00	
Gender	7.92	4.07	3.78	1	.05	
Expert	8.16	4.34	3.54	1	.06	
Age * Expert	−0.15	0.07	4.36	1	.04	
Gender * Expert	−8.03	4.95	2.63	1	.11	
Age * Gender	−0.15	0.07	5.13	1	.02	
Age * Gender * Expert	0.17	0.08	4.54	1	.03	

acceptance of the female counter-stereotypical expert. For 6- to 8-year-olds, all ratings were significantly above chance, $ts(23) > 3.43$, $ps < .01$, regardless of participant gender or expert gender.

Second, we analyzed whether participants of each gender preferred to select a same-gender counter-stereotypical expert as correct. For 4- and 5-year-olds, boys were not more likely to choose a male counter-stereotypical expert as compared with a female counter-stereotypical expert as correct, McNemar $\chi^2(1, N = 24) = 1.46$, $p = .23$, and girls were not more likely to choose a female counter-stereotypical expert as compared with a male counter-stereotypical expert as correct, McNemar $\chi^2(1, N = 24) = 0.00$, $p = 1.00$. For 6- to 8-year-olds, again there was no evidence of a preference for counter-stereotypical experts of the same gender in boys, McNemar $\chi^2(1, N = 24) = 1.50$, $p = .22$, or in girls, McNemar $\chi^2(1, N = 24) = 1.33$, $p = .25$ (see Fig. 1).

Learning preference question

Table 2 presents the results of three models examining how age, child gender, and expert gender predicted children's learning preference when asked to choose between the counter-stereotypical expert and layperson. The best fitting model ($QICC = 137.85$) included a significant interaction between participant gender and expert gender, $\beta = 14.09$, Wald $\chi^2(1) = 4.99$, $p = .03$, and a marginally significant three-way interaction among participant age, participant gender, and expert gender, $\beta = -0.17$, Wald $\chi^2(1) = 3.69$, $p = .055$.

Follow-up chi-square analyses were again conducted for each age group. We first determined whether there were gender differences in the proportion of participants who preferred to learn from male and female counter-stereotypical experts. For 4- and 5-year-olds, boys were more likely than girls to prefer learning from a male expert, $\chi^2(1, N = 48) = 6.70$, $p = .01$, and girls were more likely than boys to prefer learning from a female expert, $\chi^2(1, N = 48) = 5.78$, $p = .02$. Furthermore, preference to learn from a counter-stereotypical expert was only above chance when it was consistent with one's gender, with girls in this age group being significantly more likely than expected by chance to prefer learning from a female expert, $t(23) = 7.23$, $p < .001$, but at chance when presented with a male expert, $t(23) = 1.69$, $p = .103$. Boys were significantly more likely than expected by chance to prefer learning from a male expert, $t(23) = 11.00$, $p < .001$, but at chance when presented with a female expert, $t(23) = 1.24$, $p = .228$. In contrast, for 6- to 8-year-olds, no gender differences were found in the

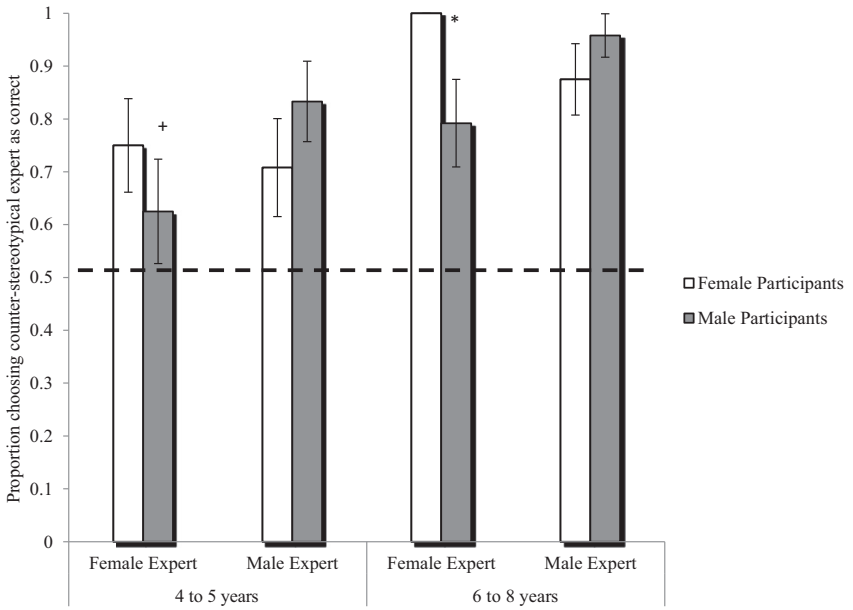

Fig. 1. Proportion of participants (and standard errors) who chose the counter-stereotypical expert as correct by participant gender, participant age group, and expert gender. Dashed line represents chance performance. Asterisk (*) indicates bars significantly different from one another. Plus sign (+) indicates responses at chance level.

Table 2
Logistic regression analysis on participants' choice of informant (expert or layperson) for the learning preference question.

Predictor	Parameter estimates					Goodness-of-fit statistic (QICC)
	β	*SE* β	Wald χ^2	*df*	*p*	
Model 1						145.37
Intercept	−1.34	1.19	1.28	1	.26	
Age	0.05	0.02	7.57	1	.01	
Gender	−0.06	0.41	0.02	1	.89	
Expert	0.09	0.46	0.05	1	.83	
Model 2						141.22
Intercept	−2.97	4.56	0.43	1	.51	
Age	0.09	0.08	1.16	1	.28	
Gender	1.42	3.83	0.14	1	.71	
Expert	0.20	3.66	0.03	1	.96	
Age * Expert	−0.03	0.04	0.16	1	.69	
Gender * Expert	2.94	1.31	4.99	1	.03	
Age * Gender	−0.04	0.07	0.44	1	.51	
Model 3						137.85
Intercept	1.12	3.56	0.10	1	.75	
Age	0.02	0.05	0.19	1	.67	
Gender	−4.09	3.99	1.05	1	.31	
Expert	−6.59	4.19	2.47	1	.12	
Age * Expert	0.08	0.06	1.67	1	.19	
Gender * Expert	14.09	6.30	4.99	1	.03	
Age * Gender	0.04	0.06	0.49	1	.48	
Age * Gender * Expert	−0.17	0.09	3.69	1	.06	

likelihood of preference for the counter-stereotypical expert for future learning regardless of whether the expert was male, $\chi^2(1, N = 48) = 0.36$, $p = .55$, or female, $\chi^2(1, N = 48) = 0.00$, $p = 1.00$. Furthermore, all ratings of preference were significantly above chance, $ts(23) > 7.22$, $ps < .001$, regardless of participant gender or expert gender.

Second, we analyzed whether participants of each gender preferred to learn from a same-gender counter-stereotypical expert. Among 4- and 5-year-olds, boys were significantly more likely to prefer learning from a male counter-stereotypical expert than from a female expert, $\chi^2(1, N = 24) = 4.90$, $p = .02$, and girls were marginally more likely to prefer learning from a female counter-stereotypical expert than from a male expert, $\chi^2(1, N = 24) = 3.13$, $p = .07$. In contrast, 6- to 8-year-old boys, McNemar $\chi^2(1, N = 24) = 0.00$, $p = 1.00$, and girls, McNemar $\chi^2(1, N = 24) = 0.50$, $p = 1.00$, did not show a preference in learning from an expert of the same gender (see Fig. 2).

Consistency in responses

To examine differences in children's responses to question type (within-participant: correctness and learning preference), we conducted two repeated measures logistic regressions on children's choice of the female and male counter-stereotypical experts. We also included participant age (between participants in months) and participant gender (between participants) in the model to examine whether consistency across question type varied by age and gender. Main effects of age and participant gender are not further reported because they likely duplicate previous analyses indicating that selection of counter-stereotypical experts increases with age and that children prefer to select their own gender.

The first analysis examined children's selection of the *female* counter-stereotypical expert (coded as 1) over the *female* layperson (coded as 0). The main effects model (*QICC* = 157.02) suggested a marginal effect of question type, Wald $\chi^2(1) = 3.52$, $p = .06$; however, follow-up analyses did not provide evidence for inconsistency across the correctness question (with 79.17% selecting the female counter-stereotypical expert) and the learning preference question (with 86.46% selecting the female

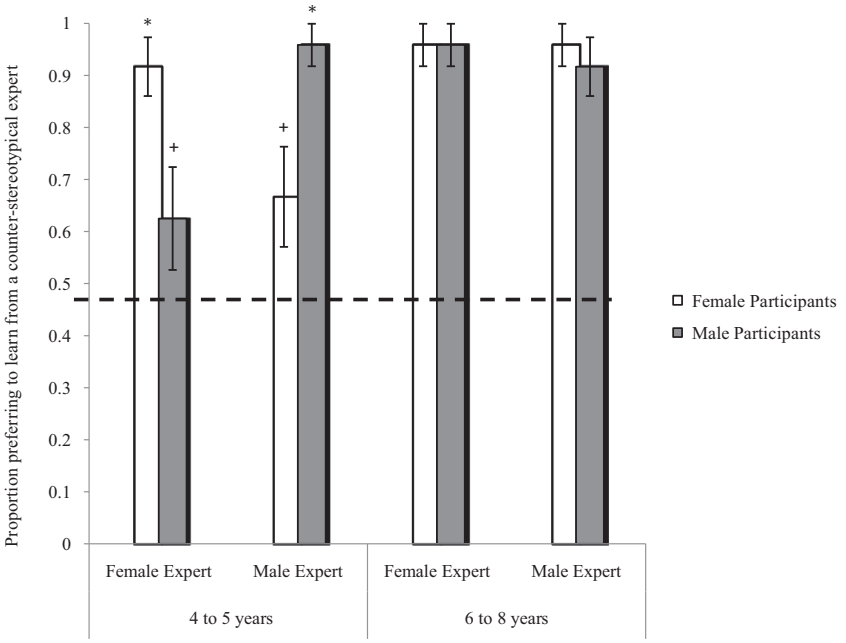

Fig. 2. Proportion of participants (and standard errors) who reported a preference to learn from the counter-stereotypical expert by participant gender, participant age group, and expert gender. Dashed line represents chance performance. Asterisk (*) indicates bars significantly different from one another. Plus sign (+) indicates responses at chance level.

Table 3
Mean liking scores (and standard deviations) for expert and layperson characters by story type, character gender, and participant gender.

	CS Story A		CS Story B		Comparison A		Comparison B	
Participant gender	Female expert	Male layperson	Male expert	Female layperson	Female expert	Male layperson	Male expert	Female layperson
Female	4.43 (1.08)	3.54 (1.39)	3.95 (1.39)	4.18 (1.10)	4.71 (0.90)	3.71 (1.41)	3.92 (1.29)	4.00 (1.30)
Male	4.06 (1.11)	3.93 (1.35)	4.54 (0.96)	3.45 (1.44)	4.17 (1.30)	3.91 (1.41)	4.78 (0.85)	3.56 (1.19)

Note. CS Story: counter-stereotypical story (within participant); Comparison: comparison stories (between participants).

counter-stereotypical expert), McNemar $\chi^2(1, N = 96) = 1.89$, $p = .17$. Further supporting consistency in responses, correctness selection was significantly correlated to learning preference, $r_\Phi(96) = .32$, $p = .002$. Models including two-way interactions (*QICC* = 161.83) and three-way interactions (*QICC* = 164.41) did not better fit the data, suggesting that children were consistent in their choice across correctness and accuracy when presented with a female counter-stereotypical expert, and these consistencies did not vary by age or gender.

Similar analyses regarding children's selection of the *male* counter-stereotypical expert (coded as 1) over the *male* layperson (coded as 0) produced similar findings. The main effects model best fit the data (*QICC* = 144.85); however, there was no evidence that children's answers across the correctness and preference questions were inconsistent, Wald $\chi^2(1) = 0.84$, $p = .36$, and correctness selection was significantly correlated with learning preference, $r_\Phi(96) = .53$, $p = .002$. Because the two-way (*QICC* = 149.05) and three-way (*QICC* = 146.37) interactions were worse fits to the data, this also suggests that consistency in responses did not vary by age or gender.

Liking of the counter-stereotypical expert and layperson

Participants were asked to rate how much they liked each counter-stereotypical expert character on a 5-point Likert scale. Table 3 displays the mean ratings by participant gender and expert gender for both gender counter-stereotypical stories and the stereotypical comparison condition.

To examine liking of the gender counter-stereotypical experts, a mixed ANOVA was conducted with participant age (4- and 5-year-olds vs. 6- to 8-year-olds), participant gender (male vs. female), and experimenter gender (male vs. female) as between-participants factors and expert gender (male vs. female) as a within-participant factor. There was a significant participant gender by expert gender interaction, $F(1,88) = 10.93$, $p = .01$, $\eta_p^2 = .11$. There was no significant gender difference in the liking of a counter-stereotypical female expert ($p > .10$), but boys reported significantly greater liking of a counter-stereotypical male expert ($p = .019$). Within-gender comparisons indicated that girls reported greater liking of a counter-stereotypical female expert than a counter-stereotypical male expert ($p = .024$), whereas boys reported greater liking of a counter-stereotypical male expert than a counter-stereotypical female expert ($p = .024$). Despite these differences, liking ratings were quite high for both male and female counter-stereotypical experts. Thus, we did not examine these ratings as a predictor of children's correctness and learning preference choices due to the restricted range of scores.

There was also a significant expert gender by experimenter gender interaction, $F(1,88) = 5.97$ $p = .02$, $\eta_p^2 = .06$. In the presence of a female experimenter, girls reported greater liking than boys of the female expert, $F(1,88) = 5.03$ $p = .03$. There was no significant rating difference between boys and girls in the presence of a male experimenter ($p > .10$). No other effects emerged as significant ($ps > .10$).

Next, we conducted the same analysis to assess liking of the layperson characters, and results again revealed a participant gender by expert gender interaction, $F(1, 88) = 11.18$, $p = .001$, $\eta_p^2 = .11$. Girls reported significantly greater liking than boys of a female layperson ($p = .007$), whereas there was no significant gender difference in the liking of a male layperson ($p > .10$). Girls reported liking a female layperson significantly more than a male layperson ($p = .01$) and boys reported liking a male layperson significantly more than a female layperson ($p = .054$). There was also a significant layperson

gender by experimenter gender interaction, $F(1,88) = 9.58$, $p = .003$, $\eta_p^2 = .098$. Once again, in the presence of a female experimenter, girls reported greater liking than boys of the female layperson, $F(1,88) = 14.90$, $p < .001$. There was no significant rating difference between boys and girls in the presence of a male experimenter ($p > .10$). No other effects emerged as significant ($ps > .10$).

Next, we used paired sample *t*-tests to assess whether participants reported greater liking of same-gender counter-stereotypical experts as compared with stereotypical experts from the comparison stories (e.g., preference for a girl with expertise in football vs. a girl with expertise in sewing). For both male and female participants, there were no significant differences in liking of counter-stereotypical versus stereotypical experts irrespective of expert gender (all $ps > .10$).

Finally, we examined the relation among liking, correctness choice, and learning preference choice with correlational analyses. None of these emerged as significant ($ps > .09$).

Discussion

We examined whether children's expectations about gender normative knowledge would interfere with their acceptance of information from an expert in a gender counter-stereotypical domain. After hearing conflicting information from a gender counter-stereotypical expert and a layperson of the other gender, participants were asked who they thought was correct, which informant they would prefer to learn from in the future, and how much they liked each informant. Broadly, this study builds on previous research by examining the acceptance of gender counter-stereotypical expertise during a developmental period in which children have an emergent understanding of expertise and conflicting perceptions about the violation of gender norms.

The comparison story about a gender stereotypical expert provides a starting point for interpreting the results. It is clear from performance on this story that children did not have difficulty in identifying an expert as correct or in choosing to learn from an expert when the expert did not transgress gender norms. Thus, reluctance to accept information from a counter-stereotypical expert cannot be attributed readily to a comprehension issue concerning expertise or a lack of willingness to accept information from a same-age peer who is described as highly knowledgeable.

Overall, responses to the correctness question support previous findings that expertise is a powerful learning cue (e.g., Lutz & Keil, 2002). Across the majority of conditions, participants judged the counter-stereotypical expert, rather than the layperson of the other gender, as correct more often than expected by chance. This is consistent with findings that 3- to 5-year-olds prioritize expertise over gender stereotypes when deciding which people know more about skills associated with a particular occupation (Shenouda & Danovitch, 2013) and that 4- to 7-year-olds take into account reliability rather than gender when learning new object objects (Taylor, 2013).

Notably, there were differences in correctness selections depending on participant age as well as gender of the participant and expert characters. As expected, older children were more likely than younger children to report that the gender counter-stereotypical expert was correct. Although 3- and 4-year-olds have a fairly sophisticated understanding of the concept of expertise (e.g., Koenig & Jaswal, 2011), there are some limits to this understanding in a gender-laden context, which is to be expected given age-related increases in gender norm flexibility. Indeed, younger children are significantly less likely than older children to report that gender norm transgressions are possible (Blakemore, 2003; Conry-Murray & Turiel, 2012). Limitations in this age group have also been noted more generally. For example, despite improvements in the recognition of expertise over the preschool years, 4- and 5-year-olds prioritize benevolence over expertise when crediting informants with knowledge (Landrum et al., 2013) and prefer informants who make positive attributions irrespective of accuracy (Boseovski, 2012).

Boys' performance on the correctness question was particularly striking. Younger boys selected a male counter-stereotypical expert systematically as correct but were at chance-level performance for a female counter-stereotypical expert. Although older boys showed greater than chance performance for both male and female counter-stereotypical experts, they were still less likely than same-age girls to judge a female counter-stereotypical expert as correct. These findings are consistent with reports that boys are less willing than girls to acknowledge that it is possible for females to

engage in traditionally male-dominated activities such as football (Blakemore, 2003). This response pattern is surprising given that the majority of children's teachers in both preschool and elementary schools are female. Young boys are accustomed to learning from females, and teacher gender is not associated with differences in academic motivation or achievement (Carrington et al., 2007; Spilt, Koomen, & Jak, 2012), even for domains associated with male stereotypes such as math and science (Marsh, Martin, & Cheng, 2008).

Perhaps boys were less responsive to the expertise information because the expert was a same-age peer and did not evoke the schema of a knowledgeable female teacher. It is also possible that the chosen counter-stereotypical domains of football and construction were perceived as relatively unlikely or inappropriate modes of expertise for females due to the athletic content. By middle school, boys report that they discourage girls from being physically active due to either perceptions of girls' incompetence or their own insecurity about being outperformed (Vu, Murrie, Gonzalez, & Jobe, 2006; see also Blakemore, 2003). Essentialist beliefs about gender may play a role in such notions (e.g., Bigler & Liben, 2006).

In addition to assessing perceptions of correctness, we asked participants which informant they would prefer to learn from in the future. We wanted to know whether children would respond differently to this question because active decision making might motivate greater reflection about expertise or because children might assume that a decision to learn from a person implies future hypothetical contact with that person and, therefore, evokes gender-related trust issues (in contrast to making a judgment about correctness in the moment). Overall, however, responses on the learning preference and correctness questions were largely consistent in both age groups.

Although the findings must be interpreted cautiously because they involve between-story comparisons, older children indicated a preference to learn from the gender counter-stereotypical expert irrespective of gender. Here, older boys did not show bias against counter-stereotypical females, perhaps due to greater reflection or because they were not required to recognize a negative characteristic (i.e., lack of knowledge) about the male layperson in choosing the female expert. Younger children as a group preferred to learn from the same-gender expert, with boys favoring a male expert over a female expert and girls favoring a female expert over a male expert. Indeed, performance was greater than chance only for same-gender experts. For these children, it is clear that among knowledgeable informants, priority is given to a same-gender peer (see Taylor, 2013). This is consistent with the strong in-group gender bias shown in previous research (e.g., Shutts et al., 2010). Although speculative, these children might have held greater trust in a same-gender peer and/or discomfort with the idea of learning directly from a peer of the other gender.

To examine participants' impressions of gender counter-stereotypical characters and whether these impressions were associated with recognition of expertise, we asked participants to rate their liking of informants. Contrary to expectations, and in contrast to previous research (Blakemore, 2003), there was little evidence of dislike based on gender counter-stereotypical interests. Across ages, mean ratings ranged from neutral to highly positive, and children's liking of the gender counter-stereotypical characters did not differ significantly from their liking of gender stereotypical characters in the comparison stories. Furthermore, performance on the gender counter-stereotypical liking question was not significantly correlated with the correctness and learning preference questions, perhaps due to limited variability in the mean liking ratings.

These relatively high liking ratings are somewhat surprising given documented biases against children with counter-stereotypical interests. However, it has also been established that children in this age range tend to make positive attributions about unknown others (e.g., Boseovski, 2010). In addition, inclusion of information that can be interpreted as positive (i.e., knowledge; see Landrum et al., 2013) may account for our positive liking ratings, in contrast to studies in which such information was not offered. Indeed, when children are presented with gender norm transgressions, they are typically given information about the transgression (e.g., a boy who plays with Barbie) but not other characteristics of the target individual.

Although liking ratings were high across conditions, girls and boys in both age groups generally favored their own gender over the other gender for both experts and laypersons, consistent with previous findings (e.g., Powlishta, 1995). Interestingly, there was evidence that boys were susceptible to experimenter influence when making these liking evaluations, as they reported lower ratings than

girls for both counter-stereotypical and stereotypical girl characters in the presence of a female experimenter. Inspection of the means indicated that this was driven by lower ratings of girls by these boys in the presence of a male experimenter rather than by higher ratings by girls in the presence of a female experimenter. Thus, in the presence of a female experimenter, there may be self-presentational tendencies in boys to exaggerate their liking of girls.

Boys' greater liking than girls of the counter-stereotypical male expert was contrary to expectations and inconsistent with findings that boys respond less favorably than girls to deviations from gender norms (Blakemore, 2003). For girls, the fact that this character was male *and* deviated from the norms might have been particularly unappealing. In contrast, for boys, perhaps same-gender identification, along with the positive attribute of expertise (see Landrum et al., 2013) was more salient than the counter-stereotypical nature of the expertise.

Girls' greater liking than boys of the female layperson is to be expected given the tendency to want to affiliate with females; however, this difference did not extend to the counter-stereotypical female expert. This character was liked highly by both boys and girls. Although speculative, this finding is again consistent with the notion that participants value expertise irrespective of whether it is counter-stereotypical. Finally, it is clear that liking ratings did not affect older children's choices for correctness and learning preference (i.e., they tended to choose the expert irrespective of gender). Thus, by middle childhood, children are capable of differentiating between expertise and personal preference in this context.

In summary, these findings indicate that with increasing age, children are willing to accept expertise information that conflicts with gender stereotypical norms. Although both younger and older children tended to choose the expert as correct, developmental differences emerged in learning preferences. Younger children preferred to learn from same-gender experts, whereas older children did not differentiate their choice based on gender. For both age groups, there was considerable correspondence overall between correctness choices and learning preference. In contrast, liking was not associated with either measure. Liking ratings were neutral to positive irrespective of informant type, although participants of both age groups reported greater liking of same-gender informants. The finding that participants viewed gender counter-stereotypical experts relatively positively was unexpected and may reflect the appreciation of knowledge as a desirable trait. Finally, this study revealed some reluctance on the part of boys to choose a female counter-stereotypical expert as correct. Younger boys exhibited chance responding in this case. Older boys systematically chose this expert as correct, but were still less likely to do so than same-age girls.

Based on these findings, there are several potential directions for future research. Among them, it is important to address the limitations of this study. First, it is unknown whether these results would generalize to other gender counter-stereotypical domains of expertise. These story domains were chosen because they were associated with either boys or girls and unexpected for a person of the other gender, based on previous research and pilot testing. However, gender norm transgressions can be viewed differently depending on the type of transgression (see Conry-Murray & Turiel, 2012). As noted above, it may be more difficult for children to accept transgressions that involve physical or athletic activity. In addition, appearance transgressions (e.g., boys with long hair) are evaluated more harshly as compared with career paths (e.g., boys becoming nurses; see Blakemore, 2003). Thus, it is possible that children would be less likely to accept the expertise of an individual who violates gender norms in an appearance-relevant domain (e.g., boys with knowledge about fashion).

Second, on a related note, the characters' appearance in this study conformed to gender stereotypical norms (e.g., girls had long hair and boys had short hair). This design feature may have resulted in greater willingness to accept information from informants with gender counter-stereotypical interests, as well as greater liking of the characters. In future research, manipulation of physical appearance characteristics could provide information about age-related boundaries of acceptance of gender counter-stereotypical expertise. This may be particularly important given the importance of appearance in determining others' gender and establishing one's own identity during childhood (Halim et al., 2014).

Third, the current study focused on group-level data, but it is important to take an individual differences perspective to gain a nuanced understanding of the mechanisms that underlie variations in acceptance of gender counter-stereotypicality. For example, research by Mulvey, Rizzo, and Killen

(2015) reveals that young children with better social–cognitive competencies, as assessed by false belief theory of mind understanding, are more likely to challenge group stereotypes that perpetuate gender norms. These skills may also be relevant to the acceptance of counter-stereotypical expertise. Another potential area of investigation concerns variation in social influences that affect children's own gender flexibility (Conry-Murray & Turiel, 2012). For example, maternal employment and fathers' attitudes about sex roles are associated with children's own ideas about gender labels and gender identity, respectively (Weinraub et al., 1984).

Fourth, and finally, this research has potential implications for how to educate children to be open toward peers with gender counter-stereotypical interests. Although we did not find evidence of discrimination against children who engage in gender counter-stereotypical behaviors, these biases surely exist (Blakemore, 2003; Carter & McCloskey, 1983). Given the developmental differences obtained here, it might be important to expose younger children to peers and/or adult role models in gender counter-stereotypical domains (e.g., male ballet instructors). Both younger and older boys may be particularly likely to benefit from this exposure. In addition to encouraging direct contact with peers or others who have atypical interests, it may be beneficial to highlight explicitly their positive characteristics (e.g., knowledge or other psychological qualities). Attention to multiple roles is associated with more egalitarian views (see Bigler & Liben, 1992) and may ultimately help to prevent or decrease the formation of negative attitudes concerning gender roles.

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