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10 Competence During Middle Childhood

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Behavioral competence and a sense of self-worth are especially important for children during middle childhood (Damon & Hart, 1982; Erickson, 1950; Harter, 1990). While much research has been devoted to understanding the antecedents and correlates of children's sense of competence, very few behavioral genetic analyses of such outcomes have been previously reported. The little work which has been done using behavioral genetic designs has focused on children's incompetence (see Rende & Plomin, 1990 for a review) or childhood delinquency and criminality (e.g., Rowe, 1986; Rowe & Rogers, 1985). Investigating the etiology of individual differences in positive outcomes is especially important given the recent assertion by Hoffman (1991) that behavioral genetic studies have not examined outcomes such as social competence which are thought to be heavily influenced by the family environment.

The purpose of this chapter is to examine genetic and environmental influences on positive dimensions of children's competence. While research in child development and family studies has concentrated on the family environment as a primary source of children's self-worth and competence (see Harter, 1983; Wylie, 1979 for reviews), these studies examined only one child per family, thereby not exploring possible differences within families. In addition, most theoretical perspectives concerning the development of social and behavioral competence have focused exclusively on environmental influences (Bandura, 1977; Cooley, 1902; Mead, 1934). For example, one line of research has examined the relationships among parenting styles and children's social responsibility and achievement (e.g., Baumrind, 1971; Steinberg, Mounts, Lamborn, & Dornbusch, 1991). Although there may be links between the parenting styles and children's outcomes, these associations may be genetically mediated or may differ between the parent and each child within the

family. Thus, it is important to investigate both genetic and environmental influences on children's social competence. Sibling studies, such as the Colorado Adoption Project (CAP), make it possible to disentangle environmental influences shared by siblings from those specific to one child. Furthermore, sibling pairs who vary in genetic relatedness (nonadoptive versus adoptive pairs) can be used to separate sibling similarity due to shared genetic heritage from that due to shared environment.

In the only study that has explored genetic and environmental components of children's perceived self-competence, a twin/stepfamily analysis of Harter's Self-Perception Profile for Adolescents (1988), genetic influences emerged while shared environmental influences had very little impact on ratings of perceived competence (McGuire, Neiderhiser, Reiss, Hetherington, & Plomin, in press). Specifically, individual differences for the dimensions of Scholastic, Athletic, and Social Acceptance and Physical Appearance were significantly heritable, whereas Self-worth, Friendship, and Behavior Conduct were primarily influenced by nonshared environment. Genetic influences on these measures may be the result of genetic contributions to cognitive development and personality. However, McGuire et al. (1993) found that most of the genetic influences on Scholastic Competence and Social Acceptance were unique to those measures and were not due to genetic influences on verbal ability and sociability, respectively.

Change and continuity in competence over time is another focus of research in this area (Bandura, 1977; Damon & Hart, 1982; Eisenberg & Harris, 1984; Kurdek & Krile, 1983; Nottelmann, 1987). Most of this research has emphasized "universal" developmental stages rather than individual differences. For example, Harter (1990) suggests that the dimensions of competence change across the life-span, with five distinct developmental stages: early childhood, middle childhood, adolescence, young adulthood, and later adulthood. Less is known, however, about the stability over time of individual differences in competence, as well as genetic and environmental contributions to stability.

CAP sibling adoption data were used to address two general issues for this chapter: (1) genetic and environmental influences on measures of self-worth assessed during middle childhood; and (2) genetic and environmental contributions to developmental change and continuity for these measures.

Method

Sample

The present analyses included children participating in the CAP tested at ages 7, 9, and 10 years. Because the CAP is an ongoing longitudinal study, the sample sizes decrease across time, ranging from 59 nonadoptive and 50 adoptive sibling pairs at 7 years to 33 nonadoptive and 25 adoptive sibling pairs at 10 years. There are approximately as many girls as there are boys in this sample (52% boys, 48% girls).

Measures

Competence data were obtained from children participating in the CAP at ages 7, 9, and 10 years of age. Two measures of competence were used: the children's self-report of their competence using Harter's (1982) Self-Perception Profile for Children, and mothers' and teachers' reports of the children's social competence using the CAP Social Competence Scale (CSCS).

Harter's (1982) Self-Perception Profile for Children consists of six subscales: Self-Worth, Behavior Conduct, Athletic Competence, Scholastic Competence, Physical Appearance and Social Acceptance. The version of the Harter used in the CAP is administered as part of a battery of questions about "feelings" during a telephone interview when the children are 9 and 10 years of age.

The CAP Social Competence Scale is based on the Walker-McConnell Scale of Social Competence and School Adjustment (Walker & McConnell, 1988). Mother and teacher reports on the dimensions of Leadership, Confidence, and Popularity were measured when the children were 7 years of age. Teacher reports were also obtained when the children were 9 years of age. Confirmatory factor analysis using LISREL 7 (Jöreskog & Sörbom, 1989) was performed in which the number of factors and the items on each scale were equated for mother and teacher reports.

Results

Mean differences

In order to assess mean gender differences and mean differences between adoptive and nonadoptive families, 2 (boys and girls) \times 2 (adoptive and nonadoptive) analyses of variance were conducted. Significant gender differences were identified for 7 of the 24 measures (see Table 10.1). Thus, the effects of gender were regressed out of the data for the remainder of the analyses. Significant mean differences for adoptive status were found for 3 of the 24 measures, but accounted for only 12% of the variance on average.

Univariate results

Intraclass sibling correlations were calculated in order to assess sibling similarity for nonadoptive and adoptive sibling pairs on the self-reports on the Harter, and mother and teacher reports on the CAP Social Competence Scale. Table 10.2 contains the intraclass sibling correlations for the competence measures. The greater correlations for nonadoptive than adoptive siblings on scholastic competence suggest genetic influence at both 9 and 10 years of age. In addition, evidence for genetic influence emerged at either age 9 or 10 for the Harter scales of Self-Worth, Physical Appearance, and Athletic Competence.

Table 10.1 Means for competence measures by adoptive status and gender

<i>Measure</i>	<i>Nonadopted</i>		<i>Adopted</i>	
	<i>Boys</i>	<i>Girls</i>	<i>Boys</i>	<i>Girls</i>
Mother report of CAP				
Social Competence Scale				
Year 7				
Popularity	21.2	21.5	21.9	21.3
Confidence	43.9	46.0	45.1	46.1 ^a
Leadership	32.9	32.5	34.0	33.6
Teacher report of CAP				
Social Competence Scale				
Year 7				
Popularity	20.3	19.6	19.9	19.6
Confidence	40.9	43.1	40.1	40.7 ^{a,b}
Leadership	31.1	31.1	29.7	29.8
Year 9				
Popularity	20.1	19.9	19.5	19.5
Confidence	39.2	43.1	38.8	40.4 ^{a,b}
Leadership	30.4	30.6	28.8	28.9
Harter self-report				
Year 9				
Physical Appearance	15.0	13.9	15.6	14.4
Athletic Competence	12.5	11.9	13.1	11.7 ^a
Behavior Conduct	14.2	15.5	13.9	14.6 ^a
Self-Worth	16.5	17.1	16.8	16.6
Scholastic Competence	13.9	14.4	13.9	13.6
Social Acceptance	15.4	14.5	16.0	15.0
Year 10				
Physical Appearance	15.6	14.6	16.0	14.4 ^a
Athletic Competence	12.5	11.6	13.4	11.5 ^a
Behavior Conduct	15.2	15.5	14.9	16.0
Self-Worth	17.3	16.8	17.3	17.3
Scholastic Competence	14.7	15.7	15.0	15.0
Social Acceptance	15.2	15.3	16.7	15.7 ^b

^a Indicates significant gender differences.

^b Indicates significant differences for adoptive status.

Even more interesting than the self-report data on the Harter are the results of mother and teacher ratings of social competence. For mother ratings at age 7 and teacher ratings at both 7 and 9 years, genetic influence is suggested for both Popularity and Confidence. In addition, teacher ratings of Leadership also suggested genetic influence at both age 7 and 9. Ratings of Leadership by mothers, who might not be expected to be as well versed in rating their children's leadership competence as are teachers, did not suggest genetic influence.

In order to estimate genetic and environmental parameters for these measures, maximum-likelihood model-fitting analyses were performed using LISREL VII

Table 10.2 Intraclass sibling correlations for competence measures

	<i>Nonadopted</i>	<i>Adopted</i>
Harter self-report:		
Year 9		
Physical Appearance	.39**	-.05
Athletic Competence	.06	.12
Behavior Conduct	-.01	.15
Self-Worth	.29*	.08
Scholastic Competence	.41**	.16
Social Acceptance	-.13	.22
Year 10		
Physical Appearance	-.07	.31*
Athletic Competence	.20	-.07
Behavior Conduct	.08	.03
Self-Worth	.08	.09
Scholastic Competence	.22	.15
Social Acceptance	.10	.20
Mother report of CAP		
Social Competence Scale		
Year 7		
Popularity	.29*	.05
Confidence	.41*	.02
Leadership	.10	.13
Teacher report of CAP		
Social Competence Scale		
Year 7		
Popularity	.36**	.07
Confidence	.42*	.00
Leadership	.37**	-.01
Year 9		
Popularity	.16	.00
Confidence	.26	-.21
Leadership	.30*	-.10

* $p < .05$, ** $p < .01$.

(Jöreskog & Sörbom, 1989). The results of these analyses are illustrated in Figures 10.1 and 10.2. Significance of the genetic and shared environmental parameters was tested by comparing nested models. When a model is compared to a reduced one, the difference in χ^2 between the two models can be used to determine the importance of a parameter to the model. In this case either the genetic or shared environmental parameter was dropped from the full model to test the significance of those parameters. For the Harter, Physical Appearance at age 9 was the only area of competence to show a significant genetic influence (Figure 10.1). However, approximately half of the total phenotypic variance of Self-Worth and Scholastic Competence at age 9 and slightly less than half of the total variance of Athletic and

Scholastic Competence at age 10 can be explained by genetic influences, although none of these parameter estimates reached significance. Shared environmental influences showed no evidence for either significant or substantial influence on any of the Harter measures at age 9 or 10.

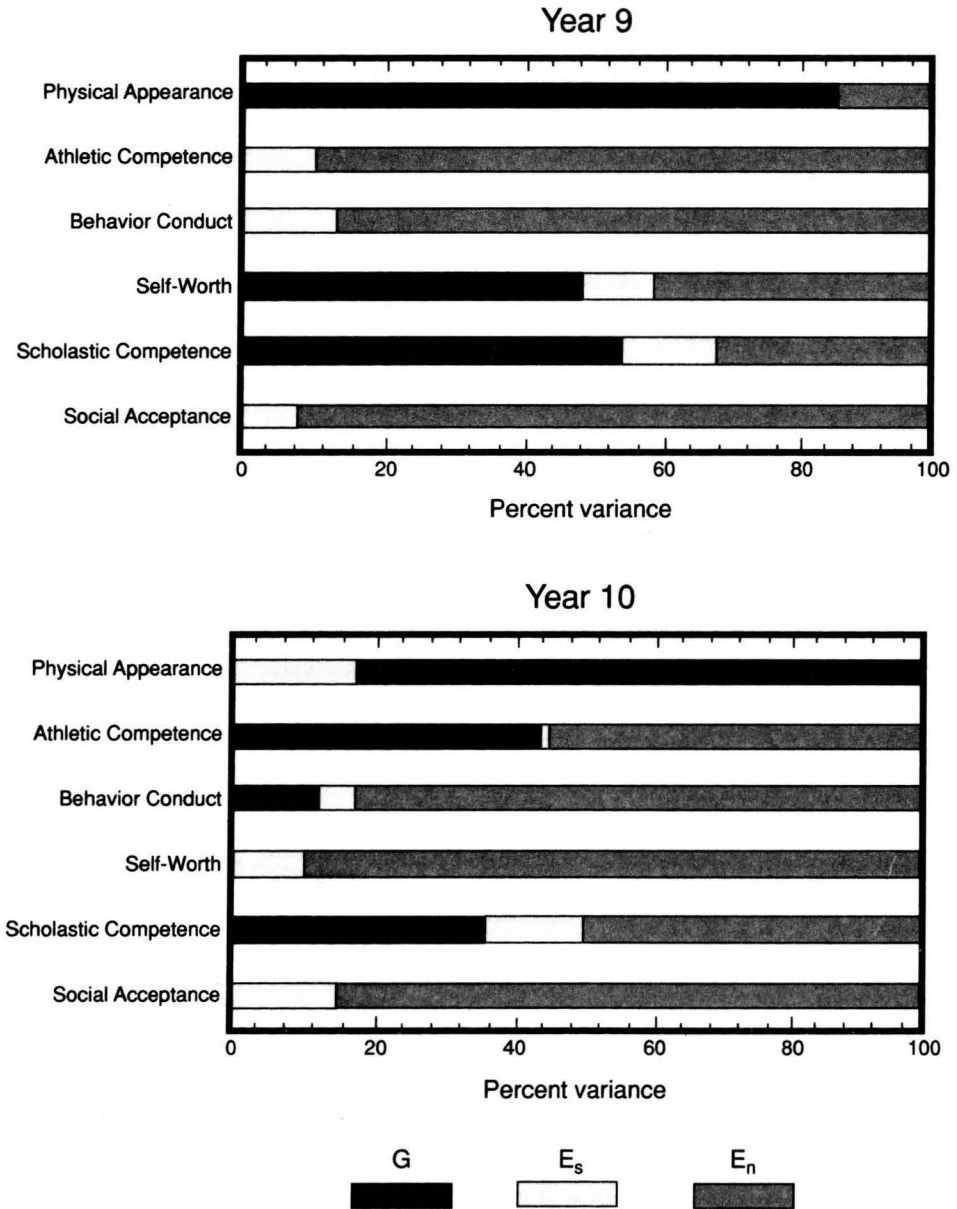


Figure 10.1 Univariate model-fitting results for the Harter (1982) Self-Perception Profile for Children, showing percentage of total phenotypic variance accounted for by genetic and environmental parameters.

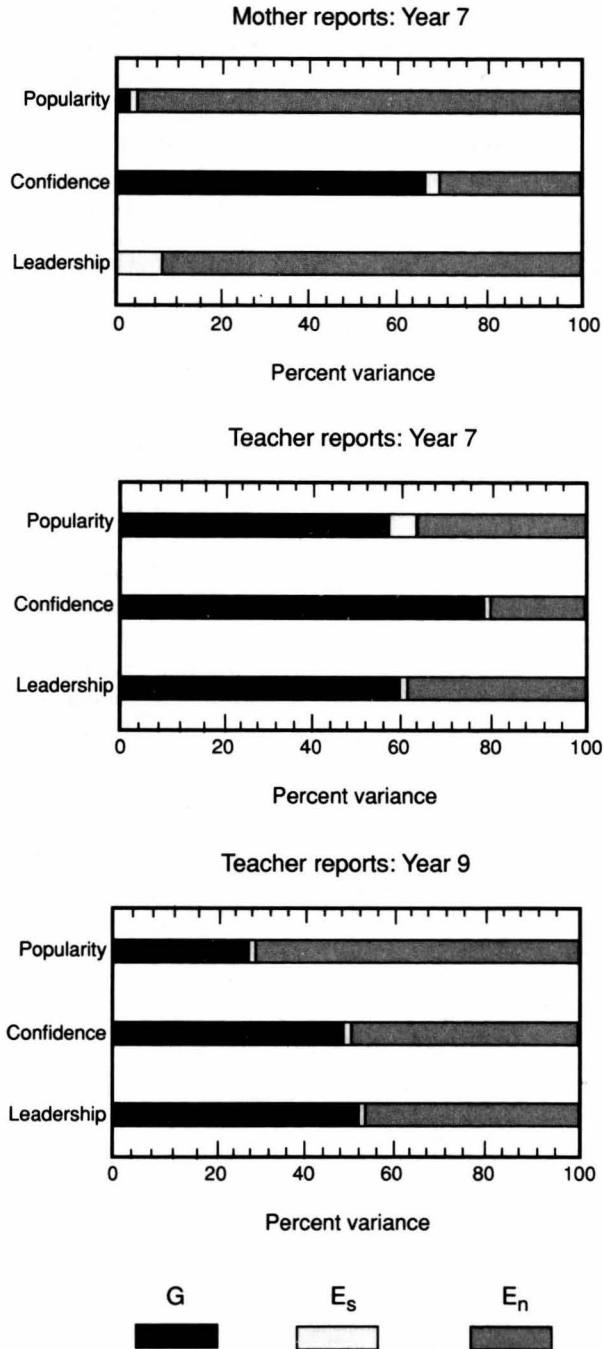


Figure 10.2 Univariate model-fitting results for the CAP Social Competence Scale showing percentage of total phenotypic variance accounted for by genetic and environmental parameters.

Figure 10.2 illustrates the results of univariate model-fitting analysis for the mother and teacher reports on the CAP Social Competence Scale. For mother reports at age 7, Confidence was significantly influenced by genetic factors and Leadership showed no evidence for genetic influence. At age 7, teacher reports of Confidence and Leadership showed significant amounts of genetic influence. As we found with the Harter, in several cases genetic influences were substantial but not significant. Specifically, genetic factors accounted for approximately half of the total phenotypic variance for teacher reports of Popularity at age 7 and for Leadership, Popularity, and Confidence at age 9. None of the teacher ratings of competence showed significant shared environmental influences.

Longitudinal analyses

Phenotypic stabilities are modest for the self-report Harter measure from 9 to 10 and for the teacher ratings of social competence from 7 to 9. As indicated below, the longitudinal correlations range from .11 to .37, with the exception of Harter Athletic Competence (.58) and teacher ratings of Leadership (.45).

To what extent are these modest continuities and substantial changes during this time of rapid development mediated by genetic and environmental factors? A longitudinal model shown in Figure 10.3 was fitted to the data. The parameters G , E_s , and E_n represent the genetic, shared environmental, and nonshared environmental covariance that is common to the two times of measurement, and the parameters g , e_s , and e_n represent the genetic, shared environmental, and nonshared environmental components of variance that are unique to the second time of measurement, and thus index change.

In Figure 10.4, longitudinal correlations from 9 to 10 for the Harter self-ratings and from 7 to 9 for teacher ratings of social competence are indicated by the heavy vertical lines. Variance in the measures that covary between the two ages – that is, continuity – is represented to the left of this marker. Variance due to change

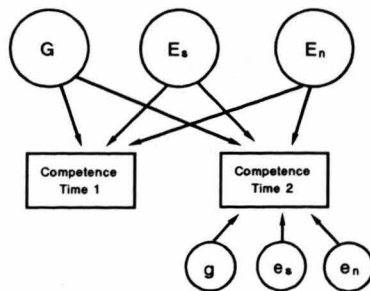


Figure 10.3 Longitudinal path model of genetic and environmental sources of change and continuity. G is a latent variable representing genetic influences that affect the phenotype at both times of assessment. E_s and E_n are latent variables representing shared and nonshared environmental influences common to the two ages. The three latent variables – g , e_s and e_n – represent genetic, shared environmental, and nonshared environmental influences that are specific to the phenotype at Time 2.

(including error of measurement) is to the right of the marker. Longitudinal genetic analysis decomposes these variances into genetic and environmental components, as indicated by the key at the bottom of Figure 10.4. Stability in the Harter Self-ratings

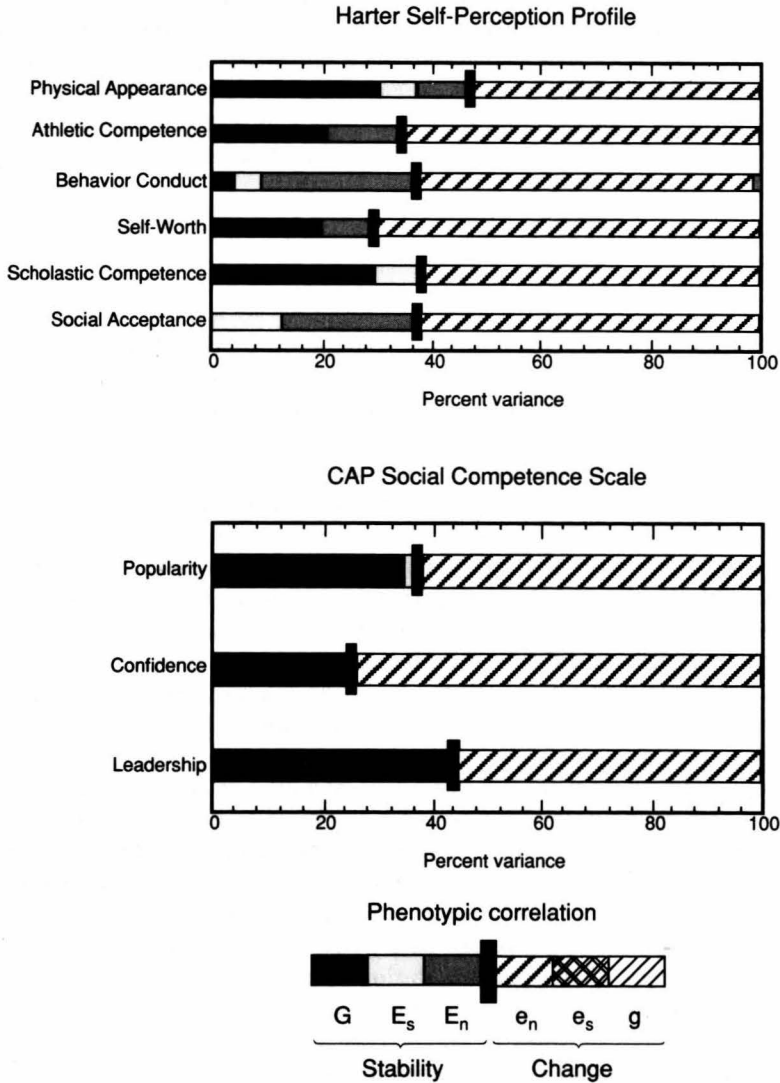


Figure 10.4 Summary of genetic and environmental components of continuity and change in the Harter Self-ratings of competence from 9 to 10 years of age and in the Teacher rating of self-competence from 7 to 9 years. As indicated by the key at the bottom of the figure, the vertical bar indicates the phenotypic correlation at the two ages. To the left of the bar are the genetic, shared environmental, and nonshared environmental components of the phenotypic correlation; to the right of the bar are the components of change.

of competence from 9 to 10 years is mediated by genetic factors for all of the measures except Social Acceptance. Shared environment is also a mediating factor in stability for self-ratings of Physical Appearance, Behavior Conduct, and Scholastic and Social Competence. It is important to note that nonshared environmental factors mediate the stability in most of the self-ratings of competence from age 9 to age 10. For all of the Harter competence measures, change from 9 to 10 years can be explained exclusively by nonshared environmental factors. Stability in teacher ratings of children's competence from 7 to 9 years can be attributed primarily to genetic mediation. Again, change in teacher ratings of competence from 7 to 9 years can be explained solely by nonshared environmental factors.

Discussion

The primary question addressed in this chapter is whether the CAP sibling adoption design would yield evidence for genetic influence or shared family environmental influence on measures of competence in middle childhood. The answer seems clear: Genetic influence is important and shared family environment is not. Self-ratings on the Harter showed genetic influence at either 9 or 10 years for Physical Appearance, Athletic Competence, Self-Worth, and Scholastic Competence. None of the scales showed significant shared environmental influence. The results for the mother and teacher ratings are even more impressive in showing substantial genetic influence and no influence of shared family environment. Especially noteworthy are the results for the teacher ratings. Although members of each sibling pair were rated by different teachers at different measurement occasions separated by two years on average, genetic influence is substantial for all three scales, especially at age 7 when the heritability estimates exceed those typically found for self-report ratings of personality.

These findings support the conclusions of McGuire et al. (in press) that genetic and nonshared environmental influences were found to be significant contributors to measures of children's perceptions of their own competence. The assumptions of some theorists (e.g., Bandura, 1977; Cooley, 1902; Mead, 1934) that environmental influences are the primary determinants of competence were not supported by these results. This does not imply that the family environment is not an important factor in the development of competence during middle childhood; however, it does indicate that the family environment that is shared by siblings does not result in sibling similarity on measures of competence and self-worth. These findings are important given the recent argument that children's social competence should show shared, rather than nonshared, environmental influences (Hoffman, 1991).

Although longitudinal stability of competence from age 9 to 10 for self-ratings and from 7 to 9 for teacher ratings is only modest, genetic factors appear to contribute to this stability for self-reports of Physical Appearance, Self-Worth, and Athletic and Scholastic Competence, and for all three teacher ratings of competence. Genetic factors do not appear to be involved in change across these relatively short intervals.

These findings suggest several avenues for future research. First, all of these measures showed substantial nonshared environmental influences. Studies have examined links between sibling differential experiences and children's adjustment and achievement (e.g., Daniels, Dunn, Furstenberg, & Plomin, 1985; McHale & Pawletko, 1992); however, this research could be extended to include other areas of children's competence including peer and athletic competence. Second, work in this area should be extended from middle childhood to adolescence when there may be important changes in genetic and environmental influences.