Gender Differences in Math Ability: The Impact of Media Reports on Parents

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ABSTRACT: Research reports of educationally relevant findings are infrequently covered by the media. When research is the focus of the popular press, the media are believed to have a strong influence on public opinions. An empirical study was conducted to investigate the impact of media coverage following the release of a research report by Benbow and Stanley (1980). Parents of adolescents were targeted as the population most likely to be influenced by the research findings. Parents who had responded to surveys regarding their children's math abilities prior to the media coverage were recontacted and their beliefs were reassessed. The results provide evidence that research reported in the media can have an effect on the beliefs of people who are exposed to it. In this article, we discuss the nature of the media coverage and its differential impacts according to gender and prior beliefs.

News is the word we use for the information that people receive second-hand about worlds that are not available to their own experience (Molotch & Lester, 1974). Out of a vast number of occurrences, only a few events are considered important enough to become news. The information generated by social science and educational researchers is seldom considered newsworthy. However, occasionally the media cover a research report in some detail. Such an event occurred shortly after the release of an article by Benbow and Stanley (1980) in *Science* that reported a major sex difference in the mathematical reasoning ability among gifted seventh-grade students. In this article we evaluate the impact of media reports on parents' beliefs regarding their sons' and daughters' math aptitudes.

The popular media coverage of this research report was extensive, including headlines such as "Do Males Have a Math Gene?" (Williams & King in *Newsweek*, 1980) and "The Gender Factor in Math: A New Study Says Males May Be Naturally Abler then Females" (*Time*, 1980). The text of the articles often implied that the sex difference was due to inherited or other biological factors. For example, in "Sex + Math = ?" *Family Weekly* (1981) reported that the study "concludes that boys are born with greater math ability"; similarly *Time* magazine (1980) concluded that "males inherently have more mathematical ability than females."

Some publications included cartoons or other graphic representations of the implied gender difference. Typically these cartoons presented an extreme characterization of male superiority in mathematics and did not illustrate the fact that the Benbow and Stanley (1980) study contained only *gifted* children. This exaggerated depiction of the magnitude of sex differences in math ability starkly contrasts the fact that gender rarely accounts for more than 4% of the variance in students' performance on standardized tests of math aptitude, and virtually never accounts for any significant variance in mathematics course grades during the primary and secondary school years (Eccles, 1984). Although criticism regarding the interpretation of the data and questions regarding the authors' conclusions appeared shortly after publication of the initial article, the media did not provide comparable coverage of these alternative views until much later.

In recent years the idea that the media have a strong influence in changing public opinion and affecting policy has been accepted by scholars, policymakers, and media leaders (Lambeth, 1978; McCall & Stocking, 1982; McCombs & Shaw, 1972). People pay attention to what they are exposed to in the mass media because the media are assumed to be objective. People read

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newspapers and magazines and listen to radio and television broadcasts in order to find out about the objective state of the world. However, the media do not simply bring the world to us; selective decisions are made about what to report and what to ignore (Howitt, 1982).

In the case of social science news, reporters responsible for science or education must be relied on to act as ambassadors to the lay world for the specialties they cover. Although they are expected to ask and report on the important questions, they typically work under pressure to meet tight deadlines. This pressure can result in the publication of findings in which "critical scrutiny of the quality of the evidence is subordinated to a forceful presentation of simplified conclusions" (Weigel & Pappas, 1981). Furthermore, reporters often overemphasize dramatic conclusions rather than point out problems or unresolved issues. For example, coverage of the Benbow and Stanley (1980) report in the popular press included the following statements:

> Can girls do math as well as boys?... last week a new study appeared that explains the difference mainly in genetic terms. (*Science*, December 15, 1980)

> According to...doctoral candidate Camilla Person Benbow and Julian Stanley...males inherently have more mathematical ability than females. (*Time*, December 15, 1980)

> Benbow and Stanley claim that males do indeed have an inherent mathematical ability, reports *Science* magazine. (*NRTA Journal*, March–April, 1980)

> Why do boys traditionally do better than girls in math? Many say it's because boys are encouraged to pursue the subject more. A controversial new study, though, concludes that boys are born with greater math ability. (*Family Weekly*, January 25, 1981)

One or two sentences expressing the skepticism of other researchers regarding the interpretation of Benbow and Stanley's (1980) findings appeared near the end of many of the original articles; however they were given little space or supporting evidence. For example, the following sentence, which appeared at the end of one article, does not refer to research and was refuted in the next sentence:

> "I think they are on darned shaky ground when they draw conclusions about genetic differences," Elizabeth Fennema, of the University of Wisconsin was reported as saying. (*New York Times*, December 7, 1980)

Because the media determine what picture of the world we see, many of us think that the media must have a powerful effect on the beliefs of individuals and communities. However, there is little evidence to support this hypothesis. Recently researchers have studied media treatment of such educationally relevant social science reports as the Coleman Report (Weigel & Pappas, 1981). The impact of such reports on public opinion, however, has not been studied, primarily because base-line data gathered before the media event are rarely available. Social scientists have had to be content with post hoc field studies unless circumstances provided for the base-line data. Such an opportunity arose with the news coverage of Benbow and Stanley's (1980) *Science* report: A longitudinal study of parental influences on achievement expectancies was underway, providing a unique opportunity to evaluate the impact of media coverage using a pre/post quasi-experimental design.

The mass communications audience is not a passive one. Selection, rejection, and interpretation of media go on in the minds of the receivers (Schramm & Roberts, 1974). Therefore, those most likely to select and interpret reports about adolescents' mathematics abilities would be readers who can use the information. If media coverage of psychological research affects readers' attitudes, then this media campaign should have created measurable changes in parents' beliefs regarding sex differences in math aptitude.

Furthermore, psychological theories of information processing predict that the content and centrality of an individual's existing beliefs influence the comprehension of new information (Rumelhart & Ortony, 1976). Therefore, the centrality of parents' beliefs regarding the relationship of sex to math aptitude should influence the extent to which they incorporated the media's message into their belief system. Both one's own sex and the sex of one's child should affect the centrality of one's belief system in this domain. Because mothers and fathers have gender-stereotyped beliefs regarding both their own math aptitudes and their children's (Parsons, Adler, & Kaczala, 1982), gender-stereotyped media information should reinforce these beliefs and encourage them to generalize their self-perceptions to their same-sex child. Consequently mothers of daughters and fathers of sons would be expected to incorporate the media's gender-stereotyped message into their beliefs to a greater extent than other parents.

The present study tests these hypotheses. Two sets of parental beliefs were studied: (a) parents' beliefs about the mathematical ability of their own children and (b) parents' general stereotypes about sex differences in mathematical ability. A sample of predominantly middle-class parents living in southeastern Michigan responded to questionnaires in the spring of 1979 and 1980. Approximately 3 months after the initial media coverage a third questionnaire was sent to a subsample of 250 parents with children in the seventh, ninth, and 11th grades. Ninety percent (114 mothers and 110 fathers) returned the questionnaire.

The questionnaires contained Likert-scaled items and open-ended questions tapping parents' beliefs regarding their child's math aptitude; the importance of advanced mathematics courses for their child; and their stereotypes regarding both sex differences in math ability and the utility of math for males and females. Parents' perceptions of their children's math abilities were assessed by items related to the effort necessary to succeed at math, the perceived difficulty of math for their children, and expectancies for their children's future success in math. These questions were identical to questions asked in the two previous waves. (More details on the items and the scales can be obtained in Parsons, Adler, and Kaczala, 1982.) In addition, the last page of the survey contained a question that described media coverage

of the research and asked if the respondent had heard about it; approximately one quarter of the parents ($N = 57$) had. Of these people, 68% had seen a magazine article about it, 18% had read about it in the newspaper, and smaller numbers had heard about it on the radio, television, or from a friend. Many people indicated that they had heard about the report from several sources.

Respondents were not asked to report either the content or the amount of the media coverage they were exposed to; therefore, the exact nature of the message received undoubtedly varied across the sample. Mass communication researchers, however, find that an average 60-page newspaper is read in 34 minutes, which leads them to conclude that readers make critical decisions about what to read based primarily on headlines and photographs (Whetmore, 1982). Thus, many of the parents in our study probably read little more than headlines and the first few sentences of the relevant article. The content of the articles read also may have varied somewhat; however, many were written from the same United Press International press release. Although we did not do a content analysis of the media reports, most of the articles we reviewed were systematically biased toward the researchers' biological interpretations of the findings. The previously cited examples of newspaper and magazine articles are representative of most accounts.

The beliefs of those who had heard about the Benbow and Stanley (1980) report from the media were compared with those who had not. For the sake of clarity, we will refer to those who heard about the report as the "exposed" group and those who did not as the "unexposed" group. Analyses of variance performed on all pretest variables and on indicators of socioeconomic class indicated that exposed and unexposed parents did not differ in their perceptions of their children's math abilities, in their level of education, or in their socioeconomic status prior to media exposure.

The impact of media exposure was tested with univariate and multivariate analyses of covariance using data from the 1979 and 1980 waves as the covariates. Mothers' and fathers' responses for sons and daughters were analyzed separately. Univariate analyses are summarized in Table I; multivariate and simple effects analyses are summarized in the following sections.

Perceptions of Child's Math Ability

Mothers. Compared to other mothers, exposed mothers of daughters appeared to think that their daughters had less math ability, were less likely to succeed in math in the future, found math more difficult, and had to work harder to succeed in math. To test this, a multivariate analysis of covariance was performed using the responses to the first and second years' questionnaires as covariates and these four ability ratings as the dependent variables. A significant interaction was found between sex of child and awareness of the media coverage, $F(4,92) = 2.63$, $p<.05$. Exposed mothers' estimates of their daughters' math abilities declined compared to exposed mothers of sons or unexposed mothers. A repeated-measures ANOVA using the same variables yielded similar results. This was particularly true for questions concerning the perceived difficulty of math for their child. A univariate analysis of covariance for a scale containing items about perceived difficulty yielded a main effect for sex and a significant interaction of sex and awareness (see Table I).

Exposed mothers of daughters also rated math as much more difficult for their daughters than both exposed mothers of boys $F(1,101) = 12.3, p<.001$, and exposed mothers of girls, $F(1,101) = 6.8$, $p<,01$.

Fathers. When fathers' attitudes about the same issue were examined, an unexpected overall trend was found (see Table I). Generally, fathers of girls thought that their daughters had slightly less ability than fathers of sons. However, exposed fathers of girls changed their beliefs in the direction of thinking their daughters had slightly more ability after hearing the media coverage, whereas unexposed fathers changed in the opposite direction. The unexposed fathers' beliefs had become more gender stereotyped since the earlier waves of data collection. Consequently unexposed fathers of girls believed their daughters had less ability by the time of the posttest. This pattern was apparent for all the ability-related questions, although differences between the groups were not always significant and the multivariate analysis of covariance did not yield significant main effects.

Summary. Although differences were not always found between exposed and unexposed groups, a striking overall pattern did emerge. The exposed group appeared to change slightly more than the unexposed group, with exposed fathers' views becoming *more similar* for girls and boys, whereas exposed mothers' responses became *more differentiated*, depending on the sex of their child. In other words, exposed mothers of girls became more conscious of sex differences after hearing the research findings, and exposed fathers became more egalitarian. The sentiment of exposed mothers is captured in open-ended responses from mothers of daughters: "Boys have a tendency to *understand* the principles (of math) but girls are trying to just *memorize* the principles" and "Boys and girls have basic, but slight, differences between inherited abilities."

Projections for the Future

When asked about expectations for their child's performance in future math classes, exposed mothers and unexposed mothers did not differ for either sons or daughters. However, exposure to media coverage had a significant effect on the expectations fathers held for their children's future success in math. Exposed fathers of both girls and boys thought that their children would perform better in future math courses than unexposed fathers, $F\ (1,93) = 7.0$, $p<.01$. Hearing about the research seemed to make future math success more salient to fathers of daughters. When exposed and unexposed fathers of girls were compared, exposed fathers thought that their daughters would do much better in advanced math courses than unex-

posed fathers of girls, $F(1,93)=5.7$, $p<.05$. This represented a change from the first 2 years of the study when we found that fathers of sons felt that calculus and trigonometry were much more important for their children than fathers of daughters (Jayaratne, 1983). In addition, after hearing about the media coverage, exposed fathers of girls increased the importance they attached to calculus for their daughters, whereas fathers of sons did not change their ratings of its importance.

General Gender-Based Stereotypes

Mothers. Parents were asked general stereotype questions about how useful males and females find math in their adult lives and who does better in advanced math classes. All mothers rated math as more useful for males than for females; there were no differences between the groups or by sex of child. A similar effect emerged on the gender stereotyping of math ability question. When asked directly, "Who does better in advanced math classes?" all mothers said that males do slightly better than females; neither sex of child nor media exposure had a significant effect.

Fathers. When fathers were asked about the future utility of math, more differences emerged. All fathers thought that math was more useful for males than females, but fathers of sons thought that math was more useful for males in general than fathers of daughters,

TABLE I
Adjusted Mean Differences (Analysis of Covariance)

	Misinformed		Uninformed		F-Ratios		
Mothers	*Daughters*	*Sons*	*Daughters*	*Sons*	*Group Effect*	*Sex of Child Effect*	*Group x Sex Effect*
Perception of Task Difficulty for Child[a]	4.5	3.2	3.8	3.6	.39	11.32***	8.01**
Future Expectancy in Math for Child[b]	5.1	5.6	5.2	5.2	.36	2.02	1.06
Importance of Trigonometry/ Calculus for child[c]	5.1	5.3	4.7	4.9	2.63	.58	.30
Future utility of math for females vs. males[d]	2.2	2.3	2.4	2.4	.37	.16	.07
Who does better in advanced math classes—females vs. males[e]	3.6	3.5	3.3	3.4	1.50	.01	1.03
Fathers							
Perception of Task Difficulty for Child[a]	4.0	3.8	4.2	3.9	.60	1.70	.10
Future Expectancy in Math for Child[b]	5.4	5.6	4.7	5.2	6.98**	2.42	.33
Importance of Trigonometry/ Calculus for child[c]	5.7	5.7	4.9	5.3	5.71*	.39	.88
Future utility of math for females vs. males[d]	2.1	1.3	1.9	1.8	1.46	9.05**	5.26*
Who does better in advanced math classes—females vs. males[e]	3.6	4.4	3.3	3.5	16.24***	9.06**	4.94*

Note. For the Mothers, significant results of MANOVA are reported in text.

[a] 1 = very easy, 7 = very hard
[b] 1 = not well, 7 = very well
[c] 1 = not important, 7 = very important
[d] 1 = males, 5 = females
[e] 1 = females, 5 = males
*p .05
**p .01
***p .001

$F(1,107)=9.05, p<.01$. The significant interaction of awareness of media coverage and sex of the child, $F(1,107)=5.26$, $p<.05$, indicated that exposed fathers of sons think that math is *much* more important for males than for females (see Table I). It appears that media exposure confirmed the gender-stereotyped attitudes of fathers of sons, but had little effect on the gender-stereotyped beliefs of mothers. Knowledge of media coverage coupled with having sons seemed to confirm and strengthen fathers' stereotyped views that math is more useful for males.

A similar pattern emerged for the question concerning gender stereotypes of math ability. Although most fathers thought that males do slightly better than females in advanced math classes, there was a clear difference between exposed and unexposed fathers. Exposed fathers endorsed more strongly than unexposed fathers the stereotype that males do better than females, $F(1,107)=16.24$, $p<.001$. In addition, exposed fathers of sons endorsed more strongly than any other group the stereotype that males do better than females in advanced math classes.

Conclusion

Generally speaking, exposure to media reports of the Benbow and Stanley (1980) study did affect parents' attitudes. As predicted, exposure had its largest impact on mothers of daughters and fathers of sons. Both became more gender stereotyped in their beliefs. But, unexpectedly, media exposure also had a positive effect on fathers of daughters; these fathers came to the defense of their daughters.

Why should the media have such a different effect on mothers and fathers of daughters? The answer, we believe, lies in the centrality and content of parents' existing beliefs as well as the appropriateness of generalizing from one's own experience and self-perception to one's child. In the two pre-exposure waves, mothers of sons almost always had a more positive evaluation of their child's math ability than mothers of daughters, whereas fathers' evaluations of sons and daughters did not differ substantially. Mothers also had a much more negative view of their own math ability than did fathers. Finally, there was a stronger relation between mothers' self-perceptions and evaluations of their child's math ability for mothers of daughters than for any other parent-child combination (Jayaratne, 1983). Apparently, mothers see themselves more negatively and are more prone to project this image onto their daughters than are fathers. Given this pattern, one would expect that exposure to the gender-stereotyped media information would confirm these mothers' self-images and legitimize projecting it onto their daughters. In contrast, the fathers had neither a negative self-image nor did they, as a group, judge daughters to be less math-able than sons. Therefore, they had little reason to incorporate the media reports into the image of their own daughters. Instead, exposure to the media seemed to sensitize these fathers to the importance of math, bringing them to defend their daughters' capabilities.

Fathers of sons responded somewhat differently. They did not raise the evaluations of their sons because these were already fairly high. Instead, they became more convinced than their unexposed counterparts of general gender-role stereotypes. Exposure to media reports also increased the gender-role stereotyping of fathers of daughters, but to a lesser extent than it did for fathers of sons. The results suggest that one of the major effects of popular media coverage of the research report was that it changed the "social desirability" climate. Before the media coverage, it was popular to espouse a belief in equal math abilities of males and females. After the media coverage it was "okay" to say that males are better than females in math.

These findings are not surprising. We know that the salience of an event determines how we interpret and remember it (Nisbett & Ross, 1980). We would expect parents with math-able daughters to interpret the news of superior male mathematical ability much differently than parents with sons, and mothers to interpret it differently than fathers. According to media experts, mass communications are more likely to reinforce beliefs than to change them (Klapper, 1960). Media absorption involves a self-selection according to previous attitude (Bauer & Bauer, 1960). In this case, it appears that hearing about the report may have had the effect of confirming mothers' beliefs that their daughters are not as able in math as their sons, and it put fathers of girls in a position of challenging the "evidence" for their daughters. The opposite happened in the case of general stereotypes for math. Fathers of sons had their beliefs confirmed, and mothers did not.

This study indicates that media coverage of research reports may be one way social science and educational research can influence public opinion. Parents' attitudes may be affected by media coverage of research reports on a broad range of topics related to their children. As educational researchers, we must be aware of the potential impact of research reports aimed at the general public, whether they are press releases, lectures, interviews, or publications. If our goal is to inform the public or to change public opinion, we need to remember that the resulting opinions are likely to be filtered by beliefs and attitudes. Ultimately, it is the responsibility of the researcher to recognize the possible impact of social forces when reporting to the general public and to insist that media reports do not contain unwarranted gender-stereotyped conclusions.

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