Socialization of Achievement Attitudes and Beliefs: Parental Influences

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PARSONS, JACQUELYNNE ECCLES; ADLER, TERRY F.; and KACZALA, CAROLINE M. *Socialization of Achievement Attitudes and Beliefs: Parental Influences*. CHILD DEVELOPMENT, 1982, **53**, 310–321. To assess the impact of parents on children's achievement self-concept and related beliefs, extensive questionnaires measuring attitudes and beliefs regarding mathematics achievement were administered to children in grades 5–11 and their parents. The potential influence of parents both as role models and as expectancy socializers was investigated. Both mothers and fathers held sex-differentiated perceptions of their children's math aptitude despite the similarity of the actual performance of boys and girls. The difference was most marked for parents' estimates of how hard their children had to try to do well in math. Parents of daughters believed their child had to work harder to do well in math than parents of sons. Parents of sons thought advanced math was more important for their child than parents of daughters. Parents' perceptions of and expectations for their children were related to both the children's perceptions of their parents' beliefs and to the children's self- and task perceptions. Further, parents' beliefs were more directly related to children's self-concepts and expectancies than were the children's past performances in math. Path analysis supported our hypothesis that the children's attitudes were influenced more by their parents' attitudes about their abilities than by their own past performances. Finally, parents as role models of sex-differentiated math behaviors did not have a direct effect on their children's self-concepts, expectations, or course plans.

The existence of a sex difference in expectancies for success and in self-concept of ability from middle childhood on is well documented (see Frieze, Fisher, Hanusa, McHugh, & Valle [1978]; Lenney [1977]; Parsons, Ruble, Hodges, & Small [1976]; and Stein & Bailey [1973] for reviews). However, the developmental origins of this difference are unclear. Parsons et al. (1976) suggested several ways in which teachers and parents might be perpetuating, if not creating, this sex difference. While several recent studies of possible teacher influences have emerged (e.g., Brophy & Good 1974; Dweck, Davidson, Nelson, & Enna 1978), there have been virtually no recent studies of parental influences. The study reported herein was designed to assess parental influences on children's achievement expectancies and self-concepts of ability with a particular focus on the contributions of parents to the commonly reported sex differences. The roles of parents both as models and as expectancy socializers were investigated.

Parents as Role Models

The importance of role models in socialization is a recurring theme throughout the sex-difference literature. The process of "observational learning" has been suggested as one of the ways in which children absorb social norms, especially those associated with sex-appropriate qualities of behavior (see Bandura & Walters 1963; Maccoby & Jacklin 1974). According to this hypothesis, models, parents in particular, exhibit behaviors which children imitate and later adopt as part of their own behavioral repertoire; if important female models exhibit different behavior patterns than comparable male models, then girls and boys

Copies of this paper can be obtained from the first author at the Psychology Department, University of Michigan, Ann Arbor, Michigan 48109. This research was funded by grants from the National Institute of Education (NIE-G-78-0022) and the National Institute of Mental Health (5R01-MH31724-01). We wish to thank Robert Futterman, Kirby Heller, Julie D. Karabenick, Judy Meece, Carol Midgley, Margaret Peterson, Linda Murray, the many undergraduate students who helped collect and code these data, and the Ann Arbor Public Schools for their assistance throughout the project.

[*Child Development*, 1982, **53**, 310–321. 0009-3920/82/5302-0014$01.00]

will exhibit different behavioral patterns. In regard to mathematics in particular, Ernest (1976) reported that after sixth grade, fathers are more likely than mothers to help their children with their math homework, and Fox (Note 1) has reported a tendency for more advanced courses to be taught by males. This underrepresentation of appropriate female role models could influence girls' decisions to engage in mathematical activities. The success of intervention programs which have increased female math participation through exposure to female models supports this line of reasoning (e.g., Brody & Fox 1980; Tobin & Fox 1980).

Role models may also influence children's achievement behaviors through the messages they provide regarding their beliefs about their own abilities. If male and female socializers hold different beliefs about their own math abilities and competence, then it would be expected that boys and girls would develop different beliefs about their own abilities. While relevant research on parents is sparse, Aiken (1970), in his review, cited data indicating that female student teachers have lower estimates of their math ability and openly admit they are less comfortable teaching math than do their male peers.

In summary, the role-modeling hypothesis takes the following form with regard to expectancies for general achievement: girls exhibit different achievement choices and have lower expectancies than boys because mothers exhibit different achievement behaviors and have lower achievement expectancies than fathers. To assess this hypothesis, two tests are needed: (*a*) a demonstration that mothers and fathers differ on key variables, and (*b*) a demonstration that these differences predict individual differences in children's responses to related variables. If parents' behaviors and self-concepts do not predict children's behaviors and self-concepts, then role modeling is not a tenable causal explanation for the sex differences found in the child sample, even if the predicted sex differences exist in the parent sample. Furthermore, even if parent behaviors and self-concepts were predictive of children's behaviors, this would only support a correlational hypothesis and would not provide definitive evidence of causality.

Parents as Expectancy Socializers

The role of parents as expectancy socializers has received less attention. Previous work (e.g., Crandall 1969; Rosen & D'Andrade 1959; Winterbottom 1958) related both parents' independence training and parental expectancies to children's need-achievement motives and related achievement behaviors. This body of work established a positive relation between parents' expectations for their children's achievement behaviors and children's actual behaviors. However, this work did not address directly the issue of parental socialization of sex differences in expectancies. Several studies suggest that, in general, parents and teachers have higher educational expectancies for boys than for girls (e.g., Sears, Maccoby, & Levin 1957), although these biases do not emerge consistently until children are older. During the elementary school years parents generally expect girls to do better than boys (see Maccoby & Jacklin 1974). In their review of socialization influences, Parsons et al. (1976) concluded that, while studies are not entirely consistent, there is some evidence that parents do have lower achievement expectancies for adolescent girls than for adolescent boys. However, the relation of these expectancies to children's expectancies and self-concepts of ability for achievement activities and the exact nature of the expectancy messages themselves have not been adequately explored.

How might parental expectancies for their children be manifested? First and foremost, parents may form specific expectancies regarding their child's probable performance in a particular course. Parents may convey these expectations in the messages they give regarding their beliefs about their child's abilities, about the difficulty of various achievement tasks, and about the importance of various achievement activities. For example, parents may stress the difficulty or the importance of certain courses more to their daughters than to their sons; they may acknowledge their sons' abilities more than they acknowledge their daughters'; they may encourage their sons to tackle difficult tasks more than they encourage their daughters. In basic agreement with this suggestion, Hoffman (1972) concluded that parents encourage independence in their sons more than in their daughters. Whether this tendency characterizes parents' behavior regarding specific achievement tasks has not been studied.

To assess the validity of the hypothesized relation of expectancy messages to sex differences in children's expectancies and achievement self-concepts, the following tests are needed: (*a*) a demonstration that parents have different expectancies and beliefs regarding the abilities of their sons and daughters, and (*b*) a demonstration that these parental beliefs predict individual differences in the children's expectancies, self-concepts of their abilities, and conceptions of the difficulty of the subject matter. Again, it should be stressed that a significant relation between these parental beliefs and children's attitudes would provide correlational rather than causal support for this hypothesis.

Math as the Domain of Study

To investigate these parental influences on sex-differentiated expectancies and self-concepts of ability, a domain was needed that met the following criteria: (*a*) sex differences in expectancies and self-concepts of ability had to exist among school-age children, (*b*) congruent sex differences in both attitudinal and related achievement behaviors had to exist among adults, and (*c*) these sex differences should not relate isomorphically to the assessment of "actual" ability differences. Additionally, to increase the relevance of the study, it was decided that the domain should be one in which the sex difference has significant long-range consequences for the children. Mathematics is one area that meets all of these criteria. Boys have both higher expectancies and self-concepts of their math abilities than girls. Men are much more likely to be involved in math-related careers. Boys and girls do equally well in the math courses in which they are enrolled. And, finally, the failure to take advanced high school math severely limits the career options of females in exactly those areas of employment that offer some of the highest and least sex-discriminatory salaries (see Parsons, Adler, Futterman, Goff, Kaczala, Meece, & Midgley [in press] for discussion of these differences).

Method

Sample

The student sample consisted of volunteering children from 22 fifth- through eleventh-grade classrooms chosen randomly from those made available by volunteering teachers. The school district was in a small midwestern city populated primarily by middle- to upper-class families. Two fifth-grade classes, one sixth-grade class, eight seventh-grade classes, three eighth-grade classes, six ninth-grade classes, one tenth-grade class, and one eleventh-grade class were selected. The larger numbers of seventh- and ninth-grade classes were chosen because past research has suggested that the early adolescence years are critical in the formation of sex-differentiated expectancies in math. The overall participation rate was 57%; participation rates varied somewhat between grades and seemed to be a function primarily of the teacher's interest in the study. The total sample included approximately the same number of boys and girls (53% of the sample being female).

The parent sample consisted of the mothers and fathers of these student subjects. Both parents of 62% of the participating students and one parent of an additional 18% of the students completed the questionnaire.

Measures

Student questionnaire.—The questionnaire was developed in two steps. Initially, nine-point bipolar rating scales anchored at the extremes with short verbal descriptors were designed and pilot tested in a school district comparable to the district in which the study was to be run. Based on these students' comments and on their responses to the items, the nine-point scale was reduced to a seven-point scale, several items were eliminated or reworded, and scales were formed using Cronbach's coefficient α. The final student questionnaire contained several scales.[1] The following were used for this study: (*a*) difficulty of current math course: absolute and comparative ratings of difficulty of current mathematics course ($\alpha = .81$); (*b*) difficulty of future math courses: absolute and comparative ratings of difficulty of future mathematics courses ($\alpha = .77$); (*c*) current expectancies: ratings of students' expected performance in current mathematics course ($\alpha = .83$); (*d*) future expectancies: ratings of students' expected performance in future mathematics courses ($\alpha = .79$); (*e*) self-concept of ability and performance in math: ratings of ability in current and advanced mathematics ($\alpha = .80$); (*f*) perception of effort involved in

[1] The full questionnaire is discussed in more detail in Parsons, Adler, Futterman, Goff, Kaczala, Meece, and Midgley (Note 3), available from the first author. The full questionnaire contained the PAQ and the following six additional construsted scales: a shortened version of the IAR, a measure of sex-role identity, sex typing of ability in math, utility of math for one's own goals, incentive value of math, cost of effort needed to do well, perceptions of parents' use of and liking of math, perceptions of parents' beliefs regarding one's math abilities, and the importance of math.

math: ratings of the effort perceived to be necessary to do well in math ($\alpha = .76$).

There were also a number of single-item scales for which alpha coefficients were not available. These include child's perception of mothers' use of math, mothers' and fathers' enjoyment of math, mothers' and fathers' beliefs regarding both child's math ability and their expectancies for the child's performance.

Parent questionnaire.—A questionnaire consisting of both seven-point Likert items and open-ended questions was employed to assess parents' attitudes and expectancies. The parents' questionnaire was constructed to parallel the children's questionnaire as much as possible. It was developed and pilot tested in a manner similar to that used in constructing the student questionnaire.

The parents' questionnaire contained items tapping three categories of information: (1) the parents' perceptions of their own experiences in math and their own attitudes regarding mathematics, (2) parents' beliefs about their children's attitudes toward math, and (3) parents' beliefs about their children's math abilities and their children's math experiences. For purposes of this paper, only items from categories 1 and 3 were included for analysis; each of these two sets of items is described in more detail below.

Referring first to parental attitudes about mathematics, parents were asked to reflect back on their years in high school and to report their experiences and attitudes at that time. Given the inaccuracies often associated with retrospection, this information was intended not so much to inform us about past conditions as to inform us about parents' current views of their past high school experiences with mathematics. This section of the questionnaire contained the following scales: (*a*) parents' perception of past math ability (mothers' $\alpha = .90$, fathers' $\alpha = .87$); (*b*) importance of math for parents in the past (mothers' $\alpha = .73$, fathers' $\alpha = .75$); (*c*) effort required by parents to do well in math in the past (mothers' $\alpha = .77$, fathers' $\alpha = .71$); (*d*) difficulty of math for parents in the past (mothers' $\alpha = .84$, fathers' $\alpha = .81$).

Current parental attitudes were also assessed. In particular, parents were asked about the following: (*a*) parents' perceptions of their current math ability (assessed with a single item; thus, α is not available); (*b*) usefulness of math for parents in the present (mothers' $\alpha = .59$, fathers' $\alpha = .73$); (*c*) difficulty of math for parents in the present (mothers' $\alpha = .75$, fathers' $\alpha = .55$); (*d*) parents' current enjoyment of math (assessed with a single item; thus, α is not available).

In addition, parents were asked to report the number of math courses they had taken in high school and college, their level of education, who presently does the household math, and their current occupation.

The second set of items from the parent questionnaire of relevance to this paper tapped parental beliefs and attitudes about their children. This section of the questionnaire included the following scales: (*a*) parents' perception of child's math ability (mothers' $\alpha = .61$, fathers' $\alpha = .58$); (*b*) parents' perception of importance of math for child (mothers' $\alpha = .49$, fathers' $\alpha = .47$); (*c*) parents' perception of effort needed by child to do well in math (mothers' $\alpha = .74$, fathers' $\alpha = .65$); (*d*) parents' perception of the difficulty of math for child (mothers' $\alpha = .79$, fathers' $\alpha = .76$); (*e*) parents' expectations for child's performance in future math courses (mothers' $\alpha = .66$, fathers' $\alpha = .83$). This section of the questionnaire also contained several single items which assessed parents' perceptions of their child's general school performance and their enjoyment of math, the amount of encouragement they have given their children to continue in math, and the amount of importance they placed on various school subjects.

School record data.—In addition to the questionnaires, several measures were taken directly from the children's school files. These measures included the children's grades in mathematics for the 2 previous years and all available absolute scores on the Michigan Educational Assessment Program and California Achievement Test. Given that teachers vary in reporting procedures, that not all children had all three scores, and that no one measure of past performance is perfectly reliable, these measures were standardized within grade and averaged to form an estimate of each child's past performance in mathematics.

Procedures

The student questionnaire was administered in two 30-min sessions in the child's math classroom in the spring of 1978. The parent questionnaires were mailed to participants' homes and returned by mail during the summer of 1978.

Results and Discussion

Parents as Role Models

To test for the hypothesized differences between mothers and fathers, the mathematics-relevant self-concepts of the mothers and fathers were compared. In comparison to mothers' responses, fathers reported that they were ($t = 5.40$, $p < .001$) and are currently better at math ($t = 8.30$, $p < .001$), that math was ($t = 5.73$, $p < .001$) and is currently easier for them ($t = 4.87$, $p < .001$), that they needed to expend less effort to do well at math ($t = 4.39$, $p < .001$), that they have enjoyed math more in the past ($t = 4.12$, $p < .001$) as well as in the present ($t = 6.67$, $p < .001$), that math has always been more useful ($t = 5.11$, $p < .001$), and that it is currently more important to them ($t = 3.31$, $p < .01$). Only two items yielded nonsignificant differences: past importance of math and the current importance of basic math skills. In sum, fathers were more positive toward math and had a more positive self-concept regarding their math abilities. Furthermore, these sex-differentiated beliefs were specific to math. Consistent with the fact that girls on the average outperform boys in school, mothers rated their general high school performance higher than did fathers ($t = 2.58$, $p < .05$).

In line with the modeling hypothesis, one might conclude at this point that boys and girls differ because their parents' beliefs and behaviors are sex differentiated. But one needs to demonstrate a relation between parents' beliefs and their children's beliefs before this conclusion is justified.

To test the modeling hypothesis more directly, the parent self-concept variables, measures of the number of math courses taken in high school and college, occupation and work patterns, and the number of years of education of both parents were correlated with their children's responses to the student questionnaire and with the measure of their children's past performance in math. Mother and father variables were correlated separately with both son and daughter variables. Two criteria were used to determine which of these relationships was meaningful: correlation coefficients had to attain a significance level of $p < .01$ and a magnitude of at least .30. These criteria were based on the fact that our large sample size made it possible to have correlation coefficients which were statistically significant from zero but did not reflect a psychologically meaningful relationship between the two variables. The relationship between those variables which did attain a significance level of $p < .01$ but did not have a magnitude of at least .30 was further examined by the use of scatter plots. None of the more than 400 correlations met our initial criteria. Thus, while parents' self-concepts do differ in the predicted direction, there was no strong relation between these differences and their children's math self-concepts and expectancies.

Parents were also asked who did the math-related tasks in the household. According to their own reports, mothers were not less likely to do the math-related tasks (58 reported that both parents did the math, 97 reported that their husbands did the math, and 91 reported that they did the math). In contrast, fathers reported that they were more likely to do the math-related tasks (53 reported that both parents did the math, 45 reported that their wives did the math, and 121 reported that they did the math). Analyses of variance using the parental reports of who did the math as the independent variable indicated that parental division of math-related tasks at home had no effect on the children's self-concept, task-concept, and performance measures ($p > .05$ for all tests).

Before ruling out the parental modeling hypothesis, two additional tests were performed. It is possible that children are not accurate in their perceptions of their parents. If children are inaccurate, then one would not expect parents' self-reported math attitudes and behaviors to correlate significantly with the children's self-perceptions, task perceptions, and performance. Instead, one would predict significant correlations between measures of children's perceptions of their parents and measures of children's self-perceptions. To test for these possibilities, the children's perceptions of their parents' attitudes and behaviors were correlated with the parents' self-reports and both the children's math ability self-concept and task-concept measures.

While the children's perceptions of their parents' use and enjoyment of math were not correlated with any of the parental occupation or schooling variables, the children's perceptions of their parents' enjoyment of math were, by and large, significantly correlated with the parents' self-reports of past and present math ability, math difficulty, and effort needed to do well in math. Of the 24 correlations tested, 19 were both significant at the $p < .01$ level and larger than .30; four more were significant at the $p < .01$ level but fell between .24 and

.29. Additionally, analyses of variance using the children's perceptions of the parents' liking and use of math as the dependent variables, and maternal reports of the sex division of math-related tasks in the household as the independent variable, yielded significant *F*s. Children whose fathers did the household math felt their fathers liked math more than did children whose mothers or both parents did the math, $F(2) = 5.25$, $p < .01$. Similarly, children whose mothers did the household math, either alone or in conjunction with the father, felt that their mothers liked and used math more than did children whose fathers did the household math, $F(2) = 3.3$, $p > .05$. Thus, children had fairly accurate perceptions of their parents' math attitudes and behaviors; the failure to find significant correlations between parents' self-reports and children's self-perceptions was not due to children's inaccurate perceptions of their parents' use of or liking of mathematics.

Were children's perceptions of their parents' use and enjoyment of math significant predictors of the children's ratings of their own math abilities, and of the difficulty and usefulness of mathematics? No. As with the correlation between parent self-reports and the children's self-ratings, none of the 30 correlations met our criteria. Twelve of these relationships were significant at the $p < .01$ level but did not attain a magnitude of .30 (they ranged in magnitude from .19 to .28; eight of these fell below .25). These relationships were further examined by scatter plot; weak linear relationships were found. In sum, neither parents' self-reports nor children's perceptions of their parents' math use were strong predictors of children's self-perceptions, task perceptions, or actual performance. Thus, it seems clear that parental role modeling of mathematical skills does not exert a very strong influence on children's math-related self-perceptions, task perceptions, actual performance, or plans to continue in mathematics courses.

Parents as Expectancy Socializers

Parental beliefs.—Parents may contribute to the sex differences in math expectancies through the messages they provide to their children regarding their beliefs about their children's math abilities, the difficulty of math itself, and the importance of taking math courses. That is, girls may have lower self-concepts and expectations because parents think daughters are not as good in math as are sons. To assess this hypothesis, the perceptions of boys' parents regarding their sons' math ability and effort, their expectancies for their sons' future performance in math, their perceptions of the relative importance of a variety of courses for their sons, and their estimates of the difficulty of math for their sons were compared to similar beliefs of the parents of girls. The data are summarized in table 1.

Despite the fact that boys and girls in this sample had performed equally well in math the previous year and on their most re-

TABLE 1

Mean Rating of Parents' Perceptions of and Values for Their Children

Variable	Mothers		Fathers		
	Sons	*F* value	Sons	Daughters	*F* value
Math ability				9.60	1.85
Effort needed to do well in math				9.67	9.32**
Task difficulty of math				8.78	13.53**
Future expectancies in math				10.08	2.38
Importance of math				10.64	.94
Relative importance of math				4.48	3.93*
Importance of English				5.97	14.61**
Importance of geometry				5.62	1.88
Importance of trig/calculus				4.99	6.94**
Importance of chemistry				5.45	1.10
Importance of American history				5.84	9.11**
Encouragement to continue in math				5.29	5.20*
Enjoyment of math				4.53	6.49*
Perception of school performance				5.97	4.60*

Note.—The first five variables represent summary scales; all other variables represent single items; $df = 1{,}250$ with the exception of the twelfth mother variable and the fourth and twelfth father variables ($1{,}106 \leq df \geq 1{,}128$).

* $p < .05$.

** $p < .01$.

cent standardized math test ($p > .05$), the sex of the child had a significant effect on parents' perceptions of their child's math ability and on parents' perceptions of the relative importance of various high school courses. While parents of daughters did not rate their child's math abilities as significantly lower than did parents of sons, parents of daughters reported that math was harder for their child and that their child had to work harder to do well in math. Their daughters' general school performance was better than their sons. In addition, parents of sons as compared to parents of daughters felt that math was more important than other subjects for their child. In general, these sex-differentiated beliefs held primarily for math and science. Parents of daughters felt that their child's general school performance was better than parents of sons, and fathers of daughters rated both English and American history as more important for their children than fathers of sons.

That parents feel their daughters have to try harder to do well in math is of particular interest in light of both our previous findings and a common finding in the attribution literature. In previous work we have found that girls think they have to try harder than boys to do well in math even though they report spending equivalent amounts of time on their math homework (Parsons et al., in press; Kaczala, Parsons, Futterman, & Meece, Note 2; Parsons, Adler, Futterman, Goff, Kaczala, Meece, & Midgley, Note 3); and on an experimental task, girls rated their efforts as greater even though an objective measure of effort did not reveal a sex difference (Parsons, Note 4). Similarly, women have been shown to attribute their successes more to effort than do men (see Frieze et al. 1978). Taken together these findings suggest that females think they will have to try harder to receive a good grade than males think they will have to try. The present data suggest that parents are reinforcing this tendency. Whether parents initiate the bias or merely echo it is not clear, but they certainly are not providing their daughters with a counterinterpretation.

Is it necessarily harmful that both girls and their parents think girls have to try harder to do well in math? It has been argued in the attribution literature that because attributions to effort do not contribute to a stable notion of one's ability in a particular domain, attributing one's success to effort is not as ego enhancing as attributing it to ability (Frieze et al. 1978). Attributing one's successes to effort may also leave doubt about one's future performance on increasingly difficult tasks. If one is having to try very hard to do well now and one expects next year's math course to be even harder, one may not expect to do as well next year. In support of this suggestion, perceptions of how hard one is trying in the present have been found to be negatively correlated with future expectancies and with one's estimates of one's ability and the difficulty of the task (Parsons et al., Note 3). In addition, using cross-lagged panel analyses, Parsons et al. (in press) found that perceptions of how hard one is trying in the present are causally related to children's self-concepts of their math ability 1 year later. If one adds to this dynamic the fact that both girls and their parents think that continuing in math is less important for them than do boys and their parents, then a cognitive set could emerge that would decrease the tendency in girls to continue in advanced math courses.

Relation of parental beliefs to children's attitudes.—Having demonstrated that parental beliefs about their children's abilities and plans are sex related, the next step is to test whether these parental beliefs are predictive of the children's self- and task perceptions. As hypothesized, children's self-perceptions, expectancies, and perceptions of task difficulty related consistently to both their perceptions of their parents' beliefs and expectancies and to the parents' actual estimates of their children's abilities (see table 2). Parents who think that math is hard for their children and who think their children are not very good at math have children who also possess a low self-concept of their math ability, see math as difficult, and have low expectancies for their future performances in math. In addition, the magnitude of the relations between parental perceptions of their child and their child's beliefs and behaviors did not vary as a function of the child's sex.

Path analysis.—As hypothesized, then, parents' beliefs about their children were related to their children's self- and task perceptions. It is possible, however, that this relation represents the shared knowledge parents and children have of the child's past math performance rather than the child's incorporation of the parents' beliefs. It is our contention that parental beliefs are causally related to children's self- and task concepts. We predict that parents' beliefs influence children's self-concepts rather than both sets of beliefs resulting from the child's past performance.

TABLE 2

Zero-Order Correlation of Mother and Father Attitudes toward Child and Child Attitudes and Perceptions of Parents' Attitudes

	Past Math Performance	Intention to Take More Math	Current Expectancies in Math	Future Expectancies in Math	Self-Concept of Math Ability	Perception of Task Difficulty	Value of Math	Perception of Parents' Perception of Child's Math Ability	Perception of Parents' Future Expectancies for Child	Perception of Parents' Perception of Task Difficulty for Child	Perception of Parents' Aspirations for Child
						Mother Attitudes					
Mother's perception of importance of math for child	.41**	.35**	.41**	.44**	.46**	−.11	.42**	.46**	.25**	−.17**	.12
	.42**	.40**	.43**	.44**	.47**	−.09	.43**	.46**	.28**	−.20*	.11
	.39**	.29**	.40**	.50**	.47**	−.16	.43**	.48**	.21*	−.16	.15
Mother's perception of child's math ability	.40**	.34**	.44**	.46**	.54**	−.31**	.33**	.54**	.33**	−.23**	.16*
	.38**	.38**	.45**	.49**	.58**	−.37**	.32**	.58**	.36**	−.29**	.14
	.43**	.27**	.44**	.42**	.49**	−.23*	.35**	.50**	.28**	−.15	.19
Mother's perception of child's effort in math	−.32**	−.21**	−.32**	−.35**	−.47**	.49**	−.20**	−.38**	−.27**	.41**	−.18**
	−.20*	−.26**	−.25**	−.35**	−.44**	.48**	−.19*	−.34**	−.26**	.45**	−.11
	−.47**	−.15	−.40**	−.31**	−.48**	.47**	−.18	−.42**	−.29**	.33**	−.26*
Mother's perception of task difficulty for child	−.35**	−.27**	−.42**	−.47**	−.58**	.52**	−.29**	−.46**[a]	−.31**	.43**	−.19**[a]
	−.28**	−.27**	−.35**	−.45**	−.53**	.50**	−.23**	−.38**	−.27**	.42**	−.07
	−.46**	−.26**	−.51**	−.48**	−.64**	.51**	−.38**	−.58**	−.38**	.40**	−.37**
Mother's perception of child's perception of importance of math	−.03	.02	.13*	.15*	.14*	−.08	.17**	.18**	.17**	−.07	.21**
	−.09	.11	.09	.10	.09	−.05	.20*	.13	.18*	−.03	.22**
	.04	−.12	.17	.18	.18	−.09	.09	.24*	.17	−.09	.17
Mother's future expectancies for child	.51**	.29**	.48**	.50**	.56**	−.33**	.28**	.55**	.36**	−.35**	.19**
	.53**	.28**	.45**	.50**	.56**	−.41**	.18*	.49**	.37**	−.34**	.17*
	.49**	.29**	.51**	.50**	.56**	−.22*	.41**	.63**	.34**	−.35**	.21*

Note.—Within each row there are three sets of correlations. The top set contains the correlations for all subjects. The middle set contains the correlations for females. The bottom set contains the correlations for males.

[a] Boxed correlations contain a set of correlations in which the male and female correlations differ $p < .05$.

* $p < .05$.

** $p < .01$.

TABLE 2—*Continued*

	Past Math Performance	Intention to Take More Math	Current Expectancies in Math	Future Expectancies in Math	Self-Concept of Math Ability	Perception of Task Difficulty	Value of Math	Perception of Parents' Perception of Child's Math Ability	Perception of Parents' Future Expectancies for Child	Perception of Parents' Perception of Task Difficulty for Child	Perception of Parents' Aspirations for Child
Father's perception of importance of math for child	.41** .48** .32**	.34** .38** .28**	.26** .30** .21*	.37** .36** .40**	.31** .34** .27**	−.02 −.06 .03	.26** .22* .35**	.34** .38** .28**	.19** .15 .25*	−.10 −.19* −.00	.07 .02 .17
Father's perception of child's math ability	.46** .47** .44**	.27** .25** .31**	.36** .36** .34**	.43** .41** .45**	.47** .48** .45**	−.28** −.33** −.20	.26** .18* .38**	.48** .43** .55**	.24** .19* .29**	−.28** −.35** −.16	.07 −.01 .19
Father's perception of child's effort in math	−.31** −.28** −.34**	−.20** −.22** −.17	−.35** −.34** −.33**	−.39** −.38** −.37**	−.45** −.43** −.43**	.38** .32** .41**	−.25** −.17* −.33**	−.37** −.30** −.43**	−.21** −.17* −.25*	.34** .33** .33**	−.16* −.11 −.18
Father's perception of task difficulty for child	−.36** −.37** −.35**	−.19** −.17* −.21	−.43** −.37** −.48**	−.43** −.35** −.49**	−.53** −.47** −.58**	.40** .35** .40**	−.25** −.14 −.38**	−.50** −.42** −.59**	−.29** −.21* −.37**	.32** .33** .27*	−.12* .01 −.27*
Father's perception of child's perception of importance of math	−.02 −.07 .03	.11 .10 .11	.06 .05 .06	.12 .08 .15	.03 −.01 .06	.10 .13 .12	.17** .18* .10	.06 .04 .09	.16* .21* .04	.01 .04 .01	.18** .25** .00
Father's future expectancies for child	.53** .57** .49**	.22** .21* .24*	.30** .30** .30**	.40** .40** .42**	.39** .38** .40**	−.21** −.28** −.12	.20** .10 .34**	.35** .28** .43**	.18** .15 .22*	−.21** −.22** −.19	.09 .07 .11
						Child Perceptions					
Perception of parents' perception of child's math ability	.34** .27** .42**	.32** .34** .29**	.61** .58** .64**	.64** .62** .65**	.72** .74** .69**	−.38** −.44** −.28**	.42** .35** .51**	1.00 1.00 1.00	.49** .45** .55**	−.36** −.36** −.36**	.25** .19** .33**
Perception of parents' future expectancies for child	.10 .04 .17	.26** .26** .27**	.47** .52** .42**	.58** .59** .58**	.52** .55** .48**	−.21** −.21** −.21*	.45** .41** .50**	.49** .45** .55**	1.00 1.00 1.00	−.26** −.25** −.28**	.73** .73** .75**
Perception of parents' perception of task difficulty for child	−.13* −.06 −.22*	−.11 −.15 −.06	−.37** −.38** −.35**	−.32** −.29** −.34**	−.44** −.45** −.42**	.51** .46** .57**	−.15** −.16* −.13	−.36** −.36** −.36**	−.26** −.25** −.28**	1.00 1.00 1.00	−.12* −.07 −.18

Recursive, path analysis (Duncan 1966) was used to assess this hypothesis. This statistical technique allows one to estimate both direct and indirect relationships among variables. The coefficients of the relations between the predictor and criterion variables provide the test of significance.

Before performing the path analysis, parent scores were factored using the exploratory factor-analytic procedures developed by Joreskog, Sorbom, and Magidson (1979). Factor analysis was performed to reduce the number of parent variables and to reduce the multicollinearity in the parent variable set. Using criteria suggested by Joreskog and Sorbom (1978), it was determined that a four-factor structure best described the underlying relationships. The four factors were (*a*) both parents' perceptions of the importance of math for their child, (*b*) fathers' perceptions of the difficulty of math for their child, (*c*) mothers' perceptions of the difficulty of math for their child, and (*d*) both parents' perceptions of their child's math ability.

A model based on the above predictions and on the model proposed by Parsons et al. (in press) was then specified. Referring to figure 1, we predicted that the variables in the first (far-left) column would have a direct effect only on the variables in column 2; the variables in column 2 would have direct effects on the variables in column 3; and finally, that children's expectancies in math would be directly predicted by the variables in column 3.

The path coefficients were estimated using a series of multiple-regression equations. At each step the criterion variables in a given level (or column) of the model were regressed on the prediction variables from all previous levels (or columns). The coefficients were standardized; thus their size provides an estimate of the relative strength of the relations specified by each path. However, since these estimates are based on multiple regressions, they are dependent on the set of variables used in each analysis and should not be taken as absolute estimates of any given relationship.

In an initial path analysis the one father factor (father's perception of the difficulty of math for his child) did not emerge as a significant predictor of anything. Rather than limit our sample to two-parent families, we omitted this father variable and used the mother's response as an indicator variable for the two-parent factors for children in one-parent households. We then repeated the path analysis. The results of this analysis are depicted in figure 1. The basic path structure was equivalent to the

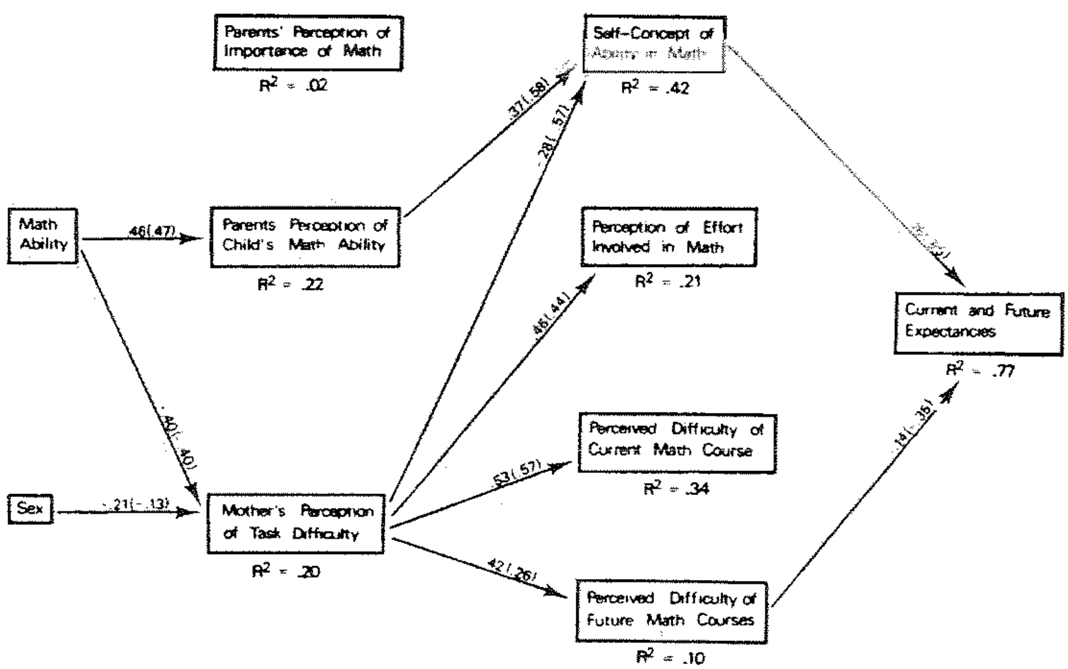

FIG. 1.—Path analysis of parent and student attitudes. All paths significant at $p < .01$; $N = 201$; standardized beta weights are shown on path; zero order correlations are shown in parentheses; R^2 = percent of variance accounted for on each criterion measure by all preceding predictor variables; each R^2 is listed under its criterion measure.

structure which emerged in the initial analysis. The results depicted in figure 1, however, are representative of a broader population of family types.

The path analysis was collapsed across our male and female samples so that sex could be used as an independent variable. To make sure that this collapsed analysis was equally representative of boys and girls, within-sex correlations of the predictor and criterion variables were compared. The only correlation which was not comparable for boys and girls at the $p <$ .05 level was that of child's math ability and parents' perception of child's math ability. However, further examination showed that both the magnitude and direction of the path coefficient of this relationship were virtually identical when within-sex path analyses were compared. We thus are confident that our path analysis applies to both boys and girls.

In support of our predictions, the children's self-concepts and task concepts were more directly related to their parents' beliefs about their math aptitude and potential than to their own past performance or their sex. While these results do not demonstrate causality, they are congruent with the hypothesized causal model.

With regard to the differential effectiveness of various socializers, the two-path analyses and the factor analysis suggest that mothers have the stronger influence on children's achievement beliefs and attitudes; fathers appear to have little independent effect over and above that which they share with mothers.

Conclusions

In conclusion, parents had sex-differentiated perceptions of their children's math aptitude despite the similarity of the actual performance of boys and girls. This difference was most marked for parents' estimates of how hard their children have to try to do well in math. Parents of sons also thought advanced math was more important for their child than parents of daughters, perhaps reflecting a tendency to encourage children to develop skills which are assumed to be "natural" for the child. Parents' perceptions of and expectations for their children were related to both the children's perception of parents' beliefs and to the children's self- and task perceptions. Further, parents' beliefs were more directly related to children's self-concepts and expectancies than were the children's own past performances in math. Path analysis supported our hypothesis that the children's attitudes are influenced more by their parents' attitudes about their children's abilities than by their own past performances. Finally, parents as role models of sex-differentiated math behaviors did not have a direct effect on their children's self-concepts, expectations, and course plans.

In line with Popper's comments (1979) on the importance of negative observations for scientific understanding, these data also indicate that parents do not influence their children's achievement attitudes and beliefs through their power as role models. Instead, parents have their major impact as conveyors of expectancies regarding their children's abilities. Unfortunately, parents hold sex-stereotyped beliefs regarding their children's achievement potential, and these beliefs appear to be the critical parental mediators of the sex differences we find in children's achievement self-concepts. Parental beliefs are even more critical mediators than the children's own math performance. While we do not have, as yet, the necessary longitudinal data to test the hypothesis, it seems probable that parents are exerting this influence through their role as interpreters of reality. By attributing their daughters' achievements to hard work and their sons' to high ability, parents may be teaching their sons and daughters to draw different inferences regarding their achievement abilities from equivalent achievement experiences.

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