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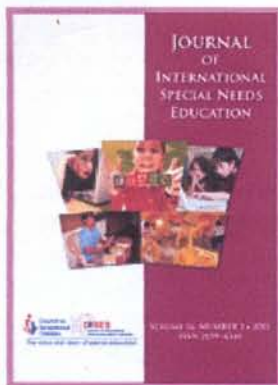
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Feature Articles

Manifestations of Dyslexia and Dyscalculia

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This study examined the prevalence of dyslexia and dyscalculia among pupils in public primary schools in Ibadan metropolis. A correlation was found between the ages of eight and 12 years, and in 4th and 5th grades with the Pupil Rating Scale (MPRS), the Slosson Intelligence Test- Revised Third Test (TPRA) and the Mathematical Abilities Test (MAT) was adopted. It was found that dyslexia and dyscalculia are in the larger percentage. It was also discovered that learning difficulties are peculiar to any gender. Persons with academic deficits in English Language and Mathematics should be taught according to their individual needs. Also, they should be taught according to the Individualized Education Plan.

Manifestations of Dyslexia and Dyscalculia

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MANIFESTATIONS OF DYSLEXIA AND DYSCALCULIA

Abstract

This study examined the prevalence of dyslexia and dyscalculia among persons with academic deficits in English Language and Mathematics in public primary schools in Ibadan metropolis. A correlational survey study, sampling 477 pupils who were between the ages of eight and 12 years, and in 4th and 5th grades with the use of four research instruments- the Myklebust Pupil Rating Scale (MPRS), the Slosson Intelligence Test- Revised Third Edition (SIT-R3), the Test of Pupil Reading Abilities Test (TPRA) and the Mathematical Abilities Test (MAT) was adopted. It was discovered that dyslexia and dyscalculia were prevalent among pupils with academic deficits in English Language and Mathematics, and that pupils with both dyslexia and dyscalculia are in the larger percentage. It was also discovered that learning disabilities, dyslexia and dyscalculia were not peculiar to any gender. Persons with academic deficits in English language and mathematics should be screened for either dyslexia or dyscalculia, even both. Also, they should be taught according to a carefully developed Individualized Education Plan.

Keywords: learning disabilities; dyslexia; dyscalculia; reading; mathematics

尼日利亚伊巴丹市部分小学生阅读障碍和计算障碍的表现

摘要

本研究探讨伊巴丹市公立小学有学习障碍的学生在英语和数学方面普遍存在的阅读障碍和计算障碍。相·调查研究包括477名年龄在8至12岁的4年级和5年级的学生。调查使用4·研究工具: 麦克巴斯特学生评估测试 (MPRS), 斯洛森智力测试-第三次修订版 (SIT-R3), 学生阅读能力测试 (TPRA), 及数学能力测试 (MAT)。结果表明阅读障碍在有英语语言和数学学习障碍的学生中普遍存在。而且同时具有阅读障碍和数学障碍的学生占大多数。结果还表明学习障碍, 阅读和计算障碍没有性·差异。具有英语语言和数学学习障碍的学生应得到阅读障碍或计算障碍, 甚至两者都有的筛选测试。而且这些学生应受到精心为他们设计的个人化教学计划的教育。

MANIFESTACIONES DE DISLEXIA Y DISCALCULIA ENTRE ALUMNOS SELECCIONADOS EN LA ZONA METROPOLITANA DE IBADAN, NIGERIA

Resumen

Este estudio examina la prevalencia de la dislexia y la discalculia entre personas con déficit académico en Inglés y matemáticas en escuelas primarias públicas en el área metropolitana de Ibadan. Una encuesta de estudio correlacional tomó una muestra de 477 niños entre los 8 y 12 años de edad, y entre el cuarto y quinto grado con el uso de cuatro instrumentos de investigación: La escala de evaluación infantil Myklebust, (Myklebust Pupil Rating Scale -MPRS), el prueba de inteligencia Slosson (Slosson Intelligence Test- Revised Third Edition -SIT-R3), La prueba infantil de habilidades de la lectura (Test of Pupil Reading Abilities Test -TPRA) y la prueba de habilidades matemáticas (Mathematical Abilities Test -MAT) Se descubrió que la dislexia y la discalculia fueron prevalentes entre los niños con déficit académicos en el idioma inglés y matemáticas y que estos niños con ambos déficit; dislexia y discalculia- presentan un alto porcentaje. Esto permitió identificar que las discapacidades de aprendizaje; dislexia y discalculia no son particulares de ningún género. Personas con déficit académicos en el idioma Inglés y matemáticas deben ser protegidos de cualquier dislexia o discalculia o de ambos. También deben ser enseñados de acuerdo a un cuidadoso Plan Educativo Individualizado.

المخلص

تناولت هذه الدراسة مدى انتشار عسر القراءة وخلل الحساب بين الأشخاص ذوي العجز الأكاديمي في اللغة الإنجليزية والرياضيات في المدارس الابتدائية الحكومية في مدينة إبيدان. دراسة استقصائية علانية، وتم فحص 477 التلاميذ الذين تتراوح أعمارهم بين ثمانية و 12 عاما، والدرجات في 4th و 5th مع استخدام البحوث في أربعة صكوك تقييم التلميذ مقياس، (MPRS) والاستخبارات تجارب المنقحة الطبعة الثالثة، (SIT-R3) اعتمد اختبار قدرات القراءة للتلميذ اختبار (TPRA) واختبار القدرات الرياضية. (MAT) تم اكتشاف أن عسر القراءة وخلل الحساب كانت سائدة بين الطلاب مع العجز الأكاديمي في اللغة الإنجليزية والرياضيات، وأن التلاميذ مع كل عسر القراءة وخلل الحساب هي في نسبة كبيرة. اكتشف أيضا أن صعوبات التعلم، عسر القراءة وخلل الحساب لم تكن غريبة على أي من الجنسين. يجب فحص الأشخاص ذوي العجز الأكاديمي في اللغة الإنجليزية والرياضيات لعسر القراءة أو خلل الحساب إما، حتى على حد سواء. أيضا، ينبغي تعليمهم وفقا لخطة وضعت بعناية التعليم الفردي.

Learning, an essential process of intellectual or attitudinal changes which always influence human behavior in a more subtle manner has been observed to be the result of experience, multifaceted and active process based on the individual cognitive functioning and reasoning. For learning to be meaningful, such learning should be purposeful and come from perceptions which are directed to the brain by one or more of the five senses of sight, hearing, touch, smell, and taste. Psychologists have also found that learning occurs most rapidly when information is received through more than one sense and is ultimately processed by the brain. Information received can either be stored in the short term memory or in the long term memory. The ability of an individual to retrieve information will then depend on how such an individual can distinctly distinguish between short and long term memories. Due to some reasons however, the brain of some categories of human beings does not interpret correctly what their senses perceive, and therefore do not learn the natural way- these are persons with learning problems or Learning Disabilities (LD). Wendle and his team, in 1971 revealed that the cause of learning disabilities seemed to be malfunctioning of one area or another of the brain. In many cases the malfunction is caused by physical damage to the brain, although such damage is difficult or impossible to prove because the damage is subtle.

According to Werts, Cullata and Tompkins (2007) children with learning disabilities are typical or average in intellectual functioning. This means that they are children whose score in a range on Intelligence tests would indicate no difficulties in cognitive skills, the learning disability lies in their ways of learning, in their perceptual systems and in how they interpret and integrate information to make sense of their world (Werts, Cullata & Tompkins, 2007), while Boon (2010) submitted that the individual is considered to have a learning disability, if achievement is not commensurate with age and ability levels in one or more of the specific areas of reading, writing, mathematics, spelling, listening, and thinking when provided with learning experiences appropriate for age and ability levels. The Queensland Studies Authority (2010) maintained that students with a learning disability are a small group of students with learning difficulties who, because of the neurological basis of their difficulties, have persistent long term needs in one or more of the areas of literacy, numeracy, and learning how to learn. These students do not have any intellectual impairment; they demonstrate idiosyncratic learning styles which are determined by the nature of the specific disorders, and thus inhibit their learning at school. Hence, it is clear that the inability to read and to solve mathematical problems are specific kinds of learning disorders.

Children with dyslexia have difficulties in their schooling, such as very poor spelling, difficulty in keeping time, and poor organization abilities (Shaywitz, 2009). The

problem is usually present in both basic spoken and written language, as persons with dyslexia take a long time to retrieve words, so they might not speak or read as fluidly and fluently as others. It is amazing to know that intelligent people with high intelligence quotient (I.Q) often have reading problems, as evidence suggests that high-performing persons with dyslexia could be very intelligent, often out-of-the box thinkers and problem-solvers (Shaywitz, 2009).

In the same vein, persons with dyscalculia usually have problems understanding basic computational skills, as they most times subitize fewer objects and even when correct may take longer time to identify the number than their age-matched peers. Persons with dyscalculia also have problems with reasoning and forming concepts in abstraction, which would limit their academic choice eventually. They can best be described as having a poor number sense. Mercer (1997) observed that mathematics-related learning disabilities are generally characterized by motor problems reflected in illegible or slowly written numbers, memory problems indicating mastery of facts in an algorithm, language problems which includes processing words with multiple meanings, vocabulary processing and oral mathematical problem-solving. Dyscalculia as a type of learning difficulties occur in children with low Intelligence Quotient, (Geary, Bailey, Littlefield, Wood, Hoard, & Nugent; 2009); dyscalculia can also be found in people with normal to superior intelligence.

It has been noted that dyslexia and dyscalculia as disorders could co-occur in an individual, which is called comorbidity. For instance, Tressoldi, Rosanti and Lucangeli (2007) averred that one of the most common ways of subtyping children with dyscalculia is according to whether or not such children have a co morbid reading disability. Children who have dyscalculia as well as dyslexia usually show a different pattern of difficulties to those who just have dyscalculia. Also, it has been affirmed that the dyscalculia/dyslexia group had left hemisphere impairments that could cause difficulties with verbal processing, and that the dyscalculia only group had right hemisphere impairments that caused difficulties with non-verbal processing (Rourke, 1993). To this end, Tressoldi, Rosati and Lucangeli (2005) conducted a study in order to investigate the extent to which some characteristics of dyscalculia may be common to dyslexia, and affirmed that the more distinctive characteristics of dyscalculia are functionally independent of dyslexia.

Interestingly, learning disabilities, dyslexia and dyscalculia cannot but be gender-related, as some researchers believe that higher prevalence rate may be easily observed in boys due to their biological vulnerability, while some have assumed that the higher prevalence observed in boys may reflect a referral bias. According to Werts, Culatta and Tompkins (2007), the category of students with learning

disabilities has grown to be the largest category of students in special education. For instance, over five million students with disabilities are served in United States (US) public schools; and over half of these students are classified as having a learning disability (Werts, Cullata & Tompkins, 2007). This means that approximately 50% of students with disabilities who are being served are identified as having learning disabilities. Accordingly, estimates of learning disabilities in the US school age population vary from the modest estimate of two percent to extreme ranges of 20 to 40 percent (Pierangelo & Giuliani, 2006). Though there has been no studies to indicate an accurate percentage of the prevalence of dyslexia, it is generally believed that dyslexia can affect between 5 to 10 percent of a given pupil population (Czepita & Lodygowski, 2006). The prevalence of dyscalculia among the school age population has also been found to be within the range of 3–14 percent (Barbaresì, Katusic, Coolligan, Weaver & Jacobsen, 2005; von Aster, Schweiter & Weinhold Zulauf, 2007). This observation might be worse in some countries, most especially the developing nations. For instance, in Nigeria the number of persons with comorbidity of dyslexia and dyscalculia might be high, based on the exceptional poor academic achievement experienced in examinations overtime. Consequent upon this, it is imperative to determine the prevalence of these difficulties among the school age population so as to realize the objectives of the National Policy on Education which emphasizes provision of adequate education for all people with special needs in order that they may fully contribute their own quota to the development of the nation, designing a diversified and appropriate curriculum for all the beneficiaries and ensuring 1:10 as the teacher/pupil ratio for smooth teaching/learning exercises in facilitating good understanding of the concepts or skills.

Culture and Education System in Nigeria

Historically, progress of education in Nigeria was slow but steady throughout the colonial era until the end of World War II, while on the eve of independence in the late 1950s, Nigeria had gone through a decade of exceptional educational growth leading to a movement for universal primary education in the Western Region (Onwuchekwa, 2006). As at 1990, there were three fundamentally distinct education systems in Nigeria: the indigenous system, Quran schools, and formal western -style of education institutions. In the rural areas where the majority lived, children learned the skills of farming and other vocations, as well as the duties of adulthood, from participation in the community (Mba, 1991). This process was often supplemented by age-based schools in which groups of young boys were instructed in community responsibilities by matured men.

Nigeria as a nation believes that education is a means of building the culture, the future and personal develop-

ment of her citizenry. The position of the National Policy on Education (2004) which states that it is the basic right of every child to be educated makes it mandatory for the government at all levels, guardians and parents to ensure that their wards no matter how "able" or "disabled" such a pupil might be. Based on this, the nation had developed a three-tier system of primary, secondary and higher education based on the British model of wide participation at the bottom, into academic and vocational training at the secondary level, and higher education. This structure is more conducive, competitive and challenging with children without special needs. On the contrary, it is rather far to suit the children with special needs, though special education practice in Nigeria has really come a long way; but more values are still needed to be injected into the system. The prevalence of the children with special needs must be determined so as to plan adequately for them. In addition, children with specific learning disabilities which easily expose the system of education to question due to recent high rate of failure in the results of National Examinations must be identified and catered for.

According to the Africa map website (2012), Nigeria currently has a total of 149,229,090 inhabitants, with the literacy rate set at 57.1% of the total population (Males: 67.3%, Females 47.3%), the prominent languages are English (official), Hausa, Yoruba, Ibo and Fulani. The school enrollment at primary schools was last reported at 83.28 (Trading Economies, 2012), while of those attending schools, 87.4% were attending formal schools and 8.1% were attending non-formal schools (The National Literacy Survey, 2010). The National Literacy Survey equally set the national youth literacy rate in English language at 76.3%, with English language being the official language of instruction.

Trends of Dyslexia and Dyscalculia in Nigeria

As at present in Nigeria, there is no available data on the prevalence of learning disabilities, dyslexia and dyscalculia in spite of the overwhelming effects on the educational achievement and psychosocial functioning of individuals with such difficulties (disorders). Ikediashi (2012) affirmed that in Nigeria, statistics are not readily available as regards the prevalence of dyslexia, as very little is known about the disorder. The same reason can therefore be advanced for the non-availability of reliable statistics on the prevalence of dyscalculia. Continued high failure rate in the internal and external school examinations is adjudged as the evidence of dyslexia and dyscalculia at both primary and secondary school system. Most of the pupils in primary (Basic) school show evidence of either dyslexia or dyscalculia, or even co morbid of such specific learning disabilities based on the underachievement performance exhibited. In fact, the results of Senior Secondary School Certificate Examination (SSCE) and the National Examination Council (NECO) in the recent times

Table 1
Demographic information of participants.

Sex	Frequency	Age	Frequency	Mean	Standard Score	Frequency	Mean
Male	219	8	20		52-68	1	
Female	258	9	69	10.69	69-79	10	
		10	191		80-89	60	96.8
		11	117		90-109	388	
		12	80		110-119	15	
Total	477		477			477	

have attested to the fact that the prevalence of learning disabilities might be high in Nigeria. It is generally believed that more than 40% of registered candidates for the Senior School Examinations failed either English Language or Mathematics, with less than four credit pass out of eight or nine registered subjects. An underlying cause of this might be learning disabilities: dyslexia and dyscalculia, since these disorders affect reading and mathematical skills. Also, more than ten percent of the students in year one of university education have been asked to leave the system by the second year due to poor performance and inability to meet requirements of the university, while some do spend more than the required time in order to graduate with at least an ordinary pass. It is obvious that learning disabilities which may be attributed to the failure does not suddenly surface in adulthood, it would have started manifesting in the early years of the school system, specifically during the primary education periods. The Cure research website (2010) published the prevalence rate for learning disabilities to the populations of various countries and regions, with a strong warning however that the prevalence extrapolations for learning disabilities are only estimates, based on applying the prevalence rates from the US (or a similar country) to the population of other countries, and therefore may have very limited relevance to the actual prevalence of learning disabilities in any region. The figure indicated that Nigeria has 300, 189 students with learning disabilities out of the total school population; this figure is clearly unrepresentative of the Nigerian school age population, since the Nigerian school age population run into millions and mass failures experienced in examinations could have some underlying learning disabilities, and also because learning disabilities has the largest disability category (Pierangelo & Giuliani, 2006).

It was in this regard that the present study aimed at identifying persons with dyslexia and dyscalculia among primary school pupils in Ibadan, and also to assess the prevalence of dyslexia and dyscalculia among primary school pupils in Nigeria, in order to determine those at risk of exiting the educational system prematurely. Specifically, the study intended to identify pupils with learning

disabilities, dyslexia and dyscalculia in the primary schools, examine the comorbidity of dyslexia and dyscalculia, determine the gender with the higher prevalence rate of dyslexia, dyscalculia and learning disabilities, examine the relationship between the variables, and determine the prevalence rates of learning disabilities, dyslexia and dyscalculia at least among the Yoruba ethnicity.

In order to achieve these, some research questions and some hypotheses were raised in this study. We predicted that dyslexia and dyscalculia were common among primary school pupils with academic deficits in English language and Mathematics of the Ibadan metropolis, and that dyslexia and dyscalculia co-occur in pupils with learning disabilities. We also predicted that there is no significant difference between male and female pupils with learning disabilities, between male and female participants with dyslexia and between male and female participants with dyscalculia.

METHOD

Participants

The participants for the study comprised 477 pupils with academic deficits in English Language and Mathematics. They were purposively selected from 25 public primary schools in Ibadan Metropolis, and were in 4th and 5th grades. The participants were the pupils who had academic deficits in English Language and Mathematics, and further ascertained by the classroom teachers as having learning disabilities using the MPRS. They were also between the ages of eight and 12 years. All together, there were 219 male and 258 female participants. The mean age (*M*) of the participants was 10.4 years, while the mean intelligence score (*MI*) on the SIT-R3 was 96.8. Details of the demographic information of the participants are revealed in table 1. All the participants were of Yoruba ethnicity and were beneficiaries of the government's free education inclusive of tuition and textbooks. In addition, the participants speak basically English and Yoruba languages, except in few instances where pidgins are being spoken, especially at home.

Research Design

The study adopted a correlational research design. The study observed variables in its naturalness and tried to determine the relationship among the variables.

Measures

Four research instruments were used for the study namely: the Myklebust Pupil Rating Scale (MPRS), the Slosson Intelligence Test Scale – Revised Third Edition (SIT-R3), Test of Pupils' Reading Ability (TPRA), and Mathematical Abilities Test (MAT). The instruments were the diagnostic package for the participants, and were used to determine, learning disabilities, participant's intelligence, dyslexia and dyscalculia respectively. The Myklebust Pupil Rating Scale (MPRS) and The Slosson Intelligence Test Scale Revised Third Edition (SIT-R3) were standardized test scales, while the Test of Pupils' Reading Abilities (TPRA) and the Mathematical Abilities Test (MAT) were self-developed tests designed to test for dyslexia and dyscalculia respectively.

The Myklebust Pupil Rating Scale (MPRS, 1981) was designed in order to screen children with learning disabilities and consequently refer them for further assessment. The scale considered demographic characteristics such as pupil's name, age, sex, grade (class), and name of school, residence, birth date, parents' name, teacher's name and date of recording. The Myklebust Pupil Rating Scale also consisted of five behavioral characteristics, namely: Auditory Comprehension and Memory, Spoken Language, Orientation, Motor Coordination and Personal- Social behavior. Each child was rated on these five characteristics in line with the options available. A rating of three was average; one and two were below average while four and five were above average. A rating of one was considered as the lowest while five was the highest that could be given. All together, the scale has 24 items and a maximum obtainable score of 120. A child with learning disabilities should have an overall score that was below 72. This scale had a reliability coefficient of .86 when the instrument was validated on the Nigerian population, using the test- retest reliability method (Kanu, 2004). This ensured the cultural relevance of the scale to the Nigerian population.

SIT- R3, which is the latest edition of the Intelligence test, was reviewed in 2006 by Nicholson, Hibpshman and Larson in order to meet the growing cultural adjustment to the definition of intelligence. The instrument was used mainly to determine the standard scores of participants. The SIT- R3 used a standard score and which had a mean of 100 and a standard deviation of 16 at all age levels. The Total Standard Score (TSS) of the scale indicated the ability level of the subject in relation to others in the standardization sample. The scale further classified intelligence accordingly- High (TSS 120–131), Above (TSS 110–119), Average (TSS

90–109), Below Average (TSS 80–89), Borderline Mental Health (TSS 69–79), Mild Mental Health (TSS 52–58), Moderate Mental Health (TSS 36–51), Severely Profound (TSS 35 and below). The reliability estimate of the SIT-R3 was .97 using the Split-half with Spearman-Brown Correction method, .97 using the Rulon method, and .96 using the Kuder-Richardson 20 technique.

Test of Pupils' Reading Abilities (TPRA) scale consisted of a comprehension passage and 20 item questions. The purpose was to test all aspects of mastery of English, namely comprehension, vocabulary, grammar, spelling and the ability of the pupil to relate sounds with the words they represent. Each subsection had five related questions, while each correct answer corresponded to one mark to give a total of 20 marks. Any participant with a score between zero and ten on the TPRA was considered to have dyslexia, while participants with a score between 10.5 and above were considered to be proficient in reading ability. The basis for this decision can be linked to the fact that questions in the Test of Pupils' Reading Abilities (TPRA) were taken from primary 3 reading text to take care of academic deficits of participants which have been earlier detected. The TPRA was a self developed scale which was the adapted comprehension passage from the official English Language textbooks of pupils in public schools in Oyo State- The Macmillan New Primary English course. Using Guttman Split- half technique, the reliability coefficient of the Test of Pupils' Reading Abilities was .71.

The Mathematical Abilities Test (MAT) scale similarly was a self developed scale which was the adapted mathematics exercises from the official mathematics textbooks for pupils in public schools in Oyo State- the Evans Modular Mathematics for primary schools. The selected texts were chosen from textbooks of basics three and four. It consisted of 15 items that was used to test for an individual's understanding of basic mathematical concepts such as time, space, number sense, mathematical rules, subitizing, and mathematical signs. Any participant with a score between zero and ten on the MAT was considered to have dyscalculia. The basis for the decision was due to the fact that persons with dyscalculia will usually perform often two years or more below their peers (Desoete, Royers & DeClerq, 2004). Using Guttman Split- half technique, the reliability coefficient of the Mathematical Abilities Test was .74.

Procedure

Personal visits were made to the selected schools with permission sought from the school authorities for the study to be carried out in the schools. The essence of the research as well as the problems of Learning Disabilities: Dyslexia and Dyscalculia if not identified early for appropriate intervention were given to solicit their permission. Afterwards, class teachers of primaries 4 and 5 of the selected schools helped to identify the participants. The

participants were both school-identified and researcher-identified. Pupils with academic deficits were initially identified by the classroom teachers, followed by the researchers ascertaining the deficits by looking at the school records of the last two terms of the teacher-identified pupils. This was to ensure that the pupils identified by the teachers were those with academic deficits in English Language and Mathematics. Using these methods, any pupil who had academic deficits, with a score below the average of 50 percent in the academic records of the last two terms in English Language and Mathematics were automatically considered for the research; as the first condition. The second condition of consideration however required participants to be within the age range of eight and 12 years.

After identifying the pupils who qualified for the study, we went to the schools to explain to the class teachers how to carry out a step by step assessment of the pupils, using the Pupil Rating Scale. This was done in the form of a pilot study. We tested some non-participating students with the MPRS, while using that as a form of training for the teachers, we explained to the teachers how to test using the MPRS and how to appropriately rate the students. We then asked the teachers to use the MPRS on some students to ascertain their mastery. Hence, we asked the teachers to use the Pupil Rating Scale on the participants, in order to screen for learning disabilities. Any pupil who has met the first two conditions and scored below an average of 72 overall on the MPRS was considered as having a learning disability and qualified to be a participant for the study. The purpose of the MPRS was to determine if the academic deficit of the pupils was due to learning disabilities, poor instruction or some other factors. Using these methods, the study was controlled, as extraneous variables such as pupils with academic deficits who had scores above 72, or pupils with academic deficits with a score below 72, but who were above 12 years were left out of the study, as they were not considered for further screening. A total of 477 pupils were identified by the teachers as having learning disabilities, using the MPRS. Therefore, the total participants for the study became 477, using MPRS as a first instrument.

Next, we used the SIT- R3 to determine the standard score of the participants. This was done to have a measure of what each participant was capable of learning, viz-a-viz his/ her intellectual capacity. We employed several research assistants in the administration of SIT-R3. Thereafter; we administered the Test for Pupils Reading Abilities on participants, with the help of the classroom teachers, to confirm if the participants had a Specific Learning Disabilities (SLD) that affects reading (Dyslexia); after being exposed to the Pupil Rating Scale. We thereafter used the Mathematical Abilities Test on participants. The MAT confirmed participants with dyscalculia – a Specific

Learning Disabilities (SLD) that affects mathematics, after being exposed to the Pupil Rating Scale.

The MPRS and SIT-R3 were administered individually on participants, while the TPRA and the MAT were administered as a joint test on the participants. Participants in each sample school were assembled for the TPRA and the MAT as an achievement test. There was a week interval in the administration of the TPRA and the MAT, and both the TPRA and the MAT lapsed for 45 minutes.

Data Analysis

SPSS 20.0 was used to analyze the data. We used descriptive statistical analyses to get some basic understandings of the variables of interest. We used simple percentage to determine if dyslexia and dyscalculia as types of learning disabilities was common among participants, and also if dyslexia and dyscalculia could co-occur. Also, we used student t-test to examine the difference in learning disabilities, dyslexia and dyscalculia based on gender.

RESULTS

The major research questions of this study were meant to determine if (1) two major types of learning disabilities (dyslexia and dyscalculia) were common among the pupils with academic deficits in English language and mathematics; (2) dyslexia and dyscalculia occur together (co-morbid) in pupils with learning disabilities; while the hypotheses focused on (1) gender difference in participants (2) gender difference participants with dyslexia (3) gender difference in participants with dyscalculia. The data analysis results are organized below in correspondence with these research questions and hypotheses.

Prevalence of Dyslexia and Dyscalculia among Pupils with Academic Deficits in English Language and Mathematics

The TPRA and the MAT were administered on the participants to test the participants for dyslexia and dyscalculia. As earlier stated, a score of zero to ten (ten inclusive) indicated the presence of a learning disability. Using simple percentage, it was discovered that 333 of the 477 participants (69.8%) and 343 (71.9%) scored between zero and ten in the dyslexia and dyscalculia tests respectively (see table 2).

Comorbidity of Dyslexia and Dyscalculia

Descriptive statistics showed that a total of 247, representing 51.8% of the participants tested to both dyslexia and dyscalculia (see table 3).

Gender Difference and Learning Disabilities

The student t-test analysis showed that of the 219 male participants and 258 female participants, there was a mean score of 68.19 and 66.02 respectively for the genders. The

Table 2

Participants' performances in reading and mathematics showing pupils' areas of learning disabilities. Table 2 reveals that 477 pupils were involved in this study out of which 333 (69.8%) and 343 (71.9%) scored between 0 and 10 in Dyslexia and Dyscalculia tests respectively. This indicates the percentage of pupils with learning disabilities in these two areas.

Scores	Frequency	Dyslexia	Dyscalculia
0-10	F	333	343
	%	69.8	71.9
11-20	F	144	134
	%	30.2	28.1
Total	F	477	477

standard deviation for the male participants was 13.51, while the standard deviation for the female participants was 12.13. Using t-test as a statistical tool, we found out that there was no significant difference between male participants and female participants ($t=1.848$, $df=475$, $p>0.05$). This hypothesis was tested at 0.05 level of significance (see table 4).

Gender Difference and Dyslexia

With the student t-test as a statistical tool, we found that 148 male participants with dyslexia had a mean score of 10.94, and a standard deviation of 4.09, while the 185 female participants with dyslexia had a mean of 11.05 and a standard deviation of 4.24. With the hypothesis tested at 0.05 level of significance, we found no significant difference between male participants with dyslexia and female participants with dyslexia ($t=-3.05$, $df=331$, $p>0.05$) (see table 4).

Gender Difference and Dyscalculia

The statistical tool employed here was the student t-test. We saw that the 165 male participants with dyscalculia had a mean score of 10.47 and a standard deviation of 3.55. The 178 female participants with dyscalculia had a mean score of 10.91 and a standard deviation of 3.87. When the data was analyzed with the hypothesis tested at 0.05 level of significance, we found no significant difference between male participants with dyscalculia and female participants with dyscalculia ($t=-2.81$, $df=341$, $p>0.05$) (see table 4).

DISCUSSION

Prevalence of Dyslexia and Dyscalculia

The results of this study showed that dyslexia and dyscalculia were prevalent primary school pupils with academic deficits in Ibadan Metropolis. This is in accordance with what we predicted earlier that dyslexia

Table 3

Summary of scores of participants with dyslexia and dyscalculia, using simple percentage. Table 3 shows that the co morbid group represents 51.8% of the participants tested to both dyslexia and dyscalculia. It is therefore common among participants with a larger percentage.

Scores	Frequency	Dyslexia	Dyscalculia	Both
0-10	F	333	343	247
	%	69.8	71.9	51.8
11-20	F	144	134	230
	%	30.2	28.1	48.2
Total	F	477	477	477

and dyscalculia is prevalent among primary school pupils with academic deficits in Ibadan metropolis. With respect to dyslexia, the higher prevalence rate may be due to the fact that the participants speak basically two opposing languages in relation to language transparency- Yoruba language and English language. A language is transparent if there is considerable letter-sound relationship, and if a letter has 'one' and only 'one' connotation and phonological sound. For example in Yoruba language, there is perfect letter-sound relationship, as 'a' is pronounced the same way at every time that it appears in a word, irrespective of the position such as 'aso', 'ala' and 'efa'. This however is not the case in English language, as 'a' as a letter can be pronounced in different ways, depending on how such occurs in a word. For example, the 'a' in 'apple' is pronounced differently from the way it appears in 'bag', 'start' or 'Abraham'. Since the problem most persons with dyslexia face is associating words with the letter-sound they represent, they are more likely to be confused and test

Table 4

Summary of t-test analysis showing differences between male and female participants in their learning disabilities scores, dyslexia test and dyscalculia test.

Variable	N	Mean	SD	t	df	Sig (p)	Remark
LD							
Male	219	68.19	13.51	1.85	474	.07	ns
Female	257	66.02	12.13				
Dyslexia							
Male	148	10.94	4.09	-0.20	331	.84	ns
Female	185	11.05	4.24				
Dyscalculia							
Male	165	10.47	3.55	-1.29	341	.20	ns
Female	178						

for dyslexia in a non transparent language such as English. The dyslexia may however not be obvious, or probably say hidden in the transparent Yoruba language. However, at school, the official language of instruction for the participants is English, and the participants should be accustomed to the demands of the language. Accordingly, the study was in agreement with the findings of International Dyslexia Association (2010) that, of people with poor reading skills, 70- 80% were likely to have dyslexia and also that one in every five students of the United States (US) population had language-based learning disabilities. Based on the findings of this study, the prevalence might be much higher in Nigeria than one in every five student population.

Comorbidity of Dyslexia and Dyscalculia

This study has shown that dyslexia and dyscalculia occur together among the participants, as a total of 51.8% had both and dyslexia and dyscalculia. This finding has earlier been predicted that dyslexia co-occurs with dyscalculia, as an impaired reading ability can easily impact on performances in other subjects. In addition, mathematics is a subject dreaded by most students; an impaired reading ability can therefore easily affect an un-nurtured mathematical ability, resulting in a combination of two learning disorders or cognitive deficits. The findings of this study therefore, concurred with Barbaresi, Katusic, Colligan, Weaver, and Jacobsen, (2005) and von Aster, Schweiter, and Weinhold Zulauf, (2007) that the percentage of persons with dyslexia who also have dyscalculia could be as high as 64 percent.

Gender and Learning Disabilities

Our study has clearly revealed that male pupils do not differ from female pupils in the level of learning disabilities exhibited. This is in line with what we predicted earlier that no significant difference existed between the genders in relation to learning disabilities, as we believe both genders have equal chances of having learning disabilities, in as much as the assessment measures are unbiased, and other conditions such as Attention Deficit Hyperactivity Disorder (ADHD) was not considered in the definition and assessment of learning disabilities. To this end, boys are not prone to learning disabilities than girls; they both have equal chances of having learning disabilities, the same way both sexes have equal chances of being born- in such a way it cannot be predetermined by their parents. Even though more males may eventually test to a learning disability than females; same way females outnumber males worldwide in population distribution. In this light, the findings of the study substantiated earlier findings that the higher prevalence of learning disabilities among males may be due to a referral bias, academic difficulties were no more prevalent among boys, but that boys were more likely to be referred for special education when they do have academic

problems because of other behavior such as hyperactivity and emotional disturbances (Pierangelo & Giulliani, 2006).

Gender and Dyslexia

This study has shown that male participants do not differ from female participants on the administered test for dyslexia. Boys naturally are kinesthetic learners- they learn through doing, while girls are auditory learners- they talk through activities (Perles, 2010). This explains why boys perform well in non- language related subjects such as mathematics and physics; while girls do well in language-related subjects such as English language and Literature-in-English. It is also the reason Science classes are male-dominated, while Arts and Humanities classes are female-dominated. Since boys are not auditory learners, they can easily be observed with academic deficits in language subjects, and consequently referred for diagnosis of dyslexia, while girls with academic deficits in language-subjects can easily be put up with- since girls naturally excel in language-subjects. Therefore, since more boys would be referred to assessment centers for eventual diagnosis of dyslexia, it follows that more boys will be diagnosed with dyslexia, the differences attributable to a referral bias problem. In this regard, the study substantiated the findings of Hurst (2010) that gender bias in dyslexia is potentially based on essentialized gender normative behavioral differences. We further agree with William (2010) who concluded that the gender-related issue of dyslexia may be a 'referral bias' type problem, while the boys' to girls' ratio of dyslexia should be 1:1, rather than 4:1, and with Hawke, Wadsworth, Olson and Defries (2007) that no differential etiology of reading difficulties exist as a function of gender, but that the same genetic and environmental influences contribute to reading difficulties in males and females, irrespective of severity.

Gender and Dyscalculia

Our study has clearly shown that male participants with dyscalculia have no significant difference from female participants with dyscalculia. Mathematics- the primary subject in which dyscalculia can be easily identified is a male-dominated subject, meaning that girls are expected to have a higher prevalence rate of dyscalculia; but, our study has discovered something contrary. We found no significant difference on dyscalculia between the genders. This we believe would be because the definition of dyscalculia cuts across mathematical underperformance to mathematical disability. The individual with dyscalculia is not only a 'mathematics underperformer', but is also unable to make use of simple mathematical rules for functional living. This means that such persons will not be able to understand simple relationships and associations, and may run into problems carrying out basic financial tasks that require no special mathematical ability. With this understanding, it is

clear that dyscalculia may not be nature-inclined, as; if males and females are both put on the same yardstick, males may not differ demonstrably from females. The study therefore corroborated with the findings of Koumoula, Tsironi, Stamouli, Bardini, Siapati and Graham – Pavlov's 2004 study that found no significant difference between the numbers of boys and girls who tested to dyscalculia. We further agree with the submissions of Hyde and Mertz (2009) which says that males and females do not differ demonstrably in overall mathematical performance.

Study Limitations

Our study was not without limitation. The participants were restricted to only grades four and five; whereas those in other classes could have been captured if not for the limited resources. Also, the study was limited to only 25 public primary schools in a metropolis of one of the states of the Nigerian Federation (Oyo State. In addition, the study could have been better conducted across the states of the federation in order to get a national prevalence rate of learning disabilities, dyslexia and dyscalculia for the country. Another limitation of the study was that it was a little bit difficult getting the participants involved, while some school administrators delayed in giving their consent for the study to be carried out. The participants were also of the Yoruba ethnicity, and could have made the sample biased. Administration of the SIT-R3 was especially strenuous, as a great deal of time was spent on it. Our study also made use of two standardized instruments- the SIT-R3 and the MPRS, and two self-developed tests- the TPRa and the MAT. The two sets of tests are empirically not balanced, as the combination of standardized and non-standardized instruments may not generate a 'valid' result. This is because the external validity of the study could have been undermined. In future researches, we would like to make use of standardized instruments that are culturally relevant all through. More so, our study of 477 pupils who scored below 72 on the MPRS was not only pupils with learning disabilities, but also included persons with intellectual disabilities. Since it is an established fact that learning disabilities is not correlated with intelligence, we ought to screen out persons with intellectual disabilities who would have below average intelligence on the SIT-R3.

Future Research

It is therefore suggested that further researches should explore other areas that were not included in this study in order to determine other factors that could impede successful educational pursuit. Other grades apart from the ones used in the study could also be sampled in order to determine if there will be changes in findings. More importantly, learning disabilities could be assessed at the college level in order to identify those qualified for accommodation programs.

Contributions to Knowledge

This study has contributed to the existing knowledge in many ways. The study has indicated that learning disabilities, dyslexia and dyscalculia is prevalent among pupils with academic deficit, and that learning disabilities, dyslexia and dyscalculia is not gender-peculiar. Our study has also revealed that a fair majority of persons with dyslexia also have dyscalculia, while noting that the majority of persons with learning disabilities, dyslexia and dyscalculia are of average intelligence that could make them perform well in schools. Based on our findings therefore, we would like to set the prevalence rate of dyslexia at 6% of the Nigerian school population of Yoruba ethnicity, and that of dyscalculia at 8% of the Nigerian school population of Yoruba ethnicity. The prevalence of learning disabilities Nigerian school population of Yoruba ethnicity we would like to set at 13%.

Study Implication

The study has shown the significant contribution of variables. The study therefore has some implications for the school administrators, teachers, school psychologist parents, educational curriculum planners and the government. The school administrator should ensure that each child is taught according to an Individualized Education Plan (I.E.P), which should be carefully developed to suit the needs of each pupil, while teachers should be equipped with new techniques and methods of teaching persons identified with learning disabilities, dyslexia and dyscalculia. Educational planners should put in mind persons with dyslexia, dyscalculia as well as other forms of learning disabilities while developing curriculum in order to cater for their educational and psychosocial needs, while school psychologists should have an understanding of the impacts of learning disabilities and appropriately counsel persons with academic deficits. Parents should realize that academic deficits or low scores could be as a result of learning disabilities, and that children with such manifestations would require a kind of home environment that is welcoming so as not to delve into some unwarranted acts such as juvenile delinquency. Moreover, the Nigerian Government should put in place policies that would accommodate the learning disabilities that pupils have. The government should also ensure that schools are provided with adequate facilities and equipment, such as resource rooms that would adequately compensate for any form of learning disabilities.

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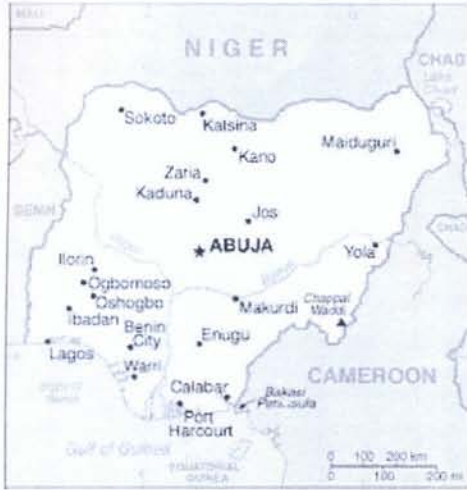
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Facts and Figures about

Nigeria



Population	155,215,573
Government Type	Federal republic
Capital	Abuja
Population 0-14 years (%)	40.9
% Children enrolled in primary education	61
School life expectancy (years)	9
Primary to secondary transition rate (%)	---
Pupil / teacher ratio (primary)	36
Percentage of repeaters, primary (%)	3
Survival Rate to Grade 5 (%)	86
Public expenditure on education :	
as % of GDP	3.1
as % of total government expenditure	--
% of Literate youth	71.8
% of Literate adults	60.8
Human Development Index	.46
Education Index	.44
Gini Index	42.93
Annual population growth rate (%)	2.5
Life Expectancy at birth (years)	51
Infant mortality rate (0/00)	90
Date of Signature of UN Convention on the Rights of Persons with Disabilities	3-2007
Date of ratification of UN Convention on the Rights of Persons with Disabilities	9-2010

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