Gender Differences in Childhood Anxiety in Relation to School Performance

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In a study of UK children aged 8-11, we investigated the potential negative impact of anxiety on school achievement. In the classroom, children completed the SEMA (Scale of Early Math Anxiety (SEMA) and SCARED (Screen for Child Anxiety Related Disorders) questionnaires. Their results were compared against their most recent indicators of school achievement. We found significant negative effects of anxiety on females, but not males. Our results related to math and writing are consistent with previous research, although there appears to be little evidence of a gender difference in anxiety on writing achievement. In relation to reading achievement, previous studies demonstrate significant negative effects of anxiety on achievement, but only in males.

Keywords: Gender, anxiety, child, school

A significant proportion of children suffer from anxiety (Polancyzk et al., 2015). Anxiety is a mood state characterized by fear-like symptoms in anticipation of real or imagined future threats (Craske et al., 2009; Furr et al., 2009). Symptoms of anxiety can be somatic (e.g., elevated heart rate), cognitive (e.g., misbeliefs), or emotional (e.g., difficulty in regulating emotion) (Furr et al., 2009). Furthermore, anxiety can have a significant impact on school achievement (Barroso et al., 2020; Namkung et al., 2019; Ramirez et al., 2019; van Mier et al., 2019).

Here, we investigated gender differences among school-aged children on the relation between anxiety and school achievement – focusing on math, reading, and writing. Math anxiety has received far more research attention than reading or writing anxiety. For math, two recent meta-analyses (Barroso et al., 2020; Namkung et al., 2019) found significant inverse correlations between math anxiety and math achievement. Barroso et al. (2020) pointed out that the evidence for gender differences is mixed (some studies show differences and others do not). Van Mier et al. (2019) showed strong gender differences in their study of children (aged 8-10 years) using a math test ("*Tempo Test Arithmetic*") and a math anxiety questionnaire ("*Child Math Anxiety Questionnaire*"),

finding a significant negative correlation between math anxiety and math achievement – but *only in girls*. For reading achievement, Ramirez et al. (2019) found a significant negative correlation (on children aged 6-8 years) between reading anxiety and reading achievement – but *only in boys*. For writing achievement, girls are often considered to do better than boys (Gelati, 2012), but there seems to be little evidence of a gender difference based on anxiety and achievement (Pajares et al., 2006).

Our research design was simple: we compared children's results on anxiety scales against the children's grades in math, reading, and writing. For the math, reading, and writing scores obtained from assessments (dependent variable), some explanation is needed here. In the United Kingdom, there was once a system called "national curriculum levels" (Boylan, 2016). This consisted of levels of attainment, starting at level 1 (age 5-6). Levels were further subdivided into sublevels a, b, or c (Boylan, 2016). Curriculum levels were originally created through a government policy, but sublevels came into ad hoc usage within the schools themselves (Boylan, 2016). National curriculum levels were discontinued in 2014 (our study was conducted in their final year of existence). Other studies have used curriculum levels as a variable (e.g., Holliman et al., 2016).

For measuring anxiety (the independent variable), we used two previously-published self-report scales. The first was the *Screen for Child Anxiety Related Disorders* (SCARED), created by Birmaher et al. (1997), and still considered a useful scale today (Etkin et al., 2020). The second anxiety scale was the *Scale for Early Math Anxiety* (SEMA), created by Wu et al. (2012), which assesses anxiety towards solving math problems and anxiety in testing and social situations when learning mathematical concepts. This is also still considered a useful scale (Barroso et al., 2020). Based on previous research (e.g., van Mier et al., 2019), we predicted that high anxiety would have a negative impact on math grades – possibly more for girls than boys. For reading and writing, we had no specific predictions (given the equivocal results of past studies).

METHOD

Participants

Seventy-seven participants (24m/53f) were recruited from three primary schools in London and Hertfordshire, UK. Participants were between 8 and 11 years of age ($M = 9.9$, $SD = 1.10$). Twelve children were 8 years old (5m/7f), 14 were 9 (6m/8f), 20 were 10 (7m/13f), and 31 were 11 (6m/25f).

Materials

Two anxiety scales were used. The first was the *Screen for Child Related Disorders* (SCARED) (Birmaher et al., 1997). Test-retest reliability for SCARED showed an intraclass correlation coefficient of .86 (Birmaher et al., 1997). Internal consistency for the 38-item version of SCARED was Cronbach's α = .93. The SCARED scale was given to the children only (the accompanying parent/guardian version of the scale was not used). The second scale was the *Scale for Early Math Anxiety* (SEMA) (Wu et al., 2012). Instead of calculating test-retest reliability for SEMA, Wu et al. (2012) calculated a split-half reliability of .77 using the Spearman-Brown coefficient. Internal consistency for SEMA was Cronbach's α = .87 (Wu et al., 2012). Sample items from both the SCARED and SEMA scales are shown in Table 1. Participants' overall subject achievement in reading, writing, and math were obtained from the school (in the form of curriculum levels).

Table 1. *SCARED and SEMA Sample Items*

SCARED sample items	SEMA sample items
When frightened it is hard to breathe.	Is this right? 9 + 7 = 18.
I feel nervous with people I don't know well.	What time will it be in 20 min?
I'm afraid to be alone in the house.	You are about to take a math test.
I worry about what is going to happen in the future.	You are in class doing a math problem on the board.

Note. Children completing the SEMA scale were asked to rate their nervousness when thinking about each item.

Procedure

Information sheets were distributed to parents/guardians, and informed consent letters were obtained. Questionnaires were administered in the classroom by school staff. One of the researchers (F.L.G.) was present throughout. This project was approved in advance by the ethics committee in the Psychology Department at Middlesex University.

RESULTS

Table 2 shows anxiety scores. Curriculum levels were not designed to map exactly onto school years (Boylan, 2016) and therefore we focused on children's ages (not school year) as cohorts. Curriculum level attainment increased with age. For analysis, we initially used sublevels as

dependent variables. However, none of those results were significant. Subsequently, we used *levels* instead of sublevels (scale 1-6) which did produce significant results (below). There were no significant differences between boys and girls in curriculum level. There was a significant inverse correlation between SEMA scores and *math* level in girls, with

Table 2. Descriptive Statistics for Anxiety Scales SEMA and SCARED (Subscales of SCARED Indented)

Anxiety scales and subscales	Mean (SD) all	Mean (SD) girls	Mean (SD) boys	Range all
SCARED	27.13 (15.49)	28.26 (15.09)	24.62 (16.37)	2 – 68
(all subscales)				
GAD[1]	6.36 (4.30)	6.77 (4.31)	5.46 (4.23)	0 – 18
SP[2]	5.97 (4.01)	6.28 (3.98)	5.29 (4.07)	0 – 16
SAD[3]	6.04 (3.40)	6.28 (3.59)	5.50 (2.96)	0 – 14
SA[4]	2.00 (1.65)	2.09 (1.61)	1.79 (1.59)	0 – 6
PD[5]	6.61 (4.70)	6.94 (4.72)	5.88 (4.67)	0 – 22
SEMA	31.92 (12.12)	31.94 (11.34)	31.88 (13.95)	20 – 81

Note. 1.Generalized Anxiety Disorder. 2. Social Phobia Disorder.
3. Separation Anxiety Disorder. 4. School Avoidance. 5. Panic Disorder

Spearman's rho equal to -.318, p = .020, but not in boys (rho = -.059, p = .784). This was our only significant result with SEMA. There was also a significant inverse correlation between SCARED score and math level in girls (rho = -.337, p = .014), but not in boys (rho = .223, p = .294).

Looking at SCARED subscales, girls only, there were significant inverse correlations between math levels and Generalized Anxiety Disorder (GAD) (rho = -.285, p = .038), Social Phobia Disorder (SP) (rho = -.378, p = .005), and Panic Disorder (PD) (rho = -.363, p = .008); but no significant results for Separation Anxiety Disorder (SAD) (rho = -.175, p = .210) nor School Avoidance (SA) (rho = -.082, p = .558). For *reading* level, there was a significant inverse correlation between SCARED score and reading level in girls (rho = -.403, p = .003), but not in boys (rho = .195, p = .362). Looking at SCARED subscales, girls only, there were significant inverse correlations between reading levels and GAD (rho = -.380, p = .005), SP (rho = -.407, p = .003), SAD (rho = -.281, p = .042), and PD (rho = -.392, p = .004); but no significant results for SA (rho = -.243, p = .080). For *writing* level, there was a significant inverse correlation between SCARED score and writing level in girls (rho = -.295, p = .032), but not in boys (rho = .161, p = .362). Looking at SCARED subscales, girls only, there were significant inverse correlations between writing levels and GAD (rho = -.273, p = .048) and

PD (rho = -.401, p = .003), but no significant results for SP (rho = -.245, p = .077), SAD (rho = -.163, p = .243), nor SA (rho = -.101, p = .474). For all analyses above, there were no significant results when boys and girls were analyzed together. There were no significant results for any SCARED subscale for boys.

DISCUSSION

Girls may suffer some negative impact of anxiety. Significant inverse correlations (ranging from rho = -.407 to -.273) were found between anxiety and girls' achievement scores in math, reading, and writing. No equivalent significant results were found in boys. Our math results are congruent with past studies (e.g., van Mier et al., 2019) showing an anxiety disadvantage for girls. For reading results, the pattern is different from past studies (see introduction). There were no previous studies on writing results that seemed directly comparable.

Our study had limitations. The sample was fairly small and lopsided (68.8% girls). Our non-causal correlations, while significant, were not particularly high. Our anxiety scales (SCARED/SEMA, two of many that exist in the literature, see Barroso et al., 2020) have the inherent disadvantage of being self-report scales. Finally, our measure of school achievement (the now-discontinued British curriculum levels) is somewhat unusual, perhaps limiting direct comparison to other studies. However, despite our limitations, we found clear sex differences. As with many studies before us (see Barroso et al., 2020), our study highlights the need to intervene early in girls' education to prevent the deleterious effects of anxiety on school achievement.

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