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PAPER

The development of implicit gender attitudes

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Abstract

The development course of implicit and explicit gender attitudes between the ages of 5 and adulthood is investigated. Findings demonstrate that implicit and explicit own-gender preferences emerge early in both boys and girls, but implicit own-gender preferences are stronger in young girls than boys. In addition, female participants' attitudes remain largely stable over development, whereas male participants' implicit and explicit attitudes show an age-related shift towards increasing female positivity. Gender attitudes are an anomaly in that social evaluations dissociate from social status, with both male and female participants tending to evaluate female more positively than male.

Research highlights

- The developmental course of implicit and explicit gender attitudes (i.e. the association of male and female with the attributes 'good' and 'bad') is charted via a large sample, large age-range cross-sectional study from age 5 to adulthood.
- While boys and girls show own-gender preference on both implicit and explicit measures, from as early as age 5 implicit own-gender preference is stronger in females than males.
- Both implicit and explicit own-gender preferences are relatively stable in females but show marked age-related declines in males, with adult males showing no implicit own-gender preference and explicit attitudes showing a full age-related reversal to strong pro-female attitudes.
- These findings suggest that gender attitudes are anomalous in that they dissociate from hierarchical social status in a way quite distinct from other intergroup domains.

Introduction

The universal presence of gender differentiation in human collectives gives the category of gender a unique position in social life. Attention to gender emerges early, with infants showing sensitivity to gender variation by preferentially looking towards faces matching the gender of their primary caregiver (Quinn, Yahr, Kuhn, Slater & Pascalis, 2002; Younger & Fearing, 1999). Children as young as 2 verbally express preferences for their own gender (Yee & Brown, 1994), and awareness of conventional gender stereotypes, including the perceived appropriateness of gender-typed dress, occupational roles, and toys, emerges soon thereafter (Leinbach, Hort & Fagot, 1997; Levy & Haaf, 1994; Shutts, Banaji & Spelke, 2010; Signorella, Bigler & Liben, 1993; Weinraub, Clemens, Sockloff, Ethridge, Gracely *et al.*, 1984).

Given this centrality, it is critical to understand how views of gender emerge and change over development (Dunham & Olson, 2008; Dunham & Degner, 2010). The present inquiry focuses on *implicit* gender attitudes, i.e. automatic evaluations of broad gender categories along the positive-negative dimension. Past work has focused on the *explicit* or self-reported component of children's gender attitudes and stereotypes (for a recent review, see Martin & Ruble, 2010), but much less is known about implicit gender attitudes (cf. Baron, Schmader, Cvencek & Meltzoff, 2013; Cvencek, Greenwald & Meltzoff, 2011; Skowronski & Lawrence, 2001, for two studies focusing on restricted age ranges), an important lacuna given that implicit processes are major contributors to social

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cognition and behavior (Greenwald & Banaji, 1995). Notably, while implicit and explicit intergroup attitudes tend to be at best modestly correlated (Hofmann, Gschwendner, Nosek & Schmitt, 2005), they independently predict discriminatory behavior in adults (Greenwald, Poehlman, Uhlmann & Banaji, 2009) and children (Dunham, Baron & Carey, 2011). Furthermore, while explicit attitudes generally show age-related shifts towards egalitarianism (Raabe & Beelmann, 2011), implicit attitudes are generally stable across ages, leading to widening explicit–implicit dissociations (Baron, 2015; Dunham, Baron & Banaji, 2008; Dunham, Chen & Banaji, 2013).

The present investigation of implicit gender attitudes should be considered in the context of research on explicit gender attitudes. Young children express preferences in favor of their own gender (reviewed in Arthur, Bigler, Liben, Gelman & Ruble, 2008), though such preferences decline somewhat in middle childhood (Egan & Perry, 2001; Powlishta, 1995; Verkuyten & Thijs, 2001). They also associate the male gender with greater power and more prestigious occupations (Liben, Bigler & Krogh, 2001; Ruble, Martin & Berenbaum, 2006). Thus, it is surprising that by adulthood both men and women tend to report more positive attitudes towards female than male (Eagly & Mladinic, 1989; Eagly, Mladinic & Otto, 1991; see also Rudman & Goodwin, 2004), a finding dubbed *ambivalent sexism*, in which generally positive evaluations or stereotypes of women (e.g. warm, nurturing) coexist alongside more negative appraisals in particular contexts such as the workplace (Glick & Fiske, 2001, 2011). This perspective suggests that, in contrast to other intergroup domains, discrimination against women is not based on antipathy per se but rather on stereotypes concerning ability in specific domains.

Positive attitudes towards women are also striking given that past work suggests general tendencies to prefer ingroups (Mullen, Brown & Smith, 1992) and high-status groups (Bettencourt., Dorr, Charlton & Hume, 2001), both factors that would seem to predict strong own-gender preference in putatively higher-status males. Do boys' initial own-gender explicit preferences undergo a complete reversal ending with favoritism for the gender outgroup? Such a pattern would be, to our knowledge, unprecedented in the attitudes literature. However, no studies have examined the entire age range from early childhood through adulthood, leaving the nature of developmental change unclear.

A few studies have explored implicit gender attitudes in children and adults (see Baron *et al.*, 2013). The first reported that 11-year-olds did not show implicit gender preferences at all, while adult women but not men showed a pro-female preference (Skowronski & Lawrence, 2001). More recently, in the context of developing a preschool-friendly measure of implicit attitudes, implicit own-gender preference was reported in 4- and 5-year-old girls but not boys (Cvencek *et al.*, 2011). Following prior adult work (Rudman & Goodwin, 2004), they suggest that this pattern may be due to the joint operation of ingroup preference and positive attachment to a maternal caregiver. This study is an important precursor to our investigation as it motivates the possible prediction that gender differences in own-gender implicit preference will be present quite early in development. Turning to adults, evidence for implicit own-gender preference in adult men is mixed, with some studies reporting weak own-gender preferences (Rudman & Goodwin, 2004), some reporting weak pro-female preferences (Carpenter, 2000), and others reporting no clear preference in either direction (Nosek & Banaji, 2001; Richeson & Ambady, 2001; Rudman & Goodwin, 2004). Notably, all these studies find strong own-gender preference in females.

Overview of the current study

Shedding light on the nature of implicit gender attitudes while reconciling previous inconsistent findings requires documenting implicit gender attitudes over a wide and continuous age range and with a sample size sufficient to ensure adequate statistical power; we accomplish this by examining children from age 5 through adolescence and an additional sample of adults. We also harness recent data-analytic advances in process dissociation (Sherman, Gawronski, Gonsalkorale, Hugenberg, Allen *et al.*, 2008), allowing us to independently estimate the strength of implicit ingroup positivity and outgroup negativity. This is crucial, because a nuanced interpretation of development requires knowing whether change is driven by positivity associated with the ingroup, negativity associated with the outgroup, or both (Aboud, 2003; Martin & Ruble, 2010). Given past work, we expected robust implicit own-gender preference in women but not men, but past work did not allow strong predictions regarding implicit gender attitudes in children. Given evidence that adult males show little or no own-gender positivity, a question of particular interest was whether this attitudinal neutrality has its origin in early childhood, or whether girls and boys show equivalent own-gender preference which then undergoes age-related decline in boys but not in girls.

Methods

Participants

Four hundred and forty-one US children (mean age = 9.3 years, *SD* = 2.7, range = 4.6 to 17.3, male = 227; see

Table 1 *Breakdown of sample size by age and gender*

Age	Male	Female
5–6*	56	56
7–8	52	44
9–10	61	55
11–12	40	37
13–14**	17	23
Adult	54	57

*Includes nine older 4-yr-olds (male = 7) **Includes six 15–17-yr-olds (male = 2)

Table 1) and 111 US adults (male = 53, mean age = 23.9 years) participated in the study. Participants were recruited and tested in lab, at schools, and at a science museum, but testing location did not relate to any reported effects. Children were predominately European-American (~75%) and Asian-American (~15%). Socioeconomic class ranged from low-middle to middle income. Adults were recruited from a university-affiliated study pool consisting of both undergraduates and members of the community, who participated for course credit or $5.

Procedures

The study was administered via a laptop or desktop computer. After securing consent, participants completed the Implicit Association Test, followed by the explicit attitude assessment. For a subset of 62 participants (male = 44), the explicit assessment was eliminated due to time constraints. As such, sample sizes differ when comparing implicit and explicit measures (details on who did not complete explicit measures are provided in the online supplement).

Measures

Implicit Association Test (IAT)

The IAT (Greenwald, McGhee & Schwartz, 1998) is a speeded dichotomous categorization task that estimates the strength of association between pairs of concepts. In one critical condition, participants respond to pictures of one gender (e.g. female) and positive words (e.g. 'good') using one response key, and pictures of the other gender (e.g. male) and negative words (e.g. 'bad') using a second response key. In a second (counterbalanced) critical condition the pairings are reversed such that (e.g.) female is paired with negative words and male with positive words; the computer records reaction times, allowing for the comparison of average latency across the two conditions. The assumption is that participants will be faster to respond when more closely associated concepts share a response key, and analysis proceeds by computing an effect size indicating the relative implicit preference for own-gender (*D-as-is*, from Greenwald, Nosek & Banaji, 2003).

We employed the IAT because nearly all past research looking at implicit gender attitudes in adults has used this measure, allowing us to compare our findings directly to past work, and because the IAT is the best-validated measure of implicit social cognition (e.g. Lane, Banaji, Nosek & Greenwald, 2007; Nosek, Greenwald & Banaji, 2007a; Nosek, Smyth, Hansen, Devos, Lindner *et al*., 2007; Greenwald *et al*., 2009; Wentura & Rothermund, 2007). In our child-friendly version (Baron & Banaji, 2006) we used photographs of girls and boys and, to avoid difficulty with reading ability in younger children, auditory presentation of positive and negative words. Using photos of children had the potential drawback that they might not clearly identify a gender ingroup for older participants, but employing different stimuli at different ages would have raised the possibility of stimulus effects, undermining cross-age comparisons. In addition, pilot data collected with adults while developing the child-friendly IAT revealed high correlations between the adult IAT (with photos of adults as stimuli) and the child IAT (with photos of children), and past research has shown that category labels such as 'male' and 'female' are larger influences of IAT responses than the specific stimuli themselves (Mitchell, Nosek & Banaji, 2003). The IAT showed high internal consistency (α = .90) as computed from a split-half analysis.

Process dissociation analysis

A recent advance in the analysis of IAT data allows dissociation of component processes thought to contribute to IAT performance (the Quadruple Process Dissociation Procedure or Quad Model: Conrey, Sherman, Gawronski, Hugenberg & Groom, 2005; Sherman *et al*., 2008). The Quad Model is a multinomial processing tree model (Batchelder & Riefer, 1999) that decomposes error rates on the IAT into independent parameter estimates associated with different hypothesized processes. The parameters comprising the Quad Model are: (1) positive and negative associations with male and female; (2) ability to adequately discriminate the stimuli (i.e. the photos of boys and girls); (3) ability to overcome associations activated by the stimuli in order to respond correctly; and (4) response bias, such as a tendency to over-select the left or right response key. The Quad Model has been well validated (Conrey *et al*., 2005; Sherman *et al*., 2008), and in a lifespan developmental context demonstrated that increased implicit race bias in

elderly populations can be uniquely attributed to declining executive function rather than increasing association strength (Gonsalkorale, Sherman & Klauer, 2009). Additional detail is available in the online supplement.

Self-report measure

Following the IAT, participants completed a self-report measure of preference in which participants viewed photographs of children drawn from the same stimulus set, one of each gender, and indicated which child they liked better; this relative measure of preference parallels the relative structure of the IAT, facilitating comparison across the two measures (Hofmann *et al.*, 2005). The task was composed of eight gender trials randomly intermixed with eight trials in which preferences for everyday objects such as toys and flowers were elicited. The measure showed reasonable internal consistency as assessed by split-half reliability, $\alpha = .83$. Analysis proceeds by comparing the percentage of own-gender choices to chance responding (50%).

Results

Implicit attitudes

Standard exclusion criteria (Greenwald *et al.*, 2003) led to the exclusion of IAT data from four children. Girls ($D = .35$, $SD = .35$, $t(213) = 14.51$, $p < .001$) and adult women ($D = .44$, $SD = .38$, $t(56) = 8.72$, $p < .001$) showed robust own-gender preference; boys showed weaker but statistically significant own-gender preference ($D = .11$, $SD = .32$, $t(222) = 5.20$, $p < .001$), while adult males did not show own-gender preference ($D = -.02$, $SD = .18$, $t(52) = -.52$, $p = .61$). To provide a finer-grained view of age patterns, we predicted implicit preference in a simultaneous linear regression with (mean-centered) age in years, gender, and their interaction as predictors. The overall model was significant, $F(3, 544) = 35.34$, $p < .001$, $R^2 = .16$; Figure 1. There was no main effect of age on preferences, $F(1, 544) = 0.01$, $p = .93$, but the effect of gender was significant, indicating stronger own-gender preference in females, $F(1, 544) = 92.52$, $p < .001$, partial $\eta^2 = .15$.

Crucially, these effects must be interpreted in the context of the interaction between age and gender, $F(1, 544) = 13.26$, $p < .001$, partial $\eta^2 = .02$, showing that age effects varied as a function of gender. To unpack these trends we regressed age on own-gender preference separately for each gender; for males, the effect of age was significant and negative, $F(1, 275) = 7.26$, $p = .008$, while for females it was significant and positive, $F(1, 269) = 6.09$, $p = .01$. In summary, these results confirm that

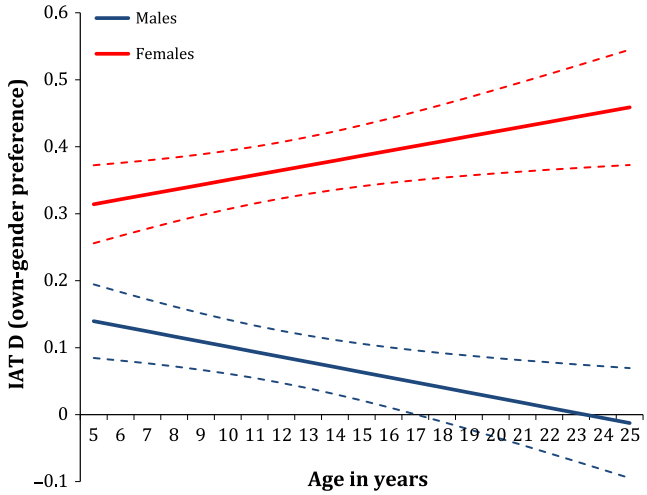

Figure 1 *Fitted estimates of implicit own-gender preference as a function of age (in years) and gender. Dashed lines represent 95% confidence intervals.*

females display strong own-gender preference; by contrast, boys display modest own-gender preference, and this preference is completely absent in adults.

Explicit attitudes

Girls ($M = .74$, $SD = .24$, $t(196) = 13.69$, $p < .001$) and boys ($M = .73$, $SD = .28$, $t(183) = 11.19$, $p < .001$) showed similar levels of explicit own-gender preference, but both male adults ($M = .18$, $SD = .14$, $t(50) = 16.81$, $p < .001$) and female adults ($M = .81$, $SD = .11$, $t(55) = 20.77$, $p < .001$) reported explicit preference for female over male. Turning again to regression analyses, we predicted self-report preference from age, gender, and their interaction. The overall model provided a good fit to the data, $F(3, 484) = 64.01$, $p < .001$, $R^2 = .28$; Figure 2. The main effects of age, $F(1, 484) = 60.05$, $p < .001$, partial $\eta^2 = .13$, and gender, $F(1, 484) = 39.17$, $p < .001$, partial $\eta^2 = .07$, as well as their two-way interaction, $F(1, 484) = 92.82$, $p < .001$, partial $\eta^2 = .16$, were all strong predictors of explicit preferences. In sum, preferences were consistently weaker in older boys and were completely reversed in the direction of pro-female preference in men, while no such age-related variation was present in females; a follow-up analysis including children under the age of 7 suggested that there was no difference in strength of preferences in this youngest group, $t(98) = .75$, $p = .46$. Examining each gender separately confirmed these patterns: for males, the effect of age was significant and negative, $F(1, 233) = 124.74$, $p < .001$, demonstrating more pro-female attitudes as a function of age, while for females it was not significantly different from zero, $F(1, 251) = 1.05$, $p = .31$, demonstrating no age-related

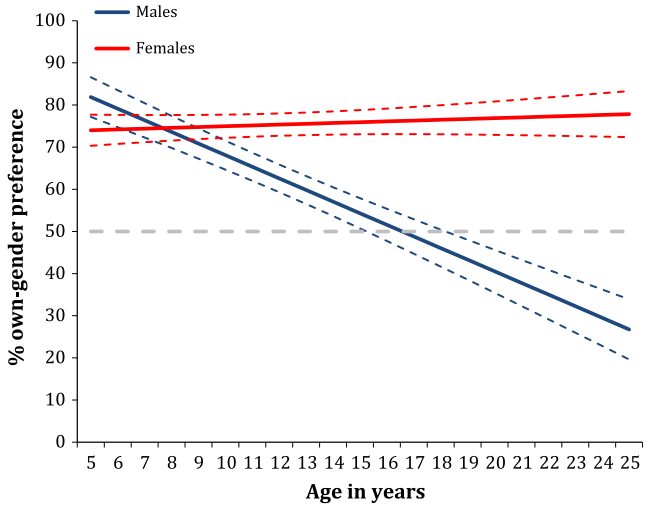

Figure 2 *Fitted estimates of explicit own-gender preference as a function of age (in years) and gender. Dashed lines represent 95% confidence intervals; grey dashed line is chance responding (50%).*

variation in attitudes. Thus, while female self-reported attitudes are female-favoring and developmentally stable, male self-reported gender attitudes were male-favoring in younger children and reversed to be female-favoring in adults.

Implicit and explicit attitudes did not correlate significantly in boys, girls, men, or women, all $|r| < .11$, $p > .15$, suggesting the presence of two independent psychological constructs.

Process dissociation modeling

We focus on the parameters representing positive association with one's own-gender ingroup and negative association with the other-gender outgroup (for further details, see the online supplement). Substantively, this allows us to independently examine positive associations with own-gender and negative associations with the other-gender. Overall, our model provided good fit to the data (i.e. model predictions did not differ significantly from observed values), $\chi^2(1) = 1.30$, $p = .25$. The tendency to associate own-gender with *good* and other-gender with *bad* were both reliable, $p < .001$, where *p*-values represent significance tests of decrement to model fit when a parameter is set to a value (in this case to zero; Gonsalkorale *et al.*, 2009). However, the association between own-gender and *good* was stronger, $p < .001$. Of particular interest was whether this pattern varied by gender and age. Looking first across both gender groups, females as a group showed both a strong positive association with female as well as a negative association with male, both $p < .001$, while males showed a positive association with male, $p < .001$, but no negative association with female whatsoever, $p = .37$; Figure 3. Crucially, these independent estimates are not possible when relying on the traditional effect size treatment of the IAT.

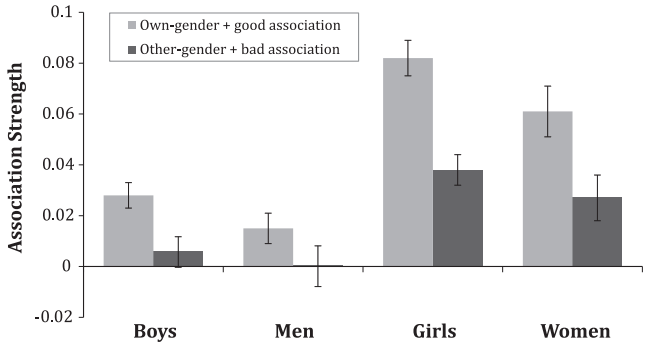

Figure 3 *Parameter estimates associated with the strength of the ingroup–good and outgroup–bad associations, by broad age group and gender. Error bars are standard errors of the estimate.*

To examine age-related changes, we compared children to adults within and between each gender group. Looking across both genders in each age group, girls had stronger positive associations with their gender ingroup and stronger negative associations with their gender outgroup than boys, both $p < .001$, and both differences were present in adults, both ps $< .009$. Looking across ages but within gender, both the ingroup–good and the outgroup–bad associations were equally strong in girls and women, both $p > .20$, suggesting broad developmental continuity. For boys, however, strength of positive associations with male differed as a function of age, with the ingroup–good association significant in boys, $p < .001$, but not in men, $p = .26$.

While our ability to pinpoint the precise period during which this decline occurs is limited by power, exploratory analyses on narrower age ranges revealed that the 95% confidence interval around the parameter estimate associated with own-gender positivity was above zero (and thus statistically significant) in each two-year age bands of boys until 13- to 14-year-olds, and in adult men. By contrast, males' association between other-gender and bad did not differ significantly from 0 in boys or men, both $p > .22$. Thus, age-related change in implicit ingroup preference in males is driven by a lack of other-gender negativity coupled with own-gender positivity in younger but not older males.

Discussion

We find that both boys and girls begin with implicit and explicit preferences for their own gender, though implicit

own-gender preferences are stronger in girls from the earliest ages tested (replicating a difference previously reported by Cvencek *et al*., 2011). Thereafter, in girls we observe a modest age-related increase in implicit own-gender preference and age-related stability in explicit preferences. By contrast, in boys we observe weaker own-gender preference even at the earliest ages we were able to test, and a dramatic age-related shift, such that by adulthood the mean pattern is implicit attitudinal neutrality and explicit preference for female over male. In other intergroup domains such as race in the US and South Africa (Baron, 2015; Baron & Banaji, 2006, 2009; Dunham, Baron & Banaji, 2006, 2007; Dunham, Newheiser, Hoosain, Merril & Olson, 2014a; Newheiser, Dunham, Merrill, Hoosain & Olson, 2014) and caste in India (Dunham, Srinivasan, Dotsch & Barner, 2014b), children's implicit attitudes are similar to adults', in all cases displaying a direction and magnitude consistent with the prevailing status relations, favoring higher-status group over lower-status groups. Thus, the present finding with males, in which own-group preference gets weaker as a function of age in a group with considerably greater economic and political power, is to our knowledge unprecedented, suggesting that gender attitudes are uniquely independent from social status.

As with the majority of past developmental work (Baron & Banaji, 2006; Dunham *et al*., 2006, 2007; Olson & Dunham, 2010), implicit and explicit attitudes did not correlate, suggesting that our measures are tapping largely independent constructs. However, the specific case of gender findings here have been mixed, with the pattern of correlations appearing inconsistently across studies in adult work (Carpenter, 2000; Rudman & Goodwin, 2004) and appearing relatively robustly in one prior developmental study (Cvencek *et al*., 2011); the reasons for these differences are not immediately clear. In any case, implicit and explicit attitudes were generally consistent in direction, especially in female participants in which both were robustly pro-female. This consistency contrasts with race attitudes, in which implicit measures usually reveal considerably more negativity than explicit attitudes, at least in members of the White majority.

In the remainder of this discussion we focus on the most prominent accounts of developmental change derivable from past work and evaluate them in light of our data with the goal of offering suggestions as to the most promising avenues for future inquiry. Two findings emerge as most in need of explanation. First is the dramatic age-related shift in male attitudes. Second is the fact that implicit (but not explicit) gender attitudes are stronger in young girls than young boys. Why do male attitudes show such dramatic age-related shifts? One prominent possibility stems from the ambivalent sexism perspective (Glick & Fiske, 2011), in which changes in attitudes are driven by predominantly positive female stereotypes. Given that stereotype acquisition is a relatively protracted process (e.g. Pauker, Ambady & Apfelbaum, 2010), this account would predict an age-related increase in female positivity as the stereotype is internalized. However, the decline in own-gender preference in males was largely a consequence of *decreasing* male-related positivity as opposed to *increasing* female-related positivity, which appeared to be stable with age in both males and females. Thus, it does not appear that a gradual increase in pro-female stereotypes can account for the patterns we observe.

However, the timing of this change, appearing to occur in adolescence, provides some support for another hypothesis proposed by Rudman and Goodwin (2004), namely that increasing male–male competition and/or emerging associations between males and violence lead to a declining positivity towards males. Future work could fruitfully examine this possibility by measuring explicit and implicit associations between males and violence and determining whether attitude change is related to the emergence of such associations.

Despite their inability to account for age-related change, positive stereotypes of females (e.g. nice, safe) could help to explain why implicit own-gender preference in girls was stronger than that in boys, because if such stereotypes were present early and consistently, it could reduce own-gender preference in boys while increasing it in girls. A related suggestion is that early maternal attachment shifts both genders in the direction of female positivity, a possibility that receives some support from retrospective studies with adults (Rudman & Goodwin, 2004; this conclusion was also favored by Cvencek *et al*., 2011, in their prior study of implicit gender attitudes). This account could be directly investigated by linking attachment relationships with gender attitudes. One complication, however, is that since young boys showed *explicit* own-gender preferences every bit as strong as girls, these explanations do not offer a satisfying account of the developmental trends in explicit attitudes.

With this point in mind, it is important to emphasize that while we have focused on implicit attitudes, change in explicit attitudes was even more pronounced for males, who showed a full reversal from ingroup positivity to outgroup positivity. On the one hand, this is similar to other intergroup domains (such as race and ethnicity), in which explicit attitudes undergo substantial shifts from ingroup preference to something close to attitudinal neutrality (Raabe & Beelmann, 2011). On the other hand, the complete reversal in the present case is striking and does not have a precedent of which we are aware. A fascinating question for future research is whether explicit

attitudes are simply more sensitive to the same factors that affect implicit attitudes or whether they are affected by a different set of factors entirely; if the former, an account of the initially quite strong explicit own-gender preferences in boys will need to be developed.

Methodologically, our ability to weigh in on these hypotheses was enhanced by the decomposition of gender attitudes into positivity towards the ingroup and negativity towards the outgroup. As noted in a recent review (Martin & Ruble, 2010), past research has too frequently relied on relative measures of preference, which obscure the structure of the underlying attitudinal representation as well as the precise form of age-related change. In the present case, we were able to overcome this limitation by harnessing, for the first time with children, recently developed analytic techniques allowing implicit attitudes to be decomposed into component parts (Sherman *et al*., 2008). We hope future researchers will explore the promise of these new techniques.

More practically, our findings support the contention that, at least after early childhood, *animosity* towards girls or women is not the primary determinant of sex-based discrimination. Following research in the ambivalent sexism tradition (Glick & Fiske, 2011), we believe that discrimination is more plausibly explained by domain-specific stereotypes, regarding, for example, women's competence in professional domains.

Some limitations should be noted. While we focused on general trends, we observed substantial individual variation around these means. This suggests the presence of moderators. For example, single-sex education impacts emerging notions of gender (e.g. Lee & Bryck, 1986; Measor, 1996), and the individual's own constellation of friends affects gender identity (Mehta & Strough, 2010). Parents' implicit attitudes and beliefs about gender also shape children's conceptions (Croft, Schmader, Bock & Baron, 2014). More generally, as a cross-sectional investigation, our study cannot definitively establish individual trajectories. Future research should incorporate measures of hypothesized cognitive mechanisms and follow children longitudinally to allow for stronger causal conclusions.

In closing, we emphasize that the observation of a putatively higher-status group growing increasingly *outgroup favoring* as a function of age is, to our knowledge, a developmental pattern unique to gender. It supports the idea that gender is an anomalous intergroup domain to which the patterns observed with racial, ethnic, and other forms of intergroup attitudes should not be assumed to generalize. Our understanding of the broader world of intergroup social cognition will benefit from continued inquiry into how and why gender functions so differently.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Data S1. Supplementary materials