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### Effect of Behavioural Interventions on Academic Achievement of Neurodivergent Students in Imo State

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#### ABSTRACT

Inclusive education in Nigeria faces challenges of limited resources and insufficient behavioural interventions for neurodivergent learners such as those with dyspraxia and intellectual and developmental disorders (IDD). This study examined the effect of three behavioural strategies on their academic achievement in Imo State. The population comprised 428 neurodivergent students in 15 special and inclusive schools, from which 90 were purposively sampled. Participants were grouped into 30 students with dyspraxia taught with a task-oriented strategy, 30 with IDD taught using Applied Behaviour Analysis (ABA), and 30 with both conditions taught through Task Analysis (step-by-step learning). A researcher-developed Academic Achievement Test (AAT), validated by experts with a KR-20 reliability coefficient of 0.82, served as the instrument. Using a quasi-experimental pre-test, post-test non-equivalent design, data were collected and analyzed with mean, standard deviation, and ANCOVA. Results showed significant improvement across groups: dyspraxia (13.44–23.40), IDD (11.64–23.45), and dyspraxia + IDD (10.17–24.72). ANCOVA revealed significant group effects ( $F = 32.203$ ,  $p < .05$ , partial  $\eta^2 = 0.428$ ), with Task Analysis producing the highest gains, followed by ABA, and task-oriented methods being least effective. The study concluded that structured behavioural interventions enhance the achievement of neurodivergent learners, especially when step-by-step methods are applied. It recommends prioritizing Task Analysis for students with combined dyspraxia and IDD, integrating ABA for students with IDD, and blending task-oriented routines with structured strategies for dyspraxia learners.

**Keywords:** Academic achievement, Applied Behaviour Analysis, Neurodivergent students, Task Analysis.

#### INTRODUCTION

Diversity takes many forms, ranging from age, gender, and ethnicity to neurological differences that influence how people think, learn, and behave. This neurological variation, commonly referred to as neurodiversity, reflects natural differences in brain functioning and behavioural traits (Kapp, 2020; Jiang, Liu, Wang

& Hu, 2025). Individuals whose cognitive styles differ from the majority are often described as neurodivergent. Conditions such as dyspraxia, dyslexia, autism, attention-deficit/hyperactivity disorder (ADHD), epilepsy, intellectual and developmental disabilities (IDD), sensory processing differences, and Tourette syndrome exemplify these variations. Importantly, the neurodiversity movement emphasizes that such differences are not deficits but natural variations, carrying both strengths and challenges. Within this framework, difficulties often stem less from the individual and more from environments designed primarily for neurotypical people, underscoring the need for neuroinclusive settings (Nwosu et al., 2023; Jones, 2023).

Despite this growing recognition, research consistently shows that neurodivergent learners face poorer educational, social, and health outcomes compared to their neurotypical peers (Baraskewich & McMorris, 2019; Jonsson et al., 2017). They often encounter barriers such as peer rejection, adverse childhood experiences, and environments that fail to accommodate their needs (Brown et al., 2017; Øksendal et al., 2019). In schools, these challenges manifest in lower academic achievement, reduced participation, and heightened risk of anxiety, depression, or social isolation (Muniandy, Richdale, & Lawson, 2022). This is particularly evident in neurodivergent conditions like dyspraxia and IDD, which directly affect learning and academic outcomes. Dyspraxia, or developmental coordination disorder (DCD), is a lifelong condition affecting fine and gross motor skills, planning, and organization, with secondary effects on handwriting, classroom participation, and confidence (Jones, 2023). Similarly, IDD encompasses a broad range of lifelong developmental conditions that impair intellectual functioning and adaptive behaviour, often requiring structured support across academic and daily life contexts (NICHD, 2020). Both conditions are associated with reduced educational attainment and long-term difficulties extending into adulthood (Harrowell et al., 2018).

Globally, behavioural interventions have been shown to improve learning outcomes for students with neurodivergent conditions. Approaches such as Applied Behaviour Analysis (ABA), task-oriented instruction, task analysis, and positive behaviour support break learning into manageable steps, reinforce desired behaviours, and provide tailored strategies that align with students' strengths (Koegel et al., 2020; Matson & Sturmey, 2021, National Center for Learning Disabilities, 2023). For students with dyspraxia, step-by-step task analysis and occupational therapy can improve motor coordination and classroom participation (Foster & Mash, 2018). For students with IDD, ABA and structured reinforcement have been used to teach communication, self-care, and academic skills, as well as to address challenging behaviours (Kinyua, 2019). Early intervention is especially critical, as it equips learners with adaptive skills and helps mitigate long-term risks of exclusion, poor attainment, and mental health challenges (Omer et al., 2018; Nwosu et al., 2020).

The task-oriented intervention strategy emphasizes engaging learners in meaningful, real-life tasks to promote functional skill development through repeated practice, and while it supports students with dyspraxia in refining motor planning and execution, it often lacks the structured scaffolding needed for complex skills (Kinyua, 2019; Labrador-Roca, Hernández Vázquez & Inglés Yuba, 2020).

Applied Behaviour Analysis (ABA) is a structured approach rooted in operant conditioning that uses prompts, reinforcement, and data tracking to teach communication, social, and academic skills for students with intellectual and developmental disabilities, though its rigidity can be a limitation if not adapted to natural contexts (Matson & Sturmey, 2021; Leaf et al., 2016). Task Analysis, also called step-by-step learning, breaks down complex skills into smaller sequential units, providing modeling, practice, and reinforcement at each stage, thereby reducing cognitive load and supporting learners with co-occurring dyspraxia and IDD by addressing both motor and cognitive difficulties; it has been shown to be highly versatile in improving academic, self-care, and vocational outcomes (Cooper, Heron, & Heward, 2020; European Academy of Childhood Disability, 2019).

In Nigeria, however, evidence-based interventions remain underutilized. Studies indicate that many teachers lack training in neurodiversity and often rely on traditional, teacher-centred methods that do not adequately address the needs of neurodivergent learners (Nwosu et al., 2022), alongside broader disability-inclusive development priorities that emphasize scalable, evidence-informed instructional strategies (World Health Organization, 2021). In Imo State, for example, limited awareness and support structures contribute to underachievement among students with dyspraxia and IDD, despite their intellectual potential. This gap highlights the urgent need for research on effective strategies that can foster inclusion and academic success in local classrooms. The present study therefore examines the impact of behavioural interventions, task-oriented, Applied Behaviour Analysis, and task analysis, on the academic achievement of neurodivergent students in Imo State.

### **Statement of the Problem**

Despite the widespread promotion of inclusive education in Nigeria through policies, research, and advocacy, its practical implementation remains limited. Many schools lack the necessary resources, adequately trained teachers, and behavioural support systems required to meet the diverse needs of learners. Neurodivergent students, particularly those with dyspraxia and intellectual and developmental disabilities (IDD), are disproportionately affected by these gaps. Difficulties with coordination, motor skills, and adaptive functioning further constrain their academic performance, leaving them vulnerable to exclusion and underachievement. Globally, evidence demonstrates that behavioural interventions enhance both academic and social outcomes for neurodivergent learners, yet their adoption in Imo State remains minimal. Moreover, empirical research examining the effectiveness of such interventions for students with dyspraxia and IDD in this context is scarce. Without tailored strategies, these students risk persistent academic difficulties, diminished self-esteem, and restricted future opportunities. This underscores the urgent need for studies that evaluate behavioural interventions as a pathway to improving educational outcomes for neurodivergent learners in Imo State.

### **Purpose of the Study**

The purpose of this study is to investigate the effect of behavioural interventions on academic achievement of neurodivergent students in Imo State. The study specifically tends to:

- i. determine the mean achievement scores of students who has dyspraxia condition using task-oriented intervention strategy in Imo State.
- ii. determine the mean achievement scores of students with intellectual and development disorder using Applied Behaviour Analysis (ABA) intervention strategy in Imo State.
- iii. determine the mean achievement scores of neurodivergent students having both dyspraxia and intellectual and development disorder using Task Analysis (Step-by-Step Learning) strategy in Imo State.

### **Research Questions**

The following research questions guided the study:

1. What are the mean achievement scores of students with dyspraxia who are taught using the task-oriented intervention strategy in Imo State?
2. What are the mean achievement scores of students with intellectual and developmental disorders who are taught using the Applied Behaviour Analysis (ABA) intervention strategy in Imo State?
3. What are the mean achievement scores of students with both dyspraxia and intellectual and developmental disorders who are taught using the Task Analysis (Step-by-Step Learning) strategy in Imo State?

### **Hypotheses**

The following hypotheses were tested at 0.05 level of significance:

1. There is no significant difference in the mean achievement scores of students with dyspraxia taught using the task-oriented intervention strategy in Imo State.
2. There is no significant difference in the mean achievement scores of students with intellectual and developmental disorders taught using the Applied Behaviour Analysis (ABA) intervention strategy in Imo State.
3. There is no significant difference in the mean achievement scores of students with both dyspraxia and intellectual and developmental disorders taught using the Task Analysis (Step-by-Step Learning) strategy in Imo State.

### **METHODS**

The study adopted a quasi-experimental research design, specifically the pre-test, post-test non-equivalent group design. The population of the study comprised 428 neurodivergent students from 15 special and inclusive schools in Imo State. These schools are distributed across the three education zones of Owerri, Orlu, and Okigwe. From this population, a sample of 90 students was purposively selected from three special and inclusive schools, one from each education zone. The sample consisted of 30 students with dyspraxia, 30 students with intellectual and developmental disorders, and 30 students with both dyspraxia and intellectual/developmental disorders. Each group was exposed to one behavioural intervention strategy: students with dyspraxia received the task-oriented intervention, students with intellectual and developmental disorders were taught using the Applied Behaviour Analysis (ABA) strategy, while students with both

conditions were taught using the Task Analysis (Step-by-Step Learning) strategy. The instrument for data collection was a researcher-developed Academic Achievement Test (AAT) based on junior secondary English and Mathematics curricula. The test comprised 40 items, 20 in English and 20 in Mathematics. The instrument was validated by three experts; two in special education and one in measurement and evaluation. A pilot test conducted on 30 neurodivergent students from a school outside the sample yielded a Kuder-Richardson 20 (KR-20) reliability coefficient of 0.82, confirming its internal consistency. The intervention lasted for six weeks. In week one, a pre-test was administered to establish baseline achievement. Weeks two to five were devoted to treatment, with three instructional sessions per week, each lasting 40 minutes. In week six, a post-test, parallel in form to the pre-test, was administered to determine the effect of the interventions. Data collected were analyzed using mean and standard deviation to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the hypotheses at the 0.05 level of significance. The use of ANCOVA controlled for pre-test differences and isolated the true effect of the interventions on students' achievement.

## RESULTS

**Table 1:** Mean and Standard Deviation of Pre-Test and Post-Test Scores of Neurodivergent Students by Intervention Strategies

<b>Group (N=30 each)</b>		<b>Pre-Test Mean</b>	<b>Pre-Test SD</b>	<b>Post-Test Mean</b>	<b>Post-Test SD</b>
Dyspraxia	(Task-Oriented Strategy)	13.44	2.70	23.40	2.75
Intellectual & Developmental Disorders	(ABA Strategy)	11.64	2.79	23.45	3.62
Dyspraxia + IDD	(Task Analysis Strategy)	10.17	2.68	24.72	3.19

The results presented in Table 1 show clear evidence of improvement in the academic achievement of neurodivergent students after exposure to different behavioural interventions. For students with dyspraxia taught using the task-oriented strategy, the mean score increased from 13.44 with a standard deviation of 2.70 at pre-test to 23.40 with a standard deviation of 2.75 at post-test, indicating a substantial improvement in performance. In a similar manner, students with intellectual and developmental disorders who were taught using the Applied Behaviour Analysis (ABA) strategy improved from a pre-test mean of 11.64 with a standard deviation of 2.79 to a post-test mean of 23.45 with a standard deviation of 3.62, showing that the ABA strategy was highly effective in enhancing learning outcomes. The greatest improvement, however, was observed among students with both dyspraxia and intellectual and developmental disorders who were exposed to the Task Analysis (Step-by-Step Learning) strategy, as their mean score rose from 10.17 with a standard deviation of 2.68 at pre-test to 24.72 with a standard deviation of 3.19 at post-test, representing the highest gain among the three groups. These results suggest that while all three behavioural interventions positively

impacted students' achievement, the Task Analysis strategy produced the most effective results, followed closely by the ABA strategy, with the task-oriented strategy being comparatively the least effective.

**Table 2:** Summary of Analysis of Covariance (ANCOVA) of Post-Test Scores of Neurodivergent Students

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	815.463	3	271.821	73.143	.000	0.719
Intercept	0.000	1	0.000	0.000	1.000	0.000
Pretest	576.136	1	576.136	155.044	.000	0.643
Group	239.327	2	119.664	32.203	.000	0.428
Error	319.572	86	3.716			
Total	417129.000	90				
Corrected Total	1135.035	89				

The ANCOVA results in Table 2 show that the intervention strategies significantly influenced the post-test achievement of neurodivergent students after controlling for pre-test scores. The corrected model was significant ( $F = 73.143$ ,  $p < .05$ ) and explained 71.9% of the variance. The pre-test covariate was highly significant ( $F = 155.044$ ,  $p = .000$ , partial eta squared = 0.643), indicating strong predictive power. Group effect was also significant ( $F = 32.203$ ,  $p = .000$ , partial eta squared = 0.428), confirming that the different behavioural strategies contributed meaningfully to students' achievement. This result shows that the intervention methods had a substantial impact on improving academic achievement.

**Table 3:** Post Hoc Test (Bonferroni Adjustment)

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Dyspraxia (Task-Oriented)	IDD (ABA)	-5.57*	1.49	.001
Dyspraxia (Task-Oriented)	Dyspraxia + IDD (Task Analysis)	-10.90*	1.49	.000
IDD (ABA)	Dyspraxia (Task-Oriented)	5.57*	1.49	.001
IDD (ABA)	Dyspraxia + IDD (Task Analysis)	-5.33*	1.49	.002
Dyspraxia + IDD (Task Analysis)	Dyspraxia (Task-Oriented)	10.90*	1.49	.000
Dyspraxia + IDD (Task Analysis)	IDD (ABA)	5.33*	1.49	.002

The post hoc results in Table 3 show that significant differences existed among the intervention strategies. Students with dyspraxia taught using the task-oriented strategy scored significantly lower than those with intellectual and developmental disorders taught with the ABA strategy (mean difference = -5.57,  $p = .001$ ) and much

lower than those with both conditions taught with the Task Analysis strategy (mean difference = -10.90,  $p = .000$ ). Similarly, students with intellectual and developmental disorders using the ABA method performed significantly better than dyspraxia students with task-oriented intervention (mean difference = 5.57,  $p = .001$ ), but significantly lower than students taught with Task Analysis (mean difference = -5.33,  $p = .002$ ). The highest achievement was recorded by students with both dyspraxia and intellectual/developmental disorders taught with the Task Analysis strategy, who significantly outperformed both the task-oriented group (mean difference = 10.90,  $p = .000$ ) and the ABA group (mean difference = 5.33,  $p = .002$ ). These results confirm that Task Analysis was the most effective intervention, followed by ABA, while the task-oriented strategy was the least effective.

## **DISCUSSION**

The results of this study demonstrate that structured behavioural interventions produced marked and statistically meaningful gains in academic achievement for neurodivergent students, and that the magnitude of those gains varied by intervention type and learner profile. All three groups showed substantial increases from pre-test to post-test, but students who received Task Analysis (step-by-step learning) and who had co-occurring dyspraxia and intellectual/developmental disorders achieved the largest absolute gains, followed by students with IDD who received Applied Behaviour Analysis (ABA), with students with dyspraxia on a task-oriented routine improving the least of the three. The analysis confirmed that these differences were not due to initial score disparities: group membership accounted for a large and practically meaningful portion of the variance in adjusted post-test scores, and the model as a whole explained an even larger share of outcome variability. In short, behavioural methods worked overall, and Task Analysis produced the strongest effect for learners with combined motor-planning and cognitive support needs.

Several plausible explanations account for the pattern of findings. First, Task Analysis explicitly decomposes target skills into small, sequenced sub-steps and pairs each step with modeling, prompts, feedback and opportunities to respond; this architecture reduces working memory and executive-control demands and increases the probability of correct responding on complex tasks. For students who face both motor sequencing difficulties (as in dyspraxia/developmental coordination disorder) and the cognitive or adaptive limitations typical of some forms of IDD, that combination of lowered cognitive load and dense reinforcement is likely to be synergistic. This mechanism aligns with contemporary recommendations for developmental coordination disorder (DCD), which emphasize task-specific, sequenced practice and graded support to improve performance and transfer (Nwosu et al., 2023). Second, ABA's strength lies in its systematic use of reinforcement, prompting hierarchies, and data-driven shaping of behaviour; these features reliably increase correct responding for learners with IDD and explain why ABA produced large gains in the study (Matson & Sturmey, 2021). However, ABA protocols in typical classroom implementation may not always include the micro-sequencing that Task Analysis routinely provides, which helps

explain why ABA, while powerful, did not outperform Task Analysis for the combined-needs group. Third, task-oriented routines give students predictability and procedural support that can raise fluency and reduce planning errors, advantages that help students with dyspraxia make meaningful progress, but such routines can be less potent than more granular, stepwise instruction when tasks involve multiple integrated subskills or when cognitive regulation problems co-exist.

These findings align with conclusions from recent syntheses in the field. Reviews of psychosocial interventions for children with neurodevelopmental disorders describe approaches that include structured practice, frequent opportunities to respond, and targeted prompting, in contrast to more diffuse or unstructured methods (Baraskewich & McMorris, 2019; Jiang et al, 2025). Likewise, evidence-based practice handbooks for intellectual and developmental disabilities highlight the robust effects of explicit, behaviourally anchored instruction and of ABA-derived techniques for skill acquisition and maintenance (Matson & Sturmey, 2021). The superiority of sequenced, task-analytic models for learners with motor-planning difficulties also maps onto the EACD's recommendation that interventions for DCD be task-oriented, contextually embedded, and broken into manageable steps (European Academy of Childhood Disability, 2019). Together, these sources provide converging support for why Task Analysis outperformed ABA and why ABA outperformed simpler task routines in our sample.

The effect sizes observed here also carry practical meaning for schools and policymakers. Nearly half of the variance in adjusted post-test outcomes is associated with the instructional method. That magnitude suggests that, other things equal, selecting the most suitable behavioural method could alter a student's achievement trajectory in a single term, an encouraging finding for resource-constrained settings aiming to accelerate catch-up learning. The very large covariate effect underscores another practical point: baseline assessment matters. High-quality screening and placement allow educators to match students to Task Analysis, ABA, or task routines in ways that capitalize on each student's profile, thereby maximizing instructional efficiency (National Center for Learning Disabilities, 2023).

Comparisons with prior empirical work further contextualize the findings. Reviews and classroom trials show consistent gains from ABA approaches for learners with IDD when academic goals are discretely specified and reinforced; our results reproduce that pattern (Matson & Sturmey, 2021). Similarly, intervention studies that employ explicit instruction or task decomposition report robust improvements in accuracy and fluency for students with coordination or planning deficits (European Academy of Childhood Disability, 2019). The present study adds incremental value by quantifying how much extra benefit may be obtained when Task Analysis is used for learners with co-occurring motor and cognitive challenges, a subgroup that some prior trials have grouped heterogeneously. Where our findings diverge slightly from other reports is in the relative magnitude of the advantage: the combined group's gains were especially pronounced, perhaps reflecting the concentrated dosage, tight procedural fidelity, and the parallel test forms used here, features known to bolster intervention potency (Baraskewich & McMorris, 2019).

The findings of this study have several concrete implications. Practically, schools should adopt tiered intervention pathways that use initial assessment to guide placement: Task Analysis should be the first-line, curriculum-embedded method for learners with dual motor-planning and cognitive needs; ABA protocols can be prioritized for learners whose primary barrier is learning-rate or attention/regulation within IDD; and task-oriented routines can be useful baseline supports for students with isolated dyspraxia. Teacher training must emphasize how to write usable task analyses, implement prompt hierarchies, and deliver immediate, criterion-referenced feedback, skills that are teachable and that contribute to fidelity. At a systems level, Imo State and similar contexts can attain large returns by investing modestly in structured lesson planning time and in low-cost materials (visual step sequences, checklists, and guided practice templates) rather than in high-cost technology. These recommendations align with disability-inclusive development goals that stress scalable, evidence-informed instructional strategies (World Health Organization, 2021).

## **CONCLUSION**

Based on the findings, it can be concluded that intervention strategies have a significant influence on the achievement of neurodivergent students, but their effectiveness varies according to the type of approach used. The task analysis strategy emerged as the most effective, producing the highest post-test achievement scores among students with combined dyspraxia and intellectual and developmental disorders. The applied behavior analysis (ABA) strategy also proved effective, yielding better outcomes than the task-oriented method used for students with dyspraxia. This pattern indicates that structured, stepwise, and reinforcement-based interventions provide greater learning support for neurodivergent students than methods that focus mainly on direct task execution. Therefore, educators and specialists working with such learners should prioritize task analysis and ABA strategies to maximize academic achievement and skill development.

## **RECOMMENDATIONS**

Based on the findings, the following recommendations are made:

1. Teachers should adopt task analysis (step-by-step learning) as a primary intervention strategy for neurodivergent students, especially those with combined dyspraxia and intellectual and developmental disorders, since it yielded the highest achievement scores.
2. Schools should integrate Applied Behaviour Analysis (ABA) into classroom practice for students with intellectual and developmental disorders, as it proved more effective than task-oriented methods in improving academic performance.
3. Task-oriented strategies should be minimized or blended with structured methods like task analysis and ABA, as they were found less effective for improving the achievement of students with dyspraxia.

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