

A COMPARISON OF PARENTS' AND CHILDREN'S ATTRIBUTIONS
FOR SUCCESSFUL AND UNSUCCESSFUL MATH PERFORMANCES

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Abstract

Students have reported that late elementary school and early junior high school are critical periods for changes in their attitudes towards mathematics. It is at this point that students in general become more negative about math, with girls becoming much more pessimistic and reporting much lower estimations of their math ability than boys -- even though by objective indices they may be performing at comparable levels. Attribution theorists (e.g. Frieze et al., 1978; Weiner et al., 1971; Weiner, 1972) argue that people's causal explanations for successes and failures have an important impact on their expectations for future success, their self-esteem, and their subsequent achievement behaviors. Dweck and her colleagues (1972) propose that boys and girls show different attributional patterns for success and failure. Boys attribute their success to ability whereas girls attribute their success to effort. Boys attribute their failure to lack of effort whereas girls attribute their failure to lack of ability. Parents may convey information regarding their beliefs about their children's abilities through the causal explanations they provide for their children's math successes and failures. Mothers and fathers of 48 junior high school boys and girls were interviewed to assess their perceptions of their children's ability and effort in math, and their causal explanations for their children's successful and unsuccessful math performances. Similar items were administered to students during their math class periods. We will discuss (1) whether boys and girls offer different causal attributions for their math successes and failures, (2) whether child sex has an impact on parents' causal attributions for their children's math successes and failures, and (3) whether there is concordance between parents and children on their causal explanations for math successes and failures.

Students have reported that late elementary school and early junior high school are critical periods for changes in their attitudes towards mathematics (Callahan, 1971; Dutton, 1968). It is at this point that students in general become more negative about math, with girls becoming much more pessimistic and reporting much lower estimations of their math ability than boys -- even though by objective indices they may be performing at comparable levels (Fennema, 1974; Fennema and Sherman, 1977; Hilton and Berglund, 1974). Furthermore these declines in students' attitudes are not paralleled in other academic subjects (Brush, 1980; Parsons et al., in press). Several studies suggest that socialization agents such as teachers and parents may have an important impact on this sex difference. We would like to focus on parents' contributions to children's attitudes towards math achievement. In a national study, junior high school students ranked what their parents think second only to the usefulness of math in influencing their decisions to take more math (Armstrong, 1980). Furthermore it has been shown that children's self-concepts of ability are more directly related to their parents' beliefs about their math aptitude and potential than to their own past achievement in math (Parsons et al., in press). These findings suggest that it would be particularly important to focus on the beliefs and expectations that parents hold for their children's math achievement.

It has already been demonstrated that child sex has an important influence on parents' achievement-related beliefs about their children. Parsons, Adler, and Kaczala (1980) found that parents in their study did not rate their daughters' math abilities significantly lower than that of their sons, but they did think that math was more difficult for their

daughters and that their daughters had to work harder in order to do well in math. Parents entertained these sex differential perceptions even though boys and girls scored similarly on such objective measures of math performance as standardized achievement tests and grades. Thus parents may convey expectations for their children's math achievement in the messages they give regarding their beliefs about the difficulty of math for boys and girls.

Attribution theorists (e.g. Frieze et al., 1978; Weiner et al., 1971; Weiner, 1972) argue that people's causal explanations for successes and failures have an important impact on their expectations for future success (e.g. Feather and Simon, 1971; Weiner, Nirenberg, and Goldstein, 1976), their self-esteem (e.g. Forsythe and McMillan, 1981; Weiner, Russell, and Lerman, 1978; Covington and Beery, 1976) and their subsequent achievement behaviors. Attribution theorists posit two dimensions which underly the various causal explanations which people may invoke for their achievement outcomes: locus of causality (dispositional/internal vs. situational/external factors), and stability (stable vs. unstable factors). Thus the attributional pattern which fosters achievement striving would invoke internal and stable factors to explain success, but external and unstable factors to explain failure. For example, if people attribute success to a stable factor, such as ability, then they continue to expect future success. If, on the other hand, people attribute success to an unstable factor such as effort or luck, they become less certain about future outcomes, especially on increasingly difficult tasks. If people attribute failure to a stable factor such as ability, they continue to expect future failure. But if they attribute failure to an unstable factor such as effort or luck,

they maintain hope for future success. Dweck and her colleagues (1972) propose that boys and girls show different attributional patterns for success and failure. Boys attribute their success to ability whereas girls attribute their success to effort. Boys attribute their failure to lack of effort whereas girls attribute their failure to lack of ability.

Parents may convey information regarding their beliefs about their children's abilities through the causal explanations they provide for their children's math successes and failures. Thus we might expect to see parents' attributional patterns for their sons and daughters following a pattern similar to the one proposed by Dweck. Hess and his colleagues (Hess, Holloway, and King, 1981; Holloway, Hess, and King, 1981; King, Hess, and Holloway, 1981), however, found a great disparity between mothers' and children's explanations for their achievement outcomes. Both boys and girls tended to attribute their successes to effort, while mothers of both boys and girls tended to attribute their successes to talent. Boys thought that lack of talent and lack of effort were equally important explanations for poor performance, but girls thought that lack of talent was a more important explanation than lack of effort. Mothers of both boys and girls thought that lack of effort was a more important explanation for poor performance than lack of talent, but mothers believed that lack of effort was a more important explanation for girls than for boys. Thus girls seem to be emphasizing lack of talent, whereas mothers of girls are emphasizing lack of effort. Attributing poor performance to lack of talent may predispose girls to continue to expect future failure. By attributing poor performance to lack of effort, mothers may be saying that their child can do the work,

thus offering girls a counter-interpretation for their unsuccessful performances. But if mothers are also conveying the message that math is harder for girls than for boys, as suggested by Parsons, Adler, and Kaczala (1980), then these two messages may end up undermining girls' math achievement as girls may then be less willing to exert the effort necessary to do as well on such a difficult task. Nevertheless, the findings by Hess and his colleagues suggest that boys' and girls' differential attributional patterns are not fostered by parents, at least not by mothers.

While Hess and his colleagues asked mothers and children for causal explanations for their best and worst subjects, we asked both mothers and fathers and their children about their causal explanations for successes and failures in mathematics in particular. Mathematics has been traditionally stereotyped as a male domain of study. As a result, we may find greater concordance between parents and their children about the causal explanations for their successes and failures in math. In other words, parents and children may be more likely to credit boys' successes to talent but girls' successes to effort, and conversely, boys' failures to lack of effort but girls' failures to lack of talent. In short, we want to find out (1) whether boys and girls offer different causal attributions for their math successes and failures, (2) whether child sex has an impact on parents' causal attributions for their children's math successes and failures, and (3) whether there is concordance between parents and children on their causal explanations for math successes and failures.

Methodology

Sample

This study is part of a large scale study investigating the impact of parental beliefs, values, and perceptions on children's developing task- and self-perceptions. Data collection for this pilot study took place during the spring of 1982. Questionnaires were administered to volunteering seventh grade students in two junior high schools of a small midwestern city. Both schools group students together according to their ability in math. School A groups students between classrooms so that within any one classroom students have the same level of math ability. School B groups students within classrooms so that within any one classroom students have different levels of math ability. Altogether 149 students participated in this study, including 73 boys and 76 girls. Students from School A were matched on sex and math ability level (as assessed by the 7th grade Michigan Educational Assessment Program and 5th grade California Achievement Tests) with students from School B. This yielded a total of 48 students, distributed as follows:

		School A		School B	
		Girls	Boys	Girls	Boys
Math Ability Level	High	4	4	4	4
	Medium	4	4	4	4
	Low	4	4	4	4

Parents of these 48 students were interviewed about their beliefs and expectations for their children's math achievement. For children of high and medium math ability levels, both mothers and fathers were interviewed. For children of low math ability levels, only mothers were

interviewed as several fathers could not be reached or refused to participate. Parent interviews were conducted by one of three interviewers, with mothers and fathers counterbalanced amongst interviewers. Altogether 48 mothers and 32 fathers participated in this study. Parent interviews took between 30-60 minutes, depending on the extent to which parents wanted to elaborate on their answers.

Measures

Parent Questionnaire A questionnaire with both open- and close-ended items was used to assess parents' beliefs and expectancies for their children's math achievement. This included questions about parents' perceptions of their children's present math performance, the amount of effort necessary in order for their child to do well in math, and the amount of talent that their child has in math. In addition we asked parents to rate on a 7-point Likert scale the importance of various attributions in explaining a successful and an unsuccessful performance in math. For success attributions, we asked about the importance of talent, enjoyment, effort, task easiness, teacher help, parent help, and having a good day. For failure attributions, we asked about the importance of lack of talent, lack of enjoyment, lack of effort, task difficulty, lack of teacher help, lack of parent help, and having a bad day.

Student Questionnaire Students were administered a questionnaire asking about their ability and effort in math, causal attributions for successes and failures in math, difficulty of math, liking of math, and interest in math.

School record data In addition to students' self-report data, we also collected information about students' performance on the Michigan Educational Assessment Program (MEAP) and California Achievement Test (CAT) as well as students' math grades for both semesters of the school year.

Results

School Effects

We were concerned that different grouping practices in School A and School B might have some impact on parents' achievement-related perceptions about their children. We thus computed pair-wise t-tests to compare School A mothers with School B mothers on beliefs about their child's math ability and effort, expectancies for their child's future math performance, importance placed on doing well in math, and math achievement standards. School A mothers did not differ significantly from School B mothers on any of these variables. Similar pair-wise t-tests were performed to compare School A fathers with School B fathers. Fathers too did not differ significantly on any of these these variables. We thus pooled together School A and School B mothers, and School A and School B fathers for further analyses.

Student Achievement Tests

As a check on our manipulations we performed a 2X3 factorial ANOVA with child sex and math ability as independent factors, and children's achievement test scores in math (on MEAP and CAT), and math grades for first and second semesters as dependent variables. There was a significant main effect for child's math ability level (Table 1). Mean scores on CAT math subtests as well as on math grades indicate that high

ability students performed better than medium ability students, who in turn performed better than low ability students (p -values range from $p \leq 0.01$ to $p \leq 0.0001$). Mean scores on MEAP math subtests followed a similar trend; although high ability students did not seem to differ significantly from medium ability students, both groups differed significantly from low ability students. This finding is not surprising as the MEAP subtests measure attainment of basic math skills. The MEAP scores thus indicate that low math ability students in our sample had not mastered some basic math skills.

There were no significant main effects for child sex (Table 2), except on MEAP math subtests, on which girls scored higher than boys. A closer inspection of the means, however, indicates that this finding results from the dramatically low performance of low math ability boys in our sample. Boys and girls in high and medium math ability groups did not differ on MEAP math subtests.

In short, low, medium, and high math ability students in our sample performed in the expected direction on CAT math achievement tests, as well as on math grades for first and second semester. On MEAP math subtests low ability students performed worse than either high or medium ability students, who did not differ from each other. Girls generally performed equally as well as boys on math achievement tests and math grades for first and second semester.

The impact of child sex on parents' attributions

Child sex has a significant impact on mothers' attributions of child's math successes to talent and effort (Table 3). Mothers think that talent is a more important explanation for boys' math successes ($F(1,42)=3.86$, $p \leq .05$), while effort is a more important explanation for

girls' math successes ($F(1,42)=3.74, p \leq .05$). This finding seems congruent with their general perceptions that girls require more effort to do well in math ($F(1,42)=6.52, p \leq .01$), and require more effort to do well in math than in other subjects ($F(1,42)=11.25, p \leq .01$), and that boys are more talented in math than in other subjects ($F(1,42)=5.83, p \leq .05$). There is also a trend that mothers have sex-differentiated perceptions about the importance of task difficulty as an explanation for math failures. Mothers believe that task difficulty is a more important reason for girls' than boys' math failures ($F(1,40)=3.47, p = .07$). We find no significant sex differences in fathers' attributions of ability and effort to girls' and boys' math successes, but fathers do believe that task easiness is a more important reason for boys' math successes ($F(1,27)=4.50, p \leq .05$), and there is a trend that fathers think that lack of talent is a more important reason for boys' math failures ($F(1,27)=3.30, p = .08$). There is no significant sex difference in fathers' general perceptions about boys' and girls' talent and effort required in math. Thus fathers think that boys and girls are equally talented and require the same amount of effort in order to do well in math.

Thus although boys and girls are doing equally well according to achievement test scores and math grades, mothers but not fathers hold different beliefs about sons' and daughters' math ability and effort, and different causal explanations for achievement outcomes. A consistent pattern emerges in mothers' ability and effort assessments: mothers credit boys with talent, and girls with effort. Talent is a stable attribute while effort is an unstable one. Parents may thus encourage boys to be more confident of continued future success, while

raising doubts about girls' future achievement outcomes. Sex differences for failure attributions were minimal and nonsignificant.

Although we have been discussing the importance of each attribution relative to child sex, it is necessary to keep in mind the importance of each attribution relative to all the other attributions. If we compare mothers' and fathers' ratings across the various success attributions we find that both mothers and fathers generally prefer internal explanations (e.g., effort, enjoyment, talent) for their child's math successes. The exception is teacher help, which also ranks very highly along with the internal attributions. Of all the success attributions, both fathers and mothers most prefer effort as an explanation for girls' math successes. Fathers most prefer talent as an explanation for boys' math successes, but mothers most prefer teacher help, followed by enjoyment. When we partial out mothers of low math ability children (Table 4), mothers agree with fathers that talent is the most preferred explanation for boys' math successes. External attributions (e.g. having a good day, task easiness, parent help) are generally less preferred explanations for child's math successes. Parent help is indeed the least preferred success attribution by both mothers and fathers. According to attribution theory, attributing success to internal factors enhances one's sense of control over future achievement outcomes. Both mothers and fathers, however, rate ability as the most important reason for boys and effort as the most important reason for girls. As effort is an unstable attribute, parents may thus communicate to girls that they are less certain of their continued success in future math achievement situations.

If we compare mothers' and fathers' ratings across the various failure attributions we find that both mothers and fathers most prefer lack of effort as an explanation for children's math failures. This is true for both boys' and girls' math failures. Other highly favored explanations are task difficulty and lack of teacher help. On the other hand, both mothers and fathers consider lack of talent as the least preferred failure attribution. Other failure attributions such as lack of parent help and having a bad day are more preferred than lack of talent as a reason for math failure. This is true even when we partial out mothers of low math ability children. As an extension of attribution theory, we might predict that parents would attribute boys' failures to lack of effort, but girls' failures to lack of ability. As an attribution to lack of ability is more debilitating to one's self-esteem and self-confidence, we might then argue that parents thus have an impact on girls' lower estimations of their math ability. In our data, however, neither mothers nor fathers showed a sex differential in attributing math failures to lack of talent or lack of effort. Our inspection of both mothers' and fathers' ratings across all the failure attributions indicates that in general lack of effort is the most preferred attribution for failures of both boys and girls. Thus parents seem to be conveying the message that successful math performance is within the control of both boys and girls: by exerting more effort, both boys and girls can do better in math.

The impact of child sex on children's attributions

Child sex has a significant impact on children's assessments of the importance of talent and effort to their math successes (Table 5). Boys think talent is a more important explanation than do girls

($F(1,39)=5.86, p \leq .05$), while girls think effort is a more important explanation than do boys ($F(1,39)=5.48, p \leq .05$). This echoes a general though nonsignificant trend in children's overall perceptions about their talent and effort, namely that boys tend to rate themselves as more able while girls tend to rate themselves higher on effort. (Girls rate themselves significantly higher on effort required in order to do well in math ($F(1,39)=4.51, p \leq .05$).) There are no significant sex differences between boys and girls on the failure attributions. So far, then, at least on the success attributions, children and mothers seem to be reporting congruent opinions about the relative importance of talent and effort to boys' and girls' math successes. We do not get strong sex differences from either parents or children on failure attributions.

If we compare children's ratings across the various success attributions we find that girls favor teacher help, followed by effort, as the most important explanations while boys favor talent, followed by teacher help, as the most important explanations for math successes. In contrast, talent ranks as the fifth most preferred explanation for girls, while effort ranks as the least preferred explanation for boys. (This is due to the particularly low evaluation which low ability boys attach to effort as an important reason for their math successes.)

If we compare children's ratings across the various failure attributions, we find that both boys and girls most favor task difficulty. Lack of effort and lack of teacher help are also highly preferred explanations for children's math failures. On the other hand, both boys and girls rate lack of talent amongst the least important explanations for their math failures. Parents and children then seem to agree on the importance of lack of effort, task difficulty, and lack of

teacher help to children's math failures, but parents rate lack of effort as most important, while children rate task difficulty as most important. Both parents and children tend to agree on the relative unimportance of lack of talent as a reason for math failures.

Thus although boys and girls are performing equally well in math, both boys and girls as well as mothers show sex differential perceptions regarding success attributions. Neither parents nor children in our sample show sex differential perceptions regarding failure attributions. If we compare ratings across all the possible success attributions, parents and children still rate effort as amongst the most important for girls, but talent as amongst the most important for boys. If we compare ratings across all the possible failure attributions, parents and children rate lack of effort and task difficulty as amongst the most important attributions, but parents rate lack of effort as the most important, while children rate task difficulty as the most important. Both parents and children tend to agree on the relative unimportance of lack of talent as a reason for math failures. Thus separate analyses of parents' and children's responses indicate that both parents and children seem to show a similar pattern of sex-differentiated beliefs about the relative importance of talent and effort to math successes and failures.

Correlations for success and failure attributions within families

Before concluding that parents and children reinforce each other's beliefs, however, it is necessary to investigate whether parents and children within families actually agree on ability and effort assessments. Correlations were thus performed separately for mothers/daughters, mothers/sons, fathers/daughters, and fathers/sons for each

success and failure attribution. In general, we found few instances of agreement between mothers and fathers with their sons and daughters.

For success attributions, there is no relationship between mothers' and daughters' attributions to effort, nor between mothers' and sons' attributions to talent. Mothers and daughters, on the other hand, show moderate agreement on the importance of teacher help ($r=.40$, $p=.06$) and the unimportance of parent help ($r=.36$, $p=.09$). Fathers and sons, however, do agree on the importance of talent ($r=.59$, $p\leq.05$). Fathers, like mothers, agree with daughters on the unimportance of parent help ($r=.54$, $p\leq.05$). Fathers and daughters also moderately agree on the importance of enjoyment ($r=.44$, $p=.09$), and the unimportance of task easiness ($r=.47$, $p=.08$), and having a good day ($r=.44$, $p=.07$).

As for failure attributions, there was no relationship between fathers and either sons or daughters on the importance they attached to the various causal explanations. Mothers, on the other hand, show strong agreement with sons on the unimportance of lack of parent help ($r=.46$, $p\leq.05$). They show moderate agreement with sons on the unimportance of lack of talent ($r=.40$, $p=.06$), and with daughters on the importance of lack of effort ($r=.37$, $p=.09$). When we partial out mothers of low math ability boys and girls, however, there emerges a different pattern of mother-child agreements. Mothers and sons now more strongly agree on the unimportance of lack of talent ($r=.64$, $p\leq.01$) as a reason for math failures, while mothers and daughters now more strongly agree on the importance of teacher help ($r=.60$, $p\leq.01$) as a reason for math successes. Mothers agree with both sons ($r=.56$, $p\leq.01$) and daughters ($r=.51$, $p\leq.01$) on the unimportance of having a good day as a reason for math successes. The only strong disagreement occurs between

mothers and sons on the importance of task easiness ($r = -.60$, $p \leq .01$) as a reason for math successes. Mothers tend to think it is less important, while sons tend to think it is more important. There is also moderate agreement between mothers and sons on the importance of enjoyment ($r = .48$, $p = .07$) to math successes. In short, few significant correlations were found between parents' and children's attributions. Only fathers and sons strongly agree on the importance of talent to successful math performances. For failure attributions, mothers agree with sons on the unimportance of lack of talent and with daughters on the importance of lack of effort. Thus correlations within families suggest that there is only weak evidence that differential ability and effort assessments are actually shared by parents and children, although separate analyses indicate that as a whole they show a similar sex difference in attributional patterns. In general parents and children seem to show stronger agreement on the factors they consider to be unimportant in explaining math successes or failures.

We then wanted to see if there was any concordance between mothers and fathers within a family on their ratings of the importance of these various success and failure attributions. We correlated mother-father dyads for only the high and medium math ability children as we had no information from fathers of low math ability children. For success attributions, parents of daughters show moderate agreement on the importance of teacher help ($r = .42$, $p = .10$) while parents of sons show moderate agreement on the importance of talent ($r = .42$, $p = .10$). As for failure attributions, parents of daughters show moderate agreement on the importance of lack of enjoyment ($r = .50$, $p = .06$) while parents of sons show strong agreement on the unimportance of lack of enjoyment ($r = .73$,

$p \leq .001$). Thus the only significant correlation occurred between mothers and fathers of sons, who agreed on the unimportance of lack of enjoyment to their child's math failures. There was a trend, however, that mothers and fathers of sons also agreed on the importance of talent for their child's math successes. Thus the only evidence of concordance between parents of children on effort and ability assessments occurred between parents of sons on the importance of talent to successful math performances, but this was only a weak trend.

We next wanted to focus on the discrepancies between parents and children on their ratings of the importance of these success and failure attributions. Using the method adopted by Hess and his colleagues (1981), we created parent-child attribution discrepancy measures. An attribution discrepancy measure was computed first by squaring the difference between parents' ratings and children's ratings. These squared differences were then summed across the seven attributions and a square root was taken. The resulting index is the generalized Euclidian distance between a parent and his/her child. Larger values indicate greater differences in the overall profiles of a parent-child dyad. Two parent-child attribution discrepancy measures were thus computed, one for attributions explaining successful math performance and one for attributions explaining unsuccessful math performance.

We then performed separate correlations with mothers/sons, mothers/daughters, fathers/sons, and fathers/daughters comparing each attribution discrepancy measure with child's math achievement as measured by two MEAP math subtests, three CAT math subtests, and first and second semester math grades. The most consistent series of significant correlations occurred in the analyses with the mother/

daughter group. The mother-daughter discrepancy measure for success attributions was negatively correlated with daughters' scores on MEAP basic skills subtests ($r=-.54$, $p\leq.01$; $r=-.64$, $p\leq.01$), CAT math achievement subtests ($r=-.35$, $p=.10$; $r=-.56$, $p\leq.01$; $r=-.51$, $p\leq.01$), and on math grades for first and second semester ($r=-.65$, $p.001$; $r=-.50$, $p\leq.01$). Thus the lower the child's math achievement, specifically daughters' math achievement, the more discrepant were mothers' and daughters' attributions for successful math performance. No other parent-child group showed such a consistent pattern of significant correlations. We also did not find any significant correlations between math achievement and parent-child discrepancy measures for failure attributions.

In order to further investigate the source of the discrepancy between mothers and daughters, we computed a composite measure of math achievement by averaging the scores on two MEAP math subtests, three CAT math subtests, and math grades for first and second semester. (Factor analysis using a Kaiser criterion determined that a one common factor model explains 65% of the variance amongst these math achievement measures.) We then divided our sample of girls into a group of low math achieving girls ($n=9$) and a group of high math achieving girls ($n=12$) based on a median split on our composite math achievement measure. (Only students with complete data were included in this analysis.) For each group pair-wise t-tests were used to compare mothers' and daughters' opinions about the importance of the various success attributions. We expected to find significant differences on those attributions on which mothers and daughters were most discrepant. Our results indicate that for low math achieving daughters mothers rate

effort as a more important reason than do their low math achieving daughters ($T=2.80$, $p \leq .05$). It is important to note, however, that both mothers and low math achieving daughters, on the average, rate effort as amongst the most important explanations for successful math performances (mean rating for mothers=6.22, mean rating for low math achieving daughters=4.67). But mothers seem to believe that it is an even more important explanation for math success than do their low math achieving daughters. For high math achieving daughters, mothers rate parent help as a significantly less important reason than do their daughters ($T=3.26$, $p \leq .01$).

Conclusions

Researchers have proposed that sex differences in mathematics achievement may be related to different causal attributions which boys and girls as well as important socialization agents such as parents offer to account for achievement outcomes in mathematics. Thus the attributional pattern which fosters achievement striving would invoke internal or stable factors to explain success, and external or unstable factors to explain failure. The attributional pattern which hinders achievement striving would invoke external or unstable factors to explain success, and internal or stable factors to explain failure. Thus parents and children may attribute boys' successes to talent and girls' successes to effort, and conversely, boys' failures to lack of effort and girls' failures to lack of talent. Hess and his colleagues (1981), however, found a great disparity between mothers' and children's explanations for their children's achievement outcomes, but while they asked mothers and their children for causal explanations for their best

and worst subjects, we asked both mothers and fathers and their children about their causal explanations for successes and failures in mathematics in particular. As mathematics has been traditionally stereotyped as a male domain of study, we expected to find greater concordance between parents and their children about the causal explanations for successes and failures in mathematics. In other words, we expected that parents and children would be more likely to credit boys' successes to talent but girls' successes to effort, and conversely, boys' failures to lack of effort but girls' failures to lack of talent.

Separate analyses of parents' and children's mean ratings of the importance of various attributions indicate that mothers as well as boys and girls show a similar sex differential in their attributional patterns for successful math performances. Thus although boys and girls are performing equally well according to achievement test scores and math grades, mothers but not fathers credit boys with talent and girls with effort. This attributional pattern is similar to one offered by boys and girls themselves. As talent is a stable attribute while effort is an unstable one, boys may thus be more confident of continued future success, while girls are more doubtful about future achievement outcomes in mathematics. Parents who maintain congruent causal explanations will not offer girls a counter-interpretation for their math successes when in fact they are performing equally as well as boys. Contrary to expectations from attribution theory, we find no sex differences in either parents' or children's mean ratings of the importance of various attributions for unsuccessful math performances. Thus we found no

evidence that parents or children were more likely to explain boys' failures as lack of effort and girls' failures as lack of talent.

When we compare across the various attributions for successful outcomes, parents and children generally prefer internal to external attributions. Thus both parents and children believe that children are responsible for their math successes. The exception is "teacher help", which also ranks very highly amongst parents and children. Although attributing success to "teacher help" seems to be invoking an external factor, it may be that having a good teacher is associated with a improvement in internal factors such as talent and effort -- that is, a good teacher brings out latent talent in math, or motivates effortful performance in math. Generally parents most prefer talent as an explanation for boys' successes but effort as an explanation for girls' successes. These relative preferences are similar to ones offered by boys and girls themselves.

For unsuccessful math performances, both parents and children most favor lack of effort and task difficulty as important explanations, but parents most favor lack of effort whereas children most favor task difficulty. Thus for failure attributions, we find some evidence for actor-observer discrepancies -- parents most favor an internal dispositional factor, while children most favor an external situational factor. This finding supports Hess' notion of ego enhancement as a motive for different attributions between actors and observers, as people choose explanations that absolve themselves of responsibility for failures. We also find that both parents and children least favor lack of talent as an explanation for unsuccessful math performances.

In short, we find evidence for the classic attribution pattern in parents' and children's assessments of the importance of various explanations for successful math performances, but we find no evidence for the classic attribution pattern in either parents' or children's assessments of the importance of the various explanations for unsuccessful math performances.

Separate analyses show that parents and children maintain a similar sex bias in their effort and ability assessments. Although this suggests that differential effort and ability assessments may be fostered in the home, when we analyse the data within families we find only weak evidence that these differential attributions are transmitted within the home. We found few significant agreements between parents and children. Most agreements seemed to be on factors which they considered unimportant to achievement outcomes in math. The greatest discrepancy occurred between mothers and low math achieving girls -- the lower the daughters' math achievement, the greater the discrepancy between mothers' and daughters' opinions about the importance of the various attributions for successful math performances. The greatest discrepancy occurred for the attribution of effort to successful math performances, where mothers thought it was a much more important explanation than their low math achieving daughters.

In short, although separate analyses suggest concordance between parents and children in effort and ability assessments, we find no evidence that different attribution patterns are transmitted within families. It may be that with separate analyses we are witnessing a general socio-cultural bias in ability and effort assessments. Although we find no evidence that different attribution patterns are transmitted

in the home, a more rigorous test to examine this issue demands a longitudinal design, for there may be a lag between when opinions are formed and when they influence others.

Table 1
Impact of child's math ability level
on achievement test scores

Variable	Math ability level			F-ratio
	High	Medium	Low	
<u>MEAP:</u>				
Math objectives 1	27.81	26.67	14.17	124.69****
Math objectives 2	5.88	5.47	3.08	34.79****
<u>CAT:</u>				
Math computation	35.56	27.25	22.67	14.11****
Math application	41.19	36.19	23.00	40.72****
Total math	76.81	63.44	45.67	38.26****
<u>Math grades</u>				
First semester	11.00	9.50	7.69	7.57**
Second semester	10.81	9.38	7.50	7.15**

¹Michigan Educational Assessment Program

²California Achievement Test

Note: F-ratios are derived from 2-way ANOVAs with child math ability level and child sex as independent factors. N's range from 46 to 48.

** $p \leq 0.01$

**** $p \leq 0.0001$

Table 2
Impact of child's sex on
achievement test scores

Variable	Child sex		F-ratio
	Girls	Boys	
MEAP ¹			
Math objectives 1	24.67	22.59	11.98***
Math objectives 2	5.29	4.64	8.11**
CAI ²			
Math computation	28.71	28.52	.....
Math application	33.04	34.35	.....
Total math	61.75	62.91	.....
Math grades			
First semester	9.17	9.63	.....
Second semester	9.42	9.04	.....

¹Michigan Educational Assessment Program

²California Achievement Test

Note: F-ratios are derived from 2-way ANOVAs with child math ability level and child sex as independent factors. N's range from 46 to 48.

** $p \leq 0.01$

*** $p \leq 0.001$

Table 5
Impact of child sex on
children's achievement-related perceptions and expectations

Variable	Girls	Boys	F-ratio
Math ability	4.88	5.23	.....
Math ability relative to other students	4.54	5.00	.....
Current math performance	4.83	5.18	.....
Required math effort	4.75	3.57	4.51*
Actual math effort	5.29	4.95	.....
Future math effort worthwhile	4.96	4.91	.....
Math difficulty	4.50	3.95	.....
<u>Success attributions</u>			
Talent	4.04	5.23	5.86*
Enjoyment	4.70	4.27	.....
Effort	4.96	3.68	5.48*
Task easiness	4.52	4.41	.....
Teacher help	5.26	4.82	.....
Parent help	3.83	4.00	.....
Good day	3.39	4.41	.....
<u>Failure attributions</u>			
Lack of talent	3.35	3.05	.....
Lack of enjoyment	3.87	3.55	.....
Lack of effort	4.91	4.27	.....
Task difficulty	5.17	4.77	.....
Lack of teacher help	4.13	4.36	.....
Lack of parent help	3.57	2.81	.....
Bad day	3.22	3.27	.....

Note: F-ratios are derived from 2-way ANOVAs with child math ability level and child sex as independent factors.
N's range from 43 to 48

* $p \leq 0.05$

** $p \leq 0.01$

All items are measured on a 7-point scale.

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