



Investigating Factors Affecting Academic Achievement And Response Pattern Of Secondary School Students With Physical Disabilities In Niger State, Nigeria

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Abstract. Although disability is part of human condition and often perceived by people as inability to perform certain tasks, it is, however, not a license to be lazy, but ability to live and be actively involved in academic pursuits by those affected. The purpose of this study was to assess factors affecting academic achievement and aberrant response pattern of secondary school students with physical disabilities. A quasi-experimental design was used. The study adopted 66 teaching staff randomly selected from the 66 public secondary schools from where 121 (59 males and 62 females) students with various and varying degrees of physical disabilities were purposively selected in Niger State of Nigeria. A self-developed questionnaire titled, “Teachers Opinion on Factors Affecting Academic Achievement and Response Pattern of Students with Physical Disability (TOFAA-ARPS-PD) was used to collect data. Data collected were analyzed using descriptive statistics of mean and standard deviation. The findings revealed that, while orthopaedic impairment was the most prevalent disability among students with varying degrees of physical disabilities in Niger State public schools, IRT related teacher-based factors and school-based factors recorded a high overall influence on their academic achievement and response pattern with means of 2.79 and 3.28 respectively. This, however, does not negate the influence of student-related factors (with mean of 2.48) on the academic achievement and response pattern of disabled students. A holistic approach to supporting students with disabilities by addressing student-based factors, teacher-based factors and school-based factors was recommended.

Keywords: Physical disability, Aberrant response pattern, Item response theory, School-based factors, Teacher based factors and Orthopaedic impairment

1. Introduction

Testing and assessments are integral parts in the process of educational measurement initiated by scoring of the item responses of the examinees. This process is systematically practised in order to determine and predict students’ potentials from their abilities in responding to examination questions. Some students, according to Smith and Lamprianau (2016), are more successful at attaining academic achievement than others can be due to several factors, some of which are out of the control of the students. Academic achievements are not just a crucial aspect of students’ educational journey, but also serve as a measure of progress, open doors to higher education, boost self-confidence, and provide opportunities for personal and professional growth (Maingi-Lore, 2016). This is not unrelated to the quality of education received by the students, which are fundamental human rights for all citizens. According to Oladele, Ogunwale and Dafwat (2016), “fundamental human rights suggest for all students, irrespective of their abilities or disabilities have a right to be educated in the same classroom setting where possible.

Hence, Physical disabilities refer to a wide variety of conditions that may interfere with a child’s ability to perform everyday activities (Kambuta, 2021). According to Osman, 2021, “Such conditions include problems with muscles, problems involving the central nervous system, problems with the structure of the skeleton or health problems”. Physical disability limits a person’s physical capacity to move, coordinate actions, or perform physical activities. However, persons with Albinism, though usually may be as healthy as the rest of the population, can be classified as disabled because of the associated visual impairments (Burger, 2016).

Academic achievement of students at the level of secondary education has strong impact on other levels of higher and tertiary education as it determines whether a student will have the opportunity to continue his or her higher education which opens opportunities for career development, meaningful occupation and a chance for a dignified life for persons with disability (Maingi-Lore, 2016). The test/examination items administered to students are expected to evaluate how effectively they have mastered specific skills on what has been taught. Hence, the need to demonstrate a reliability and validity check. It is on this note that, Mahmud (2017), proffered that, Item Response Theory (IRT) is an important methodology which has been globally used in many assessment programs to analyze students' responses to test items with a goal of improving measurement accuracy and reliability.

Item Response Theory (IRT), also known as the Latent trait, as opined by Ojerinde, Popoola, Ojo and Onyeneho (2019), "is a mathematical theory about examinee (student) item and test performance and how performance relates to the abilities that are measured by the items in the test". In IRT the focus is, therefore, on the pattern of responses, where the item responses are considered the outcome variables, and the student's ability and item characteristics are the predictor variables (Bentler, 2021).

Aberrant response patterns occurs when there is a mismatch between observed and expected response patterns of students derived from a given measurement model (Drasgow and Levine, 2019). This explains the possibility of an examinee obtaining correct answers for wrong reasons when responding to dichotomous scored test items. Rob (2023) opined that; "an aberrant score pattern is one that is not likely to be true for various possible reasons leading to these unusual patterns". Smith and Lamprianou (2016) have suggested these various possible reasons to include cheating, distractions, guessing, copying, extreme creativity, test anxiety, special knowledge among others. According to Rob (2023), aberrant response patterns may lead to an overestimate or underestimate of students' ability regardless of the kind of test.

However, Kambuta (2021) found out that physically challenged students could perform excellently well in academics like the normal students. In view of this fact, the academic achievement of students with physical disabilities has therefore, been a source of concern to the researcher. Hence, there is need to assess these factors which could predict the pattern of responses to test questions, and consequently, the academic achievement of students with physical

disabilities in public secondary schools. This appears to have received little or no attention in Niger State of Nigeria.

1.1 Statement of the Problem

One of the most challenging tasks in classroom assessment is developing a valid, reliable and usable measuring instrument that can accurately depict students' knowledge level, skill level and/or ability. It becomes more difficult, especially, where students with physical disabilities and obvious challenges are involved and are expected to be measured and evaluated without overestimating or underestimating their ability regardless of the kind of educational test.

With an understanding that students with physical disabilities may be disadvantaged on their participation in class or academic activities, it is essential that the factors affecting their academic achievement in relation to the aberrant pattern of item responses they exhibit be appraised. Hence, the focus on the question; 'How does IRT-related-factors affects academic achievement and response pattern of secondary school students with physical disabilities, thereby jeopardizing measurement accuracy among them and invalidating the use of IRT?

1.2 Objective of the Study

- To investigate incidences of categories of physical disabilities among secondary school students in Niger State.
- To assess factors affecting academic achievement and response pattern of secondary school students with physical disabilities in Niger State.

1.3 Research Questions

- What is the difference in the incidences of categories of physical disabilities among secondary school students in Niger State?
- What is the difference in the factors affecting academic achievement and response pattern of secondary school students with physical disabilities in Niger State?

1.4 Theoretical Framework

This study employed Social Cognitive Theory (SCT) developed by Albert Bandura in 1986. The theory is based on the concept that learning is affected by cognitive, behavioral, and environmental factors. The process of observational learning is governed by four key aspects, namely; Attentional Processes,

Retentional Processes, Reproduction Processes and Motivational Processes (Vinney, 2019). The Social Cognitive Theory is a valuable evaluation tool in understanding the reciprocal interactions that shape an individual's sense of competence, taking into account the mutual effects of the individual, the physical and psychological environment and the task to be learned. By implication, this theory emphasizes on self-efficacy as critical element in human behaviour and motivation, and is particularly relevant to students with physical disability who by their very nature of the physical differences, often view themselves as lesser than their counterparts, and generally suffer from low self-esteem which greatly affects their academic achievement. Based on SCT, this study will consider academic achievement and response pattern (behavior) of secondary school (environment) students with physical disability (individual self-efficacy) and factors affecting them.

2. Conceptual Issues

2.1 Types of Physical Disability

The term Physical Disability is broad and covers a range of disabilities and health issues (Lekuta, 2019). People with physical disabilities are also referred to as physically disabled people, or handicapped (Talafha, 2022). Physical disability is defined by Lekuta, as "those whose physical limitations or health problems interferes with school attendance or learning to such an extent that special services, training, equipment, materials, or facilities are required". This category of disability includes people with different types of physical and observable disorder, including upper or lower limb(s) disability, absence of a body part, polio, visual and auditory disorders, or disability in co-ordination with different organs of the body (Kamal and Hussain, 2019).

For ease of identification and purpose of placement, five dimensions of physical disability are recognized namely; Orthopedic Impairment, Visual Impairment and Albinism, Hearing/Speech Impairment.

Orthopedic Impairment

This type of physical disability is a condition that is related to physical deformity or disability of the skeletal system and associated with motor function such as affected muscular and skeletal system, and affected central nervous system (Telda et'al). They find it difficult or impossible to use legs, arms, or body trunk effectively due to paralysis, stiffness, pain, or other impairments (Lekuta, 2019).

Visual Impairment and Albinism

Visual disability deals with difficulty in perception on what the child perceives and what the brain interprets. Khanal (2015) identified two types of visual impairment as Blind and Low Vision, stressing that, "a person who cannot see the fingers of a hand by both eyes at a distance of 10 feet, or cannot read the first line of Snellen chart, is blind. And for persons with low vision, Khanal further stated "is any person who cannot distinguish fingers of a hand from a 20 feet distance nor read the letters of the fourth line of Snellen chart.

Albinism is associated with a significant reduction or absence of pigmentation in the hair, skin, and eye at birth due to lack of melanin – a pigment responsible for brown, dark, and some yellow coloration (Satasha, 2021). It is often associated with visual problems resulting from involuntary eye movement, squinting and astigmatism which are from birth and lifelong, but not progressive (Nwosu, Unachukwu, Nwasor, and Ezennaka, 2019). Burger (2016) opined that, since persons with albinism are usually as healthy as the rest of the population with growth and development occurring as normal, but for their associated visual impairments, can be classified as disabled.

Hearing / Speech Impairment

These include children who are either completely deaf or partially deaf. Children with partial hearing disorder can often use hearing aids to assist their hearing (Kohzuki, 2018). ". Children affected by this type of disability uses sign language as a means of communication. In linguistic terms, sign languages are as rich and complex as any oral language, despite the common misconception that they are not 'real languages' (Lekuta, 2019).

Speech Impairment is a communication and language disorder, such as stuttering, disorder in sound production and fluency in voice or language. School children identified with this type of disorder have difficulty in expressing ideas and comprehending complex sentences and figurative language such as idioms and metaphors (Kohzuki, 2018). Students with speech and language impairment are faced with specific challenges within the education system which in consequence adversely affect a child educational achievement (Colclasure, Thoron and LaRose 2018).

2.2 Academic Achievement of Students with Physical Disabilities

Students' academic achievement connotes the extent to which a learner has achieved the educational goals"

(Alenezi, 2018). It is the ability of the student to study and remember facts and being able to communicate his knowledge orally or in written form even under testing/examination conditions (Veresova & Mala, 2016). It defines individual progress and improvement in terms of acquired knowledge, skills and competences. Hence, academic achievement of physically disabled students is needed to give a view about the condition of their education and an evaluation tool for education (Teesa, Karimah and Tarigan, 2017). For example, Children with orthopedic impaired challenges involving the movement skills, or visually impaired with complete or partial visual problem struggle to catch up. But when they are not able to meet up, and neither consideration from their teachers, nor help from fellow students who are non-physically challenged, lack of interest for learning and discouragement may set in, which can also affect academic achievement (Teubert, 2019). However, Teubert (2019) opined that some physically disabled students with normal intelligence provide a better academic achievement result than students with multiple disabilities’.

2.3 Aberrant Response Bias in Item Response Theory (IRT)

Every response from each and every student to an item on instrument (test/examination) gives some idea about the individual’s level of ability (Clark, 2020). These responses to the items are measured by assignment of scores and grades within the context of educational objective of assessing both individual ability and item characteristic through the lenses of IRT model (Bentler, 2021). The assigned scores are used by teachers and evaluators to identify students’ strength and weaknesses, and to provide information in order to make sound decisions for educational improvements (Mahmud, 2017). However, one of the threats to the validity and accuracy of the estimated measure for performance is the Aberrant Responses of the student/test-taker.

Aberrant responses occur when the observed response patterns are not in harmony with the expected ones, which may jeopardize measurement accuracy among respondents and invalidate the use of IRT (Jia, Zhang and Zhu, 2019). For example, in a test, a student with very low cognitive ability may answer a more difficult item correctly and answering many simple items incorrectly.

2.4 Factors Affecting Academic Achievement and Response Pattern of Students

Academic achievement is commonly measured through test/continuous assessments and

examinations, but there are no conclusive results over which individual factors successfully predict academic achievement (Bethel-Eke and Eremie, 2018). In any educational setting, inaccurate test scores could result in erroneous test result and consequently, the student academic achievement (Trabin, 2018). One of the most significant factors consistently identified across the literature is students’ cognitive ability to cope with the academic demands in secondary school setting (Al Husaini and Shukor, 2023). But when factors other than the student’s ability being measured affect the response process, the student’s response behaviour becomes abnormal, and the resulting test score does not adequately reflect the level of the latent (ability) trait (Avcu, 2021).

The most research works found in the literature by many authors (such as Crisan et’al 2017; Trabin, 2018; Gafni and Levine, 2021; Rob, 2023; Williams and Emons, 2019; and Clark, 2020) revealed some identified possible factors associated with aberrant responses as:

Test Anxiety

This is an emotional and complex reaction caused by an individual who interprets a test situation as a threat. Test anxious students do experience fear and heightened psychological activity in situations such as examinations and influence the manner in which they interpret and respond to test items”. Hence, it is a possible source of aberrance since its effect normally makes simple items seem very difficult to respondents which may result to many errors, usually in the first items of the test.

Academic Self-Concept

This relates to students’ perception of their academic competence and expectations of academic success or failure. Physically disabled persons feel they are often treated as socially inferior and academically not fitting may end up with a “cannot-do attitude”, low esteem, especially when they constantly realize that their body does not work like everyone’s else.

Interest in Subject

Student interest in subject is the inclination of a student towards a particular subject in which he or she is easily able to connect without any pressure. Students’ interest for each subject is correlated with academic outcomes.

Attention Deficit Hyperactivity Disorder (ADHD)

ADHD is a specific developmental disorder that comprises deficits in behavioral inhibition, sustained attention and resistance to distraction, and regulation of one’s activity level to the demands of a situation. This condition can certainly affect the response pattern, hence, disrupting academic performance, since children affected often have problems sitting still, staying focused, following instructions, staying organized, and completing assignments/test.

Length of Test

Length of test is the number of both the items and the score points per term in a given test.

Item Arrangement

In test construction, it is a practice to arrange items in order of their difficulty. This procedure gives confidence to individuals approaching the test and reduces wasted time on items that are beyond an individual’s ability.

Mis-match between Curriculum and Test Content

If item difficulty levels coincide with the content area that has not been treated and the examinee has less knowledge of that particular content area on the test, aberrant response patterns will result.

Different Teacher

There is a direct relationship between student test scores and stable, experienced, and qualified teaching staff. Frequent change of subject teacher can have a detrimental effect on the students’ academic achievement, and may cause disruptions in the existing work plan.

Class Effect

In academic environment, the condition of the class ranging from the size, arrangement and teacher to students’ ratio is of paramount importance in students’ academic success.

Different School

The school is a social and learning agent that provides the environment upon which students are formally educated in order to attain educational goals. Changing schools even within a district can disrupt the flow of learning in school which could affect the academic achievement of a student.

Since Academic achievement of students according to Bethel-Eke and Eremie (2018) is dependent on the responses of students and a function of the extent to which student¹, teacher² or institution³ has achieved their short term or long-term educational goals within a specified period; it becomes imperative to classify the aforementioned factors into the following three (3) groups.

Table 1: Classification of IRT – Related Factors

S/No	Student Based Factors	Teacher Based Factors	School Based Factors
1.	Test anxiety	Length of test	Class effect
2.	Academic self-concept	Items arrangement	School environment
3.	Interest in subjects	Mis-match between curriculum and test content	
4.	Display of ADHD	Different teacher	

3. Research Methodology

A quasi experimental design was used among 66 teachers randomly selected from the 66 public secondary schools from where 121 (59 males and 62 females) students with various and varying degrees of physical disabilities were purposively discovered and selected in Niger State of Nigeria. A self-developed questionnaire which yielded 0.76 validity index and 0.83 coefficients of internal consistency for teachers titled, “Teachers Opinion on Factors Affecting Academic Achievement and Response Pattern of Students with Physical Disability (TOFAA-ARPS-PD) was used to harvest data. The data was analyzed using descriptive statistics of percentages and mean. The 66 questionnaires that were distributed among the selected teachers were all returned for analysis.

4. Results

Answering Research Questions

The results of this study are presented in tables 2 and 3.

Table 2: Incidence of students with disability in Secondary Schools in Niger State

Disabilities	Male		Female	
	Freq	Percent	Freq	Percent
Orthopaedic Impairment (OI)	44	59%	31	41%
Visual Impairment and Albinism (VIA)	8	35%	15	65%
Hearing and Speech Impairment (HSI)	7	30%	16	70%
Total	59	49%	62	51%

Table 2 presents an overview of the incidence of students with physical disabilities in secondary schools across Niger State. Firstly, the result indicates that the most prevalent physical disability dimension among the students is Orthopaedic Impairment (OI), with 44 male students, constituting 59%, and 31 female students, representing 41%. This suggests a higher proportion of male students with orthopaedic impairment. Visual Impairment and Albinism (VIA) exhibits a different gender distribution, with 8 male students (35%) and 15 female students (65%). This reveals a higher percentage of female students with visual impairments and albinism in the State. Lastly, the data on Hearing and Speech Impairment (HSI) highlights 7 male students (30%) and 16 female students (70%), implying there is higher proportion of female students with Hearing and Speech Impairment.

Table 3. Descriptive Statistics of Teachers’ Responses on Factors Affecting Academic Achievement and Response Pattern of Students with Physical Disability in Niger State

Student Based Factors	AA%	A%	D%	CD%	Mean	Remark
Test anxiety	44	14	29	14	2.88	High
Academic self-concept	62	29	5	5	3.48	High
Interest in compulsory subjects.	18	21	42	18	2.39	High
Display of ADHD	0	3	11	86	1.17	Low
Sub-total	31	17	22	31	2.48	Fair
Teacher Based Factors						
Length of test	44	47	6	3	3.32	High
Items arrangement	53	41	6	0	3.47	High
Mismatch between curriculum and test content.	32	18	27	23	2.59	High
Different teacher	5	15	33	47	1.77	Low
Sub-total	33	30	18	18	2.79	High
School Based Factors						
Class effect	73	14	8	6	3.53	High
School environment	33	47	9	11	3.03	High
Sub-total	53	30	8	8	3.28	High

Note: 0.00-1.00=Very low; 1.01-2.00=Low; 2.01-2.49=Fair; 2.50-3.49=High; 3.50-4.00=Very High

Table 3 analyzes the factors affecting academic achievement and response pattern of students with physical disability in secondary schools in Niger State. The data indicates that Student Based Factors (STBF) had a moderate effect on the academic achievement and response pattern of the students, with an aggregate mean of 2.48. Test anxiety (2.88), academic self-concept (3.48), and interest in subjects (2.39) were identified as significant contributors to this effect.

These findings suggest that while student-related factors play a role in shaping academic achievement, their overall impact is moderate compared to other factors.

In contrast, Teacher Based Factors (TBF) had a high effect on academic achievement and response pattern, with an aggregate mean of 2.79. Factors such as the length of the test (3.32), items arrangement (3.47), and

mismatch between curriculum and test content (2.59) demonstrated a significant influence on student academic achievement. However, the presence of a different teacher (1.77) had a lower impact. Similarly, School Based Factors (SHBF) had a high effect with an aggregate mean of 3.28; Class effect (3.53) and school environment (3.03) identified as influential factors affecting student academic achievement and response pattern, in Niger State.

5. Discussion on the Findings

Findings from the study on research question one revealed that there is difference in the incidences of physical disability among secondary school students in the Niger State. The data showed that orthopaedic impairment was the most prevalent disability. This is in line with the findings of Wuraola, Abiola, Ayoola, Folasade, Abolore, Akeem, Ganiyu and Chandan (2023) whose study revealed that students with disabilities are not evenly distributed.

Physical disability is a complex and multidimensional concept that encompasses a wide range of physical impairments, each with its unique challenges and implications for education. In the context of inclusive and equitable learning environment and education, therefore, it is imperative to understand the distribution patterns and dimensions of students' disability within specific geographic regions, to ensure their needs are adequately addressed and appropriate support systems are in place.

The study further revealed that teacher-based factors and school-based factors have a high overall influence on the academic achievement of disabled students in Niger State, with sub-total means of 2.79 and 3.28 respectively. This result is not unconnected with the views of Maingi-Lore (2016) and Gomwalk and Nuhu (2022), whose findings revealed school-based factors have influence on academic achievement of students with physical disability.

These findings suggest that while student-related factors play a role in shaping academic performance, their overall impact is moderate compared to other factors. The findings highlight the need to address teacher-based and school-based factors to effectively support the academic achievement of disabled students in the state. Interventions and strategies targeting factors such as test length, item arrangement, curriculum alignment, class effect, and school environment could potentially lead to significant improvements in the educational outcomes of this vulnerable student population.

6. Conclusion

This study offers a comprehensive understanding of the factors affecting academic achievement and response patterns of secondary school students with physical disabilities in Niger State of Nigeria. By examining a wide range of factors, this research provides valuable information into the complex interplay of variables that shape the educational experiences and outcomes of disabled students. One of the striking findings is the significant variation in the incidences of different disability types across the state, with orthopaedic impairment being the most common. While critical factors affecting academic achievement and response patterns, including student-based factors, teacher-based factors, and school-based factors were identified.

7. Recommendations

- Investment in accessible educational resources, such as Braille materials, audio aids, and so on, to facilitate effective learning and academic success for students with impairments, should be done.
- A holistic approach to supporting students with disabilities by addressing student-based factors, teacher-based factors and school-based factors should be adopted.

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