

Is anxiety more common in school students with newly diagnosed specific learning disabilities? A cross-sectional questionnaire-based study in Mumbai, Maharashtra, India

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ABSTRACT

Background and Objectives: School students with specific learning disabilities (SpLDs) experience chronic academic underachievement and resultant stress. The present study aimed to determine if school students with newly diagnosed SpLD were more likely to have anxiety than their regular peers. **Materials and Methods:** The study cases (aged 8-15 years) were recruited from our institute’s learning disability clinic. The matched controls were recruited from four schools in Mumbai, Maharashtra, India. Anxiety was measured using the Spence Children’s Anxiety Scale (SCAS)-child self-report version questionnaire. Median SCAS scores and the proportion of students with an SCAS score in the “clinical anxiety” range were compared between the groups. **Results:** SCAS scores were significantly higher in 8-11-year-old learning-disabled male and female students ($P < 0.0001$ for both groups) and 12-15-year-old female students ($P = 0.004$), as compared with matched controls. A significantly higher number of learning-disabled students were found to have “clinical anxiety” [24.64% vs 4.35%, crude odds ratio (OR) = 7.19, 95% confidence interval (CI) 2.91-17.78, $P = 0.0001$], as compared with the controls regardless of gender, age group, presence of comorbid attention-deficit/hyperactivity disorder (ADHD), or associated medical conditions. A significantly higher proportion of 8-11-year-old learning-disabled students, especially males, were found to have “clinical anxiety” as compared with 12-15-year-old learning-disabled students (crude OR = 4.38, 95% CI 1.94-9.92, $P = 0.0004$). Gender, presence of comorbid ADHD or associated medical conditions, and type of school attended or curriculum did not impact the prevalence of “clinical anxiety” in learning-disabled students. **Interpretation and Conclusions:** Students with newly diagnosed SpLD have greater odds of being “clinically anxious” relative to their regular peers. We recommend screening for anxiety in children with SpLD immediately after diagnosis so that their optimum rehabilitation can be facilitated.

KEY WORDS: Anxiety, attention-deficit/hyperactivity disorder (ADHD), dyslexia, scholastic backwardness, students

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Introduction

Specific learning disabilities (SpLDs) are a group of neurodevelopmental disorders characterized by severe and persistent difficulties in learning to efficiently read

(“dyslexia” or “SpLD₁”), write (“dysgraphia” or “SpLD₂”), and/or perform mathematical calculations (“dyscalculia” or “SpLD₃”), despite conventional instruction, intact

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hearing and vision, adequate motivation, and sociocultural opportunity.^[1-3] It is estimated that 3-15% of school students have one or more of these disabilities.^[1,4-6] These students achieve school grades that do not correspond to their abilities,^[1,2] that is, they are “underachievers” and may also experience difficulties in coping with the problems of daily living and social adaptation.^[7] Being a chronic condition, the student’s problems generate stress for the entire family.^[7] Students with newly diagnosed SpLD perceive their psychosocial, physical, and overall health-related quality of life to be significantly compromised.^[8]

A PubMed search using the medical subject headings (MeSH) words “learning disorders,” “dyslexia,” and “anxiety” did not reveal any research studies related to anxiety in Indian school students with SpLD. Hence, we conducted the present study to assess whether school students with newly diagnosed SpLD have a higher prevalence of anxiety compared with their “regular” peers.

Materials and Methods

Ethics

The present study was approved by the institutional ethics committee and is registered with the Clinical Trials Registry of India (CTRI/2014/06/004667). An accompanying parent or legal guardian signed an informed consent form permitting the participation of his/her offspring. Additionally, all school students signed an assent form prior to enrolment. The school students and their parents were assured that the answers to the questionnaire would be kept confidential.

Sample size calculation

The prevalence of SpLD in school children in India has been reported to be 3-10% among student populations.^[6] In the present study, we assumed that 10% of school students would have SpLD. With a 95% confidence level and 5% precision, Daniel’s formula^[9] yielded a sample size of 138. A 1:1 ratio of students with SpLD (“study cases”) and regular students (“controls”) were taken. The controls were age- and gender-matched and were from similar socioeconomic strata, as determined by the Kuppaswamy’s socioeconomic scale.^[10,11]

Inclusion criteria and enrolment process

The study population comprised students aged 8-15 years who were newly diagnosed with SpLD (“one or more of these three disabilities,” viz., $SpLD_1 \pm SpLD_2 \pm SpLD_3$). All students in the study group were studying in schools situated in the city of Mumbai in Maharashtra, India where the medium of instruction was English. They were well-versed with the English language and did not have any language barrier. They were enrolled after their psychoeducational assessment had confirmed the diagnosis of SpLD but before their diagnosis had been communicated to their parents or to them. This enrolment process was conducted at the learning disability clinic of a medical college from March 2011 to January 2012.

The students in the control group were recruited from four English medium schools in Mumbai, Maharashtra, India (three “coeducational” schools and one “all-female” school) after consultation with their respective classroom teachers. The controls had normal medical history and physical examination, and had no history of academic underachievement or poor school performance or symptom of hyperactivity/inattentiveness.

Thus, both the groups were selected using purposive sampling. Both groups of children were comparable in terms of age (8-15 years), gender, socioeconomic status, and medium of instruction (English medium schools).

Diagnosis of SpLD

Only children above 8 years of age were included in the study as a conclusive diagnosis of SpLD cannot be made before that age.^[1,3] Unlike children with SpLD, some children are “normal late developers” who by the age of 8 years outgrow their learning problems on their own.^[1,3] All the students in the study group had been referred for assessment due to poor school performance. Our clinic is recognized by the state government of Maharashtra as a certification center for SpLD. Each student in the SpLD clinic underwent the standard recommended evaluation before the diagnosis of SpLD was confirmed.^[3] Over a period of 3 weeks, each student was assessed by a multidisciplinary team (pediatrician, counselor, clinical psychologist, and special educator).^[3] Visual and hearing deficits of >40% were ruled out by an ophthalmologist and an otolaryngologist, respectively.^[3] The counselor ruled out whether any environmental deprivation due to poor home or school environment, or any emotional problem (withdrawn or aggressive behavior) due to stress at home or at school was primarily responsible for the child’s poor school performance.^[3] The Wechsler Intelligence Scale for Children-Revised (Indian adaptation by M.C. Bhatt) was used to determine whether the student’s global intelligence quotient score was average or above average (≥ 85).^[3,12,13]

Curriculum-based evaluation is a recommended method of diagnosing SpLD.^[3,14,15] Employing a locally developed and validated English curriculum-based test, the special educator conducted the educational assessment in specific areas of learning, namely, basic learning skills, reading comprehension, oral expression, listening comprehension, written expression, mathematical calculation, and mathematical reasoning.^[3,15] Based on this test, an academic underachievement of up to 2 years below the student’s actual school grade placement or chronological age led to a diagnosis of SpLD.^[1,3,15] Using information from the child’s parents and teachers, the diagnosis of co-occurring attention-deficit/hyperactivity disorder (ADHD), if present, was made by the pediatrician and confirmed by the psychiatrist by ascertaining that the student’s specific behaviors met the required diagnostic and statistical manual of mental disorders-IV-revised (DSM-IV-R) criteria.^[16] About 20-25% of students with SpLD have comorbid ADHD that is characterized by persistent hyperactivity, impulsivity, and inattention and which may further impair their academic and social functioning.^[1,3]

Data collection

Anxiety was measured using the Spence Children's Anxiety Scale (SCAS)-child self-report version questionnaire.^[17] All students were explained on how to complete the SCAS questionnaire following which they individually completed it in a quiet room. The cases completed the questionnaires at the Learning Disability clinic from where they were recruited and the controls completed them in their respective schools. A supplementary questionnaire that contained items relating to potential confounders [age; gender; comorbid ADHD; associated medical conditions; type of school attended, viz., "co-educational," "only males," or "only females"; and type of school board curriculum, viz., Secondary School Certificate (SSC), Indian Certificate of Secondary Education (ICSE), Central Board of Secondary Education (CBSE), International General Certificate of Secondary Education (IGCSE), or National Institute of Open Schooling (NIOS) were also collected. Anxiety disorders (e.g., separation anxiety, generalized anxiety disorder, panic disorder) are commonly observed in school students with ADHD.^[18] Students with "chronic medical conditions" (such as asthma and epilepsy) are known to undergo stress due to their illness resulting in poor school performance.^[19] The ability of a learning-disabled student to cope with academic difficulties may vary according to the type of peer pressure faced in school and the ability to cope with the rigors of the school curriculum.

Measuring anxiety scores

The SCAS is a widely used self-report questionnaire to assess children and adolescents' perceptions of the frequency with which they experience symptoms relating to separation anxiety, social anxiety, obsessions/compulsions, panic/agoraphobia, fears of physical injury, and generalized anxiety, and is based on the DSM-IV diagnostic categories of anxiety disorders [Table 1].^[16,17] The SCAS is a Likert-type scale and consists of 44 items. Of these, 38 relate to specific symptoms of anxiety and

six are positive filler items that have been included to reduce negative response bias.^[17] The response to each item can be one of the following: "never," "sometimes," "often," or "always." Each item is scored 0-3 and therefore, the maximum possible SCAS total score is 114. Each item question is simple and easy to understand. However, as recommended by S.H. Spence, a student was permitted to take the help of one of the trained interviewers to read out the question and explain before marking his/her response.^[17] The SCAS has been shown to have good test-retest reliability and internal consistency.^[20-22]

Data analysis

Analysis was done using the Statistical Package for Social Sciences, version 20.0 for Windows (Chicago, Illinois, USA). Demographic data were expressed using descriptive statistics. The study population was divided into subgroups based on gender and age with students of 8-11 years of age forming one group and those of 12-15 years of age forming the other group. The SCAS scores (individual subscales and total) of the students in both the groups were calculated as per the recommended guidelines^[23] and were tested for normality using the Kolmogorov-Smirnov test that indicated nonnormal distributions. Hence, the Mann-Whitney U test was used to calculate differences between the two groups.

In the present study, we defined SCAS total scores greater than 2 standard deviations (SDs) above the mean SCAS total score among the regular students as indicative of "clinical anxiety." We based our definition of "clinical anxiety" on a similar study done by Vuillermin *et al.*^[24] After the study was completed, we found that an SCAS total score of 45.81 represented a value greater than 2 SDs above the SCAS total score among the regular students and was used for subsequent calculations. The Fisher's exact test was used to compare the proportion of students identified as having "clinical anxiety" between the two groups. Several subgroup analyses were carried out using Fisher's exact test to compare the proportions of anxious children between cases and controls within the following subgroups: (i) males (ii) females (iii) 8-11-year-olds and (iv) 12-15-year-olds. The crude odds ratio (OR) [with 95% confidence interval (CI)] of students having "clinical anxiety" was calculated for all the groups. Subsequently, in a logistic regression analysis, the total SCAS score was used as the binary dependent variable (presence or absence of clinical anxiety) with age and gender as independent variables. Lastly, several subgroup analyses were similarly carried out within the study group itself to find out whether the odds of being "clinically anxious" was influenced by gender, age group, presence of ADHD and/or associated medical conditions, type of school attended, or curriculum. A two-tailed *P* value of less than 5% was considered significant.

Results

Characteristics of students enrolled in the study

Two-hundred and seventy-six students (138 study cases and 138 controls) were enrolled. No parent/guardian or student declined consent/assent for participation. The mean age of the study group was 12.23 ± 2.03 years and of the control group was 12.17 ± 2.04 years ($P > 0.05$). The boys to girls ratios in both

Table 1: Anxiety types and their meaning^[17]

Type of anxiety	Meaning
Separation anxiety	Extreme fear or discomfort regarding separation from one's home or from attachment figures
Social anxiety	Excessive anxiety when being among people or performing in front of people, particularly those who are unknown
Obsessions/compulsions	Marked distress caused by recurrent thoughts, impulses, or images that are intrusive and may lead to repetitive behaviors such as hand-washing and rechecking or mental acts such as praying
Panic/agoraphobia	Intense discomfort with somatic symptoms such as sweating, dizziness/ may be accompanied by fear of being in places from which escape is difficult
Fears of physical injury	Extreme fear caused by a specific object (e.g., animals) or situation (e.g., driving through a tunnel)
Generalized anxiety	Excessive worrying about a number of events or activities

groups were 2.9:1. Both groups had 34 males and 15 females in the 8-11 years age group and 69 males and 20 females in the 12-15 years age group.

In the study group, 63 (45.65%) students had ADHD as a comorbidity and 13 (9.42%) students had associated “chronic medical conditions”; viz., 9 (6.5%) had asthma or chronic allergies or both; and 1 each had epilepsy and asthma, Erb’s palsy, nocturnal enuresis and strabismus (0.73% each). As per the modified Kuppuswamy’s socioeconomic scale,^[10,11] 84 (61.0%) students who enrolled in the study group belonged to the upper socioeconomic class, 42 (30.0%) to the upper middle class, 9 (7.0%) to the lower middle class, and 3 (2.0%) to the upper lower class of the society.

Overall analysis: Comparison of SCAS total and subgroup scores between the study group and control group

All students

The cases had significantly higher total SCAS scores as compared with the controls ($P < 0.0001$). In the logistic regression analysis, after adjusting for age and gender, the difference in the total SCAS scores continued to remain statistically significant.

Subgroup analysis: Comparison of SCAS total and subgroup scores between the study group and the control group

Male students

Male students aged 8-11 years with SpLD had significantly higher SCAS scores, viz., total score ($P < 0.0001$) and five subgroup scores (“separation anxiety,” “social anxiety,” “obsessions/compulsions,” “panic/agoraphobia,” and “fears of physical injury”) than their matched regular peers [Table 2].

However, there was no significant difference between the SCAS total ($P = 0.140$) and all six subgroup scores of male students aged 12-15 years with SpLD and those of their matched regular peers [Table 3].

Female students

Female students aged 8-11 years with SpLD had significantly higher SCAS scores, viz., total score ($P = 0.0006$) and five subgroups scores (“separation anxiety,” “obsessions/compulsions,” “panic/agoraphobia,” “fears of physical injury,” and “generalized anxiety”) than their matched regular peers [Table 4].

Female students aged 12-15 years with SpLD had significantly higher SCAS scores, viz., total score ($P = 0.005$) and two subgroup scores (“social anxiety” and “panic/ agoraphobia”) than their matched regular peers [Table 5].

Overall analysis: Comparison of “clinical anxiety” between the study group and the control group (aged 8-15 years)

Thirty-four cases versus six controls had “clinical anxiety” [34/138 (24.64%) vs 6/138 (4.35%), crude OR = 7.19, 95% CI 2.91 to 17.78, $P = 0.0001$], indicating that learning-disabled students (aged 8-15 years) had greater odds of being “clinically anxious” compared with their regular peers (aged 8-15 years).

Table 2: Comparison of subscale and total SCAS scores between the study group and control group for male students aged 8-11 years

Type of anxiety	Median score (range)		P value [§]
	Cases (n = 34)	Controls (n = 34)	
Separation anxiety	6.5 (0.0-13.0)	1.5 (0.0-12.0)	<0.0001
Social anxiety	7.0 (1.0-14.0)	4.0 (0.0-12.0)	0.001
Obsessions/compulsions	10.0 (4.0-15.0)	6.0 (0.0-15.0)	<0.0001
Panic/agoraphobia	8.0 (0.0-24.0)	2.0 (0.0-9.0)	<0.0001
Fears of physical injury	5.0 (0.0-13.0)	2.0 (0.0-7.0)	0.020
Generalized anxiety	6.5 (0.0-15.0)	5.0 (0.0-11.0)	0.080
Total SCAS scores	44.5 (10.0-83.0)	23.5 (2.0-50.0)	<0.0001

[§]Mann-Whitney U test

Table 3: Comparison of subscale and total SCAS scores between the study group and control group for male students aged 12-15 years

Type of anxiety	Median score (range)		P value [§]
	Cases (n = 69)	Controls (n = 69)	
Separation anxiety	3.0 (0.0-16.0)	2.0 (0.0-10.0)	0.220
Social anxiety	6.0 (0.0-13.0)	5.0 (0.0-14.0)	0.130
Obsessions/compulsions	7.0 (0.0-18.0)	6.0 (0.0-16.0)	0.330
Panic/agoraphobia	2.0 (0.0-12.0)	1.0 (0.0-8.0)	0.090
Fears of physical injury	3.0 (0.0-10.0)	3.0 (0.0-10.0)	0.750
Generalized anxiety	5.0 (1.0-11.0)	5.0 (0.0-12.0)	0.540
Total SCAS scores	27.0 (8.0-66.0)	23.0 (6.0-58.0)	0.150

[§]Mann-Whitney U test

Table 4: Comparison of subscale and total SCAS scores between the study group and control group for female students aged 8-11 years

Type of anxiety	Median score (range)		P value [§]
	Cases (n = 15)	Controls (n = 15)	
Separation anxiety	8.0 (3.0-16.0)	3.0 (0.0-10.0)	<0.0001
Social anxiety	7.0 (2.0-14.0)	4.0 (1.0-11.0)	0.100
Obsessions/compulsions	10.0 (4.0-12.0)	5.0 (1.0-12.0)	0.004
Panic/agoraphobia	7.0 (1.0-14.0)	3.0 (0.0-9.0)	0.001
Fears of physical injury	8.0 (0.0-11.0)	4.0 (1.0-6.0)	0.002
Generalized anxiety	9.0 (1.0-13.0)	4.0 (0.0-13.0)	0.020
Total SCAS scores	46.0 (22.0-70.0)	22.0 (10.0-53.0)	<0.0001

[§]Mann-Whitney U test

Subgroup analysis: Comparison of “clinical anxiety” between the study group and control group

Male students

Twenty-two cases versus five controls had “clinical anxiety” [22/103 (21.36%) vs 5/103 (4.85%); crude OR = 5.32, 95% CI 1.93 to 14.69, $P = 0.0007$], indicating that male learning-disabled students had greater odds of being “clinically anxious” compared with their regular male peers.

Female students

Twelve cases versus one control had “clinical anxiety” [12/35 (34.29%) vs 1/35 (2.86%), crude OR = 17.74, 95% CI 2.16 to

Table 5: Comparison of subscale and total SCAS scores between the study group and control group for female students aged 12-15 years

Type of anxiety	Median score (range)		P value [§]
	Cases (n = 20)	Controls (n = 20)	
Separation anxiety	4.0 (0.0-10.0)	2.0 (0.0-7.0)	0.170
Social anxiety	10.0 (3.0-16.0)	3.0 (1.0-7.0)	<0.0001
Obsessions/compulsions	8.0 (2.0-14.0)	4.0 (1.0-11.0)	0.100
Panic/agoraphobia	3.0 (0.0-14.0)	1.0 (0.0-6.0)	0.040
Fears of physical injury	3.0 (1.0-13.0)	3.0 (0.0-9.0)	0.450
Generalized anxiety	7.0 (2.0-18.0)	6.0 (2.0-12.0)	0.080
Total SCAS scores	32.0 (12.0-68.0)	21.0 (10.0-44.0)	0.004

[§]Mann-Whitney U test

145.96, $P = 0.001$], indicating that female learning-disabled students had greater odds of being “clinically anxious” compared with their regular female peers.

8-11-year-olds

Twenty-one cases versus three controls had “clinical anxiety” [21/49 (42.86%) vs 3/49 (6.12%), crude OR = 11.5, 95% CI 3.14 to 42.10, $P = 0.0001$], indicating that learning-disabled students aged 8-11 years had greater odds of being “clinically anxious” compared with their regular peers aged 8-11 years.

12-15 year olds

Thirteen cases versus three controls had “clinical anxiety” [13/89 (14.61%) vs 3/89 (3.37%), crude OR = 4.9, 95% CI 1.35 to 17.86, $P = 0.020$], indicating that learning-disabled students aged 12-15 years had greater odds of being “clinically anxious” compared with their regular peers aged 12-15 years.

Effect of comorbid ADHD

In the study group, 63/138 (45.65%) students had comorbid ADHD; of these, 15/63 (23.81%) had “clinical anxiety.” In the control group, no student had comorbid ADHD. Even after excluding these 63 students from the analysis, a significantly higher number of cases were found to have “clinical anxiety” [19/75 (25.33%) vs 6/138 (4.35%), crude OR = 7.46, 95% CI 2.83 to 19.68, $P < 0.0001$], indicating that learning-disabled students, regardless of the presence of comorbid ADHD had greater odds of being “clinically anxious” compared with their regular peers.

Effect of associated “medical conditions”

In the study group, 13/138 (9.42%) students had associated “medical conditions”; of these, 5/13 (38.46%) had “clinical anxiety.” In the control group, no student had associated “medical conditions.” Even after excluding these 13 students from the analysis, a significantly higher number of cases were found to have “clinical anxiety” [29/125 (23.20%) vs. 6/138 (4.35%), crude OR = 6.65, 95% CI 2.66 to 16.64, $P < 0.0001$], indicating that learning-disabled students, regardless of presence of associated “medical conditions” had greater odds of being “clinically anxious” compared with their regular peers.

Combined effect of concomitant comorbid ADHD and/or associated “medical conditions”

In the study group, 71/138 (51.45%) students had comorbid ADHD and/or associated “medical conditions”; of these, 17/71 (23.94%) had “clinical anxiety.” In the control group, no student had comorbid ADHD and/or associated “medical conditions.” Even after excluding these 71 students from the analysis, a significantly higher number of cases were found to have “clinical anxiety” [17/67 (25.37%) vs 6/138 (4.35%), crude OR = 7.48, 95% CI 2.79 to 20.05, $P < 0.0001$], indicating that learning-disabled students, regardless of the presence of comorbid ADHD and/or associated “medical conditions” had greater odds of being “clinically anxious” compared with their regular peers.

Subgroup analysis: Comparison of “clinical anxiety” between the subgroups within the cases

Male versus female

Twenty-two male versus 12 female students with SpLD had “clinical anxiety” [crude OR = 0.52, 95% CI 0.22 to 1.21, $P = 0.170$], indicating that the odds of being “clinically anxious” within learning-disabled students was not influenced by gender.

Students (age 8-11 years vs 12-15 years)

Twenty-one “8-11 year olds” versus 13 “12-15-year olds” with SpLD had “clinical anxiety” [crude OR = 4.38, 95% CI 1.94 to 9.92, $P = 0.0004$], indicating that learning-disabled students aged 8-11 years had greater odds of being “clinically anxious” compared with learning-disabled students aged 12-15 years.

Age 8-11 years (male vs female)

Fifteen “8-11-year old males” versus six “8-11 year-old females” with SpLD had “clinical anxiety” [crude OR = 1.18, 95% CI 0.34 to 4.07, $P = 1.000$], indicating that the odds of being “clinically anxious” in 8-11-year-old learning disabled students was not influenced by gender.

Age 12-15 years (male vs female)

Seven “12-15 year old males” versus six “12-15 year-old females” with SpLD had “clinical anxiety” [crude OR = 0.26, 95% CI 0.08 to 1.00, $P = 0.070$], indicating that the odds of being “clinically anxious” in 12-15-year-old learning disabled students was not influenced by gender.

Males (age 8-11 years vs 12-15 years)

Fifteen “8-11-year-old males” versus seven “12-15-year-old males” with SpLD had “clinical anxiety” [crude OR = 6.99, 95% CI 2.49 to 19.66, $P = 0.0002$], indicating that male learning-disabled students aged 8-11 years had greater odds of being “clinically anxious” compared with male learning-disabled students aged 12-15 years.

Females (age 8-11 years vs 12-15 years)

Six “8-11-year-old females” versus six “12-15-year-old females” with SpLD had “clinical anxiety” [crude OR = 1.56, 95% CI 0.38 to 6.36, $P = 0.720$], indicating that the odds of being “clinically anxious” in female learning-disabled students was not influenced by age group.

Effect of comorbid ADHD

There was no significant difference between those with ADHD and those without ADHD [crude OR = 0.92, 95% CI 0.42 to 2.01, $P = 1.000$], indicating that the odds of being “clinically anxious” in learning-disabled students was not influenced by presence of comorbid ADHD.

Effect of associated “medical conditions”

There was no significant difference between those with associated “medical conditions” and those without it [crude OR = 2.07, 95% CI 0.63 to 6.81, $P = 0.300$], indicating that the odds of being “clinically anxious” in learning-disabled students was not influenced by the presence of associated “medical conditions.”

Combined effect of concomitant comorbid ADHD and/or associated “medical conditions”

There was no significant difference between those with ADHD and/or associated “medical conditions” and those without [crude OR = 0.93, 95% CI 0.43 to 2.01, $P = 1.000$], indicating that the odds of being “clinically anxious” in learning-disabled students was not influenced by the presence of comorbid ADHD and/or associated “medical conditions.”

Effect of other demographic factors

In the present study, neither the type of school (“coeducational” (21/93; 22.58%), “only males” (9/30; 30.0%), “only females” (4/15; 26.67%) attended nor the type of school board curriculum, viz., SSC (23/86; 26.74%), ICSE (6/35; 17.14%), CBSE (4/7; 57.14%), IGCSE (1/5; 20.0%), or NIOS (0/5; 0.0%) influenced the prevalence of “clinical anxiety” in the study group ($P = 1.000$ and $P = 0.430$, respectively), indicating that the odds of being “clinically anxious” in learning disabled students was not influenced by type of school attended or the curriculum.

Discussion

In support of our hypothesis, the present study documents that in the city of Mumbai, Maharashtra, India a significantly higher proportion of learning-disabled students (24.64% vs 4.35%, crude OR = 7.19, 95% CI 2.91 to 17.78, $P = 0.0001$) have “clinical anxiety” regardless of gender, age group, presence of comorbid ADHD, and/or associated medical conditions as compared to their regular peers. We also found out that “clinical anxiety” within these learning-disabled students was not influenced by gender, associated ADHD and/or associated medical conditions, type of school attended, or curriculum. Subsequent subgroup analysis revealed that:

1. All students (aged 8-11 years) and only female students (aged 12-15 years) with newly diagnosed SpLD had significantly higher “levels of anxiety” than their regular peers;
2. A significantly higher proportion of 8-11-year-old learning-disabled students, especially males, were “clinically anxious” as compared with 12-15-year-old learning-disabled students.

A recent meta-analysis by Nelson and Harwood^[25] of the empirical literature on anxious symptomatology among school-

aged students with SpLD in comparison with their regular peers has indicated that learning-disabled students have higher mean scores on measures of anxiety than their regular peers. Additionally, the results of the within-study analysis of gender indicated that male and female students with SpLD do not experience significantly different levels of anxious symptomatology.^[25] The results of the present study are similar to the results of this meta-analysis.^[25] A review by Mugnaini *et al.* has reported that dyslexia is a specific risk factor for developing anxiety from first grade to university.^[26] Also, female gender and co-morbid ADHD are factors which contribute to higher anxiety levels in these students.^[26] In the present study, however, presence of comorbid ADHD did not increase odds of being “clinically anxious” in learning-disabled students. Similar to our results, Alexander-Passe too has reported that all 8-10-year-old learning-disabled students experience higher levels of stress at school than their regular peers, specifically in interactions with teachers and worries over academic examinations.^[27]

Three theories have been proposed to explain the possible relationship between SpLD and anxiety.^[25,28] The most commonly accepted theory is that anxiety develops as a secondary reaction to the academic difficulties experienced by learning-disabled students.^[25,28] A second theory is that learning-disabled students primarily have high levels of anxiety that leads to them develop learning problems.^[25,28] A third theory is that of “cerebral dysfunction,” which proposes that SpLD and anxiety are related to a third factor that is either genetic/constitutional or based on brain dysfunction, that is, a biological factor and therefore, they frequently co-occur.^[25,28]

What is the significance of the present study? First, to our knowledge ours is the first study to report that students with newly diagnosed SpLD have greater odds of being “clinically anxious” compared with their regular peers. The meta-analysis by Nelson and Harwood^[25] had only suggested the possibility that students with SpLD are more likely to experience “clinically significant anxiety” than regular students. Second, in our study we found no evidence that these greater odds could be explained by any of the known confounding factors.

What are the practical implications of the present study? First, we recommend screening for anxiety in all children with SpLD immediately after their diagnosis is confirmed. There is now convincing evidence that with cognitive behavior therapy, a majority of the students with anxiety disorders show favorable outcomes.^[29] Rarely, anxiolytic medications such as selective serotonin reuptake inhibitors (SSRIs) are needed to be prescribed.^[29] It is known that high levels of anxiety have a deleterious effect on academic performance.^[30] Also, untreated anxiety over a period of time would contribute to negative educational outcomes such as failure to complete high school and failure to enter college.^[30] Second, the present study has identified higher levels of specific subtypes of anxiety disorder in learning-disabled children. This data may help the treating counselor/psychiatrist in alleviating their symptoms.

The strengths of the present study include adequate sampling size, matched controls, high participation and response rates,

use of a validated curriculum-based test to diagnose SpLD, and use of a validated pediatric instrument, namely, the SCAS questionnaire to measure anxiety symptoms. We have no proper explanation as to why, among the learning-disabled students, a significantly higher proportion of young (8-11-year-old) learning-disabled male students was found to be “clinically anxious.” In our society, parents often have high academic expectations from their male child. A young learning-disabled male student may therefore, experience a lot more stress at home due to parental expectations for good school grades and develop higher levels of anxiety due to age-related inherent inability to cope with this stress. Paradoxically, male students (aged 12-15 years) with SpLD did not have significantly higher “levels of anxiety” compared with their regular peers. It could be argued that male students (aged 12-15 years) with SpLD might have by then got adjusted or might have just stopped caring (“burn-out”) about their academic problems. Burn-out is a well-known response to chronic stress. Also, it has been recently hypothesized that females in the period from puberty to menopause are more susceptible to anxiety due to a complex and as yet incompletely understood effect of their sex steroids (estrogen and progesterone) on the brain.^[31] This hypothesis may explain as to why, in the present study, only female students (aged 12-15 years) with SpLD had significantly higher “levels of anxiety” compared with their regular peers.

However, the present study has its limitations. First, it should be noted that our definition of “clinical anxiety” (2 SDs above the mean SCAS scores among regular children) is relatively arbitrary. Regular students were not an unselected population, as by definition; children with history of academic underachievement or poor school performance or symptoms of hyperactivity/inattentiveness and abnormal medical history had been excluded. It is reasonably likely that the prevalence of clinical anxiety among our regular students was lower than what it would be among an unselected population. While we can be confident that the OR for “clinical anxiety” was significantly elevated among students with SpLD in comparison to regular students, the prevalence of DSM-IV anxiety disorders within each group is uncertain. Second, the cross-sectional design of the present study limited us from drawing “conclusive” cause-effect relationships between newly diagnosed SpLD and development of anxiety. Longitudinal data is required to more clearly examine the potential relation between SpLD and anxiety. Third, the results were based solely on the students’ self-reports and no behavioral observations or clinical indices were used to confirm these self-report measures and this could have biased some of our results.^[32] Future studies should employ clinical diagnostic interviews in order to examine the possible role of the student’s home, school, and wider social environment in the development of anxiety symptoms. Fourth, it is possible that the students’ perceptions might have differed from those of their parents. However, we believe that the students are more accurate sources of information since their internal distress might not be recognizable to their parents. Also, their parents are known to themselves have anxiety and may unknowingly overreport symptoms in their children.^[33] For a better understanding, future researchers should simultaneously get data from both students and parents (utilizing Spence Children’s Anxiety

Scale-parent-report version). Although we used a validated instrument, further assessment by a psychologist or psychiatrist would have helped in identifying those children with a DSM-V diagnosis of an anxiety disorder but this was beyond the scope of the present study. Fifth, as vernacular (Hindi or Marathi or Gujarati) versions of the SCAS questionnaire are not available, non-English-speaking students were excluded from the study. However, >95% of students referred to our clinic were referred from English-medium schools as the awareness of SpLD is still probably suboptimal in vernacular-medium school professionals. Sixth, students from the lower socioeconomic strata of society were not represented in our study population probably since their parents were not motivated enough to bring them to our clinic for assessment. However, we do not believe that these limitations adversely affected the utility of our results. Due to the limitations outlined above and the general paucity of data on anxiety in Indian students having SpLD, future researchers should investigate whether the present study’s results can be generalized to the population level.

Conclusion

In conclusion, we have found that students with newly diagnosed SpLD are at a substantially higher risk of anxiety than their regular peers. We recommend screening for anxiety in children with SpLD immediately after diagnosis so that their optimum rehabilitation can be facilitated. The use of the SCAS questionnaire can assist in this process. Future studies are required to evaluate the role of parental anxiety in the pathogenesis of comorbid SpLD and anxiety, the longer-term issues associated with comorbid SpLD and anxiety, and strategies to prevent “clinical anxiety” among learning-disabled students.

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Conflicts of interest

Sunil Karande and Nithya J. Gogtay are the current Associate Editor and Editor, respectively, of the Journal of Postgraduate Medicine.

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