



## Prenatal hormones and childhood sex segregation: Playmate and play style preferences in girls with congenital adrenal hyperplasia

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### ABSTRACT

We investigated playmate and play style preference in children with congenital adrenal hyperplasia (CAH) (26 females, 31 males) and their unaffected siblings (26 females, 17 males) using the Playmate and Play Style Preferences Structured Interview (PPPSI). Both unaffected boys and girls preferred same-sex playmates and sex-typical play styles. In the conflict condition where children chose between a same-sex playmate engaged in an other-sex activity or an other-sex playmate engaged in a same-sex activity, boys (both CAH and unaffected brothers) almost exclusively chose playmates based on the preferred play style of the playmate as opposed to the preferred gender label of the playmate. By contrast, unaffected girls used play style and gender label about equally when choosing playmates. Girls with CAH showed a pattern similar to that of boys: their playmate selections were more masculine than unaffected girls, they preferred a boy-typical play style and, in the conflict condition, chose playmates engaged in a masculine activity. These findings suggest that prenatal androgen exposure contributes to sex differences in playmate selection observed in typically developing children and that, among boys and girls exposed to high levels of androgens prenatally, play style preferences drive sex segregation in play.

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### Introduction

Childhood sex segregation is a robust phenomenon and the developmental trajectory of same-sex affiliation has been well documented (Fabes et al., 2003; Jacklin and Maccoby, 1978; LaFreniere et al., 1984; Maccoby and Jacklin, 1987; Martin and Fabes, 2001; Ruble and Martin, 1998; Wasserman and Stern, 1978). The magnitude of the preference for same- versus other-sex affiliation is quite large, increases at least into middle childhood, and appears to be resistant to change (Maccoby and Jacklin, 1987; Powlishta et al., 1993; Serbin et al., 1977). However, while the behavioral features of children's sex-typed playmate preferences are generally understood, the underlying mechanisms are not.

The extant literature on childhood sex segregation in general implicates cognitive, social, and biological processes with the general consensus that the full explanation integrates these theoretical perspectives. Independent effects of gender labels and play styles in children's playmate selections have also been

investigated with some researchers hypothesizing that the sex differences in play style themselves probably contribute to children's preferences for same-sex play partners. For example, it has been demonstrated that boys and girls differ in toy choices, activity levels, and rough-and-tumble play. Compared to boys, girls play more with dolls and doll furnishings, are less active, and are less interested in rough, outdoor play. By contrast, compared to girls, boys play more with construction and transportation toys, are more active and are more interested in rough, outdoor play (Berenbaum and Hines, 1992; DiPietro, 1981; Eaton and Enns, 1986; Hines and Kaufman, 1994; Maccoby and Jacklin, 1974; Pasterski, et al., 2005; Pasterski, et al., 2007; Ruble and Martin, 1998; see Hines, 2009a,b for review). Furthermore, research with non-human primates and other mammals has shown similar sex differences. Male rats and monkeys show more rough-and-tumble play than females of the species (Meaney and Stewart, 1981; Ward and Stehm, 1991) and two studies (Alexander and Hines 2002; Hassett et al., 2008) have found sex differences in toy choices among vervet and rhesus monkeys which parallel those of children. Given the clear sex differences in preference for play styles, it is not surprising that children engaging in sex-typed activities generally do so with others of the same sex.

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However, even when the activity or toy is neutral, sex segregation is still observed (Jacklin and Maccoby, 1978), suggesting that play style cannot fully account for children's preferences for same-sex play partners. Cognitive-developmental theory suggests that sex segregation occurs as children begin to understand gender and grow to value and prefer members of their own gender group (Maccoby, 1988; Maccoby and Jacklin, 1987), and that playmate selection is based on the gender label of the playmate rather than the play style. Accordingly, this theory suggests that the ability to correctly label oneself and others by gender underlies the formation of gender schemas (Martin and Halverson, 1981). These schemas allow children to recognize attributes about the other sex while distinguishing and adopting behaviors characteristic of their own sex. As children's schemas grow, so does their repertoire of sex-typed behaviors, including preference for same-sex partners.

Social learning theory suggests that, as they develop, children acquire knowledge regarding socially approved behavior (Mischel, 1966) including play with same-sex peers. As they grow to accurately identify their own sex, they apply this knowledge to their own behavior. There is ample evidence that children receive reinforcements from their peers for sex-appropriate behavior (Fagot and Hagan, 1991), and they appear to be more responsive to reactions by their own sex than by the other sex (Fagot, 1985). According to this theory, then, sex segregation is presumed to result from socialization by peers (in addition to parents and others) (Maccoby, 1988).

With respect to inborn influences on sex segregation, the most prominent explanation proposes an influence of prenatal hormones (primarily androgens) on neurobehavioral development. Evidence for such an influence comes mostly from studies of girls with congenital adrenal hyperplasia (CAH; Hines, 2004). This disorder involves an enzymatic deficiency resulting in an overproduction of adrenal androgens, beginning prenatally. Girls affected with this disorder are usually born with virilized genitalia and, beginning in early childhood, typically show masculinized patterns of sex-typed behavior such as toy and activity preferences (Collaer and Hines, 1995; Ehrhardt and Baker, 1974; Pasterski et al., 2005).

In addition to toy and activity preferences, playmate preferences have also been studied in this particular population. Specifically, five studies have investigated the influence of prenatal androgens on children's playmate preferences (Berenbaum and Snyder, 1995; Dittmann, et al., 1990; Ehrhardt and Baker, 1974; Hines and Kaufman, 1994; Servin et al., 2003) by studying girls with CAH; however, the findings from these studies are contradictory, with three reporting effects of androgen (Ehrhardt and Baker, 1974; Hines and Kaufman, 1994; Servin et al., 2003) and two reporting no effects (Berenbaum and Snyder, 1995; Dittmann, et al., 1990). Furthermore, those who do report an effect do not point to a mechanism by which androgens influence playmate selection. There are two possible modes of action of prenatal androgens on playmate preferences. First, androgen may directly influence peer preferences. Alternatively, androgen may influence components of play style which then influence playmate selection. Behavioral compatibility hypotheses, for example, suggest that children choose playmates who are compatible, e.g. they have similar toy and activity preferences (Maccoby and Jacklin, 1987; Moller and Serbin, 1996; Pellegrini, 2004). From this perspective, one might consider that hormone influences on toy and/or activity preference may underlie sex-typical playmate selection.

Because play styles covary with sex, it is difficult to disentangle the relative contributions of play styles and gender labels to children's playmate preferences. To address the issue, Alexander and Hines (1994) developed a structured interview to assess play style preference, playmate preference, and the preference for one over the other in a conflict condition. The Playmate and Play Style Preferences Structured Interview (PPPSI) requires the child to indicate preferences for feminine or masculine activities (play style preference), for female targets or male targets (playmate preference),

and for female targets engaging in masculine activities or male targets engaging in feminine activities (conflict condition). With respect to the conflict condition, for boys, a consistent preference for female targets engaging in masculine activities would indicate playmate selection on the basis of play style and a consistent preference for male targets engaging in feminine activities would indicate conflict resolution based on gender labels. Likewise, for females, a consistent preference for male targets engaging in feminine activities would indicate conflict resolution on the basis of play style and a consistent preference for female targets engaging in masculine activities would indicate conflict resolution on the basis of gender labels. Alexander and Hines (1994) found that boys made most of their selections based on the play style of the targets and that, overall, girls did not show a selection bias based on the play style or the gender label of the target. This led them to conclude that the processes that led to children's sex segregation differed to some extent for girls and boys.

The relative importance of play style in gender-typical boys' preference for boys as playmates is consistent with the observation that boys are more stereotyped in their play style preferences than are girls (Eisenberg et al., 1982). Although this sex difference may be explained in part by stronger social pressures for sex-appropriate play for boys than for girls, biological, particularly hormonal, influences may also be partially responsible. The purpose of the current study was to investigate the potential role of prenatal androgen in playmate selection with respect to the mechanisms underlying sex segregation in playmate selection. To do so, we assessed preferences for gender labels and play styles, including when the two are in conflict, in a cohort of children exposed prenatally to excess androgen, due to CAH, as compared to unaffected siblings.

Hypotheses for the current investigation were as follows: (1) compared to unaffected girls, unaffected boys will choose more male targets as playmates and more masculine activities; (2) compared to unaffected boys, unaffected girls will choose more female targets as playmates and more feminine activities; and (3) compared to unaffected girls, girls with CAH will choose more male targets as playmates and more masculine activities. Given the sex difference in conflict resolution found by Alexander and Hines (1994), we predicted further that: (4) unaffected boys will choose playmates based more on the play style than on the gender label of the target; (5) unaffected girls will not show a preference for play style or gender label of the target when choosing playmates; and (6) girls with CAH will choose playmates based more on the play style than on the gender label of the target. We had no specific hypotheses for boys with CAH since previous findings suggest they generally do not differ from unaffected boys in play style or playmate preference.

## Method

### Participants

One hundred 3- to 10-year-old children (26 females, 31 males with CAH; 26 unaffected sisters, 17 unaffected brothers) completed the PPPSI as part of a larger study (Pasterski et al., 2005, 2007). The mean age of the children was 86.2 month (SEM = 3), and the mean ages (with SEMs) of the four groups were  $83.1 \pm 5$  for girls with CAH;  $78.6 \pm 5$  for unaffected girls;  $88.4 \pm 5$  for boys with CAH; and  $98.6 \pm 3$  for unaffected boys. A one-way analysis of variance (ANOVA) for age indicated that the four groups were not significantly different,  $F(1, 96) = 2.02$ . Fifty-three (95%) of the children with CAH had the more severe salt-wasting form of the disorder, and 3 (5%) had the simple virilizing form of the disorder.

Thirty-three of the children were recruited through pediatric endocrinologists in Los Angeles, California, and participated at the University of California Los Angeles (UCLA), and 67 children were recruited in the United Kingdom through pediatric endocrinologists in London or through a CAH support group. Forty-seven percent of the

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