Pergamon

Journal of School Psychology, Vol. 39, No. 6, pp. 463–481, 2001

Printed in the USA
0022-4405/01 $–see front matter

PII S0022-4405(01)00084-X

Linkages Between Children's Social and Academic Competence: A Longitudinal Analysis

Mara Welsh
University of California—Berkeley

Ross D. Parke
University of California—Riverside

Keith Widaman
University of California—Davis

Robin O'Neil
Orange County Social Services Agency

The relation between social and academic competence was examined in a group of school-age children ($N = 163$) using structural equation modeling to determine the direction of influence between these two domains across time. A model posing that a reciprocal relation exists between the two domains was tested. The two nested models within the reciprocal model were also tested. To test these models, social acceptance as well as prosocial and aggressive behaviors were assessed by teachers and peers, and children's academic achievement was measured by language and math report-card grades and work skills. Results supported the reciprocal model, indicating that academic achievement directly influenced social competence from both first to second and second to third grade, and social competence was reciprocally related to academic achievement from second to third grade. Implications of these findings for the education process are discussed. © 2001 Society for the Study of School Psychology. Published by Elsevier Science Ltd

Keywords: Social, Academic, Competence, Longitudinal, Structural equation modeling.

Research has demonstrated that social and academic competence are related (Wentzel, 1993; Kupersmidt, Coie, & Dodge, 1990; Parker & Asher,1987; Bursuck & Asher, 1986). However, the nature of this relation needs to be better

Received April 13, 2000; accepted March 26, 2001.
Address correspondence and reprint requests to Mara Welsh, UC Links/Graduate School of Education, 615C University Hall, University of California—Berkeley, Berkeley, CA 94720-1040. Phone: (510) 643-7349; fax: (510) 642-3890; E-mail: mwelsh@uclink4.berkeley.edu

understood. Is it social competence that influences later academic competence or does academic competence influence later social competence?

Coie and Krehbiel (1984) discussed these contrary explanations regarding the longitudinal relations between academic and social outcomes. The first explanation posits that poor social skills influence later academic difficulties and the second explanation posits that academic deficiency influences later peer relationships. The authors propose that one explanation for social skills influencing later academic difficulties is that children with social skill deficits become distracted from the learning situation as a result of these deficits. In this case, a child may not have the social skills that would allow him or her to pay attention for periods of time. Thus, his or her academic performance would likely suffer. Another justification is that children may not have the skills to deal effectively with social situations, which may lead to problems with both teachers and peers. It is possible that these interpersonal problems may, in turn, hinder the learning process.

Conversely, the second explanation for the relation between social and academic competence asserts that academic deficiency influences later peer relationships. The authors suggest that this could be due to children entering school with deficient academic skills or performing below grade level and, therefore, becoming frustrated and engaging in inappropriate or disruptive social behavior. These behaviors may, in turn, lead to rejection by their peers. Finally, children may be rejected due to stigma associated with academic failure.

Together, these contrary explanations present competing models characterizing the longitudinal relations between academic and social outcomes. These competing models, nested within a reciprocal model, posit that social and academic competence influence each other over time. When reviewing the literature, empirical findings lend support to each of the nested models, thereby making it difficult to understand the true nature of the relationship between these two domains. By testing a reciprocal model with targeted follow-up of the nested models, the current study seeks to better understand the direction of influence between social and academic competence by analyzing a longitudinal data set across a 3-year period.

The reciprocal model subsumes the two unidirectional models and posits that social and academic outcomes influence each other across time. In this model, academic outcomes influence later social outcomes, as well as the reverse. Although reciprocal models have been proposed (Hinshaw, 1992; Sameroff & Chandler, 1975), little empirical evaluation of this model has been undertaken.

One exception is a study by Chen, Rubin, and Li (1997) who tested a reciprocal model in a sample of elementary school children in Shanghai. A sample of fourth- and sixth-grade students were followed for 2 years and assessed again in sixth and eighth grade on measures of social competence (as assessed by teachers and peers) and academic achievement in language

and mathematics. Cross-lagged correlations and regression analyses indicated that these two domains were mutually and positively predictive of each other from fourth to sixth grade. Results indicated that social competence, positive sociometric nominations, and leadership predicted academic achievement after gender and stability of achievement were controlled. Conversely, results also indicated that academic achievement positively predicted social competence, positive sociometric nominations, and leadership. Overall, results from this study provide support for a reciprocal relation between these two domains, with social and academic competence being mutually predictive of each other from Time 1 to Time 2. However, the Chen et al. (1997) study is limited in the conclusions that may be drawn from it, given the correlational nature of the analyses. Further testing of this model using more sophisticated analytical techniques as well as using samples from cultures outside of China is needed to establish its generalizability.

According to the reciprocal model, social and academic competence will be related over time. Previous research in the areas of social and academic competence has demonstrated considerable evidence supporting both directions of influence between these two domains. Kupersmidt and Coie (1990) examined the links between social and academic outcomes and investigated the value of peer rejection in predicting adolescent delinquency and school maladjustment. Kupersmidt and Coie (1990) followed a group of fifth graders until their completion of high school, and found both peer rejection and early childhood aggression to be significant predictors of school drop out, police or juvenile court contacts, school suspension, grade retention, and school truancy. More recently, O'Neil, Welsh, Parke, Wang, and Strand (1997) examined the linkages between social competence and academic achievement by testing the extent to which first- and second-grade achievement and work habits may be predicted by kindergarten classroom sociometric status. Children who were classified by their peers as popular in kindergarten received significantly higher scores in academic achievement and teacher-rated classroom adjustment in both first and second grade.

Similarly, Wasik, Wasik, and Frank (1993) found that children who were rated by their second-grade teachers as being at high risk for academic failure had been rated during kindergarten as more disruptive and aggressive. In contrast, children who were rated more positively by their peers in kindergarten were judged by their second-grade teachers to be at no risk for school failure. Children judged by their second-grade teachers to be at no risk for academic failure were rated as helping and sharing more often during kindergarten. Ladd (1990) also investigated the link between peer relations and later academic achievement in young children. Ladd (1990) found that kindergartners who began the school year with some familiar peers in their classrooms and who developed new friendships in the first 2

months of kindergarten had more positive perceptions of school and higher academic performance by the end of kindergarten. Conversely, children who were rejected by their peers suffered lower performance levels and less favorable school perceptions. Together, these findings suggest that social outcomes influence later academic adjustment.

In contrast to these studies positing that social competence leads to academic competence, a number of studies have found evidence supporting the opposite claim. Bursuck and Asher (1986) investigated the relation between social competence and academic achievement in third- and fourth-grade boys, and found that low-status low-achieving students had lower levels of social knowledge, and were rated by their teachers as less socially skilled overall. Bursuck and Asher (1986) found no significant differences in social knowledge or rated levels of social skill between low-status high-achieving students and their high-status high-achieving counterparts. These findings suggest that when achievement is controlled, no differences in social knowledge and skills are apparent between low-status and high-status children.

In an experimental test, Coie and Krehbiel (1984) implemented both social and academic interventions to evaluate their effects on the social status of low-achieving socially rejected children. Forty third graders were randomly assigned to one of four intervention conditions: academic skills training, social skills training, a combination, or control. Both sociometric scores and standardized test scores were obtained at the end of third, fourth, and fifth grade. Results indicated that academic skills training was the most successful of the intervention groups; academic skills training produced significant improvements in reading and math and improved sociometric scores. Conversely, social skills training was ineffective in altering scores. Coie and Krehbiel (1984) suggested that by providing children with basic skills in reading and math, the children had less opportunity for disruptive behavior and, instead, focused on the successful completion of classroom tasks. Alternatively, or in addition to this explanation, cognitive gains could contribute to the development and refinement of social–cognitive information processing skills (Crick & Dodge, 1994) that, in turn, could contribute to improvements in social competence with peers. Taken together, these findings provide evidence supportive of academic competence leading to social competence.

The disparate findings that are presented by these two bodies of literature may be due to at least two methodological limitations. First, previous research did not test alternative hypotheses. With the exception of Coie and Krehbiel (1984), most studies tested only one direction of influence, leaving alternative hypotheses untested. Second, findings based on correlational techniques (e.g., Chen et al., 1997) do not take into account autoregressive effects of variables or relations between variables at different time points. Therefore, only certain pieces of the relations among variables

are tested, rather than testing all of the relations between social and academic outcomes.

THE CURRENT STUDY

The current study extended previous research in a number of ways. First, the current study was longitudinal, following a moderately large sample over a 3-year period. Second, the current study utilized a wider range of information from more sources than previous studies, including sociometric measures, peer and teacher ratings of behavioral characteristics, and report-card information from children's cumulative school files. Finally, the current study was able to evaluate more adequately the links between social and academic outcomes due to its longitudinal design, the fact that data were collected every year from first through third grade, and the utilization of structural equation modeling (SEM) techniques. Although SEM furthers previous work by testing paths of influence between multiple variables at multiple time points, SEM methods applied to correlational data are not a substitute for experimental studies. Furthermore, results from SEM cannot support causal statements of the same form as derived from experimental investigations.

The primary goal of this study was to examine the linkages between social and academic competence and test a reciprocal model with targeted follow-up of the nested models within this reciprocal model. As seen in Figure 1, the model represents the reciprocal relation between social and academic outcomes. In the current study, we extend prior research by testing the reciprocal model in addition to the two nested unidirectional models, under the hypothesis that bidirectional relations will be found between social and academic outcomes. The two nested models represent first, the hypothesis that social competence influences later academic competence and, second, the competing hypothesis that academic competence influences subsequent social competence. However, it should be noted that it may also be the case that there is a third variable influencing both social and academic competence.

METHOD

This study was part of an ongoing longitudinal project: the University of California—Riverside Social Development Project. The project began when the children were in kindergarten. During this first year of data collection, 1,480 children were interviewed and 100 of these children and their families participated in a lab-based longitudinal study. Sociometric and academic information for these 100 target children were collected each year. To obtain sociometric information, each child in the target child's

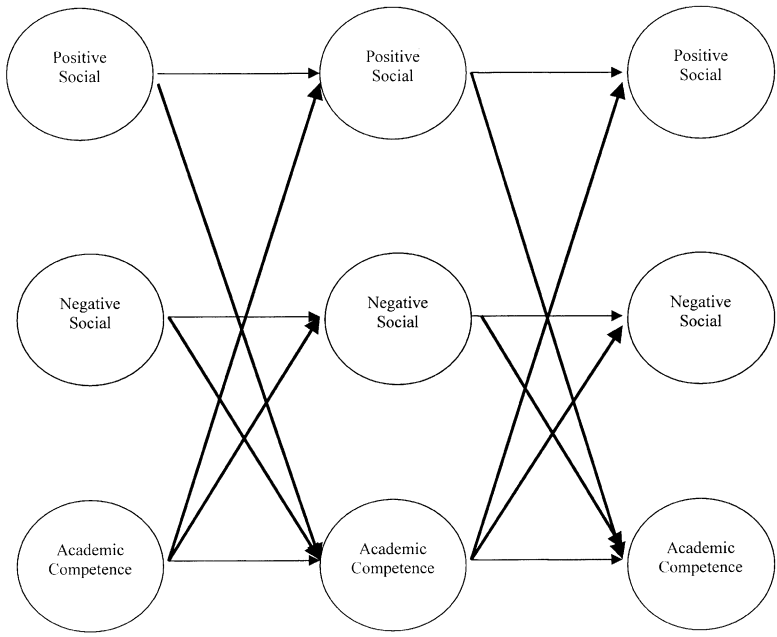

Figure 1. Conceptual model.

classroom was interviewed. Therefore, there were large numbers of children sampled every year of data collection. As a result of interviewing everyone in a target child's class, there were some children who, in addition to the 100 target children, were interviewed each year. This study focused specifically on data collected from first through third grade and included all of those children who were assessed in first through third grade and had complete data for all 3 years ($N = 163$). It should be pointed out that the primary aim of the study was to follow the 100 target children and to continue to include the larger sample of children as raters of the social behavior of the target children. As a result, the study gained 63 other children (in addition to the target sample of 100) who also had complete data from first to third grade and, together, constitute the sample for the current study.

Sample

The longitudinal sample for the current study consisted of 163 children (75 males and 88 females) from eight elementary schools in a Southern California school district. This group was comprised of children who participated in the ongoing longitudinal project being conducted at the Uni-

versity of California—Riverside and those classmates for whom complete sociometric and academic information existed from first through third grade. Data from kindergarten were not included in these analyses because the type of academic records from kindergarten did not permit comparison with the records for children in the later elementary school grades. For example, kindergarten records described children's competencies in drawing, cutting, and recognizing shapes, whereas records for later grades indicated achievement and effort in areas of language and math, thereby making meaningful comparisons difficult. Data were used from participants who had 2 years of complete data, and multiple regression was employed to estimate missing values for a third data point. If a subject was missing data for 1 year, that data point was estimated using values for the other 2 years of data. Missing values were not estimated if a subject was missing more that 1 year of data. Not more than 14% of the data was estimated in this manner. The sample was made up of 33% Caucasian children, 35% Latino, 9% African American, 4% Asian, 2% from other ethnicities, and 17% who declined to state ethnicity. Although detailed socioeconomic information was unavailable for the total sample, socioeconomic status (SES) of the target families ($n = 100$) ranged from working class to middle class. Median family income was approximately $35,000, and the educational level of the parents averaged 12 and 13 years for mothers and fathers, respectively. Because the children in the total sample and the target sample were drawn from the same classrooms and schools, it is our assumption that this description is a fair estimate of the SES of the total sample.

Analyses of variance (ANOVAs) were conducted to test whether the 163 children remaining in the sample differed significantly from the 1,480 first graders who were assessed that year but were not assessed in subsequent years of data collection. ANOVAs indicated some significant differences between the two groups. Specifically, the children in the current sample were rated as less disliked by their teachers and peers than first graders overall, $F(1, 1{,}352) = 16.17$, $p < .001$, and more accepted by their peers than first graders overall, $F(1, 1{,}479) = 9.94$, $p < .001$. Children in the longitudinal sample also differed significantly from first graders overall in levels of prosocial behavior, $F(1, 1{,}399) = 5.42$, $p < .02$, and aggressive behavior, $F(1, 1{,}323) = 6.82$, $p < .01$. These findings indicate the presence of selective attrition that must be addressed when considering limitations of the study.

Measurement of Social Competence

Peer ratings of social competence. In first and second grade, children sorted photographs of their classmates to indicate those children with whom they liked to play, those children with whom they kind of liked to play, and those children with whom they did not like to play. During third grade, children were given a roster of their classmates and asked to circle a

number representing those children with whom they liked to play (3), those children with whom they kind of liked to play (2), and those children with whom they did not like to play (1). These ratings were then standardized by classroom to form the child's social acceptance score. Oden and Asher (1977) reported a test-retest correlation of $r = .82$; considerable evidence of the predictive and discriminate validity is available (see Oden & Asher, 1977).

Peer ratings of behavioral characteristics. Children's behavioral characteristics were also assessed by having children nominate their classmates in different categories. At all times of measurement, students were asked to nominate up to three classmates for both prosocial and aggressive characteristics (i.e., those children who are good at helping, sharing, and taking turns, and those children who start fights and say mean things). These ratings were also summed for each child and standardized by classroom. Again, evidence of the psychometric properties for these ratings is well documented for both reliability and validity (see Cassidy & Asher, 1992; Musun-Miller, 1990).

Teacher ratings of social competence and behavioral characteristics. In addition to peer ratings, teacher ratings were also obtained for each year of data collection. Teachers completed ratings developed by Cassidy and Asher (1992) that assessed each child's likability by his or her peers as well as ratings on behavioral characteristics similar to those already provided by their peers. Cassidy and Asher (1992) presented evidence of the discriminative validity of these measures. Test-retest reliability (across 1 month) averages .93 across the teacher ratings (Spitzer, Cupp, & Parke, 1995). In addition, Spitzer et al. (1995) reported evidence of the validity of these ratings; the teacher ratings were specifically correlated in the expected ways with the subscale of the Classroom Behavior Inventory (Schaefer & Edgerton, 1979, 1982).

Teachers were provided a roster of their students' names and were asked to use a 5-point Likert scale (1 = "not at all like this child" to 5 = "very much like this child") to evaluate the following six statements: is well liked by other children, is not well liked by other children (social acceptance); helps, shares, and takes turns (prosocial); says mean things (verbal aggression); hits, kicks, or bites (physical aggression); and interrupts or disrupts other children's activities (disruptive). Measures of aggression and disruptiveness were found to be highly correlated with each other, and were therefore combined to form one measure of aggressiveness. Teacher ratings were then standardized by classroom.

As mentioned above, to address the issue of missing data, multiple regression was employed to estimate missing values. If a subject was missing data for 1 year, that data point was estimated using values for the other 2

years of data. Missing values were not estimated if a subject was missing more that 1 year of data.

Measures of Academic Competence

Report cards. School records were also obtained for each child at each year of data collection. From first through third grade, teachers rated student's achievement and effort levels by indicating whether their progress was unsatisfactory, satisfactory, needs improvement, or outstanding. These performance indicators each had three levels (−, ✔, +), and a fourth indicator, incomplete, was also available. Therefore, achievement and effort were recorded for both language and math and assigned point values ranging between Outstanding = 13, Unsatisfactory = 2, and Incomplete = 1 (primary grades used these performance indicators rather than an A–F 5-point scale). The performance levels for both achievement and effort were then summed across the four quarterly assessments in each year to derive overall language and math achievement and effort scores. Analyses indicated that achievement and effort were highly correlated (above r = .60), and therefore were combined to form overall achievement and effort scores for both language and math. These scores were standardized by classroom.

Teacher ratings. Children were also rated by teachers on their classroom work habits. Teachers used a 3-point scale to indicate whether each child's behavior was unsatisfactory, satisfactory, or above average. Students were rated on such items as participates well in a group, gets along with others, follows class and school rules, and works independently. The totals were then summed across each of the four quarters and combined to form one measure of "classroom work habits." The scores were then standardized by classroom.

Again, multiple regression was employed to estimate missing data. If a subject was missing data for 1 year, that data point was estimated using values for the other 2 years of data. Missing values were not estimated if a subject was missing more that 1 year of data.

The Measurement Model

The conceptual model included two domains: social and academic competence. These domains were kept separate because empirically forcing all indicators for both Positive Social Competence and Negative Social Competence to load on a single social competence latent variable led to poor fit of the model. To best operationalize the measurement model the social competence domain was represented by two latent variables: Positive Social Competence and Negative Social Competence. To simplify the measurement model, teacher and peer ratings on like measures were com-

bined to form composite measures. The three indicators of Positive Social Competence included (a) summed teacher and peer ratings of how much a child was liked (labeled Like), (b) summed teacher and peer ratings of prosocial behavior (labeled Pro), and (c) an overall measure of peer social acceptance (labeled Total). The two indicators of Negative Social Competence included (a) summed teacher and peer ratings of how much a child was disliked (labeled Dis), and (b) summed teacher and peer ratings of aggressive behavior (labeled Agg). Academic Competence was operationalized by one latent variable whose three indicators included (a) language report-card scores (labeled Lang), (b) math report-card scores (labeled Math), and (c) a measure of classroom work habits (labeled Work).

Within the measurement model, a total of nine latent variables were identified: three latent variables (Positive Social Competence, Negative Social Competence, and Academic Competence) at each of three times of measurement (see Table 1). The model was identified by fixing the variance of each of the three Grade 1 latent variables to unity; all loadings on the latent variables were then estimated. To ensure that identical latent variables were obtained at each time of measurement, factor loadings were constrained to be invariant across the three grades. For example, the loading of the Like indicator on the Positive Social Competence latent variable was constrained to be identical at the three times of measurement. Invoking across-time invariance constraints on factor loadings led to identification of the residual variances of the three latent variables at Grade 2 and the three latent variables at Grade 3, so these six variances were estimated. The three correlations among the Grade 1 latent variables were estimated freely, as were the three residual covariances among Grade 2 latent variables and the three residual covariances among Grade 3 latent variables. Across grade covariances among like-named unique factors (e.g., Like at Grade 1 with Like at Grade 2) were a reasonable a priori specification. A total of 24 covariances (eight for Grade 1 with Grade 2, eight for Grade 1 with Grade 3, and eight for Grade 2 with Grade 3) were specified initially, but only the nine that were statistically significant were retained. Thus, the following residual covariances were estimated: (a) Agg Grade 1 and Agg Grade 2; (b) Agg Grade 1 and Agg Grade 3; (c) Agg Grade 2 and Agg Grade 3; (d) Work Grade 1 and Work Grade 2; (e) Work Grade 2 and Work Grade 3; (f) Like Grade 1 and Like Grade 3; (g) Like Grade 2 and Like Grade 3; (h) Pro Grade 2 and Pro Grade 3; (i) Math Grade 1 and Math Grade 2. Further testing of this model should determine whether these paths should be freed in other samples as well.

Model Testing

To test the three competing models, a SEM approach using LISREL8 (Jöreskog & Sörbom, 1993) was employed. The reciprocal model was

Table 1
Residual Covariances Among the Latent Variables Across Three Grade Levels

Variable	PosSoc1	NegSoc1	Acad1	PosSoc2	NegSoc2	Acad2	PosSoc3	NegSoc3	Acad3
PosSoc1	1.00[a]								
NegSoc1	−.68 (.07)	1.00[a]							
Acad1	.54 (.07)	−.45 (.08)	1.00[a]						
PosSoc2	.0[b]	.0[b]	.0[b]	.18 (.07)					
NegSoc2	.0[b]	.0[b]	.0[b]	−.21 (.06)	.44 (.12)				
Acad2	.0[b]	.0[b]	.0[b]	.11 (.05)	−.07 (.06)	.50 (.10)			
PosSoc3	.0[b]	.0[b]	.0[b]	.0[b]	.0[b]	.0[b]	.40 (.10)		
NegSoc3	.0[b]	.0[b]	.0[b]	.0[b]	.0[b]	.0[b]	−.29 (.07)	.42 (.13)	
Acad3	.0[b]	.0[b]	.25(.07)	.0[b]	.0[b]	.0[b]	.17 (.05)	−.08 (.05)	.48 (.10)

Note. Values are parameter estimates, with standard errors in parentheses. PosSoc = Positive Social, NegSoc = Negative Social, Acad = Academic Competence. The number accompanying each variable indicates the grade level (i.e., PosSoc1 stands for Positive Social at Grade 1).

[a]Parameter fixed at reported value to identify the solution.

[b]Parameter fixed at reported value.

tested first because the two competing models were nested within the reciprocal model. Pathways were removed based on a priori hypothesis and model fit was evaluated.

RESULTS

Descriptive Statistics

Means, standard deviations, and correlations for all variables included in the LISREL model across all time points are presented in Table 2. A 3 × 2 repeated measures ANOVA, using time (3 levels) and gender (2 levels) was performed to determine whether significant differences between females and males were apparent on any of the variables. Results indicated significant main effects of gender for (a) prosocial behavior, $F(1, 161) = 7.38$, $p < .001$, with females being rated as more prosocial than males; (b) aggressive behavior, $F(1, 161) = 18.08$, $p < .001$, with males being rated as significantly more aggressive than females; and (c) ratings of classroom work habits, $F(1,161) = 6.03$, $p < .01$, where females were rated as having significantly better work habits than males. Because significant gender differences were found for only a small number of the variables included in the LISREL model, and sample size did not permit the testing of the proposed models separately by gender, the groups were combined and the LISREL models were tested using the combined sample.

A 3 (Time) × 6 (Ethicity) repeated measures ANOVA was also conducted to test whether results differed by ethnicity. Results indicated no significant differences between ethnic groups over time. Therefore, all subsequent analyses were performed on the entire sample irrespective of gender or ethnicity.

The Reciprocal Model

The reciprocal model tested the hypothesis that social and academic competence influence each other reciprocally over time. In the reciprocal model, six longitudinal stability paths were estimated. These stability paths lead from a given latent variable at one time of measurement to the identically named latent variable at the next time of measurement. In addition, eight cross-lagged paths were estimated: (a) paths from Positive Social Competence and Negative Social Competence at Grade 1 to Academic Competence at Grade 2; (b) paths from Positive Social Competence and Negative Social Competence at Grade 2 to Academic Competence at Grade 3; (c) paths from Academic Competence at Grade 1 to Positive Social Competence and Negative Social Competence at Grade 2; and (d) paths from Academic Competence at Grade 2 to Positive Social Competence and Negative Social Competence at Grade 3. Results indicated that

Table 2
Means, Standard Deviations and Correlations Between the Measured Variables Included in the Structural Equation Model at Grade 1, Grade 2 and Grade 3

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1. DIS_1	1.00																							
2. AGG_1	.52	1.00																						
3. LIKE_1	−.39	−.22	1.00																					
4. PRO_1	−.46	−.30	.60	1.00																				
5. TOTAL_1	−.48	−.28	.42	.40	1.00																			
6. LANG_1	−.33	−.29	.39	.41	.25	1.00																		
7. MATH_1	−.27	−.17	.25	.36	.17	.75	1.00																	
8. WORK_1	−.34	−.22	.24	.20	.22	.19	.10	1.00																
9. DIS_2	.43	.54	−.30	−.37	−.18	−.40	−.24	−.19	1.00															
10. AGG_2	.37	.75	−.17	−.27	−.25	−.36	−.15	−.14	.63	1.00														
11. LIKE_2	−.36	−.18	.49	.52	.41	.45	.32	.12	−.50	−.28	1.00													
12. PRO_2	−.37	−.31	.44	.52	.38	.48	.37	.19	−.40	−.38	.56	1.00												
13. TOTAL_2	−.35	−.23	.25	.38	.31	.36	.22	.07	−.38	−.30	.44	.35	1.00											
14. LANG_2	−.25	−.27	.26	.33	.18	.63	.48	.17	−.35	−.30	.37	.44	.26	1.00										
15. MATH_2	−.19	−.14	.17	.25	.14	.53	.58	.12	−.26	−.15	.31	.33	.27	.70	1.00									
16. WORK_2	−.27	−.32	.27	.35	.26	.23	.16	.46	−.28	−.31	.17	.44	.11	.37	.32	1.00								
17. DIS_3	.25	.25	−.18	−.31	−.25	−.31	−.17	−.15	.25	.25	−.15	−.21	−.22	−.32	−.23	−.20	1.00							
18. AGG_3	.32	.42	−.10	−.17	−.25	−.31	−.14	−.13	.33	.51	−.18	−.22	−.27	−.18	−.11	−.24	.41	1.00						
19. LIKE_3	−.25	−.18	.40	.35	.28	.32	.24	.19	−.31	−.18	.44	.31	.33	.38	.30	.34	−.31	−.27	1.00					
20. PRO_3	−.39	−.35	.35	.47	.35	.43	.33	.29	−.27	−.34	.37	.53	.36	.45	.36	.49	−.35	−.36	.51	1.00				
21. TOTAL_3	−.39	−.22	.30	.37	.36	.32	.24	.18	−.32	−.29	.36	.30	.43	.26	.22	.30	−.44	−.35	.40	.45	1.00			
22. LANG_3	−.25	−.28	.32	.37	.25	.63	.49	.19	−.33	−.31	.38	.50	.35	.58	.44	.28	−.32	−.25	.39	.57	.35	1.00		
23. MATH_3	−.20	−.25	.22	.28	.19	.52	.48	.08	−.23	−.21	.36	.42	.25	.47	.47	.25	−.31	−.27	.38	.47	.33	.77	1.00	
24. WORK_3	−.24	−.36	.21	.27	.20	.35	.28	.16	−.34	−.39	.20	.31	.16	.19	.21	.29	−.16	−.21	.22	.33	.28	.40	.44	1.00
Mean	.03	−.07	.00	.05	.03	.09	.07	.04	−.02	−.01	.01	.04	.05	.08	.03	−.01	−.07	−.04	.07	.05	.03	.09	.05	.07
SD	1.23	1.18	1.29	1.24	.98	.98	.99	1.01	1.26	1.33	1.26	1.27	.98	1.01	.99	.98	1.08	1.14	1.26	1.25	1.00	.93	.93	.96

Table 3
Summary of Fit Statistics for Structural Models

Model	χ^2	*df*	*p*	RMSEA	NNFI	CFI	$\Delta\chi^2$	*df*
3	345.29	229	< .001	.06	.92	.94	—	—
1	366.45	233	< .001	.06	.91	.93	20.46	4
2	368.12	233	< .001	.06	.91	.93	22.13	4

Note. Represents the change in χ^2 and degrees of freedom (*df*) for a particular model against Model 3, in which it is nested. RMSEA = root mean square error of approximation, NNFI = non-normed fit index, CFI = comparative fit index.

the reciprocal model was rejectable statistically (See Table 3), $\chi^2(229) = 345.99$, $p < .001$, but had adequate levels of practical fit, root mean square error of approximation (RMSEA) = .06, non-normed fit index (NNFI) = .92, comparative fit index (CFI) = .94.

As can be seen in Figure 2, the stability estimates between pairs of latent variables were strongest between Grade 1 and Grade 2 ($.75 > \beta > .66$) and weaker from Grade 2 to Grade 3 ($.58 > \beta > .22$). The specified cross-lagged pathways from Grade 1 to Grade 2 exhibited nonsignificant paths of influence from social competence to later academic competence. Conversely, significant paths of influence from academic competence to later social competence were found, with Academic Competence being positively related to

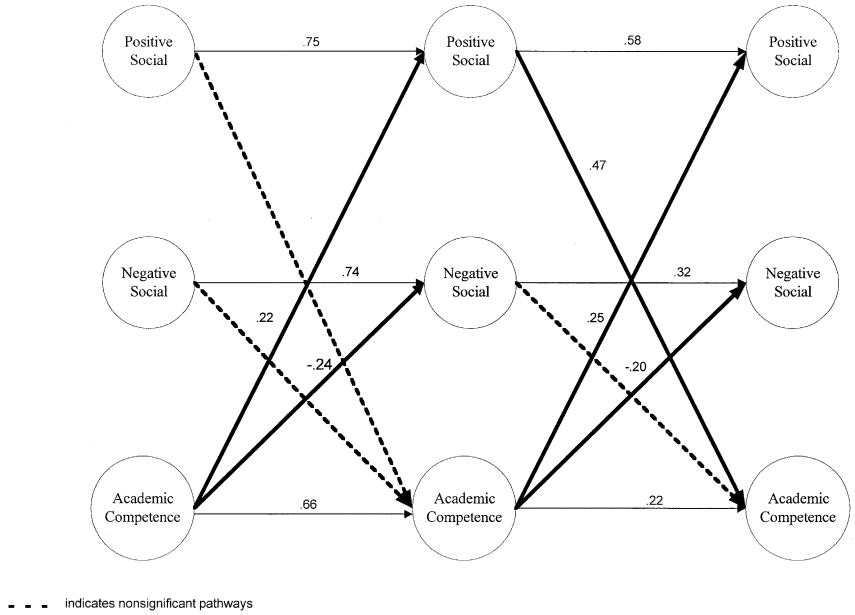

Figure 2. Statistical model. Dashed lines indicate nonsignificant pathways.

Positive Social Competence ($\beta = .22$, $SE = 0.04$) and negatively related to Negative Social Competence ($\beta = -.24$, $SE = 0.09$). This pattern of influence from academic to social competence remained significant from Grade 2 to Grade 3 as well ($\beta = .25$, $SE = 0.10$, and $\beta = -.20$, $SE = 0.09$, for Positive and Negative Social Competence, respectively). Interestingly, one pathway of influence from social to later academic competence was significant from Grade 2 to Grade 3, a positive significant path coefficient from Positive Social Competence to Academic Competence ($\beta = .47$, $SE = 0.14$).

In considering the testing of the two nested models, the first nested model that hypothesized that social competence influenced later academic competence was rejectable statistically, $\chi^2(233) = 366.45$, $p < .001$, and levels of practical fit were somewhat worse (RMSEA = .06, NNFI = .91, CFI = .93). However, the first nested model fit the data significantly worse than the reciprocal model, $\Delta\chi^2(4) = 20.46$, $p = .001$, and marginally worse practically (ΔNNFI = .01, ΔCFI = .01; see Table 3). The second nested model that reflected the hypothesis that academic competence influences later social competence was rejectable statistically, $\chi^2(233) = 368.12$, $p < .001$, but acceptable practically (RMSEA = .06, NNFI = .91, CFI = .93). As with the first nested model, the second nested model fit the data significantly worse than the reciprocal model, $\Delta\chi^2(4) = 22.13$, $p = .001$, and marginally worse practically (ΔNNFI = .01, ΔCFI = .01; see Table 3). This significant worsening of fit suggests that dropping all four paths from social competence to later academic competence is ill advised, despite the fact that only one of these was statistically significant.

DISCUSSION

The primary aim of the study was to test a reciprocal model in order to understand the direction of effects between social competence and academic competence over time. Results were consistent with the reciprocal model. It was hypothesized that bidirectional relations between the two domains would best characterize the relation between social and academic competence. Findings indicated that academic competence consistently led to social competence over time with a bidirectional pattern of influence emerging between social and academic competence from second to third grade. Academic competence in first grade influenced second-grade social competence, with Academic Competence being positively related to Positive Social Competence. Lower academic competence in first grade also influenced social competence in second grade, with Academic Competence being negatively related to Negative Social Competence. This pattern of relations was replicated from second to third grade as well. These findings indicated that academic competence exerts a significant influence over social competence consistently over this 2-year period.

In addition, there was a significant path from social competence in the second grade to third-grade academic competence. This significant path could be the beginning of a reciprocal relation between social and academic competence, although data from the fourth grade is needed to extend and test this reciprocal model further. Without this information from the next grade and/or replication of the current findings, this result should be viewed with caution. Future research should focus on the years after third grade to further study the continued influence of academic competence on social competence and determine whether the influence of social competence on later academic competence becomes more consistent and remains stable in magnitude. It is also interesting that Negative Social Competence in second grade did not influence Academic Competence in third grade. This suggests that there may be differential effects of Positive and Negative Social Competence, and future research should examine this issue as well.

These findings are important in demonstrating the significant contributions of social competence contrary to much of the literature that is based on deficit models (Kupersmidt & Coie, 1990; Parker & Asher, 1987; Walker, Shinn, O'Neill, & Ramsey, 1987). This research focuses on a "normal" sample and characterizes the relation between these two domains as a positive one. Specifically, these findings indicate that in a fairly well-adjusted sample of school-age children, positive social behaviors (as opposed to negative social behaviors) are directly related to later academic competence over time.

The second pattern that emerges from these findings concerns effects of poor academic competence. Lower academic competence also influences social competence consistently over time. In this case, poor academic performance as early as first grade leads to poor social performance in later grades. Contrary to the first pattern discussed above, this pattern does not include a reciprocal pathway, so the pattern of reciprocal influence is not perpetuated, thereby leaving the possibility of academic interventions. Such interventions might target specific skills such as reading or math. Coie and Krehbiel (1984) found that when they did provide such academic skills training in third grade, both social and academic competence were improved in fourth and fifth grade.

Practically, the findings from this study indicate that academic interventions would be most effective when trying to increase both academic and social competence in early grades. Given this knowledge, educators may be alerted to the importance of early academic success and intervene quickly when deficits emerge in this area. Given that social and academic competence begin to be related to each other reciprocally in the later years, it is possible that two levels of intervention, both social and academic, would be most effective.

This study also has important implications for prevention programs. Findings from this study indicate that deficits in academic competence as early as first grade are related to later social competence. Given this information, children who are "at risk" for deficits in academic competence

may be targeted to prevent these deficits from developing further. Our findings also indicate that early academic competence leads to later social competence, which also lends more support for preventative measures to ensure early academic and social success.

To best tailor these interventions, more needs to be known about the underlying processes that connect these two domains. The social, cognitive, or other underlying mechanisms that could potentially account for the relation between academic and social competence remain unspecified by this study. The data that were collected for this study allowed us to successfully model the direction of influence between these two domains and answered questions of directionality, but not questions of process. Toward this aim, some researchers propose that mechanisms such as attention and emotion regulation may be the common factors underlying competence in both social and academic domains (Wilson & Gottman, 1996; Kellam, 1994). In addition, other aspects of social–cognitive information processing such as goals, strategies, and response selection may be influenced by improvements in social skills and/or cognitive skills. More research on these mechanisms would be worthwhile and would illuminate the processes by which social and academic competence are related. A major implication of our findings is that both academic and social variables need to be recognized as important contributors to children's success in school settings.

Limitations

Several limitations of the current study should be noted. First, results indicated that there were significant differences between the children in this sample and the children in the larger sample of first graders who were originally enrolled in the study. The original sample of first graders included children who were rated as more disliked, more aggressive, and less prosocial by both teachers and peers than the children who remained in the sample over time. In light of these differences and some restriction of range, results may not be generalizable to the larger population. With a less restrictive range, the pattern of findings for the social to academic competence path may have been clearer.

Second, due to the sample size, definitive analyses by gender and ethnicity were not possible. More participants would be needed to examine the relation between social and academic competence separately for males and females.

Generalizabilty issues also arise in regard to ethnicity and SES because our sample did not allow for meaningful comparisons by ethnicity or SES. Earlier research suggests that there may be very different processes at work for different ethnic groups. For example, Black students may exhibit deficits in academic competence in order to avoid "acting White" (Fordham & Ogbu, 1986; Fordham, 1988). To test competing models by ethnicity or SES, a larger and more diverse sample would be required.

Although valid and reliable measures were used, the inclusion of measures which tap a wider range of social and academic functioning would be desirable in future studies. Classroom and playground observations, for example, would yield a richer portrait of social competence, and a fuller battery of achievement evaluations would provide a more meaningful assessment of academic competence. More in-depth measures of both constructs may have yielded a more robust set of links between these two domains.

Finally, we only examined data at three time points. Extending this study by including fourth-grade data might establish more conclusive evidence for a reciprocal model. However, this could not be done with the current sample, as there were insufficient participants available in fourth grade.

Although SEM is especially useful in analyzing longitudinal data, there are two limitations that must be addressed. First, SEM only tests specified models. Although the study represents an advance over previous work by testing alternative models, other models could fit the data as well. Future research could test a third variable model to determine whether an unspecified variable (e.g., SES, IQ, central nervous system damage, or parents' education) could account for the relation between academic and social competence (Gresham, 1992; Vitaro, Tremblay, & Gagnon, 1992). Second, although SEM may indicate whether specified paths of influence are significant or not, correlational data cannot determine causality with the same certainty as experimental interventions.

Acknowledgments

This research was supported by grants from the National Science Foundation (BSN8919391) and the National Institute of Child and Human Development (HD32391) to Ross D. Parke and Robin O'Neil, as well as a dissertation grant from the University of California—Riverside Graduate Division. This research could not have been conducted without the continued support from Dr. Karen Harshman, Superintendent, the teachers and staff of the Fontana Unified School District, and the University of California—Riverside Social Development Project. We would also like to thank Barbara Tinsley and Don MacMillan for their guidance and support, Mike Furr, David Clatfelter, and Christopher Mahmood for statistical support, and Julie Fisher, Janice Allen, and Marina Merrill for their help with data collection. Most important, we would like to thank all of the children of the Fontana Unified School District who contributed to the University of California—Riverside Social Development Project over the years.

REFERENCES

Bursuck, W. D., & Asher, S. R. (1986). The relationship between social competence and achievement in elementary school children. *Journal of Clinical Psychology, 15,* 41–49.

Cassidy, J., & Asher, S. R. (1992). Loneliness and peer relations in young children. *Child Development, 63,* 350–365.

Chen, X., Rubin, K. H., & Li, D. (1997). Relations between academic achievement and social adjustment: Evidence from Chinese children. *Developmental Psychology, 33,* 518–525.

Coie, J. D., & Krehbiel, G. (1984). Effects of academic tutoring on the social status of low-achieving, socially rejected children. *Child Development, 55,* 1465–1478.

Crick, N. R., & Dodge, K. A. (1994). A review and reformulation of social information-processing mechanisms in children's social adjustment. *Psychological Bulletin, 115,* 74–101.

Fordham, S. (1988). Racelessness as a factor in black students' school success: Pragmatic strategy or pyrrhic victory? *Harvard Educational Review, 58,* 58–84.

Fordham, S., & Ogbu, J. U. (1986). Black students; school success: Coping with the "burden of 'acting white.' *The Urban Review, 18,* 176–206.

Gresham, F. M. (1992). Social skills and learning disabilities: Causal, concomitant or correlational? *School Psychology Review, 21,* 348–360.

Hinshaw, S. P. (1992). Externalizing behavior problems and academic underachievement in childhood and adolescence: Causal relationships and underlying mechanisms. *Psychological Bulletin, 111,* 127–155.

Jöreskog, K. G., & Sörbom, D. (1993). *LISREL8 user's reference guide.* Chicago: Scientific Software International.

Kellam, S. G. (1994). The social adaptation of children in classrooms: A measure of family child rearing and effectiveness. In R. D. Parke & S. G. Kellam (Eds.), *Exploring family relationships with other social contexts* (pp. 147–168). Hillsdale, NJ: Erlbaum.

Kupersmidt, J. B., & Coie, J. D. (1990). Preadolescent peer status, aggression, and school adjustment as predictors of externalizing problems in adolescence. *Child Development, 61,* 1350–1362.

Kupersmidt, J. B., Coie, J. D., & Dodge, K. (1990). The role of poor peer relationships in the development of disorder. In S. R. Asher & J. D. Coie (Eds.), *Peer rejection in childhood. Cambridge studies in social and emotional development* (pp. 274–305). New York: Cambridge University Press.

Ladd, G. W. (1990). Having friends, keeping friends, making friends, and being liked by peers in the classroom: Predictors of children's early school adjustment? *Child Development, 61,* 1081–1100.

Musun-Miller, L. (1990). Sociometrics with preschool children: Agreement between different strategies. *Journal of Applied Developmental Psychology, 11,* 195–207.

Oden, S., & Asher, S. R. (1977). Coaching children in social skills for friendship making. *Child Development, 48,* 495–506.

O'Neil, R., Welsh, M., Parke, R. D., Wang, S., & Strand, C. (1997). A longitudinal assessment of the academic correlates of early peer acceptance and rejection. *Journal of Clinical Child Psychology, 26,* 290–303.

Parker, J. G., & Asher, S. R. (1987). Peer relations and later personal adjustment: Are low-accepted children at risk? *Psychological Bulletin, 102,* 357–389.

Sameroff, A. J., & Chandler, M. J. (1975). Reproductive risk and the continuum of caretaking casualty. In F. D. Horowitz, M. Hetherington, S. Scarr-Salapatek, & G. Siegel (Eds.), *Review of child development research* (Vol. 4, pp. 187–244). Chicago: University of Chicago Press.

Schaefer, E., & Edgerton, M. (1979). *Parent interview and sociodemographic of predictors of adaptation and achievement.* Paper presented at the annual meeting of the American Psychological Association, New York, NY, September.

Schaefer, E., & Edgerton, M. (1982). *Circumplex and spherical models for child school adjustment and competence.* Paper presented at the annual meeting of the American Psychological Association, Washington, DC, August.

Spitzer, S., Cupp, R., & Parke, R. D. (1995). School entrance age, social acceptance, and self-perceptions in Kindergarten and 1st grade. *Early Childhood Research Quarterly, 10,* 433–450.

Vitaro, F., Tremblay, R. E., & Gagnon, C. (1992). Peer rejection from kindergarten to grade 2: Outcomes, correlates, and prediction. *Merrill-Palmer Quarterly, 38,* 382–400.

Walker, H. M., Shinn, M. R., O'Neill, R. E., & Ramsey, E. (1987). A longitudinal assessment of the development of antisocial behavior in boys: Rationale, methodology, and first year results. *Remedial and Special Education, 8,* 7–16.

Wasik, B. H., Wasik, J. L., & Frank, R. (1993). Sociometric characteristics of kindergarten children at risk for school failure. *Journal of School Psychology, 31,* 241–257.

Wentzel, K. R. (1993). Does being good make the grade? Social behavior and academic competence in middle school. *Journal of Educational Psychology, 85,* 357–364.

Wilson, B. J., & Gottman, J. M. (1996). Attention—The shuttle between emotion and cognition: Risk, resiliency, and physiological bases. In E. M. Hetherington & E. A. Blechman (Eds.), *Stress, coping, and resiliency in children and families* (pp. 189–228). Hillsdale, NJ: Erlbaum.