

# Study habits among Nigerian secondary school students with brain fog syndrome

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## Abstract

Brain Fog Syndrome (BFS) is a psychiatric disorder associated with study affecting two to four out of every ten African students. One of the consequences of this illness is early fore-closure of education in affected students. Etiological factors such as nervous predisposition, motivation for achievement, and psycho-stimulant use have been found associated with it. However, the contributions of study habits to the pathogenesis of this study-related illness deserve more attention than has been given. We carried out this cross-sectional study to ascertain the types of study habits associated with BFS among a sample of senior secondary school students in Ile-Ife, Nigeria. Five hundred students from six schools in Ile-Ife were selected using a stratified random sampling technique. The selected students completed the Socio-demographic Data Schedule, the Brain Fog Syndrome Scale, and Bakare's Study Habit Inventory. The prevalence of BFS was 40.2% (201). There were no significant socio-demographic variables identifying BFS students apart from those without BFS. The significant measures of study habits that predicted BFS were homework and assignments, examinations, and written work. Those with BFS had 3.58 times the odds to perform poorly on homework and assignments, 3.27 times the odds to perform poorly on examinations, and 1.01 times the odds to perform poorly on written work compared to those without BFS. We concluded that the results of this study suggest that homework and assignments, examinations, and written work were significant study habit variables associated with BFS.

## Introduction

In recent years the economic success of newly industrialized nations has been linked to substantial prior investment in human resources.<sup>1</sup> In these nations institutional and policy choices have been made to guide their

educational systems. In sub-Saharan Africa the situation is different. For instance, the Nigerian population is a very important agenda that is a single point that involves the issues of poverty, education, employment, health, food, and all other aspects of national growth.<sup>2</sup> Nigeria accounts for the highest population rate in the continent of Africa. However, the economy is not among the best; rather it rates among the twenty poorest countries of the world.<sup>2</sup> The Nigerian population, according to World Bank research and the United Nation Population Funds estimate in 2000, has a population of at least 126.9 million. The country's population growth rate was estimated at an average of 2.5%, which in some years would cause a greater challenge to attempts to eradicate poverty. With the population growth in Nigeria, health hazards and progressive educational attainments are major issues.

Primary education in Nigeria enrolls 81% of the relevant age groups and graduates 69% of these.<sup>3,4</sup> Therefore, just over half of all children complete primary school. School drop-out rates have been rising and educational standards reportedly have declined.<sup>5</sup> Secondary education enrolments grew at roughly 10% yearly during the 1990s, but access remains constrained (fewer than half of secondary school-age children attend school). Technical education is neglected substantially and oriented to the teaching of traditional hand skills that often are divorced from labour market requirements. Higher education enrolls a very modest 4% of the relevant age cohort. This level compares poorly with economic competitors such as South Africa (17%), India (7%), Indonesia (11%), and Brazil (12%).<sup>6</sup>

In addition, a literature search has revealed that educational attainment is related to diverse health outcomes.<sup>6</sup> The poor state of mental health among adolescents in industrializing nations jeopardizes their chances of achieving optimum educational goals, and indirectly, their economic successes. Hence, in Nigeria the mental health of students should be of public importance if the country is to achieve economic success.

Brain Fog Syndrome (BFS) is a culture-bound syndrome associated with study that affects two to four of every ten secondary school students in Nigeria.<sup>7</sup> One of the consequences of this illness is early inability to continue schooling. Etiological factors such as nervous predisposition, motivation for achievement, and psycho-stimulant use have been found to be associated with this illness. However, the contributions of study habits to BFS pathogenesis deserve more attention because of the possible implications for intervention studies. From a diligent review of studies, there is a dearth of information on possible relationships between study habits and

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BFS. We carried out this study to ascertain the relationship of study habits to BFS, and if there were a relationship, what types of study habits would be associated with BFS.

## Materials and Methods

### Setting of the study

The study was carried out in Ile-Ife, Osun State, Nigeria. Ile-Ife is a sub-urban city in the South West geopolitical zone of Nigeria and is about 200 km from Lagos, the commercial capital of Nigeria. Within this city are thirty secondary schools, which are spread over two local government areas: Ife Central and Ife East Local Governments.

### Ethical considerations

The Research and Ethical Committee of Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, approved the study protocol, after which the permission to carry out the study was obtained from the Local Inspectors of Education in the two local governments. The principals and teachers of the schools involved and the students (including their parents) who participated in the study were informed formally and their consent was obtained.

## Sampling method

A stratified random sampling technique was used to select six schools for the study. Initial stratification of Ife-Ife was done on the basis of the two local governments. Simple balloting was used to select: (a) two mixed and the only “girls only” school in Ife Central local government, and (b) three mixed schools from Ife East local government. From senior secondary school (SSS) classes only, two and three students were recruited from the six schools because of time constraints and better comprehension of English. A further stratification was done to select the four arms of the SSS 2 and SSS 3 classes that finally participated in the study through simple balloting. Each selected class formed a cluster from which all the students participated. A preliminary investigation by the authors showed that the average number of students in a class was 37 (range of 33-41).

Before the administration of the instruments to the selected clusters, the students were told that: (a) their participation was voluntary and there was no foreseeable risk in participation, (b) those who refused to participate would not be penalized or have loss of benefits, (c) they should not liaise with each other to answer the questions, and any question they might have should be directed to the researcher, (d) their anonymity was assured, and (e) this was not a test, and they should answer the questions honestly.

The sample size used for this study was computed using the formula:

$N = p (1-p) [z/d]^2$ , where the prevalence rate for psychopathology (p) is 22.9%; z is the score at 95% confidence level; and d is the degree of accuracy desired and set at 4%.<sup>7</sup> The level of significance was set at 5%.

## Instruments

**Brain Fog Syndrome Scale (BFSS):** this scale was first developed by Prince in 1962 to assess BFS among students.<sup>8</sup> With BFS delineated as a distinct nosological entity, Prince and Morakinyo refined the questionnaire into a seven-item scale. The possible responses to each item on the questionnaire are three (often, sometimes, and never) with scores 2, 1, and 0, respectively. The scores obtainable on this scale range from 0-14. The higher the score, the more severe the syndrome is. A BFS case must have a minimum total score of 6 on one hand, which must include at least a score of 1 on each of the items 4 and 5 on the other hand because these items are the core construct of BFS. Items 4 and 5 are concerned with the presence of symptoms in the head (such as crawling sensation or heat) and their interference with study. The validity of the scale rests squarely on the construct of the syndrome.<sup>7,9,10</sup>

**Bakare's Study Habit Inventory (SHI):** was developed specifically for Nigerian secondary

**Table 1. Comparison of socio-demographic characteristics of BFS cases and non-BFS cases.**

Variables	BFS Cases	Non-BFS cases	Total	Test of significance
Age (years)				$\chi^2 = 5.328$ df=4 P=0.255
11-13	7 (3.5)	14 (4.7)	21 (4.2)	
14-16	158 (78.6)	223 (74.6)	381 (76.2)	
17-19	30 (14.9)	58 (19.4)	88 (17.6)	
20-22	4 (2.0)	4 (1.3)	8 (1.6)	
23-25	2 (1.0)	-	2 (0.4)	
Total	201 (100)	299 (100)	500 (100)	
Mean (SD)	15.6 ( $\pm 1.6$ )	15.4 ( $\pm 1.5$ )		t = 1.058 df = 498 P = 0.301
Median	15.0	15.0		
Range	12-24	12-21		
Gender				$\chi^2 = 0.143$ df = 1 P = 0.387
Male	92 (45.8)	142 (47.5)	234 (46.8)	
Female	109 (54.2)	157 (52.5)	266 (53.2)	
Total	201 (100)	299 (100)	500 (100)	
Class				$\chi^2 = 0.003$ df = 1 P = 0.96
SSS 2	95 (47.3)	142 (47.5)	237 (47.4)	
SSS 3	106 (52.7)	157 (52.5)	263 (52.6)	
Total	201 (100)	299 (100)	500 (100)	
Course				$\chi^2 = 0.869$ df = 2 P = 0.647
Science	128 (63.7)	181 (60.5)	309 (61.8)	
Arts	67 (33.3)	111 (37.1)	178 (35.6)	
Social science	6 (3.0)	7 (2.3)	13 (2.6)	
Total	201 (100)	299 (100)	500 (100)	
Religion				$\chi^2 = 1.984$ df = 1 p = 0.195
Christianity	170 (84.6)	238 (79.6)	408 (81.6)	
Islam	31 (15.4)	61 (20.4)	92 (18.4)	
Total	201 (100)	299 (100)	500 (100)	
Nationality				$\chi^2 = 0.674$ df = 1 P = 0.412
Nigerian	201 (100)	298 (99.7)	499 (99.8)	
Others	-	1 (0.3)	1 (0.2)	
Total	201 (100)	299 (100)	500 (100)	
Family type				$\chi^2 = 2.665$ df = 1 p = 0.114
Monogamous	143 (71.1)	232 (77.6)	375 (75)	
Polygamous	58 (28.9)	67 (22.4)	125 (25)	
Total	201 (100)	299 (100)	500 (100)	
Residence				$\chi^2 = 1.976$ df = 2 P = 0.372
Parents	183 (91)	282 (94.3)	465 (93)	
Guardian	17 (8.5)	16 (5.4)	33 (6.6)	
Friends	1 (0.5)	1 (0.3)	2 (0.4)	
Total	201 (100)	299 (100)	500 (100)	
Years Spent in School				$\chi^2 = 1.225$ df = 3 P = 0.747
Five	97 (39.8)	147 (60.2)	244 (48.8)	
Six	102 (40.6)	149 (59.4)	251 (50.2)	
Seven	2 (50)	2 (50)	4 (0.8)	
Eight	-	1 (100)	1 (0.2)	
Total	201 (100)	299 (100)	500 (100)	

school students using existing inventories and published studies.<sup>11</sup> It is a self-report inventory that consists of 45 items in the form of direct questions toward tapping eight aspects of the study habit. The responses to each item are graded on a five-point Likert-type scale. The possible responses to each item on the questionnaire are five (almost never, less than half of the time, about half of the time, more than half of the time, and almost always) with scores 1, 2, 3, 4, and 5, respectively, for a positive question and the scores reversed for a negative question. The scores for all questions in each section are totaled and converted to the Stanine equivalent using the Table of

Stanine Norms for the SHI. The Stanine equivalent of the total score on the inventory (i.e. addition of all section's scores) is provided as SHI TOTAL. The Table of Norms for the SHI was obtained by testing a nationwide sample of 520 secondary school students selected from the northern, eastern, and western parts of Nigeria. The schools included boys, girls, and mixed schools, as well as urban and rural schools. All classes in the secondary schools were represented in this sample. The eight aspects of the study habit in this scale are: (i) Homework and Assignments, (ii) Time Allocation to Work, (iii) Reading and Note-taking, (iv) Study

Period Procedures, (v) Concentration, (vi) Written Work, (vii) Examinations, and (viii) Teacher Consultation.

(i) Homework and Assignments cover the habits that students adopt in studying outside the class hours. It assesses how the student organizes his/her academic schedule at home to facilitate learning. It evaluates a student's homework and bedtime routines, and how he/she organizes books, notebooks, and papers for return to school. (ii) Time Allocation to Work is the dimension that assesses the habit of a student to avoid certain factors that might distract his/her focus from succeeding in the course of studying. Other habits assessed here are allocation of time to subjects and the number of hours in studying. (iii) Reading and Note-taking is the dimension that assesses students' habits of note-taking in class. Orderly, labeled, and legible notes written in a student's own words and the use of key words and some supporting details are habits that have been correlated with positive academic outcomes. Other habits of reading such as recitation, reflection on main ideas, and any poorly understood concepts and periodical review of notes are assessed also in this domain. (iv) The Study Period Procedures sub-scale assesses habits related to spreading/spacing studying. The domain of (v) Concentration assesses the habits a student has formed to avoid distractions while studying. (vi) Written Work assesses a student's habit in expressing his/her thoughts in an organized manner with attention to neatness and mistakes. (vii) The Examinations dimension looks at the habits of a student in preparing for examinations. Habits to avoid excessive anxiety are assessed. (viii) Teacher Consultation evaluates a student's habit of interacting with the teacher in studying effectively. The instrument has a test-retest reliability of 0.83 with one group of students, and 0.64 with another group of students over a time interval of three weeks and six weeks, respectively. In addition, it has been found by other Nigerian authors to be reliable and valid among Nigerian students.<sup>12-14</sup>

### Data analysis

The Statistical Package for the Social Sciences (SPSS) for Windows version 11 was used to process the data.<sup>15</sup> The analysis was based on the total number of respondents. For scales and questions with defined categories, frequencies and percentages were calculated for each of the dimensions of BFS and for study habits.

The  $\chi^2$ - and student's t-test were used to test for the differences in the responses between the groups. Multiple correlations were conducted using Pearson's  $\chi^2$ -test. Logistic regression was used to test for the relationship between study habits and BFS. All the tests

were two-tailed and the level of significance was set at 0.05. Odds ratio and the 95% Confidence Interval were calculated for significant variables.

## Results

The mean age of the respondents was 15.5 years (S.D $\pm$ 1.5). About three quarters of the total cohort (76.2%) were aged between 14

and 16 years. Higher proportions of the respondents (53.2%) were females. Two hundred and thirty seven (47.4%) were in the SSS 2 while 263 (52.6%) were in the SSS 3 groups. The majority (81.6%) were Christians. Other socio-demographic details are shown in Table 1.

### Socio-demographic characteristics and Brain Fag Syndrome

The comparison of BFS cases and non-BFS cases on socio-demographic characteristics is

**Table 2. Comparison of students with and without BFS on study habits' dimensions.**

Study Habit Dimension	Category	BFS n (%)	Non-BFS n (%)	Total	Test of significance
Homework and Assignment	Poor	129 (64.2)	108 (36.1)	237 (47.4)	$\chi^2 = 38.136$ df = 2 P $\leq$ 0.001
	Average	55 (27.4)	151 (50.5)	206 (41.2)	
	Good	17 (8.4)	40 (13.4)	57 (11.4)	
	Total	201 (40.2)	299 (59.8)	500 (100)	
Time Allocation	Poor	118 (58.7)	137 (45.8)	255 (51.0)	$\chi^2 = 8.153$ df = 2 P = 0.017
	Average	66 (32.8)	125 (41.8)	191 (38.2)	
	Good	17 (8.5)	37 (12.4)	54 (10.8)	
	Total	201 (40.2)	299 (59.8)	500 (100)	
Reading and Note-taking	Poor	127 (63.2)	145 (48.5)	272 (54.4)	$\chi^2 = 10.626$ df = 2 P = 0.005
	Average	51 (25.4)	111 (37.1)	162 (32.4)	
	Good	23 (11.4)	43 (14.4)	66 (13.2)	
	Total	201 (40.2)	299 (59.8)	500 (100)	
Study Period Procedures	Poor	99 (49.2)	120 (40.1)	219 (43.8)	$\chi^2 = 12.852$ df = 2 P = 0.002
	Average	92 (45.8)	135 (45.2)	227 (45.4)	
	Good	10 (5.0)	44 (14.7)	54 (10.8)	
	Total	201 (40.2)	299 (59.8)	500 (100)	
Concentration	Poor	77 (38.3)	76 (25.4)	153 (30.6)	$\chi^2 = 9.891$ df = 2 P = 0.007
	Average	70 (34.8)	117 (39.1)	187 (37.4)	
	Good	54 (26.9)	106 (35.5)	160 (32.0)	
	Total	201 (40.2)	299 (59.8)	500 (100)	
Written Work	Poor	118 (58.7)	108 (36.1)	226 (45.2)	$\chi^2 = 30.066$ df = 2 P $\leq$ 0.001
	Average	60 (29.9)	108 (36.1)	168 (33.6)	
	Good	23 (11.4)	83 (27.8)	106 (21.2)	
	Total	201 (40.2)	299 (59.8)	500 (100)	
Examinations	Poor	72 (35.8)	69 (23.1)	141 (28.2)	$\chi^2 = 18.714$ df = 2 P $\leq$ 0.001
	Average	92 (45.8)	126 (42.1)	218 (43.6)	
	Good	37 (18.4)	104 (34.8)	141 (28.2)	
	Total	201 (40.2)	299 (59.8)	500 (100)	
Teacher Consultation	Poor	40 (20.1)	42 (14.0)	82 (16.5)	$\chi^2 = 3.306$ df = 2 P = 0.192
	Average	144 (72.4)	230 (76.9)	374 (75.1)	
	Good	15 (7.5)	27 (9.0)	42 (8.4)	
	Total	199 (40.0)	299 (60.0)	498 (100)	
Total Study Habit	Poor	128 (63.7)	116 (38.8)	244 (48.8)	$\chi^2 = 34.153$ df = 2 P $\leq$ 0.001
	Average	65 (32.3)	140 (46.8)	205 (41.0)	
	Good	8 (4.0)	43 (14.4)	51 (10.2)	
	Total	201 (40.2)	299 (59.8)	500 (100)	

**Table 3. Regression analysis to determine measures of study habits predicting BFS.**

Variables	-	t	P	Odds ratio	95% C.I	Partial correlation coefficient
Homework and assignments	-0.176	-3.94	$\leq$ 0.001	3.58	1.44-5.94	-0.485
Examinations	-0.140	-3.029	0.003	3.27	1.65-6.72	-0.423
Written work	-0.119	-2.499	0.013	1.10	1.01-1.12	-0.461

C.I. = confidence interval.



shown in Table 1. The two groups had a similar age distribution. They both had a slight predominance of the female gender. The majority of students in both groups were in the science class, were Christians, and lived with their parents in a monogamous setting. The differences between them were not statistically significant.

### Prevalence of Brain Fag Syndrome

The prevalence of BFS was 40.2%. The severity of BFS was graded thus: mild = having a range of scores of 6 to 8 on BFSS; moderate = having scores of 9 to 11; and severe = having scores of 12 to 14. A higher proportion of BFS (178 [35.6%]) were mild; 21 (4.2%) were of moderate severity; and 2 (0.4%) were severe. This classification is elementary and without empirical support; but may be of clinical significance.

### Study habits and Brain Fag Syndrome

These are shown in Table 2. The subjects were regrouped into three categories according to their Stanine scores as follows: Stanine 1-3 = "Poor"; Stanine 4-6 = "Average"; Stanine 7-9 = "Good". There were significant differences between BFS students and non-BFS students in all the dimensions of the study habit except in teacher consultation. Using total SHI scores, BFS students also had significantly poorer performance. Specifically, BFS students had more problems in homework and assignments, reading and note-taking, time allocation, and written work.

### Study habit measures as predictors of Brain Fag syndrome

A binomial logistic regression was conducted to evaluate how well study habit measures (independent variables) would predict BFS (dependent variable). The overall percentage classification was 68% and the Hosmer and Lemeshow test of goodness-of-fit was non-significant ( $\chi^2=9.223$ ;  $df=8$ ;  $P=0.324$ ), indicating that the model adequately fitted the data. The Likelihood Ratio (LR) was significant ( $LR=609.69$ ;  $P\leq 0.001$ ) indicating that the hypothesis that all the predictors effects were zero was to be rejected. Conducting a forward stepwise binomial regression analysis revealed three of the study habit measures to be significant; that is, homework and assignments; examinations; and written work. The regression equation was significant with  $R^2=0.097$ , adjusted  $R^2=0.092$ , F change (1, 496)=6.244 and significant F change=0.013. Table 3 shows the predictor variables in the regression analysis with their odds ratio and partial correlation coefficients.

## Discussion

BFS has been reported from other parts of West Africa, in other parts of Africa south of the Sahara, and in students from Africa who are studying abroad.<sup>16,17</sup> In this study its prevalence is 40.2%. This is much higher than the reported prevalence of 22.9% among secondary school students in Ilesa by Fatoye and Morakinyo,<sup>7</sup> and 22.4% among secondary school students in Osogbo by Egunranti.<sup>18</sup> It also contrasts with 25% reported by Peltzer *et al.* among South African secondary school students.<sup>17</sup> This difference might reflect the varying degree of westernization in the different populations of students studied.<sup>17</sup> It could also reflect a possible increase in new cases of BFS. It is interesting to find out that the majority of BFS students in our study belonged to the mild category of BFSS. Seeking medical attention possibly would be difficult among this category. Screening for BFS would be important in order to help these people.

Age and gender were not found to be related to BFS in our study. This concurred with the findings of Prince,<sup>19</sup> Guinness,<sup>20</sup> as well as Fatoye and Morakinyo.<sup>7</sup> Factors such as family type, type of residence, and parental educational and occupational statuses were not significantly associated with BFS. This is in contrast with some studies that found BFS more common among people with low socio-economic status.<sup>8,10,21</sup> Studies that compare rural and urban students are needed to clarify this.

Even though the majority of BFS students had good study habits, a significantly higher proportion of students with BFS had poor study habits in comparison to students without BFS. This finding confirmed earlier suggestions that faulty study habits might play a significant role in the etiology of BFS.<sup>7,21,22</sup> In our study the significant measures of study habits that predicted BFS were homework and assignments, examinations, and written work. Those with BFS had 3.58 odds of performing poorly on homework and assignments, 3.27 odds of performing poorly on examinations, and 1.01 odds of performing poorly on written work compared to those without BFS.

Using the psychophysiological theory of Morakinyo, high neuroticism in BFS-prone individuals was likely to increase their levels of anxiety over and above the optimal range that would increase academic performance.<sup>21</sup> The cognitive appraisal of homework and assignments as signifying examinations would worsen their states especially when examinations were close. This might result in studying poorly and written work would also be affected. Their concentration in states of anxiety would be poor and distractions from academic focus would be the rule. Subsequently academic outcomes would be affected negatively. This could

be noticed from the performance in homework and assignments. Poor academic outcomes might portend failure to these individuals who had a high achievement orientation. Their self-esteem would be affected thereby. The resultant effect would be a vicious circle as noted by Morakinyo in his exposition of the theory.

This study is not without limitations. First, it could not be ascertained to what extent the subjects answered the questionnaires sincerely. Second, our study has established associations between study habits and BFS. It would be difficult to say which of the pairs gave birth to the other. Third, findings from our study might be difficult to generalize to primary school pupils and students of tertiary institutions. This is because secondary school students, particularly the senior secondary school students who had better ability to understand the questions and had been studied more, were sampled in our study. However, it is the first study to ascertain the association between study habits and BFS.

## Conclusions

Our study found a significant association between study habits and BFS and found that dimensions of home work and assignments, examinations, and written work were significant predictors of BFS. These factors should be given consideration when planning any intervention program for BFS students.

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