Anxiety and Worries About Math and English Before and After the Junior High Transition

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Anxiety continues to be a significant problem in our schools. Hill and Wigfield (1984) suggest that as many as ten million elementary and secondary school students do more poorly than they should on achievement tests and other school tests because anxiety interferes with their performance. Most research on anxiety has focused either on general school anxiety or anxiety about tests. Recently, investigators have become interested in anxiety about particular school subjects, with math anxiety receiving the most attention (see Wigfield & Meece, 1988). Studies have shown that math anxiety interferes with students' math performance, and some researchers have proposed that math anxiety contributes to the observed sex differences in math achievement and course enrollment (Tobias & Weisbrod, 1980).

Along with this interest in anxiety about particular school subjects, researchers also have become interested in identifying different components of anxiety. In the test anxiety literature, Liebert and Morris (1967; see also Morris, Davis, & Hutchings, 1981) distinguished two components of test anxiety, worry and emotionality. Worry refers to the cognitive component anxiety, and consists of self-deprecatory thoughts about one's performance and other negative self-reflective ruminations. Emotionality refers to the affective component of anxiety, including psychosomatic signs of anxiety, tension, and nervousness. Using factor analysis, Liebert and Morris showed that these two components are empirically distinct, though they are correlated. Wine (1980)

has argued that the worry or cognitive component of test anxiety interferes most with test performance.

In the math anxiety literature, Wigfield and Meece (1988) also have found evidence for two components of math anxiety that are somewhat analogous to the worry and emotionality components of test anxiety. Wigfield and Meece called the cognitive component of math anxiety worry, and the emotional component negative affective reactions. They found that the negative affective reactions scale had a stronger negative correlation to grades in math than did the worry scale.

Though there has been much interest in the general topic of anxiety, there have been remarkably few studies of the development of anxiety, particularly longitudinal studies. In one major longitudinal study, Hill and Sarason (1966) showed that test anxiety increased from first through sixth grade, and that the negative correlation of test anxiety and test performance also increased, reaching -.44 in some groups by sixth grade. In a cross-sectional study, Manley and Rosemier.(1972) found that junior high school aged-boys had higher mean levels of test anxiety than did high school-aged boys, suggesting that for boys anxiety may peak in junior high. For the girls in their study, some decrease in anxiety following junior high school was observed, but the pattern was not as consistent. In the math anxiety literature, there is some evidence that math anxiety increases across age (Brush, 1980; Meece, 1981). Wigfield and Meece (1988) looked at grade differences in worry and negative affective reactions to math in their sample of fifth through twelfth graders. There were no grade differences in negative affective reactions. Worry was highest in the ninth grade group and lowest in the sixth grade group.

In the present study, we build in this previous work in several ways. First, we looked at longitudinal changes in anxiety about different school subjects before and after the transition to junior high. This school transition has been shown to have a significant negative impact on many students' beliefs, attitudes and motivation about school (Eccles, Midgley, & Adler, 1984). In keeping with recent trends in the test anxiety (Morris, Davis, & Hutchings, 1981) and math anxiety (Wigfield & Meece, 1988) literatures showing that anxiety should be viewed as a multidimensional construct, we assessed both a cognitive/worry component of anxiety and an emotional/negative affective component of anxiety. Second, since math anxiety has been the subject area that has received the most attention, we looked at math worry and negative affective reactions and also worry and negative affective reactions about English, so that we could compare students' anxiety across these subject areas. Third, previous research has shown that girls tend to be more anxious about math (Betz, 1978; Brush, 1980). We assessed gender differences in anxiety about math and English for this age group, to determine if girls are more anxious only about math, or about other subjects as well. Fourth, previous research suggests that students doing less well in school tend to be more anxious (see Wigfield & Eccles, in press). We assessed math and English affective reactions and worries of students rated by their teachers as performing well, average, or poorly in math.

Based on previous work, we hypothesized that children's worries and negative affective reactions to math in particular but also English would increase over time, as a result of the transition to junior high school. Girls were expected to be more worried about math and have stronger negative affective reactions to math than were boys. We predicted no gender differences for English worries or negative affective reactions. Children

rated as higher in math ability by their teachers were expected to be less worried and have more positive affective reactions to both math and English than were children rated lower in math ability.

Method

Study Overview

The data for this study are part of a large investigation (the Transitions in Early Adolescence Project) that is concerned with how early adolescents' beliefs and attitudes about different school subjects and a variety of other activities change across the transition to junior high school. The study has a two-year, 4 wave design, with questionnaires given in the fall and spring of each of the two school years. Approximately 3500 students were included in the study. The questionnaires contained items assessing many different beliefs and attitudes about mathematics, English, and other activities. Since items assessing English affective reactions and worry were asked only at Waves 2 and 4 (the spring of students' sixth and seventh grade years), we report data from just these two waves.

Sample

Because we were interested in how the transition to junior high influenced students' anxiety, the sample for our analyses consists of the approximately 2000 students from the larger study who were in sixth grade in elementary school during year 1 of the study and in seventh grade in a junior high school during year 2, and who had complete data on the anxiety measures. The students come from 12 different school and are from lower middle class to middle class backgrounds. Nearly all the students are white.

Measures

The Wave 2 and 4 questionnaires contained three items assessing students' worries and three items assessing negative affective reactions to both math

and English. The items were parallel across the two subject areas. The worry items assessed students' cognitive concerns about math or English, and the negative affective reactions items assessed students' fears about math and English tests. The items are listed in Table 1. We created scales for each of these item sets, and the reliabilities (Cronbach alphas) for the scales are reported in Table 1.

Students' level of performance in math was obtained from teachers' ratings of their students' natural talent in math and performance in math. To create extreme groups, we tried to achieve a 20-60-20% split, but the distribution did not allow that split, Instead, we created a 12-66-22% split for low, average, and high-performing students, respectively. The split produced similar numbers of boys and girls in each group.

Analysis

Students' responses to the worry and negative affective reaction scales were analyzed using multivariate analysis of variance (MANOVA). The .01 level of significance was adopted because of the large sample size. The MANOVA included two between-subject factors, teacher-rated math ability (3 levels) and sex (2 levels), and two within-subject factors, subject area/worry-negative affective reactions (4 levels) and wave (2 levels). Significant subject area/worry-negative affective reactions effects and interactions of this factor with other factors in were followed up by 3 (Ability Level) X 2 (Sex) X 2 (Wave) MANOVAs within each of the different anxiety variables. These analyses provided univariate effects for the significant multivariate effects.

Results

Subject Area and Wave Differences

Results show that children's negative affective reactions and worries differ across subject area and over time, as the significant subject area by

wave interaction shows, $F(3, 2032) = 8.77$, $p < .01$ (see Figure 1). Children's worries about math are highest, followed by worries about English,negative affective reactions to math, and then negative affective reactions to English. The univariate follow-up tests showed that over time children's negative affective reactions and worries about math and negative affective reactions to English decline significantly ($p < .01$), but their worry about English stays the same across the transition to junior high.

Sex Differences

The sex by subject area interaction is significant, $F(3, 2032) = 18.81$, $p < .001$. As predicted, the univariate trends show that girls express significantly ($p < .01$) more negative affective reactions and worries about math than do boys. Girls' and boys worries and negative affective reactions to English do not differ. In general, the differences between boys' and girls' math negative affective reactions and worries decrease somewhat over time, as the sex by wave interaction shows, $F(1, 2034) = 10.10$, $p < .001$ (see Figure 2 for the means for math worries and negative affective reactions.). However, the differences remain strong.

Ability Level Differences

The math ability level by subject area interaction is significant, $F(6, 4062 = 7.68$, $p < .01$, and the means are presented in Table 2. As predicted, the univariate trends show that students rated by their teacher as performing better in math express significantly less worry and negative affective reactions to math and English than children rated as average performers. The average-rated children are less worried and have more positive affect about math and English than are the children rated as performing poorly. In general, the differences between the groups are strongest for negative affective reactions to math, though all the univariate trends are significant at

the .01 level. As indicated by the significant ability level by wave interaction, $F(2, 2034) = 12.71$, $p < .001$, the differences between the high-rated and low-rated groups decrease over time. This effect occurred mostly because the low-rated children's scores on all of the variables (particularly negative affective reactions to math) decline between waves 2 and 4, whereas those of the high-rated group are relatively similar at each wave.

Discussion

Several important findings emerged from this study, and each will be discussed with a particular focus on what kinds of intervention strategies might be appropriate to alleviate problems associated with anxiety.

1. The results illustrate the importance of distinguishing between cognitive and affective components of anxiety, and show that children's worries about math and English are stronger than their negative affective reactions to each subject. Comparing the two subjects, children worried more about how they are doing in math, and had somewhat stronger negative affective reactions to math, especially at Wave 2.

These results and those from the test anxiety literature suggest that more attention should be paid to anxiety intervention strategies emphasizing cognitive variables rather than focusing solely on relaxation and desensitization techniques (see Wine, 1980). These strategies attempt to alleviate children's negative ruminations about performance, and try to focus children's attention on strategies for dealing with different kinds of problems or test questions. To date, most intervention approaches continue to emphasize the emotional/affective aspects of anxiety; this situation needs to be changed.

2. The sex differences were as predicted: girls worried more and had stronger negative affective reactions to math than did boys, whereas no sex differences occurred for English. The sex differences for math declined some over time,

but remained relatively strong. In terms of intervention, these results suggest that girls' worries and anxieties need to be addressed to facilitate their continuing participation in math. In our other work (e.g., Eccles, 1983) we have found that girls often outperform boys in math at these ages; yet they are more worried and have stronger negative affect about math. This seeming paradox may be explained by the ways in which math is taught, particularly at the secondary school level. Changing certain math instructional practices, especially competition between students, and making its relevance more apparent to girls, could lessen girls' anxiety about math. Regarding English, it is interesting to note that in our other work girls often outperform boys in English classes, yet boys do not appear to become anxious about English in the way girls become anxious about math. Comparisons of English instruction versus math instruction might yield interesting information on why these differences occur.

3. The ability level differences also were as predicted, and were particularly pronounced for mathematics. These results suggest that anxiety intervention programs should focus on lower-achieving children's problems in math more than their problems in English. However, given the relatively low skill level of these children, they also may need skill or efficacy training along the lines of programs developed by Schunk (1984). The combination of training to reduce these children's anxiety about math as well as to enhance their skills should be a particularly effective way of improving both their performance in and motivation for math.

4. The declines in math worry, math negative affective reactions, and English negative affective reactions across the junior high transition were somewhat surprising to us. One possible explanation for this finding is that from our observations of math instruction in many of the classrooms in which the study

was conducted, much of the material in seventh grade was a review of material first presented in sixth grade. As a result of this repetition, students may experience less anxiety about math in seventh grade- though they express less interest in math as well! Another possible explanation is that many of the children went from heterogeneously grouped classes in sixth grade to homogeneously grouped classes in seventh grade. Perhaps the lower ability children, whose anxiety scores decreased the most, felt less anxious in seventh grade because their social comparison group now consisted of students performing at similar levels to them. It would be interesting to follow these students through junior high school to see if the low achieving students anxiety increases again.

5. Future directions- we are looking at how these different groups of students' worries and negative affective reactions about math and English relate to their actual performance in those subjects. We also are examining how different kinds of classroom instructional practices may increase or decrease students' anxiety, especially about math. And we are looking at how students' anxiety about math and English relate to other important achievement-related beliefs, such as perceptions of ability, and valuing of the subjects.

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Table 1

Items in the Math and English Worry and Negative Affective Reactions Scales.

Math and English Worry

1. How much do you worry about how well you are doing in (math/English)?

2. If you are absent from school and you miss a (math/English) assignment, how much do you worry that you will be behind the other students when you come back to school?

3. When the teacher says she is going to ask you some questions to find out how much you know in(math/English), how much do you worry that you will do poorly?

Math and English Negative Affective Reactions (NAR)

1. Before you take a test in (math/English), how nervous do you get?

2. While you are taking a (math/English) test, how nervous do you get?

3. Do (math/English) tests scare you?

Alphas for the Scales

	Wave 2	Wave 4
Math Worry	.62	.68
English Worry	.78	.75
Math NAR	.87	.89
English NAR	.90	.91

Table 2

Math and English Worry and Negative Affective Reactions for Students Differing in Teacher-Rated Math Ability

	Time of Measurement	
	Wave 2	Wave 4
Math Worry		
Low Ability Children	14.83	13.59
Average Ability Children	13.74	12.89
High Ability Children	12.55	12.54
English Worry		
Low Ability Children	12.71	12.08
Average Ability Children	11.70	11.26
High Ability Children	10.72	11.21
Math Negative Affective Reactions		
Low Ability Children	12.75	10.90
Average Ability Children	10.40	9.04
High Ability Children	8.84	8.55
English Negative Affective Reactions		
Low Ability Children	11.18	10.12
Average Ability Children	9.68	8.90
High Ability Children	8.95	9.03

Note. Scores range from 3 to 21.

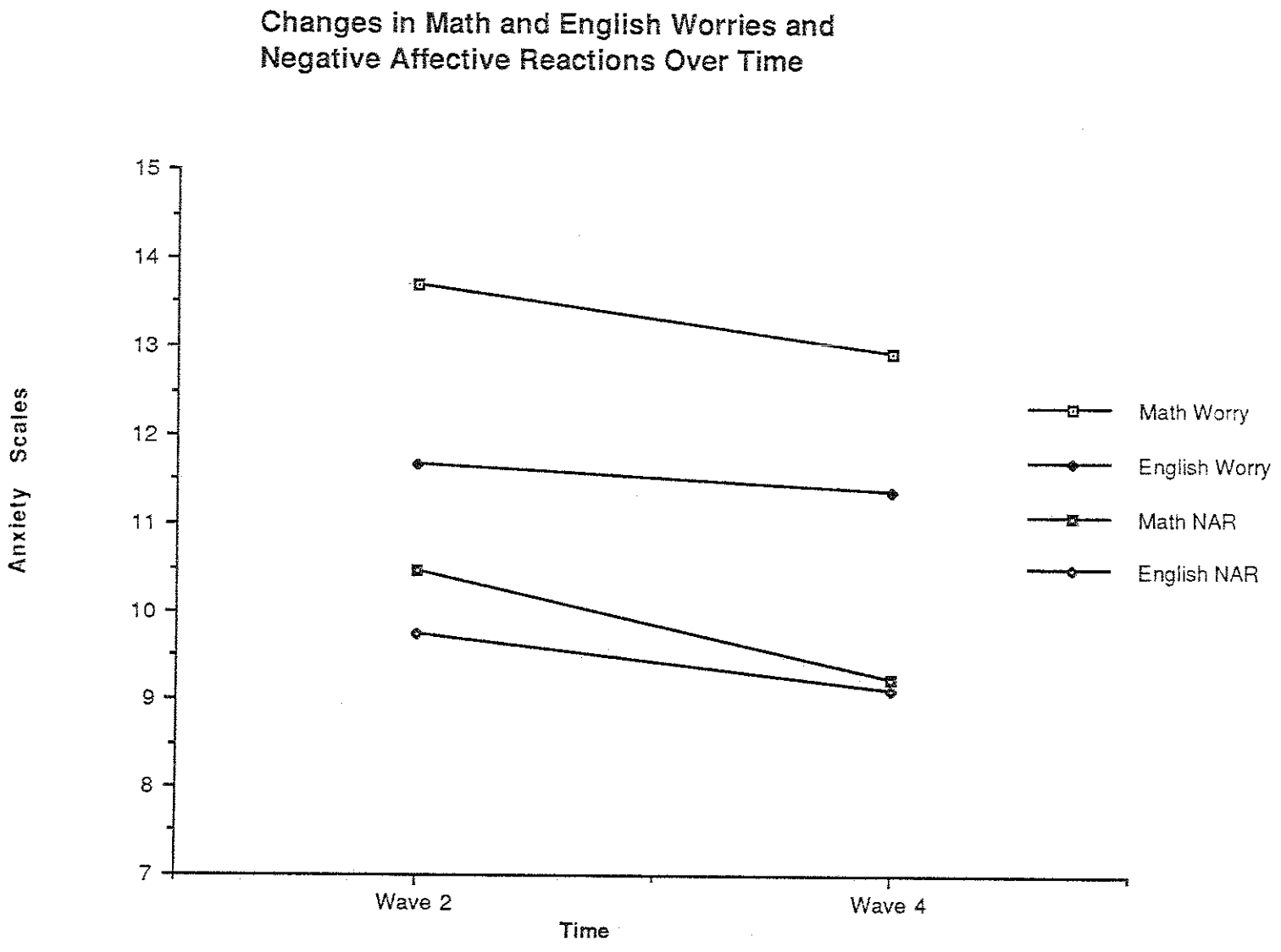
Changes in Math and English Worries and
Negative Affective Reactions Over Time
Anxiety Scales
15
14
13
12
11
10
9
8
7
Wave 2
Wave 4
Time
Math Worry
English Worry
Math NAR
English NAR

Figure 1

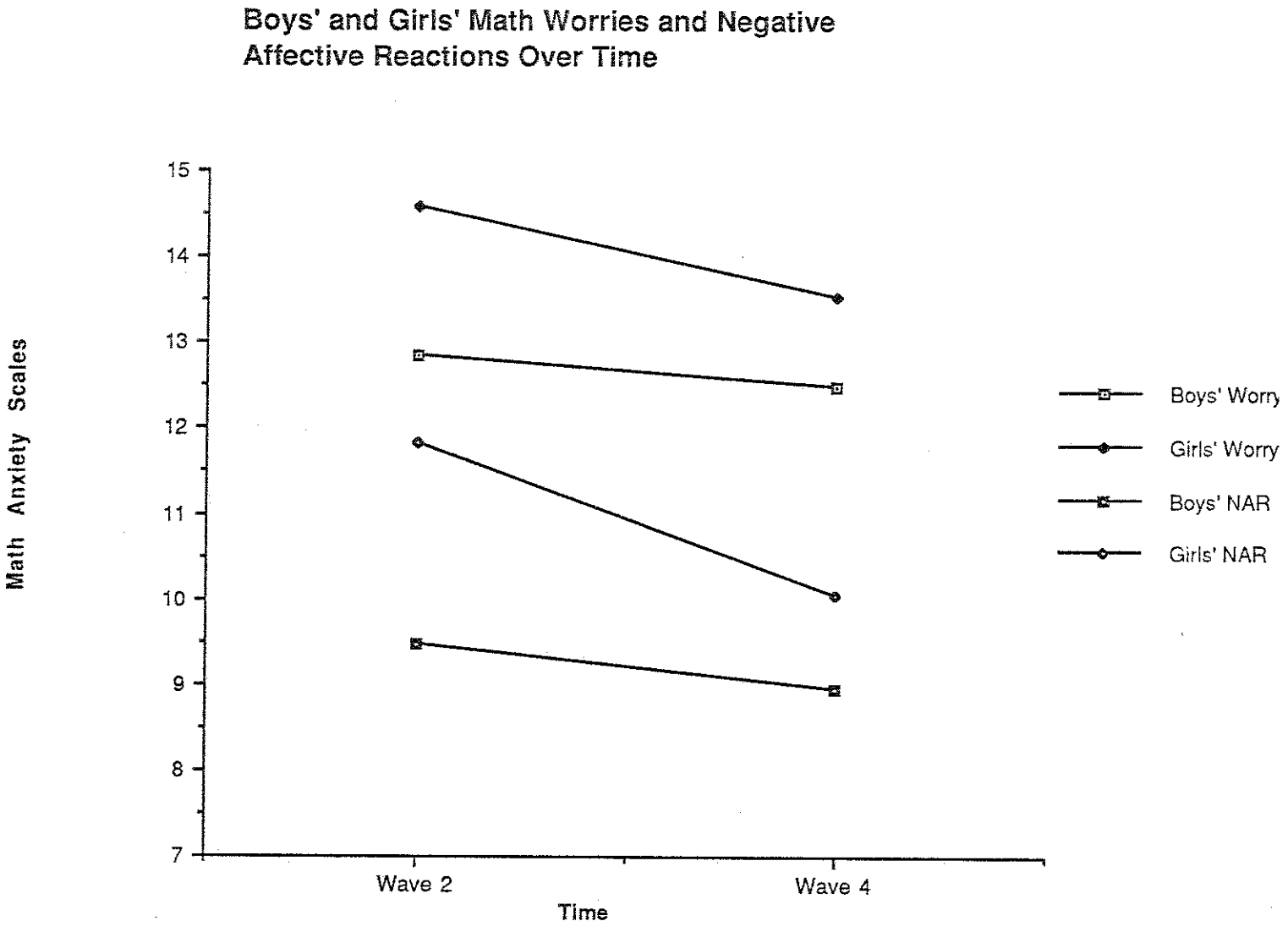
Boys' and Girls' Math Worries and Negative Affective Reactions Over Time
Math Anxiety Scales
15
14
13
12
11
10
9
8
7
Wave 2
Wave 4
Time
Boys' Worry
Girls' Worry
Boys' NAR
Girls' NAR

Figure 2