Acta Genet Med Gemellol 33: 173-179 (1984)

TWIN RESEARCH 4 - Part B: Twin Psychology and Behavior Genetics
Proceedings of the Fourth International Congress on Twin Studies (London 1983)

Childhood Sex-Role Behaviors: Similarities and Differences in Twins

P.H. Elizabeth, R. Green
Department of Psychiatry and Behavioral Science, State University of New York at Stony Brook

Abstract. Parents of 702 twin pairs, ages 4 through 12, completed a sex-role behavioral preference questionnaire for each cotwin. Data were analyzed to determine the effects of gender, zygosity, and age on behavioral similarities and differences between cotwins. Among same-sex cotwins, male MZ pairs were reported to behave the most similarly. Girl-boy pairs were the most dissimilar. Sex and zygosity contributed significantly to cotwin behavioral differences, with female pairs varying more on sex-typed behaviors than male pairs and DZ pairs varying more than MZ pairs. Age of twins was not a major source of differences within twin pairs.

Key words: Sex-roles, Psychosexual development, Sex-typed behaviors, Gender identity, Twin zygosity effect

INTRODUCTION

Sex differences in behaviors are evident from early childhood as children behave in "girl-like" or "boy-like" ways. Variability in these childhood behaviors occurs within each sex as well as between girls and boys. This study is concerned with similarities and differences in childhood sex-typed behaviors between same-sex cotwins and girl-boy cotwins, as well as between female and male non-cotwins.

Sex-role behavior may be conceptualized within the broader framework of "sexual identity" or "gender identity". Sexual identity encompasses three components: (1) core morphologic identity, the basic conviction of being female or male; (2) sex-role behaviors, activities and interests culturally associated with femininity and masculinity; and (3) sexual orientation, a preference for female, male, or female and male sexual partners [3]. This study is primarily concerned with the second component, sex-role behavior, as it emerges in childhood. The study was designed to answer the following questions: (1) How similar

are cotwins on specific sex-typed childhood behaviors?, and (2) How are age, gender, and zygosity related to behavioral similarities or differences?

REVIEW OF THE LITERATURE

In an on-going prospective study of samples of male and female children exhibiting atypical sex-typed behaviors compared with demographically matched children exhibiting typical sex-typed behaviors [3,4], activities have been identified which clearly discriminate typical from atypical patterns of sex-role development. The specific behaviors include differential preferences for male or female playmates, extent of doll-play, game preferences, imitation and role-playing activities, cross-dressing, rough-and-tumble play and participation in sports, and expressed wish to be of the other sex.

There have been no large twin studies relating specifically to sex-role development in children. Developmental studies involving twins have focused predominantly on analyses of intrapair similarities in groups of monozygotic (MZ) and dizygotic (DZ) twins. Questionnaire ratings have been used to study the relationship between twins' similarity of appearance and similarity of behavior. In a study of 121 MZ and 70 same-sex DZ twin pairs, ages 3½ to 13 years, no systematic relationship was found between similarity of appearance and similarity of behavior for either MZ or DZ twin pairs [8].

Other studies have focused on intratwin behavioral differences in infancy and early childhood. Fifty-three mothers of same-sex twin infants between 2 and 9 months of age were interviewed regarding differences in temperamental attributes. By comparing MZ and DZ groups, it was found that genetic factors play an important role in the development of temperamental characteristics [9]. A study of 140 mothers of preschool twins, ages 1 month to 6 years, attempted to account for behavioral differences. Data were analyzed for interrelations between birth weight, birth sequence, and behavioral differences. Greater concordance was found between MZ twins, and a lower birth weight of the cotwin was related to twin discordance for feeding problems, regardless of age or zygosity [1].

In a longitudinal study on the emergence and persistence of behavioral differences in twins, mothers of 232 pairs of twins were interviewed periodically about similarities and differences in behavior displayed by their twins during infancy and early childhood [11]. The results showed that: (1) twins are frequently discordant on such variables as attention span, temper, vocalization, and smiling; (2) there is a high degree of age-to-age stability in behavior; (3) at one year, discordant twins differ primarily in temperament and attention span, but by 4 they primarily differ in sociability; and (4) concordance is generally higher for MZ than DZ twins.

Psychosexual development was studied in a sample of 10 MZ and 6 DZ twins in their mid-twenties [2]. Interview material was used to assess heritability of overt sexual behaviors. It was concluded that genetic factors play a part in the age at which an individual begins developing and exploring his/her sexuality, and that this is an expression of genotype as well as a function of environmental experiences. Finally, one of us (RG) studied a pair of 8-year-old male MZ twins markedly discordant for sex-role behaviors. Early environmental factors were identified, consistent with theories of psychosexual differentiation, that could account for the behavioral discordance [3].

MATERIALS AND METHODS

A 17-item behavioral preference questionnaire was developed to measure the degree to which twin children were similar in childhood sex-typed behaviors. The specific behaviors measured were those reported to discriminate between typical and atypical sex-role development in male and female children [3,4]. The first 16 items addressed a specific aspect of each cotwin's behavior assessing the child's preference for play items and activities and included playmate preferences, dress-up games, doll play, role-taking in games like "mother-father" or "playing house", cosmetic play, participation in sports and rough-and-tumble games, romantic interests, and expressed wish to be of the other sex. Most items had five possible responses to assess the frequency or degree to which the child participated in each type of behavior. Item 17 was a 10-point scale, asking for an overall global rating of how each twin would be subjectively rated by the parent on a feminine/masculine continuum ranging from very feminine (1) to very masculine (10).

The 17-item questionnaire was pilot-tested on 95 pairs of same-sex twin children from the greater New York City and Long Island area and found to discriminate between male and female twin pairs [ANOVA, $F = 722.7$ (1,188) $P < 0.001$]. DZ pairs were found to be more discordant in sex-role behaviors than MZ pairs [ANOVA, $F = 10.6$, (1,91) $P = 0.002$] and there was a trend [ANOVA, $F = = 1.9$ (1,91) $P = 0.1$] for female cotwins to differ more than male cotwins. Consequently, we obtained a larger national sample and collected questionnaire data on girl-boy pairs as well as same-sex twins.

Families with twin children were located through Mothers of Twins Clubs in the United States, and through the Parents of Multiple Births Association of Canada. Ninety-seven percent of the sample is from the United States, and 3% from Canada. The U.S. families were from 35 states, with the greatest number (20%) from New York State. Parents completed a brief family background sheet and a behavior questionnaire, separately, for each cotwin.

The sample includes 702 pairs of twins. Zygosity is reported in this paper according to parental report as sample size precluded physiological testing. Twins' ages ranged from 4 to 12 years with a mean of 6.77. Forty-seven percent were males and 53% females; 41.5% were reported to be MZ and 58.5% DZ. The number of children per family ranged from 2 to 9 with a mean of 3.26. Twins were only children in 25% of the families and 42% were twins with one sibling. The birth order of the twins ranged from 1st to 8th born with a mean of 1.91. Forty-two percent of the twin pairs were first and 35% second born.

RESULTS

Data were analyzed first to determine the survey instrument's power to discriminate boys from girls. A total behavioral score for each cotwin was calculated to compare means by sex. The possible range of total scores was 16-82. The mean total scores for males was 55.45 and for females 33.57 [ANOVA, $F = 2959.0$ (1,524) $P < 0.001$]. The mean rating on the 10-point feminine-masculine rating scale was 8.2 for males and 2.7 for females [ANOVA, $F = 3317.2$ (1,544) $P < 0.001$]. The average total score per pair was then correlated with the average rating per pair on the feminine-masculine scale. The correlation was 0.897 ($P < 0.001$).

Thus, the survey items clearly discriminated between the sexes and the rating on the feminine-masculine scale was highly related to the individual behavioral items.

Sex-Role Similarities in Cotwins

Table 1 shows the Pearson correlation coefficients between cotwins, by subgroupings of sex and zygosity, on the total sex-role behavior scores and on the feminine-masculine rating scale.

The cotwin correlations for total scores derived from the 16 sex-role behavioral items yielded a strong correlation for all subgroups (r's = 0.88, 0.59, 0.52, 0.49, and -0.88;

$P < 0.001$). Cotwin correlations on the feminine-masculine scale reached significance (r's = 0.70, 0.43, 0.60, 0.13, and -0.91; $P < 0.001$) for all groups except the female DZ pairs ($r = 0.13$).

A test on the standard transformation of the correlation coefficients for total scores from the behavioral items showed that male MZ pairs are more similar than the other same-sex pairs (arc sine test, $P < 0.001$). There were no significant differences in the cotwin correlation between the male DZ, female MZ, and female DZ groups. The transformation on the correlation coefficient for the male-female pairs showed that they were different (arc sine test, $P < 0.001$) from all other groups.

The same test was applied to the cotwins' correlations on the feminine-masculine ratings and revealed the largest correlations to be for the male MZ and female MZ pairs, with no statistical difference between the correlations of these two groups. The male MZ correlation was found to be significantly larger than correlations for the three DZ groups (arc sine test, $P < 0.001$). The correlation between male DZ pairs was third largest and greater than the correlations for female DZ and male-female pairs (arc sine test, $P < 0.001$). The female DZ correlation differed from all other subgroups (arc sine test, $P = 0.01$). The male-female cotwin correlation was different from all other subgroups (arc sine test, $P < 0.001$).

Sex-Role Differences in Cotwins

To evaluate differences between cotwins, an absolute difference score was calculated between cotwins on total scores derived from the 16 sex-role behavioral items and again on the total differences obtained on the feminine-masculine rating scale. A one-way ANOVA was used to compare mean difference scores by subgroups. The means and standard deviations for these comparisons are shown in Table 2.

The mean absolute differences between same-sex cotwins on total behavioral scores are small (2.66-6.01) compared to the mean differences between male-female cotwins (25.47). Male-female DZ pairs differ significantly from all same-sex groups [ANOVA, $F = 489.7$ (4,667) $P < 0.001$]. Within the same-sex groupings, however, male DZ cotwins differ more on total scores than male MZ cotwins [ANOVA, $F = 489.7$ (4,667) $P < 0.001$] and female DZ cotwins differ more than male or female MZ cotwins [ANOVA, $F = 489.7$ (4,667) $P < 0.001$].

On the 10-point femininity-masculinity rating scale, the differences between male-female cotwin ratings are significantly greater than any of the same-sex cotwin groups [ANOVA, $F = 497.3$ (4,697) $P < 0.001$]. Within the four same-sex groups, female DZ pairs differed most on the rating scale [ANOVA, $F = 15.4$ (3,542) $P < 0.001$].

To assess the effects of sex and zygosity, separately, on the total differences scores, a two-way ANOVA was applied to total differences scores as the independent variable, using sex and zygosity as dependent variables, for same-sex cotwins only. Significant main effects were found for sex [ANOVA, $F = 6.6$ (1,524) $P = 0.01$] and for zygosity [ANOVA, $F = 34.7$ (1,524) $P = 0.001$]. No interaction was found ($P = 0.6$), suggesting that sex and zygosity contribute independently to the differences between cotwins on total sex-role behavioral scores.

To determine the effect of age on total differences scores, an ANOVA was applied to differences scores, using age, above or below the mean, as dependent variables. No significant differences were found between groups.

TABLE 1 - Cotwin Correlations for Childhood Sex-Role Behaviors and Feminine-Masculine Ratings

Subgroups	N	Total sex-role behavioral score r	Rating on feminine-masculine scale r
Male MZ pairs	131	0.88*	0.70*
Male DZ pairs	120	0.59*	0.43*
Female MZ pairs	160	0.52*	0.60*
Female DZ pairs	135	0.49*	0.13
Male-Female pairs	156	−0.88*	−0.91*

* $P < 0.001$

TABLE 2 - Means and Standard Deviations for Cotwin Total Differences Scores on Behavioral Items and on the Femininity-Masculinity Rating Scale

Subgroups	Sex-typed behavioral items		Femininity-masculinity rating scale	
	M	SD	M	SD
Male MZ pairs	2.66	2.89	0.54	0.97
Male DZ pairs	4.80	4.84	0.86	1.08
Female MZ pairs	3.50	4.93	0.76	1.17
Female DZ pairs	6.06	5.29	1.49	1.57
Male-Female pairs	25.47	6.81	6.73	2.08

Within-Sex Comparisons

To assess the influence on a twin of having a cotwin of the other sex, we compared the total scores of the males who had female cotwin with the average total scores of the male MZ and male DZ pairs; and compared the total scores of the females who had male cotwins with the average total scores of the female MZ and female DZ pairs. Group means for the three groups of males were numerically similar; male MZ 55.75, male DZ 55.20 and males with female cotwins 54.08. The lower mean score for the males with female cotwins reached statistical significance (ANOVA, $F = 3.48$ (2,381) $P = 0.03$]. The total score group means for the three groups of females were also very similar; female MZ 33.2, female DZ 33.8, and females with male cotwins 33.7. No significant differences were found among these three groups of females [ANOVA, $F = 0.578$ (2,430)].

DISCUSSION

It should be kept in mind that due to the large number of subjects in the sample, presumptive zygosity was not confirmed by bloodgroupings or other laboratory measures. Therefore, some error exists in the designation of zygosity. However, the percentages of twins classified by zygosity in the study do not depart radically from expected frequencies.

There was a discrepancy in comparisons of similarities and differences for male and female MZ twin pairs on the total scores derived from the 16 sex-typed behavioral items compared to the 10-point global ratings of femininity-masculinity. On the total behavioral scores, the female cotwins were less similar than the male cotwins, but the groups did not differ on the global rating scale. This discrepancy may be due to parents' collapsing otherwise discernible behavioral differences when making the global rating.

Different sex-role socialization for boys and girls has been well substantiated. For a full review of these studies, see Maccoby and Jacklin [7]. A stricter code of sex-role socialization for boys than for girls could account for the behavioral differences reported here as a function of sex, (female pairs more behaviorally discordant than male pairs). Childhood sex-roles for boys are more rigidly defined, with the stigma for "girl-like" (sissy) behavior in boys ranging from mild to severe. By contrast, "boy-like" (tomboy) behavior in girls is generally accepted [5]. Thus, given a wider cultural latitude for sex-role expression, female cotwins, MZ of DZ, may evolve more dissimilar behaviors.

Since DZ twins are genetically and phenotypically less similar than MZ twins, it may also be that parents of DZ twins expect, accept, and reinforce greater differences between their cotwins. On the other hand, some parents of MZ twins promote behavioral individuality between their cotwins.

A less substantiated explanation for our findings could be the suggestion by Lyon [6] that female MZ cotwins differ more from one another in genetic makeup than do male MZ cotwins. This is due to females having two X chromosomes, only one of which becomes apparent in the phenotype with the possibility of a different X chromosome active for each female cotwin. Thus, female MZ twins may be less alike than male MZ pairs for any characteristic carried on the X chromosome, but not as grossly dissimilar as DZ twins. Vandenberg [10] reported this to be true on a range of physiological measures, but later, after correcting for an error in data compilation, reported no differences in the within-pair variances. In the absence of data documenting the role of the X chromosome in the behaviors reported in the present study, this explanation must remain highly speculative.

In the within-sex comparison, total sex-role behavioral scores of females who had male cotwins were indistinguishable from females with same-sex cotwins. However, males with female cotwins were found to score in a somewhat more feminine direction when compared with males who had same-sex cotwins. The small numerical difference of 1 point between the means of these three groups, while statistically significant, would appear to be behaviorally trivial when compared to the 22-point difference between male and female twins and the 6-point difference found between female DZ cotwins.

CONCLUSIONS

Same-sex cotwins are similar in childhood sex-role behaviors. MZ male pairs are significantly more similar in sex-typed behaviors than other same-sex pairs. Male-female cotwins' behavior is very dissimilar.

Male DZ pairs differ more on sex-typed behaviors than male MZ pairs, and female DZ pairs differ more than either male or female MZ pairs.

Sex and zygosity appear to contribute independently to cotwin behavioral differences. Female pairs were found to be more variable in sex-typed behavior than male

pairs; DZ pairs more variable than MZ pairs. Age of cotwins was not found to be a major source of differences within twin pairs.

Acknowledgments. This study was supported in part by funds from the Long Island Research Institute, Department of Psychiatry and Behavioral Sciences, SUNY at Stony Brook, and ADAMHA Small Grant 1 RO3 MH37220-01. Support for P. Elizabeth was provided in part by NIMH Training Grant 5 T32 MH14621 and New York State Health Research Council Grant 13-014. Aspects of this study were presented at the Sixth World Congress of Sexology, Washington, D.C., May, 1983.

We express our gratitude to Ms. Virginia Bentley and Ms. Carol Sancimo, who worked extended hours to provide clerical and other much needed support services that greatly facilitated this study; to Stephen Finch, Ph.D., who performed the tests on the standard transformations of the correlation coefficients; and to the parents from the National Mothers of Twins Clubs of America and Parents of Multiple Births Association of Canada for their generous time and cooperation in completing our survey.

REFERENCES

1. Brown A, Stafford RE, Vandenberg SG (1967): Twins: behavioral differences. Child Dev 38: 1055-1064.
2. Chilton B (1972): Psychosexual development in twins. J Biosoc Sci 4:277-286.
3. Green R (1974): Sexual Identity Conflict in Children and Adults. New York: Basic Books; London: Gerald Duckworth.
4. Green R (1976): Masculinity and femininity during boyhood: 100 families. In A Davis (ed): Child Personality and Psychopathology. New York: John Wiley.
5. Green R, Williams K, Harper J (1980): Cross-sex identity: peer group integration and the double standard of childhood sex typing. In JM Samson (ed): Enfance et Sexualité/Childhood and Sexuality. Montreal: les Editions Etudes Vivantes.
6. Lyon MR (1961): Gene action in the X chromosome of the mouse (mus musculus L). Nature 190:372.
7. Maccoby E, Jacklin C (1974): The Psychology of Sex Differences. Stanford: Stanford University Press.
8. Matheny AP, Wilson RS, Dolan AB (1975): Relations between twins' similarity of appearance and behavioral similarity: testing an assumption. Behav Genet 6:343-351.
9. Torgersen AM, Kringlen E (1978): Genetic aspects of temperamental differences in twins. J Am Acad Child Psychiatry 17:433-444.
10. Vandenberg SG (1962): Twin data in support of the Lyon hypothesis. Nature 194:505-6.
11. Wilson RS, Brown AM, Matheny AP (1971): Emergence and persistence of behavioral differences in twins. Child Dev 42:1381-1398.

Correspondence: Pamela H. Elizabeth, Department of Psychology, Alfred University, Alfred, NY 14802, USA.