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# Social Development of Twins

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This project sought to examine 2 competing hypotheses: first, that twins are likely to be more prosocial by virtue of growing up with another same-age peer in the home, or second, that they are less prosocial because they have become more comfortable interacting with a same-age peer who is both genetically and environmentally similar to themselves and therefore they are less comfortable with other children who are dissimilar. Two studies were conducted to compare twins to singletons on measures of prosocial and aggressive behaviors. In Study 1, 5-year-olds ( $N = 91$  twins and  $N = 152$  singletons) engaged in a peer play situation with an unfamiliar, same-age, same-sex peer, and they were rated on items assessing prosocial and aggressive behaviors. Results showed that twins were less prosocial but not more aggressive than were singletons. In Study 2, which was a supplemented follow-up study of twins in Study 1, 10- to 15-year-old twins ( $N = 98$ ) and singletons ( $N = 84$ ) were rated by their parents on prosocial and aggressive behaviors. No significant differences were found between the groups on prosocial behavior, but twins were rated as more aggressive than singletons. Thus, in early childhood twins appear to exhibit fewer prosocial behaviors with unfamiliar peers, but this prosocial deficit was not aligned with parent-reported prosocial behaviors in adolescence. In adolescence, twins were rated by parents as more aggressive. These studies suggest that twins may be at risk for poorer social interactions in early and middle childhood.

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The socialization of children depends on a large number of factors. The most proximal of these can be grouped into the ecologically valid structures (Bronfenbrenner, 1994) of child characteristics and parent and family variables. Most studies of child development have focused on a single child from a single family and compared children across families. Thus, most of what we know about child development is relevant for singleton children but may be less applicable for twins, triplets, or other multiples. This article will focus on the social development of twins. There are two important reasons for studying twin development in particular (Thorpe, 2003). First, twins are worthy of study in and of themselves so that we

can help them as a population with any particular issues that they might encounter. Second, by learning about the effects of growing up with a same-age sibling, we may learn more about the family environment that also impacts singleton social development.

There are a number of developmental issues specific to twins that theoretically may affect their social development, such as the increased difficulty of parenting two infants simultaneously (Thorpe, 2003), which may impact attachment (Feldman & Eidelman, 2004), or competition between siblings for various family and social resources. These could negatively impact twins' socialization. On the other hand, twins experience specific circumstances that may augment their social development, which has been called 'the adaptive hypothesis' (Pulkkinen et al., 2003). For instance, monozygotic (MZ) twins have shown higher co-operation with their co-twin than have dizygotic (DZ) twins (Segal & Herschberger, 1999). It is possible that having a co-twin who is genetically identical may foster cooperative behaviors. However, the authors also found that MZ twins are not more co-operative when paired with an unknown child (Segal et al., 1996). It is also possible that simply growing up with a same-age sibling may foster prosocial behaviors by virtue of needing to learn to share with a same-age playmate more than nontwin singletons do. The influence of siblings has been studied for measures of temperament, intelligence, and delinquency (Matte et al., 2001; Parke et al., 2002; Volling, 2003). However, the impact of having a same-age sibling on both prosocial and aggressive behaviors has not been studied.

Two competing hypotheses for the socialization of twins can be proffered. First, according to a developmental social genetics perspective, children may be expected to be more co-operative and to play better with children who are more genetically like them (Segal & Herschberger, 1999). An extension to this perspective might suggest therefore that children who are used to having a genetically similar, same-age sibling may be less co-operative and may play less

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well with children who are not genetically similar to themselves. Thus, according to this hypothesis, MZ twins should be less prosocial and more inhibited with other children than are DZ twins, who should be less socially positive than are nontwin singletons (DiLalla & Caraway, 2004). Similarly, MZ twins may be more aggressive with other children than are DZ twins, who may be more aggressive than nontwin siblings. This is because MZ twins are used to playing with their co-twin, who is more like themselves for both genetic and environmental reasons, and therefore they would be expected to be less comfortable playing with other children than would DZ twins. DZ twins are used to playing with their co-twin also, but their co-twin is less like themselves than in the case of MZ twins. Nontwin singletons, of course, are not used to playing with a sibling who is their same age and therefore may be more open to playing with other children who do not share either their age or their genes. In a study examining inhibition at age 5, some support for this hypothesis was found (DiLalla & Caraway, 2004), in that DZ twins were rated in a peer play situation as more inhibited than nontwin siblings, but MZ and DZ twins did not differ from each other. Similarly, Segal and Herschberger (1999) paired twins aged 11 to 83 years with their co-twins in a co-operation–competition task and found more co-operation between MZ pairs than DZ pairs. However, MZ twins were not more co-operative than DZ twins when 8- to 12-year-old children were paired with an unfamiliar twin rather than with their co-twin (Segal et al., 1996).

On the other hand, it is possible that having a co-twin may help children learn how to interact with other children because twins always have another child in the home with whom to play. Results of studies on behaviors of children who attend daycare might suggest such a pattern of behavior. Daycare can provide an essential socializing influence that may increase children's adaptability in social situations (NICHD Early Child Care Research Network, 1997). A number of studies have shown that children in daycare settings are both more aggressive and more prosocial (DiLalla, 1998). Apparently, the experience of playing with a greater number of children tends to increase children's likelihood of behaving in many different ways, some more positive and others more difficult. It is possible that having a co-twin and therefore always having someone else to play with might lead twins to show a similar pattern of behavior, with increased rates of both aggressive and prosocial behaviors as compared to nontwin singletons. Adolescent siblings have been shown to provide an opportunity for practicing and developing social relationships (Hair et al., 2001; Slomkowski et al., 2001). Having a same-age sibling might provide the best opportunity of all to learn to engage appropriately in social relationships with same-age peers.

Thus, this project sought to determine whether twins are likely to be more prosocial by virtue of

growing up with another same-age peer in the home, or less prosocial because they have become more comfortable interacting with a same-age peer who is both genetically and environmentally similar to themselves and therefore they are less comfortable with other children who are dissimilar. Twins were compared to nontwin singletons on several measures of prosocial behaviors. In addition, if being raised with a genetically similar co-twin leads to decreased prosocial behaviors with other children, it was expected that MZ twins might be less prosocial than DZ twins, who in turn would be less prosocial than nontwin singletons. Similar but inverse results were expected for aggressive behaviors. Aggressive behaviors are not the reverse of prosocial behaviors, but the lack of aggression may be equally important for forming social relationships. Aggressive behaviors also were measured to assess whether twins would be more or less aggressive than singletons for reasons similar to those postulated for the prosocial behaviors.

Twins and singletons were compared on behavioral and parent-rated measures of prosocial and aggressive behaviors in two studies. The first study involved behavioral ratings of 5-year-old children playing with an unfamiliar peer. The second study utilized parent ratings of social behaviors and included a subset of the Study 1 children when they were aged 10 to 15 years, combined with a separate sample of twins aged 11 years to augment the twin sample.

## Study 1

### Method

#### Participants

Children in this study participated in the Southern Illinois Twins and Siblings Study (SITSS; DiLalla, 2002). All children in this phase of the project were tested within 2 months of their 5th birthday. Coding of the 5-year-old data is ongoing, so the entire SITSS sample is not included in the present study. In addition, there were 10 children who refused to go in the playroom or whose matched peer refused to play, and there were four instances of technical malfunction so that interactions could not be coded. In some cases, one twin but not the co-twin was coded. Therefore, a subsample of the total sample was analyzed. Included in the present sample were 243 children: 36 MZ twins (17 girls, 19 boys), 55 DZ twins (26 girls, 19 boys; 38 from same-sex pairs, 17 from opposite-sex pairs), and 152 nontwin singletons (81 girls, 71 boys). Most of the children were Caucasian (97%); the rest were African American or Asian. The parents were primarily married (94%) and in average to upper income families (57% earned \$35,000 or more at the time of the study). Half of the mothers had less than a college education, 39% had a college degree, and 11% had an advanced degree. Similarly, half of the fathers had less than a college education, 35% had a college degree, and 15% had an advanced degree.

## Procedure

Two families were brought to a campus laboratory and were kept separated for the first 5 to 10 minutes while becoming comfortable with the general setting. Then one child from each family was brought to a laboratory playroom. One child was always a singleton and the other child was either one member of a twin pair or another singleton. Children were always the same sex, and birthdays were within 1 month of each other. The two children were allowed to play freely by themselves for 20 minutes. The room was equipped with puppets, a toy tool set, kitchen toys, checkers, and posters. Children's play was videotaped for later behavioral coding.

## Measures

### Zygosity

Zygosity was assessed by having parents rate twin similarity on eight physical attributes taken from the Nichols and Bilbro (1966) zygosity questionnaire (reported accuracy 95%). The research assistant who spent the most time with the twins also completed this questionnaire. Parent and tester ratings were averaged to assess zygosity (as done in the Twin Infant Project [TIP], DiLalla et al., 1990, and the MacArthur Longitudinal Twin Study [MLTS], Emde et al., 1992). Subsequent DNA analyses of a pilot subset of 40 twin pairs in the SITSS has shown that 93% of these zygosity ratings were accurate for this sample.

### Behavioral Ratings

Laboratory ratings of prosocial and aggressive behaviors were obtained from behavioral ratings of the children during the 20 minutes of peer play interaction. Although raters could have known whether they were coding a twin or a singleton, they did not know the zygosity status of the twins they coded, and they never coded both members of a twin pair or a play pair. In addition, raters had no reason to expect twins and nontwins to behave differently, and they were blind to the study hypotheses.

Raters viewed the first 10 minutes of the play study videotape and then rated the child on seven items using a 5-point, Likert-type scale. They then viewed the next 10 minutes and rated the child again on the same items. The items on the rating scale were designed to tap various forms of prosocial and aggressive behaviors, including behaviors that involved children's abilities to interact well with others. These scale items include behaviors that may be especially important as children learn to interact with others during the preschool years, including co-operating, leading as well as following others, not being afraid to interact with others (Erikson, 1963), and showing both aggressive and prosocial behaviors while playing with others (National Network for Childcare, 1995). The seven items that were assessed during the free play session were: (1) *Domineering* — How domineering was this child? How much did s/he try to tell the other child what to do? Rated 1 (*not at all domineering*) to 5 (*extremely domineering*); (2) *Complying* — How much

did this child comply to commands or requests from the other child? Rated 1 (*never complied*) to 5 (*always complied*); (3) *Enjoyed Other* — How much did this child enjoy playing with the other child? Rated 1 (*didn't enjoy at all*, e.g., told the other child to go away) to 5 (*really enjoyed*, e.g., played happily and boisterously with other child, acted as though they had been good friends for a long time); (4) *Other Enjoyed* — How much did the other child enjoy playing with this child? Rated 1 (*didn't enjoy at all*, e.g., told the other child to go away) to 5 (*really enjoyed*, e.g., played happily and boisterously with other child, acted as though they had been good friends for a long time); (5) *Prosocial* — How often did this child engage in prosocial behaviors, such as complimenting, offering a toy, offering to help, or instigating an interaction? Rated 1 (*no prosocial behaviors*) to 5 (*very many prosocial behaviors*); (6) *Difficult* — How difficult was this child? Difficult included behaviors such as complaining, being rude, hurting the other child, becoming extremely boisterous, or ignoring the other child. Rated 1 (*not at all difficult, a real pleasure to be around*) to 5 (*extremely difficult*); and (7) *Aggressive* — How often did this child engage in aggressive behaviors, including hitting, grabbing toys, or insulting? Rated 1 (*no aggressive behaviors*) to 5 (*very many aggressive behaviors*).

Nine raters were trained to reliability criterion by coding tapes that had been keyed prior to training. Reliability scores (per cent agreement) across raters across the measures ranged from .67 to 1.00, with a mean of .95. More rigorous weighted kappa coefficients (Cohen, 1968) ranged from .54 for *Difficult* to .85 for *Enjoyed Other*, with a mean of .69.

Factor analysis using Principal Components and Varimax rotation suggested two factors at Time 1 that accounted for 60% of the variance. The first factor was labeled *Prosocial Time 1* and consisted of scores on *Enjoyed Other*, *Other Enjoyed*, and *Prosocial*. The second factor was labeled *Aggression Time 1* and consisted of scores on *Domineering*, *Complying* (reverse), *Difficult*, and *Aggressive*. Similar factor analysis was conducted on Time 2 data and yielded slightly different factors, accounting for 61% of the variance. The first factor was labeled *Prosocial Time 2* and consisted of scores on *Enjoyed Other*, *Other Enjoyed*, *Prosocial*, and *Domineering*. The second factor was labeled *Aggression Time 2* and comprised *Complying* (reverse), *Difficult*, and *Aggressive*. All factor loadings were greater than .50. Reliability of the factors was acceptable. For *Prosocial Time 1*, Cronbach's alpha = .83; for *Aggression Time 1*, alpha = .58; for *Prosocial Time 2*, alpha = .76; and for *Aggression Time 2*, alpha = .66. It was interesting that according to the factor analysis, *Domineering* was an aggressive trait early in the play session when the children did not know each other well, but then became a prosocial trait as the children became more familiar with each other. This suggests that children who frequently command an unfamiliar child upon first contact or try to direct his

**Table 1**  
Descriptive Statistics for Study 1

	ProsocialT1	ProsocialT2	AggressiveT1	AggressiveT2
MZ twins				
Mean (SD)	2.67 (.78)	2.52 (.66)	1.84 (.51)	1.88 (.54)
Min	1.00	1.00	1.25	1.00
Max	4.33	3.75	3.25	3.67
DZ twins				
Mean (SD)	2.48 (.90)	2.57 (.79)	2.07 (.52)	2.22 (.70)
Min	1.00	1.00	1.25	1.00
Max	4.00	5.00	3.75	5.00
Singletons				
Mean (SD)	2.80 (.83)	2.79 (.73)	1.93 (.53)	2.12 (.63)
Min	1.00	1.00	1.00	1.00
Max	5.00	4.50	3.75	4.67

or her play are also more difficult and aggressive. However, as the children become more familiar and more comfortable with each other, children who attempt to tell the other child what to do are also more prosocial and engage in more enjoyable interactions. Means are presented in Table 1.

## Results

### Twins Versus Singletons

Twins were compared to singletons on the behavioral measures of prosocial and aggressive behaviors during the peer play at age 5. One member from a twin pair was randomly chosen for the analyses ( $N = 62$ ), and all singletons ( $N = 143$ ) were included. Multivariate analysis of variance (MANOVA) was used to determine whether twins differed from nontwin singletons, first on measures of prosocial behavior and second on measures of aggressive behavior. Sex was entered as a fixed factor to determine whether boys and girls differed and whether there was an interaction of sex and twin or nontwin status.

There was a small but significant effect of twin status on prosocial behavior,  $F(2,200) = 3.16$ ,  $p < .05$ , partial  $\eta^2 = .03$ , as well as a significant effect of sex,  $F(2,200) = 4.86$ ,  $p < .01$ , partial  $\eta^2 = .05$ . The interaction between twin status and sex was not significant,  $F(2,200) = 1.25$ ,  $p = ns$ . Univariate results showed that twins were significantly less prosocial than singletons on prosocial behavior during the second 10 minutes of the play interaction,  $F(1,205) = 6.29$ ,  $p < .05$ , partial  $\eta^2 = .03$ , and there was a trend toward the same result for prosocial behavior during the first 10 minutes of play,  $F(1,205) = 3.75$ ,  $p < .06$ , partial  $\eta^2 = .02$ . In addition, boys were significantly less prosocial than girls, but only during the first 10 minutes of play,  $F(1,205) = 8.40$ ,  $p < .01$ , partial  $\eta^2 = .04$ .

Results for aggressive behavior were different. There was no significant difference between twins and singletons on aggressive behavior during either the

first or second 10 minutes of play,  $F(2,202) = 0.21$ ,  $p = ns$ . However, there was a significant sex effect,  $F(2,200) = 4.13$ ,  $p < .05$ , partial  $\eta^2 = .04$ . Univariate analyses showed that boys were significantly more aggressive than girls during both the first 10 minutes of play,  $F(1,205) = 4.62$ ,  $p < .05$ , partial  $\eta^2 = .02$ , and the second 10 minutes,  $F(1,205) = 7.41$ ,  $p < .01$ , partial  $\eta^2 = .04$  (see Table 2).

### MZs Versus DZs Versus Nontwins

The twin sample was further split into MZ and DZ children to compare MZ, DZ, and singleton children on the measures of prosocial and aggressive behaviors. A MANOVA examining the two prosocial behaviors as the dependent variables and zygosity group status and sex as the independent variables showed a marginal, nonsignificant effect for group status,  $F(4,398) = 1.99$ ,  $p < .10$ , partial  $\eta^2 = .02$ , and a significant effect for sex,  $F(4,398) = 4.13$ ,  $p < .05$ , partial  $\eta^2 = .04$ . There was no significant sex-by-group status interaction.

Analyses were repeated for the two aggression dependent variables. A MANOVA showed a nonsignificant group status effect,  $F(4,398) = 0.37$ ,  $p = ns$ , and again a significant sex effect,  $F(4,398) = 3.07$ ,  $p < .05$ . There was no significant sex-by-group status interaction.

## Discussion

This study demonstrated that twins show fewer prosocial behaviors than do nontwin singletons during a peer play situation with an unfamiliar peer. Thus, a social-genetic theory interpretation may be relevant, that children will behave less prosocially with a nongenetically related peer and that this will be more true for children who are used to interacting with a genetically related, same-age peer. There was also a significant sex effect, with boys behaving less prosocially and more aggressively.

The children's behaviors were assessed during an unfamiliar peer interaction rather than during play interactions with friends. This is likely to have affected the types of responses seen, and it is possible that the

**Table 2**  
Means (*SD*) by Sex and Twin Versus Singleton Status

	Boys	Girls
Age 5 peer play measures		
Prosocial Time 1 <sup>a</sup>		
Twins	2.28 (0.85)	2.80 (0.83)
Singletons	2.68 (0.73)	2.88 (0.89)
Prosocial Time 2		
Twins	2.34 (0.76)	2.66 (0.74)
Singletons	2.81 (0.73)	2.76 (0.76)
Aggression Time 1 <sup>b</sup>		
Twins	1.97 (0.50)	1.88 (0.43)
Singletons	2.07 (0.55)	1.82 (0.51)
Aggression Time 2 <sup>b</sup>		
Twins	2.18 (0.70)	1.97 (0.44)
Singletons	2.28 (0.64)	1.99 (0.60)
Follow-up PCPR measures		
Prosocial		
Twins	25.66 (4.34)	25.92 (2.70)
Singletons	26.38 (3.04)	26.19 (3.04)
Aggression		
Twins	11.36 (5.35)	9.46 (2.96)
Singletons	9.80 (3.08)	8.68 (2.26)

Note: a = Boys' scores were significantly lower than girls ( $p < .05$ ) for Prosocial Time 1.

b = Boys' scores were significantly higher than girls ( $p < .05$ ) for Aggression Times 1 and 2.

twin/singleton difference may not replicate in a more familiar situation. However, it clearly is true that twins behaved less prosocially in this unfamiliar context, and this parallels many situations in which people are placed throughout their lives, such as the first day at a new school or camp, having to meet the children of a parent's friend, or beginning a new job when the children get older. Thus, this situation represents an important real-life situation that children and adults encounter in everyday life.

These results suggest that being raised with a twin is not similar to the experiences children gain from daycare as neither boy nor girl twins were more prosocial than singletons. Therefore, having a twin is not necessarily similar to spending time with many other same-age children. There appears to be something particular about being raised with a genetically related, same-age child that affects how children interact with other children. Specifically, twins' behaviors toward other unfamiliar children were less prosocial, although they were not more aggressive.

## Study 2

### Method

#### Participants

Children for Study 2 were pre- or early adolescents aged 10 to 15 years. Two samples were combined.

Fourteen pairs of twins and 84 singletons from the SITSS, who were originally tested at age 5, participated in a follow-up study that involved completing questionnaires via mail. The children who completed follow-up questionnaires were compared to those who did not in terms of their age 5 prosocial and aggression scores. No significant differences were noted between the two groups on any of the four measures.

In addition, 48 pairs of twins from the greater Boston area were mailed questionnaires, and these were combined with the SITSS twins to augment the twin sample. Names of all twin pairs born within the greater Boston area in 1990 were obtained from the Massachusetts State Bureau of Health Statistics, Research and Evaluation in 1999. Recruitment letters were mailed to all families. Of these, 50% were returned as undeliverable (addresses were from the State Bureau from 9 years earlier when the twins were born) and 84 families (28%) returned the original questionnaires. Of these, 20 were MZ pairs (10 male pairs, 10 female pairs), 41 were same-sex DZ pairs (18 male pairs, 23 female pairs), and 24 were opposite-sex DZ pairs (ascertained by responses to questions concerning whether parents or others confuse the twins). When the twins were 11–12 years old, two more questionnaires were mailed to the 84 original families to assess personality, aggression, and prosocial peer interactions. Of these, 48 pairs (57%) returned the questionnaires (13 MZ pairs, 20 same-sex DZ pairs, 15 opposite-sex DZ pairs). There was no significant difference in zygosity groups between those who responded the second time and those who did not ( $\chi^2$  contingency coefficient = .10, *ns*). Nearly all mothers of the children in this sample (95%) had completed high school, 56% had a college degree, and 18% had an advanced degree. Similarly, 95% of fathers had completed high school, 40% had a college degree, and 20% had an advanced degree.

### Procedure

Families were sent a set of questionnaires and were asked to complete them and mail them back in an enclosed, stamped envelope. Follow-up postcards were sent after approximately 3 weeks, and phone calls were made approximately 3 weeks after that to families who had not returned the questionnaires.

### Measures

#### Zygosity

Zygosity for the Massachusetts twins was assessed using a method based on Nichols and Bilbro's (1966) categorization of four twin similarity ratings. Parents rated how often the two twins were confused by mother, father, others who know them well, and others who do not know them well, and this information was used to rate them as MZ or DZ. Zygosity for the SITSS twins was assessed at age 5 as described in Study 1.

#### Peer Relationship Ratings

Parents completed the Parent Checklist of Peer Relationships (PCPR; Dodge, 1986). The PCPR

**Table 3**  
Descriptive Statistics for Study 2

	PCPR prosocial	PCPR aggression
MZ twins		
Mean (SD)	26.56 (3.37)	10.24 (3.91)
Min	14.00	6.00
Max	30.00	23.00
DZ twins		
Mean (SD)	25.32 (3.58)	10.04 (4.00)
Min	14.00	6.00
Max	30.00	27.00
Singletons		
Mean (SD)	26.26 (3.20)	9.21 (2.70)
Min	15.00	6.00
Max	30.00	16.00

assesses three scales: Social Competence (six items measuring competence with peers), Reactive Aggression (three items measuring responding aggressively to provoking situations), and Proactive Aggression (three items measuring behaving aggressively in order to get something, not as a response to provocation). Reactive and Proactive Aggression were highly correlated ( $r = .61, p < .001$ ). For this sample, Cronbach's alpha for the six items comprising these two scales was .85. Therefore, in order to have a single aggression score as we had in Study 1, an aggression scale was formed by summing the six aggression items. Descriptive statistics are presented in Table 3.

## Results

Twins were compared to nontwin singletons on the measures of prosocial and aggressive behavior. As with Study 1, one member of each twin pair was randomly chosen for these analyses yielding 62 twins and 77 singletons. Two univariate analysis of variance models were run, one for prosocial behaviors and one for aggression behaviors, as it was expected that the comparison between twins and singletons would differ for each of these. Group status (twin or nontwin) and sex were entered as independent variables.

Twins and singletons did not differ on prosocial behaviors,  $F(1,139) = 1.32, p = ns$ , and there was no effect of sex,  $F(1,139) = 0.01, p = ns$ . However, twins were rated by their parents as significantly more aggressive than were nontwin singletons,  $F(1,139) = 3.87, p < .05$ , partial  $\eta^2 = .03$ , and boys were rated as significantly more aggressive than girls,  $F(1,139) = 4.15, p < .05$ , partial  $\eta^2 = .03$ . The interaction effect was not significant.

Univariate analyses of variance were conducted in order to compare MZ twins, DZ twins, and singletons on the PCPR prosocial and aggression measures. Again, there was no significant group difference for prosocial behaviors, nor was there a significant sex

effect. For aggression, the group effect was no longer significant when the MZ and DZ twins were separated, and the effect of sex on aggression was diminished,  $F(1,139) = 3.17, p < .08$ , partial  $\eta^2 = .02$ .

## Discussion

Results from this study demonstrated a difference between twins and nontwin singletons on parent ratings of aggression. When twins were compared to singletons, twins were rated by their parents as more aggressive than were singletons. In addition, boys were rated as more aggressive than girls. However, the effect sizes were small, and when twins were separated into MZ and DZ groups, there was no significant difference between the groups on either prosocial or aggressive ratings. Thus, no difference between MZ and DZ twins was shown, although this may be partly a result of the smaller sample size when the two twin types were separated into two groups.

These results contrast with a study using peer nominations of 12-year-old children (Pulkkinen et al., 2003). In that study, twins scored higher on a measure of adaptive behaviors than did singletons. This measure assessed behaviors such as leadership, interactions with others, and popularity. These are behaviors primarily seen at school, and the ratings took place in a school setting, which may partly explain why similar results were not found in this study utilizing parent ratings. There are differences in children's behaviors across various settings, and different raters, such as parents, teachers, or peers, focus on different behaviors when they complete their ratings, so it is not surprising that there is often little agreement between ratings made by these different groups of people (Achenbach & Rescorla, 2001).

## General Discussion

Study 1, examining peer relationship variables in 5-year-olds, demonstrated that twins behaved less prosocially than did nontwin singletons in an unfamiliar peer play situation. There was no significant difference between MZ and DZ twins. This suggests that there is something about being a twin that leads to a decrease in prosocial behaviors in an unfamiliar situation at this young age. However, when prosocial behaviors were examined in 10- to 15-year-olds, some of whom were the same children studied at age 5, there was no difference between the parent-rated behaviors of twins and singletons. Instead, twins were rated as more aggressive than singletons.

There are two primary differences between the two studies presented here. First, there is a large age difference, with the first study examining 5-year-olds and the second study examining pre- and early adolescents. It is possible that twins rely on their co-twin more during the preschool years, but that experiences at school enable them to become more outgoing and friendly with other children, so that by the time they are 10 years or older they catch up to singletons in

terms of their prosocial behaviors. If this were true, then it would be expected that prosocial scores of singletons from age 5 to early adolescence should be more stable than the scores of twins. This was checked for the children who were in both studies, and the correlations for both twins and singletons were not significant. Thus, either prosocial behaviors are not stable across this rather large time span, or the difference in how prosocial behavior was rated at each age is substantial.

This leads to the second primary difference between the two studies. Children at age 5 were rated by trained coders and ratings were based on behaviors in a situation that was the same for all children. In the second study, children were rated by their parents, and a parent rating bias has been identified in several studies (Scourfield et al., 2004; Sperry et al., 2002). The bias can take several forms. It is possible that parents tend to rate their children as more like themselves than they really are (Sperry et al., 2002), or it is also possible that parents rate their children differently than others would by virtue of knowing them throughout their lives and seeing their behaviors across a range of situations. Both of these would make parent ratings differ from ratings of others, such as trained observers, teachers, or the children themselves.

Understanding the social development of children is critical for understanding how positive and negative behaviors develop in adolescence and adulthood. For instance, children and adolescents with poorer social skills are more at risk of being aggressive and rejected (Coie & Kupersmidt, 1983; Crick & Dodge, 1994; Dodge, 1983) and have an increased likelihood of drinking alcohol (Gaffney et al., 1998) and behaving delinquent (Dishion et al., 1994). It is equally important to consider behaviors that increase resiliency among children, such as positive social behaviors, which may lead to increased positive friendships and optimism. The present study suggests that twins may be at risk for poorer prosocial behaviors in early childhood, and this may put twins at risk for later social behaviors. The stability of prosocial behaviors in very young children is unclear (Eisenberg, 2003), although most studies appear to demonstrate some short-term stability (Mayeux & Cillessen, 2003; Persson, 2005).

There are several limitations to these studies. First, the effect sizes were quite small, so the results must be interpreted accordingly. Although there were differences between twins and singletons in terms of prosocial behaviors with unfamiliar peers at age 5, these differences may not be large enough to have an effect on future peer interactions. In fact, for the small number of twins who were retested approximately 5 to 10 years later, in Study 2, there was no longer a difference between twins and singletons on the parent rating of prosocial behaviors. At that age there was a difference on aggressiveness, with twins being rated by parents as more aggressive than singletons, but again the effect was small. A second limitation is the small

number of twins. The sample was large enough to compare with the singletons, but it became quite small when MZ and DZ twins were separated and compared. Although no differences were found between MZ and DZ twins, it is possible that differences would emerge with a larger sample.

The limitations notwithstanding, these studies provide an important starting point for the examination of the development of social behaviors in young twins. The behavioral measures at age 5 are particularly interesting because they provide a departure from parent ratings and actually involve assessment of the children in a real situation — interaction with an unfamiliar same-age peer in a novel setting. In addition, Study 2 added a longitudinal component by assessing many of the original children several years later, although the sample was combined with twins only assessed in early adolescence. There is a need for large, longitudinal studies examining children's social behaviors (Thorpe, 2003), and this study provided a first step in that direction. Future research should focus on specific aspects of prosocial behaviors and how the early sibling relationship affects the development of these behaviors.

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