

THE RELATION BETWEEN PARENTS' AND ADOLESCENTS'  
GENDER STEREOTYPES AND ABILITY BELIEFS

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A growing body of literature has established the importance of parents' beliefs in influencing their children's achievement attitudes and academic performance. Parents' beliefs and expectations have been related to the child's performance history (Entwisle & Baker, 1983; Entwisle & Hayduk, 1978, 1981); performance on cognitive tasks (McGillicuddy-De Lisi, 1985); and self-perceptions of ability and achievement expectancies (Hess, Holloway, Dickson, & Price, 1984; Parsons, Adler, & Kaczala, 1982; Stevenson & Newman, 1986). The influence of parents may be especially important during early adolescence when children are making choices about courses, friends, and how to spend their time.

Although parents' specific beliefs about their children have been studied, less is known about parents' more general beliefs about the abilities of males and females. In addition to specific beliefs about their child's math abilities, parents may hold more general stereotyped beliefs about achievement. Studies suggest that parents and other adults hold general beliefs about the appropriateness of certain behaviors for each sex (Connor & Serbin, 1977; Fagot, 1973, 1974; Jacobs & Eccles, 1985; Perloff, 1977). These, more general attitudes are likely to contribute to the influence of parents' specific beliefs about the child's

abilities on children's beliefs about achievement. The interrelationships of various parent attitudes and their combined effects on the child are not known. The purpose of the study reported here was to investigate the relation of parents' gender stereotyped ability beliefs to their specific beliefs about their child's ability; and to measure the influence of stereotyped and specific ability beliefs on children's math achievement attitudes and performance.

### Stereotyping

The word "stereotype" is used here to refer to beliefs about characteristics of a social group that are generally agreed upon by a significant proportion of the population. Thus, in this paper, the groups in question are males and females and the stereotype of interest is the belief that males are more talented at mathematics than females. Those people who see no differences between the abilities of males and females are considered to be non-stereotyped for this belief.

The idea that stereotypes about a group should affect reactions to individuals within that group is borne out in everyday experiences with people who hold stereotypes that seem to influence their behavior. An extensive social psychological literature supports this notion. This research indicates that, even in the presence of information about specific individuals, stereotypes have a significant impact on other perceptions (Amir, 1969; Darley & Gross, 1983; Landy & Sigall, 1974). However, Locksley and her associates have evidence challenging this idea

(Locksley, Borgida, Brekke, & Hepburn, 1980; Locksley, Hepburn, & Ortiz, 1982). They suggest that when specific "individuating" information about a particular person is available, such as past or present behavior, stereotypes will exert little, if any, effect on a judgment made about the person. For example, although parents may believe that boys in general are superior in math when compared to girls, they may not believe that a particular boy is better in math than a particular girl. Stereotypes are probabilistic beliefs about the extent to which traits are associated with particular groups and they function as a kind of base-rate (or prior probability). Evidence that base rates are ignored in favor of specific sources of information is consistent with the decision-making literature (Bar-Hillel, 1980; Kahneman & Tversky, 1973).

#### Changes in Beliefs with Development

Parents' impact on their children is expected to vary by the age of the child. Parents may have more or less influence at particular times and their stereotyped and specific beliefs may have differing effects as children develop. In addition to changes in the ways parents influence children as they get older, the child's development may alter parents' beliefs. Parents assess performance amidst changing external conditions and as children's needs, knowledge, abilities, and motivations change. This may produce ability beliefs about the child that are not very stable, so the parent may depend more on stereotyped beliefs to make specific ability assessments when the child is young.

This study was designed to investigate the influence of stereotypes held by parents on their specific beliefs about their own child and on the child's beliefs and performance. Beliefs about gender differences in math ability was the stereotype chosen because of its inherent salience to parents and because parents could be expected to vary in the degree to which they held the stereotype. Three general issues are of interest: (1) the relations between parents' gender stereotyped ability beliefs and their specific beliefs about their own child's ability; (2) the relative influence of parents' stereotyped and specific ability beliefs on children's attitudes and performance; and (3) the effects of the child's development on parents' and children's stereotypes and ability beliefs.

## Method

### Subjects

This study was part of a two-year, longitudinal study of children from sixth through eleventh grade. Only students whose parents participated are included in the present study. Approximately equal numbers of girls and boys participated (females make up 51.4% of the sample). The parent sample consisted of 424 mothers and 390 fathers of these students. In most cases, the mothers and fathers are parents of the same child (N=387). The classrooms were located in two school districts in primarily white, middle class suburbs outside of a large midwestern city.

### Measures

Student and parent questionnaires. A variety of questions regarding children's and parents' beliefs and attitudes about math appeared on the questionnaires. The items used in this study are a subset of the total asked on the questionnaires. Two three-item scales were used for students and parallel scales were used for parents. These scales were originally developed by Parsons, et al. (1980) and have high internal consistency as tested by Cronbach's alpha coefficient. Students answered all scale items using 7-point Likert response formats. All scales are scored so that high scores are consistent with the label of the scale. In addition, students and parents answered one gender-stereotype item about males' and females' relative math abilities.

School record data. In all of the analyses math grades are used as a measure of math performance and as a control for math ability. Math grades were collected from school records. Schools varied in their grading systems, however all grades were coded to reflect a system ranging from "F" for failing to "A+". Codes from these letter grades range from 1 (F) - 14 (A+).

### Procedures

Trained field staff administered questionnaires to students in two 30-minute sessions during math class. Students completed questionnaires each spring of the two year study. They answered questions at their own pace without time limits (except the length of the class period).

The parent questionnaires were mailed to the homes of

parents who had agreed to participate. Each parent completed a separate questionnaire and then returned it in an enclosed pre-paid mailer. Seventy-two percent of the mothers and sixty-six percent of the fathers returned questionnaires.

## Results

### Preliminary Analyses

Preliminary analyses revealed no significant relations between parent's occupation, education, number of siblings and parent or child attitudes. Similar tests to discover the association between math attitudes and previous math grades revealed that parent and child attitudes were significantly related to child's math grades ( $r$  ranged between .20 and .60). Due to the lack of a relationship or very small relationship between parent occupation, number of siblings, education, and the attitudinal variables these three variables were not controlled in the subsequent analyses. Because of the significant relation between math grade and attitudes, however, child's previous grade was controlled in all analyses reported here.

### Relations Between Mothers' and Fathers' Beliefs

A question of interest in this study is the relation between the beliefs of parents within one family. If a mother and father base their ability beliefs on information obtained from interactions with and external evaluations of their child, the two parents' beliefs are likely to be highly related to each other. If the parents use different sources of information or interpret it differently, their beliefs about their child may be

dissimilar from each other. To test these relationships, comparisons between mothers' and fathers' specific beliefs and their stereotyped beliefs were made. Mothers' and fathers' specific beliefs about their child's math ability were highly related,  $r = .61$ ,  $p < .00001$ , but their stereotyped beliefs bore much less resemblance to each other,  $r = .14$ ,  $p < .01$ . This indicates that mothers and fathers share beliefs about their child's math ability, but do not hold gender stereotyped beliefs in common. Parents' may form their impressions of their child's abilities from shared information available about the child, but their stereotyped beliefs do not seem to be formed in response to information about their own child.

#### Relations Between Child's Ability and Parents' Perceptions

If parents' specific beliefs are informed by their children's performance or other characteristics, it is possible that the relation between specific and stereotyped beliefs may be different for parents of children at different ability levels. To check this, children were categorized according to their previous year's grades into low, medium, and high ability groups. Pearson product-moment correlations between parents' stereotyped and specific ability beliefs were then calculated for children at the three ability levels. To test the hypothesis that the populations have equal correlations, the correlations for each ability level were compared using Fisher's  $r$  to  $Z$  transformation (Hays, 1973, pp. 662-664). Beliefs of mothers and fathers of sons and daughters were compared separately. No



significant differences between ability levels ( $p$ 's  $> .05$ ) were found for mothers' or fathers' beliefs for either sons or daughters (mothers: daughters,  $V = 2.64$ , sons,  $V = 2.79$ ; fathers: daughters,  $V = 1.68$ , sons,  $V = 2.70$ ).

#### Parent Influences on Child Beliefs and Behavior

A major goal of this study was to examine the relative influences of parents' gender stereotypes and specific ability beliefs on children's attitudes and performance. Although research in the last decade has demonstrated that the child affects the parent as well as vice versa (Bell, 1968; Lewis & Rosenblum, 1974; Wachs & Gruen, 1982), the concern of this paper is the parents' influence upon the child. Therefore, the model is limited to testing unidirectional effects.

As suggested earlier, mothers' and fathers' specific ability beliefs are highly related, but their gender-stereotyped beliefs are not. This does not differ by the age of the child. This may mean that parents' beliefs about their own child are responsive to changes in the ability information available and to perceived changes in the child's performance, but that stereotypes are not affected by information about one's own child. If this is the case, parents' stereotypes may influence their child-specific attitudes, which, in turn, are related to their children's beliefs. Thus, stereotyped beliefs may have an indirect effect on children's attitudes rather than a direct effect.

To investigate this, a path analytic model which tested both the direct and the indirect effects was developed. Recursive

path analyses (Duncan, 1966) permit the estimation of both direct and indirect relationships among variables. This model is an elaboration of the model proposed by Parsons, Adler, Futterman, Goff, Kaczala, Meece, & Midgley (1983) and tested by Parsons, Adler, & Kaczala (1982). Their model focused on parents' and children's attitudes about the target child's math abilities. The model presented here focuses on a more narrow set of beliefs in greater depth by emphasizing the impact more general, stereotypes may have on those beliefs and by including the impact of the beliefs on a performance outcome variable.

The same model was used for mothers and fathers. The results for mothers are illustrated in Figure 1. The variables included in the first column are previous year's math grade, year in school, sex of child, parent stereotype, and the interaction of parent stereotype and child sex. The previous year's math grade is included as a measure of math ability and because it is expected to predict to both parents' and children's perceptions of the child's math ability. Year in school is included to answer many of the developmental concerns posed earlier. The interaction term is the variable of major interest for many of the questions raised in this study because parents' gender-stereotyped beliefs are expected to affect sons and daughters differently. A significant path between the interaction term and parent or child beliefs will indicate that the influence of parents' stereotypes about gender differences in math ability depends on the sex of their own child.

The interaction of stereotypes, sex, and year in school was originally included to test the differential effects of stereotypes on boys and girls as they get older. However, the triple interaction term was not a significant predictor of either parent or child beliefs in any of the models, suggesting that the interaction of sex and stereotypes does not depend on the child's age. Therefore, the triple interaction is not included in the models described here. Other interaction terms were included in earlier models, but they did not contribute significantly to an explanation of parent and child beliefs.

Sex of child was coded as daughters = 0, sons = 1. The interaction term was constructed by first standardizing the stereotype variable and then, multiplying the sex and stereotype variables together. All other variables (dependent and independent) were standardized before being entered into the regression equation. The reported path coefficients are b-weights rather than beta-weights (Kerlinger & Pedhazur, 1973, p. 25), but the two are equivalent in all cases except for sex and the interaction term. This analysis strategy allows a straightforward interpretation of the relative weights received by sex, stereotype and the interaction of sex and stereotype. The coefficient for sex corresponds to the difference between sons and daughters in standard deviation units. Because of the coding for sex and stereotype, the path coefficient for the interaction term may be interpreted as the difference between the standardized effect of stereotyped beliefs for parents of sons

and parents of daughters (Kerlinger & Pedhazur, 1973, p. 252-253). Due to the gender-specific nature of the beliefs, it is this difference between the effects for boys and girls that is critical for determining the impact of stereotyped beliefs. Therefore, the effect for stereotypes can only be interpreted in light of the interaction term. The coefficient for stereotypes is the effect for parents of daughters. The effect for parents of sons can be calculated by adding the coefficient for the interaction term to the coefficient for stereotypes.

A concern about the use of year in school as an indication of developmental patterns might be raised because regression allows for only linear relationships to other variables. This would be inadequate if the real relation between age and attitudes is non-linear. However, preliminary examination of age-specific means for the variables used in this study indicates that linear relationships hold. The preliminary analyses indicated that previous year's math grade is related to parent and child attitudes, so it is also included as a control.

Year in school, child sex, and previous math grade are expected to have direct effects on parent beliefs, child beliefs, and current math grade. Current math grade was used as the final outcome variable. This was the grade received at the end of the first year of data collection, which was after the data reported in this paper were collected, so that the current grade did not affect the beliefs used to predict to it. All of the analyses have also been done with the grade received at the end of the

second year of the study as the outcome variable and with children's beliefs from year two. The patterns of results remain the same, although the effects are weaker.

The path coefficients were estimated using a series of least squares regressions. At each step the criterion variables in a given level of the model were regressed on the prediction variables from all previous levels. Because the variables were standardized, the size of the coefficients provides an estimate of the relative strength of the relations specified by each path. The amount of variance accounted for is listed under each criterion measure. Due to concerns about multi-collinearity, separate analyses were done for mothers and fathers. The model for mothers is presented in Figure 1 and the the model for fathers is presented in Figure 2.

Ability Perceptions. The models for ability perceptions of both mothers and fathers clearly uphold the hypothesis that stereotyped beliefs have a direct effect only on parents' specific ability beliefs and have indirect effects on children's self-perceptions and later grades. The path coefficients for stereotypes and the interaction term indicate that parents of daughters who believe that males and females have equivalent math talents believe that their daughters have more math ability than do parents who hold the stereotype that males are better in math. The relationship was significantly different for parents of sons. Parents of sons who believe that males are mathematically superior have higher ability beliefs about their

sons than parents not holding the stereotype. These findings suggest that stereotyped beliefs have a sex-specific impact and that the effect for sons is weaker than the one found for daughters.

Mothers' ability beliefs about their own children are most strongly influenced by the previous year's grades and the sex of their child. Their beliefs, in turn, have a strong influence on the ability beliefs of their children. Children are also influenced by their previous math grades and their self-perceptions decrease with increasing age. Finally, children's self-perceptions of ability are predictive of the current year's math grade. A direct path also exists between mothers' beliefs and the current year's math grade.

Last year's math grade is the strongest predictor of fathers' ability beliefs, followed by the interaction of child sex and stereotypes, and stereotypes alone. Child sex has no direct influence except as it interacts with stereotyped beliefs. Fathers' ability beliefs also have a strong direct influence on child's ability beliefs. Previous math grades appear to have both a direct influence and an indirect influence on children's ability beliefs. Child's ability beliefs also are directly related to current math grade.

A comparison of the models for mothers and fathers indicates that most of the paths are the same in the two models, with one notable exception. It is the strong path between child sex and mothers' beliefs which does not exist for fathers for either

ability beliefs or future expectancies. Fathers' beliefs about their children are not directly affected by the sex of the child, except as child sex interacts with their stereotypes. This may mean that mothers and fathers use slightly different information to inform their perceptions of their child's abilities, so that the content of their beliefs differ slightly. This may result in the provision of different information to the child about her/his abilities.

As predicted, in both models, child sex directly affects children's self-perceptions and their current math grades. It is important to note that the coefficient for the path between sex and child beliefs is positive, indicating that boys have higher ability beliefs, but that the coefficient between sex and math grade is negative, indicating that girls actually have higher grades in math. These coefficients represent estimates after controlling for all other predictors, although the relationships hold for the zero-order correlations as well.

Future Expectancies. A second model was tested, again using parents' stereotyped beliefs, but predicting to the future expectancies of parents and children for the child's success in math. This model is depicted in Figure 3 for mothers and in Figure 4 for fathers. Generally, the models for ability beliefs and future expectancies look very similar. As in the model for beliefs about ability, parents' stereotypes and the interaction of sex and stereotypes have a direct influence only on parent expectancies, and therefore, an indirect influence on children's

future expectancies. The path coefficients for stereotypes and for the interaction term indicate that parents of daughters who hold egalitarian beliefs have higher expectancies for their children's future success in math. This differs considerably from the effect for parents of sons. Almost no relation is found between stereotypes and parents' expectancies for parents of sons. Mothers and fathers again look very similar with the exception of the direct path between sex of child and fathers' beliefs. Instead, the effect of child's past performance in math on fathers' beliefs is quite strong.

Although the models for parents' ability perceptions and future expectancies look very similar, one major difference is that the direct effects of year in school on parents' and children's beliefs are not seen for future expectancies. Apparently, future expectancies for success in mathematics are not directly linked to the age of the child. Another difference between these models is that both mothers' and fathers' future expectancies have a much larger direct effect on the current math grade than did their ability beliefs, however, children's future expectancies have much less of a direct effect than did their ability beliefs.

#### Grade Level Effects on Parent and Child Beliefs

Although many of the analyses reported above tested the effects of child's grade level on parents' and children's beliefs, these points have not been emphasized. In this section, the changes in parents' and children's beliefs related to the



development of the child will be explored. Findings from a number of different analyses will be reviewed and summarized.

Developmental effects are usually conceived in terms of changes in children as they get older. However, parents' beliefs and attitudes also are likely to change as their children age. An analysis of variance, comparing the three grade levels (elementary, junior high, high school) was done for each parent ability belief to examine the way in which stereotypes and specific beliefs change. Fathers of children in the three age groups have significantly different ability beliefs ( $F(2,503) = 15.95, p < .0001$ ) with fathers of elementary children believing that their children have less math ability than do fathers of the two older groups. The same is true for mothers. Mothers of children in the three age ranges have significantly different ability beliefs about their children ( $F(2,546) = 12.84, p < .0001$ ). Again, the mothers of elementary children have significantly lower beliefs than mothers of the older children.

The findings reported above may be due to differences in the samples. The younger group of children represents a more diverse group of children because children in the lower grades are required to take math. This may mean that, on the average, they have lower abilities than the older group who may self-select into more advanced math classes. The age differences do not hold, however, for stereotyped beliefs. No significant differences were found between parents of children in the three age groups for stereotypes. These findings suggest that parents

do not alter their general views to fit their beliefs about their child as the child gets older.

It appears that parents' specific ability beliefs are affected by the development of their child, but do parents' beliefs affect children differently as they develop? If parents and children are influencing each other, their attitudes may be expected to become more similar as children get older. However, when Fisher's  $\underline{r}$  to  $\underline{Z}$  transformation was used to compare the relations between parents' and children's math ability beliefs over the age span, no significant differences were found. The same was true for the relation between parents' and children's stereotyped beliefs. Whatever influence one group has on the other appears to remain stable between elementary school and high school.

Grade-level effects appear in the path models in the form of direct paths from year-in-school to all three criterion variables. School year has a relatively weak, positive relation to parent beliefs in the ability model, indicating that parents of older children hold more favorable beliefs about their children's math abilities than parents of younger children. Again, this could be due to the selection bias in the older sample. Grade level has the opposite influence on children. The negative path coefficients between year-in-school and children's ability beliefs indicates that older children's self-perceptions are lower than younger children's. This effect may reflect a general developmental decline or a cohort effect. The

increasingly negative self-perceptions of math ability with grade level may be related to the fact that older children are receiving lower grades, as demonstrated by the negative path coefficients between school year and current math grade. Although this may be an artifact due to stricter grading practices in advanced math classes and self-selection into those classes, it is important to note that parents are aware of the fact that just being in higher math classes denotes higher ability, thus their increasingly positive beliefs about their child's ability. Parents typically have access to the same grading information, but they do not let it outweigh the fact that continuing in advanced math classes is related to high ability. Children may not be aware of this fact, may not use it to inform their ability perceptions, or may overuse the social comparison information available from ability-grouped math classrooms.

The picture is slightly different for the models of future expectancies. The major difference between these models and the ability models is that the direct paths between school year and parent and child beliefs do not exist in the future expectancy models. This suggests that any changes in expectancies for future success in math experienced by parents or children as children mature are not due primarily to age or other selection factors. Grade in school did not interact with any other variables to modify this lack of effect. These findings suggest that the future expectancies of parents and children do not

depend on the age of the child or continued participation in math classes at more advanced levels.

#### Discussion

Three issues were addressed in this study. First, the relations between parents' gender-stereotyped ability beliefs and their specific beliefs about their own child's math ability were investigated. Second, the relative influences of parents' stereotyped and specific ability beliefs on children's self-perceptions of their math abilities were examined. Third, this study addressed the effects of the child's grade level on both parents' and children's ability beliefs. The analyses presented here have provided useful information relative to all three issues.

The first issue concerns the relation between stereotypes and beliefs about a specific member of a stereotyped group. This study provides more insights into the nature of that relationship in a setting in which beliefs have real consequences for the messages parents give to their children. Two major facets of the relationship between stereotyped and specific beliefs were apparent. First, parents' gender stereotyped ability beliefs have a direct effect on their specific beliefs about the child's math ability and expectancies for the child's future success in math, but only an indirect effect on their children's beliefs. Second, the effect of parents' stereotypes on their beliefs about their child's math abilities is sex-specific--parents who hold stereotypes have higher ability perceptions than non-stereotyped

parents if they have sons and lower ability perceptions and future expectancies than their non-stereotyped counterparts if they have daughters.

These results suggest that stereotypes are used as another source of information about the child, rather than changing in response to individuating information about the child. Although parents' specific ability beliefs are informed by characteristics of their child, their stereotyped beliefs do not change in response to the child's performance or to the child's grade level. This could be interpreted as a use of base-rates in addition to individuating information to make an informed evaluation of the child's ability.

The second goal of this study was to investigate the influence of parents' beliefs on children's self-perceptions and performance. Generally, parents' beliefs about their children's ability had a major impact on younger and older children beyond the effects of grade level and past performance. Parents' perceptions of their child's math ability had an even greater impact on the child's self-perceptions of ability than previous math grades. This finding replicates the earlier findings of Parsons, et al (1982) and supports their conception of parents as "interpreters of reality".

The path models suggest that parents' stereotyped beliefs have their main impact on children's self-perceptions indirectly, as mediated through parents' specific beliefs about their child's ability. As predicted, the effect is different for sons and

daughters. Parents of daughters who believe that males and females have equal talents in math have higher ability beliefs and higher future expectancies for their children than stereotyped parents of daughters. Similarly, parents of sons who believe that males are superior in math have higher ability beliefs than those who do not hold stereotypes.

The effects of grade level on children's and parents' perceptions was the third issue considered in this study. Parents' specific beliefs about the abilities of their own children appear to be affected by their child's grade level, being more positive for older children. However, no differences between the stereotypes of parents of younger and older children were found and none of the predicted interactions between grade level and other variables were found. Because parents of older children have more performance information than parents of younger children, these findings suggest that parents' specific beliefs are informed primarily by changes in their child's performance, but that their stereotyped beliefs are not. Two other findings support this interpretation: (1) that a child's mother and father hold similar perceptions of their own child's ability, but do not share stereotyped beliefs and (2) that parents' stereotyped and specific beliefs do not converge with increasing age of the child. Interestingly, older children's stereotypes are not any more similar to their parents' stereotypes than are those of younger children.

Although parents' specific ability beliefs are more positive

for older children, older children's ability beliefs are lower than those of younger children. This could be interpreted as accuracy on the part of children because their grades are actually going down as they get older. However, their grades probably go down because the courses become more difficult and more selective in the upper grades and because teachers appear to use more stringent grading practices in higher grades. This means that parents may be discounting the grades and interpreting the information that their children are still enrolled in math as evidence of their ability. This study does not provide evidence of the reason for children's increasing pessimism about their math abilities with increasing grade level, but it appears that children do not interpret the information about grades and continued enrollment in the same way as their parents.

It is important to note that in the analyses presented here boys have consistently higher ability beliefs and future expectancies than girls; and by high school, boys and girls hold the stereotype that boys are better in math than girls. However, girls have consistently higher grades in mathematics than boys at all grade levels. This incongruity suggests that children are forming their self-perceptions and stereotypes based on something besides their own and classmates' performance. One source of information is their parents' beliefs, which are generally higher for boys than girls in the math domain. It is clear from this study that their parents are not using the true base-rate to inform either their specific or their stereotyped beliefs. That

is not too surprising because they are not likely to have access to performance information about very many children. Thus, they continue to hold stereotypes that do not change based on the information they receive about their own child and believe that their child is an exception to the rule. Parents use all of the information available to them to form their perceptions of their children, including perceived base-rates and individuating information. It is this amalgam that they present to their children.



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Figure 1  
Mothers' Perceptions of Ability: Path Analyses

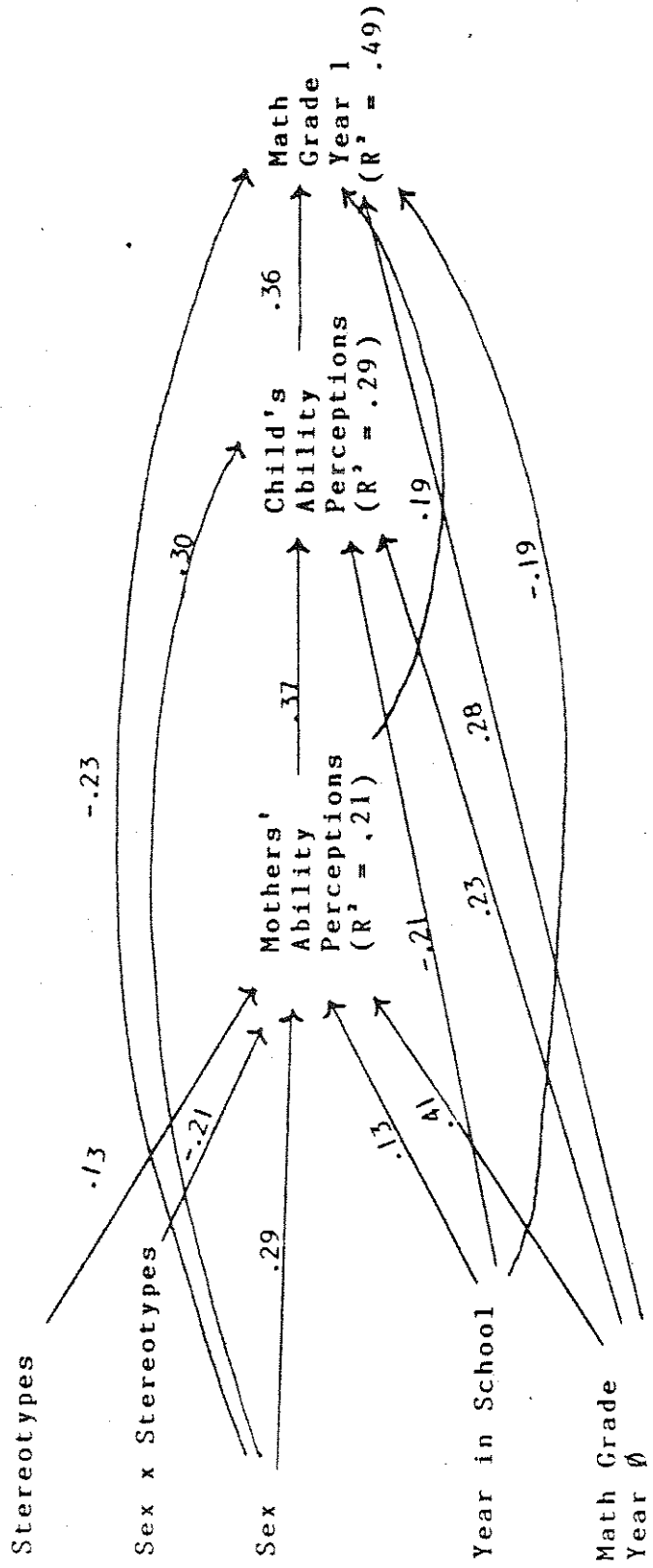


Figure 2  
Fathers' Perceptions of Ability: Path Analyses

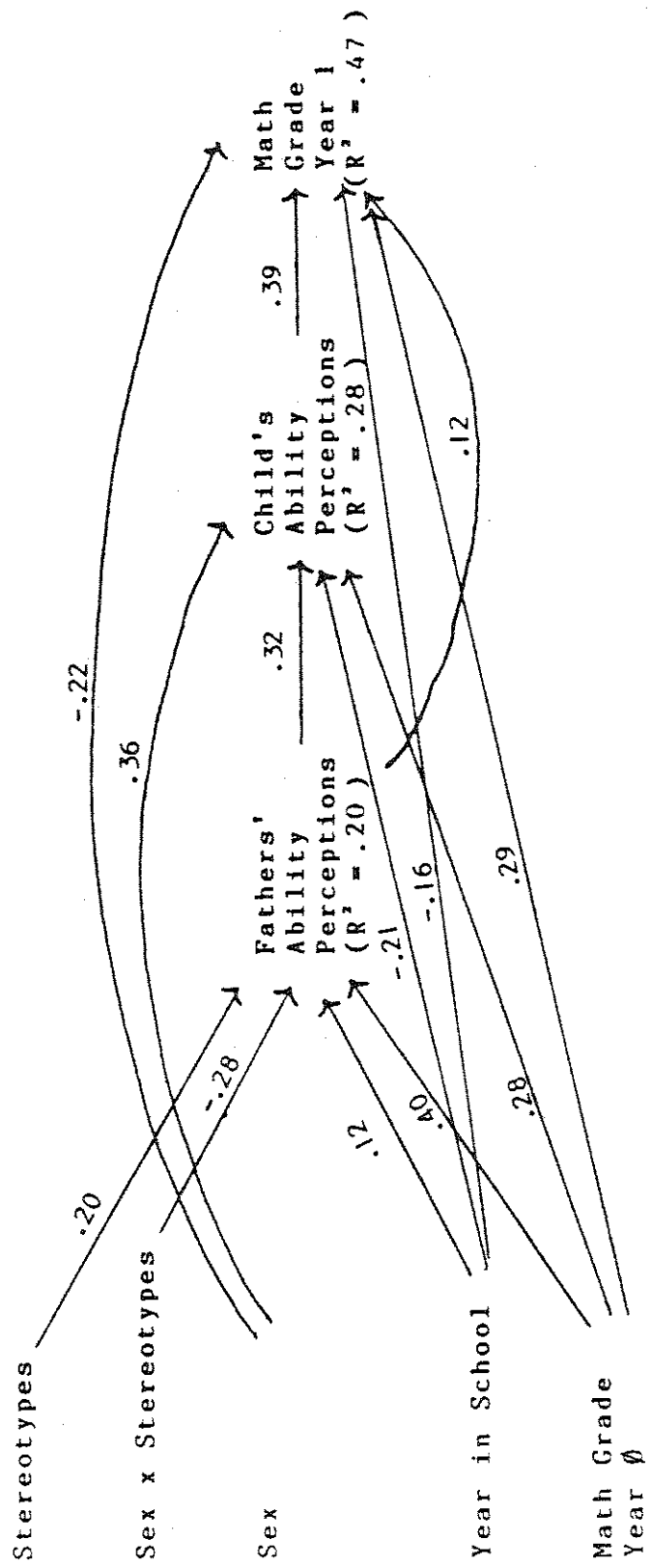


Figure 3  
 Mothers' Future Expectancies: Path Analyses

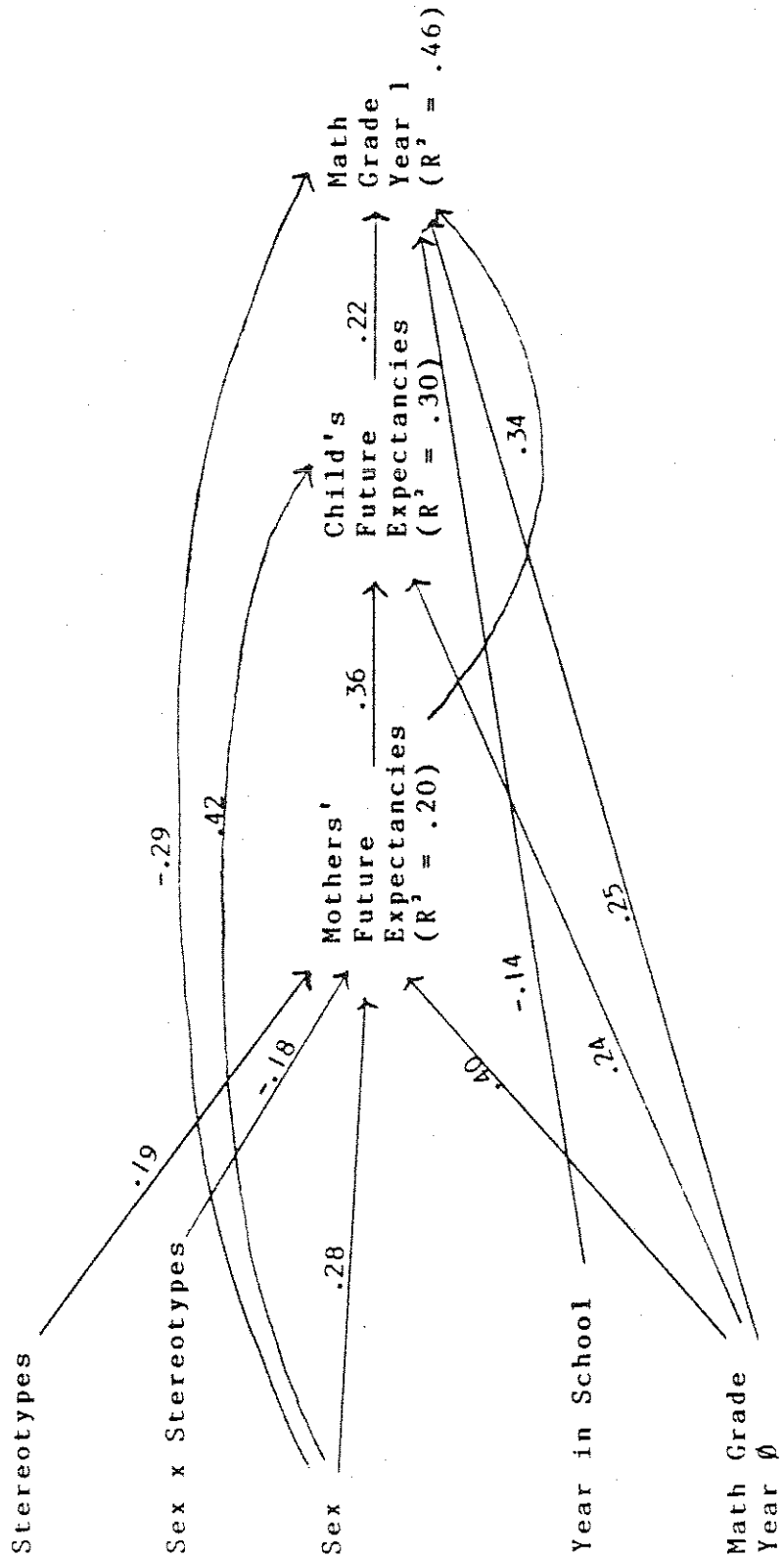


Figure 4  
Fathers' Future Expectancies: Path Analyses

