Common Comorbid and Interrelated Psychological Traits Among Children with Neurodevelopmental Disorders

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ABSTRACT:

Neurodevelopmental Disorders (NDDs) in children present with complex psychological and behavioral symptoms, often complicating clinical assessment. The study provides an overview on comorbid psychological traits or psychiatric disorders in children with NDDs in Palestine, specifically focusing on Autism Spectrum Disorder (ASD), Attention Deficit/Hyperactivity Disorder (ADHD), Specific Learning Disorder (SLD), and Intellectual Developmental Disorder (IDD).

Using a Descriptive Analytic approach, 175 mothers rated their children’s psychological traits using a questionnaire developed from DSM 5 TR and ICD 11th criteria. The questionnaire covered eleven domains of comorbidity. Notable relations were found that necessitate clinical attention. Specific disorders like Phobic Disorder, Camouflage and Noli Me Tangere were more prevalent in children with ASD, while Phobic Disorder followed by Depression was evident in IDD. ADHD and SLD majorly exhibited Phobic Disorder and Anxiety Disorder. The study highlighted evident comorbidity and interrelation of certain psychological traits/disorders among NDDs.

Recognizing comorbid psychological traits in assessment can enhance case management, recognize individual and cultural differences, and improve care for individuals with NDDs.
INTRODUCTION

Neurodevelopmental Disorders (NDDs) typically emerge early in life, often before a child enters school, presenting as developmental delays that can impact personal, social, academic, or occupational areas. These disorders are characterized by disruptions in the development of the brain’s structure and function, leading to challenges in cognitive abilities and daily functioning. Both genetic predispositions and environmental factors play roles in the onset of these disorders, with research suggesting that they may share common underlying biological pathways and imbalances in brain chemistry. Comorbid psychological traits, particularly when intensified, can complicate the clinical assessments in terms of diagnosis, prognosis, and interventions. Early identification of these traits can optimize the clinical process (World Health Organization, 2018). The complexity and high disability rates associated with neurological and neuropsychiatric disorders make their diagnosis continually evolving challenge (Gautam & Sharma, 2020). Certain psychiatric conditions such as Depression, Anxiety, and obsessive-compulsive disorder (OCD) can sometimes mask or modify the clinical presentation of other disorders, further complicating the diagnostic landscape (Grace & Christensen, 2007; Gidziela et al., 2023).

The American Psychiatric Association (APA) has, over the years, aimed to provide a clearer understanding of NDDs. From its initial classification of these disorders as “Infancy and Early Childhood Disorders” to the more recent DSM 5 and DSM 5 TR versions, there has been a continued effort to better classify and group NDDs. However, despite these advancements, a clear-cut clinical picture remains elusive, especially given the reality of extensive co-occurring and often interrelated psychiatric disorders. The International Classification of Diseases (ICD), in its 10th and 11th editions, has similarly tried to refine NDDs classifications, but the boundaries remain permeable (Wolfgang et al., 2020).

Both the DSM and ICD have aimed to facilitate clinical assessments and diagnoses, providing practitioners with a more transparent framework. Yet, there is still a gap in addressing the intricate web of interactive comorbid or Transdiagnostic symptoms, underscoring the need for continued research and exploration.

EPIDEMIOLOGY OF NDDS IN PALESTINE

According to the Palestinian Central Bureau of Statistics (2011) jointly with the Ministry of Social Affairs, Neurological Disability is 7.0% of the population among which are 1.5% suffer from functional memory problems, 1.2% suffer from communication Disorders, 1.1% classified as slow learners, and psychiatric Disorders 0.7%. The report does not comply with DSM or ICD classifications but rather with an academic performance perspective. Along with that, 46.1% of the total disabled children in Palestine suffered from learning disability in 2011; 44.9% in the West Bank and 48.1% in Gaza Strip. Communication disability is the second most prevalent with 37.3% (35.7% in the West Bank and 40.1% in Gaza Strip). Palestinian children reported higher rates of learning disabilities. Special education, therefore, evolved as a means of providing specialized interventions primarily through prescribed instruction based on individual student progress on individualized objectives (Dajani et al., 2013).

Neurodevelopmental Disorders (NDDs): Genetic Underpinnings, Environmental Influences, and Neurological Signatures

Etiological comorbidity of NDDs: Genetics, Anatomy and Heredity

Du Rietz and colleagues (2021) used an advanced analytic model to study associations between ADHD, general psychopathology, and its three subfactors: neurodevelopmental, externalizing, and internalizing. Their findings highlight that ADHD comorbidity is rooted in genetically influenced general psychopathology, with unique genetic factors further intensifying the link between ADHD and other neurodevelopmental disorders. Also, Dellapiazza with coauthors (2021) examined the clinical characteristics of children with ASD and comorbid ADHD, noting that externalizing/internalizing behaviors were more frequent in groups with neurodevelopmental disorders compared to typical development. This underscores the complex interplay between ADHD, ASD, and broader psychopathological trait.

Both ADHD and ASD show overlapping abnormalities in brain structures, particularly in the corpus callosum. Common atypical brain white matter patterns, especially shared microstructural abnormalities in the splenium of the Corpus Callosum, emerge as a characteristic feature (Zhao et al., 2022; Zhang et al., 2023). However, studies on ADHD’s brain connectivity, using diffusion weighted imaging (DWI), present inconsistent findings. These inconsistencies arise from methodological and demographic variations among studies, hindering our grasp of ADHD’s neurobiology (Parlatini et al., 2023).

Furthermore, children with ADHD exhibit functional anomalies in their brain, particularly decreased efficiency in the parietal and temporal cortices (Soman et al., 2023).
Disrupted biological pathways, genes imperative during embryonic brain development, play a role in neurodevelopmental disorders (Cardoso et al., 2019). ADHD in children is marked by heightened parasympathetic activity, impacting emotion regulation (Musser et al., 2011). Notably, some molecular and cellular characteristics seen in neurodevelopmental disorders are also found in schizophrenia (Berdenis van Berlekom, 2022; Schmitt et al., 2023). Moreover, connectivity defects in the brain offer insights into the origins of neurodevelopmental disorders (Lesch & Waider, 2012; Liu et al., 2021).

**Comorbid Familial confounding and Environmental Risk Factors**

Psychosocial diversity, familial influences, environmental risks including toxicants and malnutrition, along with adversities in early life, have long been considered to potentially impair neurodevelopment. The contemporary research arena reflects a growing emphasis on studying these factors. Belhaouari and team delved into perinatal factors related to neurodevelopmental disorders (NDDs) worldwide. They identified prevalent maternal issues such as stress (68.7%), physical illness (66.1%), insufficient nutrition/rest (53.9%), and inadequate weight gain during pregnancy (50.4%). Key fetal and neonatal factors included birth complications (82.6%), preterm birth (80%), low birth weight (75.6%), neonatal diseases (69.6%) like pneumonia (30%) and jaundice (20%), and birth asphyxia (61.7%). They advocated early detection of these factors to potentially prevent NDDs in children (Belhaouari et al., 2020).

Similarly, Gopalkrishnan et al. (2020) examined the association between NDDs and various risk factors in high socioeconomic families. Their study distinguished significant family histories of mental illnesses or NDDs and perinatal contributors as influential for NDDs, while pre and postnatal factors had a negligible effect. Additionally, Carlsson and colleagues (2020) performed a systematic review of twin and sibling studies to evaluate early environmental risk factors for NDDs. They found that factors like advanced paternal age, low birth weight, and perinatal hypoxia were associated with autism spectrum disorder (ASD), while low birth weight and gestational age were linked to attention-deficit/hyperactivity disorder (ADHD). The study suggests the importance of both genetic and environmental factors in the development of NDDs.

**Comorbidity through interrelated Neurological Soft Signs**

Neurological soft signs (NSS) refer to subtle abnormalities in sensory-perceptual, motor, or other central nervous system functions without causing pervasive functional impairment. These include motor incoordination, clumsiness, and challenges with rapid movements, among others (Cass & Yeates, 2011). Such signs are notably present in psychiatric disorders, especially schizophrenia (Bombin et al., 2005). Given that ADHD and SLD often stem from delayed maturation, a hallmark of NSS, these signs can be valuable in clinical assessment (Patankar et al., 2012; Mukherjee et al., 2020; Fountoulakis et al., 2018). Alamiri with coauthors (2018) highlighted a connection between NSS and cognitive deficits, not necessarily linked to known brain injury risks or abnormal neurodevelopment. This underscores the importance of a meticulous approach in diagnosing and managing Neurodevelopmental Disorders (NDDs).

**Comorbid and interrelated psychological conditions among children with NDDs.**

Anxiety disorders are highly prevalent in ADHD and needs to be addressed in the treatment process to limit further distress in affected children’s life (Quenneville et al., 2022). Comorbidity is the concurrent presence of more than one condition alongside a primary medical or psychiatric condition (Valderas et al., 2009; Pati et al., 2021). ADHD is a prime example of this, presenting with high comorbidity rates alongside various disorders such as ASD, SLD, Tic Disorder, anxiety, bipolar disorders, ODD, CD, and more (Gnanavel et al., 2019; Hansen et al., 2018; de la Côte-Sainte-Catherine, 2015; Quenneville et al., 2022). Camouflaging behaviors, common in autism, are seen as spanning across various disorders (Dell’Osso et al., 2021). Obaid’s study identified key behavioral traits in ASD, which can impact intervention efficacy (Obaid, 2021). Children with neurodevelopmental disorders often exhibit sleep problems and face challenges in conflict zones, highlighting heightened risk for conditions like PTSD (Tan-MacNeill, Kim M. 2020; Thabet et al., 2011).

Further, camouflaging has been associated with various conditions such as depression, anxiety, social phobia, and autism (Oshima et al., 2023; McQuaid et al., 2022; Corbett et al., 2021; Cook et al., 2021; Hull et al., 2021). Parents of children with special needs, especially those with NDDs, often grapple with their own psychological distress and employ diverse coping mechanisms (Jadidi & Jadidi, 2020; Albustami, 2013). Children with Intellectual Developmental Disorders are notably vulnerable, frequently exposed to trauma and adverse life events (Venkatasubramanian & Ranalli, 2022; Wigham & Emerson, 2015).
Specific Learning Disorders (SLD) are marked by impairments in reading, writing, or math skills. Children with intellectual disabilities may face trauma but struggle to articulate it due to limited assessment tools tailored to their needs (American Psychiatric Association, 2022). ADHD symptoms often overlap with those of ASD, further complicating diagnosis, and treatment (Deutsch et al., 2008). Lastly, a study by Operto and colleagues demonstrated that while children with NDDs, including ASD, ADHD, and SLD, have unique neuropsychological profiles, they and their parents experience heightened emotional-behavioral challenges compared to their typically developing counterparts (Operto et al., 2021).

**Transdiagnostic Interrelation or continuum?**
Kern and colleagues identified significant similarities between autism spectrum disorder (ASD) and ADHD, such as rising prevalence, male-biased incidence, and shared neurological patterns. They postulate that these disorders might exist on a continuum with a shared origin (Kern et al., 2015). Despite these diagnostic criteria, it is important to note that children with NDDs display cognitive heterogeneity, necessitating tailored treatment approaches (Márquez-Caraveo et al., 2021).

There is a growing belief in the value of a Transdiagnostic approach to understanding neurodevelopmental disorders. Astle et al. argue against relying on outdated diagnostic criteria, advocating for more modern research approaches (Astle et al., 2022). Coordinated with this, Fletcher-Watson discusses the alignment of the Transdiagnostic method with the neurodiversity paradigm, suggesting that this approach might be more supportive of neurodiversity-affirmative research and practice (Fletcher-Watson, 2022). Some researchers, such as Morris-Rosendahl & Crocq, and Dalgleish et al, highlight the continuum nature of NDDs and the potential shortcomings of the DSM and ICD, suggesting that their taxonomies might not be entirely suitable for current research and clinical practice (Morris-Rosendahl & Crocq, 2020; Dalgleish et al., 2020).

Stanton et al. also champion Transdiagnostic approaches, noting their potential to enhance research and psychopathology measurement (Stanton et al, 2020). Elder and Ward introduced the Phenomena Detection Method for Theory Construction (PDM-TC) as a novel framework for psychopathological explanation (Hawkins -Elder & Ward, 2020). Even with critiques of the DSM and ICD, they remain foundational in psychiatry. The emergence of alternative systems, such as the Research Domain Criteria (RDoC), highlights a shifting perspective on mental illness classification away from the traditional DSM-ICD model, aiming for a more comprehensive understanding (Lilienfeld & Treadway, 2016).

**Study Statement**
This study aims to uncover the complex intersections of co-existing conditions among various neurodevelopmental disorders (NDDs), such as ADHD, ASD, learning disabilities, and intellectual disabilities. Previous research has highlighted the pronounced comorbidity rates between ADHD and disorders like ASD and SLD (Gnanavel, 2019; Hansen et al., 2018). Moreover, camouflage behaviors are prevalent across these disorders (Dell’Osso et al., 2021). As such, it is crucial to gain a deeper understanding of the distinct and shared adversities faced by these children. This includes their increased susceptibility to PTSD in conflict situations (Tan-MacNeill, Kim, 2020) and the amplified emotional and behavioral challenges encountered by them and their families (Operto et al., 2021).

Focusing on the overlapping symptoms, particularly between ADHD and ASD and between learning and intellectual disabilities (Deutsch et al., 2008), this study seeks to shed light on the nuanced nature of comorbidity within NDDs. The goal is to inform more specialized interventions. The research will primarily address two pivotal questions:

1. What are the concurrent psychological traits observed in children with NDDs?
2. How do these psychological traits interrelate among children with NDDs based on diagnostic classification criteria?

**METHODS AND INSTRUMENTS**

**Study methods**
This study employed a cross-sectional approach to explore the psychological traits in children with Neurodevelopmental Disorders (NDDs) as discerned by their mothers. Data was gathered from 205 mothers across various centers in the West Bank Governorates at a specific point in time. To assess these traits, mothers utilized the comorbid Psychological Trait Inventory (CPTI). This methodology rendered a comprehensive snapshot of the concurrent and interconnected psychological traits, elucidating the prevailing landscape without the confounding influence of temporal variables. For analysis, the data was subjected to a descriptive procedure, with statistical tests chosen based on their pertinence to the study’s objectives.
Study Sample
Data was collected from twenty-two local centers across the West Bank Governorates. Centers were identified based on recommendations from ten experts in the field. From these, twelve centers were randomly chosen to represent the main governorates in the south, north, and central geographical areas of the West Bank. A purposive convenient sample of 175 mothers of children with NDDS participated. These children attended the specialized centers in the northern governorates of Palestine (the West Bank). Additionally, a comparison group comprised of thirty mothers of Typical Developing Children (TDC) was included. These mothers were selected from those willing to participate among the staff working at the centers, and their children attended nearby public or private schools. The total sample size was 205 mothers. Data collection occurred either at the nominated service-providing sectors (n=111) or at participants’ homes (n=75) based on their preference.

Sample Characteristics
Mothers’ ages were grouped as follows: 38.4% (18-25 years), 38.4% (26-34 years), 20.7% (35-45 years), and 2.5% (above 45 years). Fathers’ ages during conception were: 10.3% (18-25 years), 43.3% (26-34 years), 36.9% (35-45 years), and 9.4% (above 45 years). Children’s ages ranged from under 6 years (3.5%) to older than 16 years (2.5%). In terms of weight, 22.8% of the children were underweight (<2.5 kg), 70.8% were of normal weight (2.5-4 kg), and 6.4% were overweight (>4 kg).

Regarding clinical classification, 30.2% were diagnosed with ASD, 16.6% with ADHD, 20.5% with IDD, 18.0% with SLD, and 14.6% were TDC. Income levels were categorized as very bad (1.5%), bad (9.0%), moderate (9.0%), good (60.6%), and very good (19.9%).

In the sample, 2.0% of the NDDS children had at least one parent with a disability. Additionally, 12.2% reported another disabled family member, and 31.7% reported kinship with their husband. Regarding environmental exposure, 11.7% of the children were exposed to tear gas. Psychologically, 6.7% of mothers experienced severe psychological problems, 28.9% encountered debilitating stress, and 20.7% reported clinical post-partum depression. Furthermore, 27.5% of mothers faced domestic violence, and 20.0% of children experienced grief or bereavement.

Study Instrument
Mothers assessed their children’s psychological traits using the Comorbid Psychological Trait Inventory (CPTI), a 89-item questionnaire. This instrument, designed on a five-point Likert scale model, ranges from 0 (indicating non-existence) to 4 (representing the highest level of existence). The authors developed the CPTI to pinpoint specific psychological traits as observed and perceived by mothers.

The inventory integrates criteria from ten co-occurring psychological traits and behavioral characteristics frequently referenced in comprehensive research findings. The chosen items are rooted in primary criteria from diagnostic manuals, particularly the DSM-5-TR and the ICD-11. The CPTI emphasizes traits that capture shared, co-existing, and interconnected characteristics highlighted in pertinent literature. The selection of these traits drew guidance from various prior research findings.

To validate the CPTI’s consistency and reliability, rigorous evaluations were executed. A panel of ten esteemed local and international professionals in the field reviewed the questionnaire, achieving consensus on 92% of the final ninety-four items. Beyond the content validity affirmed by these experts, the study also conducted internal validity assessments and Cronbach’s alpha reliability tests. To further evaluate the CPTI’s internal validity, item-domain correlations were calculated, with results presented in Table 1.

As shown in Table 1, the internal validity of the Comorbid Psychological Trait Inventory (CPTI) was evaluated using item-domain correlations across a variety of psychological traits. In the Oppositional Defiant Disorders (ODD) domain, correlation coefficients varied between 0.37 and 0.63, denoting moderate to strong internal consistency. The Conduct Personality Disorders (CPD) domain displayed a broader range of 0.33 to 0.72. Traits associated with anxiety disorder demonstrated a consistently robust correlation, with coefficients ranging from 0.53 to 0.69. Likewise, the Depression domain spanned from 0.46 to 0.73, reflecting notable internal consistency. Phobic Disorders exhibited particularly elevated correlations, ranging from 0.50 to 0.73. The coefficients for the obsessive-compulsive disorder (OCD) domain varied between 0.45 and 0.69, while the Aggressiveness domain peaked notably at 0.79. Reactive Sensitivity presented coefficients between 0.58 and 0.65, and the Psychosis domain maintained a compact range from 0.56 to 0.69. Finally, the “Camouflage and Noli me tangere” domain showed correlations between 0.40 and 0.57. In conclusion, all domains within the CPTI demonstrated moderate to strong item-domain correlations, emphasizing the instrument’s exceptional internal
validity in assessing the outlined psychological traits. Additionally, the CPTI reliability was assessed using Cronbach’s alpha method, and the results are shown in Table 2.

Table 2 outlines the domains being studied, along with the number of items in each domain and their corresponding Cronbach’s alpha coefficients. The table illustrates that the domains, such as Oppositional Defiant Disorders (ODD), Conduct Personality Disorders (CPD), and anxiety disorder, consist of varying numbers of items, with their respective Cronbach’s alpha values indicating the internal consistency of the measurement. It is worth noting the strong internal consistency observed in domains like Depression, Phobic Disorders, and obsessive-compulsive disorder (OCD), each exhibiting a Cronbach’s alpha of 0.91, 0.87, and 0.85, respectively.

Domains like Reactive Sensitivity (5 items, alpha = 0.82) and Psychosis (11 items, alpha = 0.88) also demonstrate satisfactory internal consistency.

In summary, Table 2 effectively summarizes domain characteristics and their internal consistency, measured through Cronbach’s alpha, contributing to the assessment of measurement reliability.

**Study Procedure**

Data collection primarily occurred in person, but nineteen questionnaires were collected electronically. This electronic method catered to mothers who were in distant locations or had challenging schedules. After the collection and filtering processes, the data were inputted into the Statistical Package for the Social Sciences (SPSS) for analysis. Relevant statistical tests were then employed to address the study’s questions.

Each domain score is aggregated from the average values assigned to each response, thus the total domain score ranges from 0 to 3, where a higher score indicates greater manifestation of the traits measured in that domain.

Ethical considerations were paramount throughout this study. From the proposal submission to the research practices, measures were taken to ensure ethical integrity. This included voluntary participation, informed consent, maintaining participant anonymity and confidentiality, considering potential harm, and transparent communication of results. Considering these considerations, the Arab American University’s ethical committee granted approval.

**RESULTS**

To address the primary research question, “What are the comorbid, co-occurring, and interconnected psychological traits observed in children with NDDs?”, we calculated the means and standard deviations (SD). The findings are presented in Table 3.

Table 3 presents means and standard deviations (SD) for NDDS scales categorized according to different disability types. The table underscores variations in mean scores across each disability type and provides insight into potential trends within the data. Among individuals with the “Normal” no disability type, the NDDS scale means are as follows: Oppositional Defiant Disorders (ODD) = 1.09, Conduct Personality Disorders (CPD) = 0.14, anxiety disorder = 0.29, Depression = 0.31, Phobic Disorders = 0.23, obsessive-compulsive disorder (OCD) = 0.41, Aggressiveness = 0.36, Reactive Sensitivity = 0.77, Psychosis = 0.31, Camouflage and Noli me tangere = 0.43. The standard deviations alongside these means signify the level of variability within each domain for this disability/Disorder type.
Table 3. Means and SD for NDDS scales according to the type of disability.

<table>
<thead>
<tr>
<th>Disability type (Disorder)</th>
<th>Oppositional Defiant Disorders (ODD)</th>
<th>Conduct Personality Disorders (CPD)</th>
<th>Anxiety Disorder</th>
<th>Depression</th>
<th>Phobic Disorders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Normal</td>
<td>1.09</td>
<td>0.78</td>
<td>0.14</td>
<td>0.32</td>
<td>0.29</td>
</tr>
<tr>
<td>Autism</td>
<td>1.34</td>
<td>0.85</td>
<td>0.54</td>
<td>0.77</td>
<td>0.93</td>
</tr>
<tr>
<td>ADHD</td>
<td>1.87</td>
<td>0.97</td>
<td>0.72</td>
<td>0.81</td>
<td>1.11</td>
</tr>
<tr>
<td>Intellectual</td>
<td>1.34</td>
<td>0.86</td>
<td>0.46</td>
<td>0.55</td>
<td>0.87</td>
</tr>
<tr>
<td>Specific Learning</td>
<td>1.52</td>
<td>0.80</td>
<td>0.52</td>
<td>0.61</td>
<td>1.02</td>
</tr>
</tbody>
</table>

For the “ASD” Disorder type, the NDDS scale shows a trend in certain domains: obsessive-compulsive disorder (OCD) has a relatively higher mean (M = 1.05), while Conduct Personality Disorders (CPD) and Phobic Disorders have lower means (M = 0.54 and M = 0.93, respectively). A similar trend is observed for the “ADHD” Disorder type, where obsessive-compulsive disorder (OCD) retains a higher mean (M = 1.11), while Conduct Personality Disorders (CPD) and Phobic Disorders exhibit lower means (M = 0.72 and M = 1.11, respectively). The “Intellectual Developmental Disorder” type presents a pattern where Reactive Sensitivity has a higher mean (M = 1.29) compared to other domains, such as Conduct Personality Disorders (CPD) and Phobic Disorders. In contrast, the “Learning Disability” disability type demonstrates consistently elevated mean scores across various domains, such as obsessive-compulsive disorder (OCD) (M = 1.01) and Aggressiveness (M = 1.12).

In summary, the comments above reveal a consistent distribution of scores across the NDDS scales among individuals classified as “normal” without disabilities. An observable trend is noteworthy within the “Autism” Disorder type, particularly concerning obsessive-compulsive disorder (OCD), Conduct Personality Disorders (CPD), and Phobic Disorders domains. Similarly, the “ADHD” group demonstrates a consistent pattern in the OCD domain, distinct from lower scores in CPD and Phobic Disorders. Individuals with intellectual Disorder exhibit a distinct trend, where Reactive Sensitivity scores higher in comparison to Conduct Personality Disorders (CPD) and Phobic Disorders. Notably, the SLD group consistently showcases elevated scores across domains, notably in obsessive-compulsive disorder and Aggressiveness.

To address the research question, “What are the interconnected psychological traits observed in children with NDDs based on diagnostic classification criteria?”, we employed multinomial regression analysis. This analysis was used to determine if any of the psychological traits corresponded with a specific disability/Disorder type.

Table 4. Model Fit Measures

<table>
<thead>
<tr>
<th>Model statistics</th>
<th>Overall Model Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deviance</td>
<td>AIC</td>
</tr>
<tr>
<td>454</td>
<td>550</td>
</tr>
<tr>
<td>0.202</td>
<td>115</td>
</tr>
<tr>
<td>44</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

The deviance value for Model 1 was 454, indicating the model’s goodness of fit. The Akaike Information Criterion (AIC) score was 550, providing a basis for model comparison. The coefficient of determination ($R^2$) was 0.202, suggesting that approximately 20.2% of the vari-
ability in the response variable was accounted for by the model. The McFadden’s pseudo-$R^2$ was 0.115, signifying the proportion of variance explained by the model in relation to the null model. Additionally, the chi-square test of overall model fit revealed a $\chi^2$ statistic of 115 with 44 degrees of freedom (df). The associated $p$-value was < .001, indicating a statistically significant deviation from the null hypothesis. In summary, the model fit measures underscore the adequacy of Model 1 in capturing patterns within the dataset, demonstrating its explanatory potential in the context of the multinomial regression analysis. Furthermore, model coefficients were computed for all disability types in relation to the normal children group for each personality trait. The calculated coefficients demonstrate the change in odds ratios associated with specific traits within the context of disabilities, referencing the normal children group. An increase in the odds ratio indicates an elevated likelihood of the presence

<table>
<thead>
<tr>
<th>Disability type</th>
<th>Predictor</th>
<th>Estimate</th>
<th>SE</th>
<th>Z</th>
<th>p</th>
<th>Odds ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>autism</td>
<td>Intercept</td>
<td>-1.34</td>
<td>0.61</td>
<td>-2.19</td>
<td>0.03</td>
<td>0.26</td>
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<tr>
<td></td>
<td>Oppositional Defiant Disorders (ODD)</td>
<td>-0.92</td>
<td>0.61</td>
<td>-1.52</td>
<td>0.13</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>Conduct Personality Disorders (CPD)</td>
<td>0.88</td>
<td>1.15</td>
<td>0.77</td>
<td>0.44</td>
<td>2.41</td>
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<tr>
<td></td>
<td>Anxiety Disorder</td>
<td>0.63</td>
<td>1.16</td>
<td>0.54</td>
<td>0.59</td>
<td>1.87</td>
</tr>
<tr>
<td></td>
<td>Depression</td>
<td>1.41</td>
<td>1.32</td>
<td>1.07</td>
<td>0.29</td>
<td>4.11</td>
</tr>
<tr>
<td></td>
<td>Phobic Disorders</td>
<td>3.08</td>
<td>1.08</td>
<td>2.86</td>
<td>0.00</td>
<td>21.71</td>
</tr>
<tr>
<td></td>
<td>Obsessive-Compulsive Disorder (OCD)</td>
<td>-0.91</td>
<td>0.96</td>
<td>-0.95</td>
<td>0.34</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>Aggressiveness</td>
<td>0.03</td>
<td>0.75</td>
<td>0.03</td>
<td>0.97</td>
<td>1.03</td>
</tr>
<tr>
<td></td>
<td>Reactive Sensitivity</td>
<td>-1.04</td>
<td>0.58</td>
<td>-1.79</td>
<td>0.07</td>
<td>0.35</td>
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<tr>
<td></td>
<td>Psychosis’</td>
<td>0.54</td>
<td>1.03</td>
<td>0.53</td>
<td>0.60</td>
<td>1.72</td>
</tr>
<tr>
<td></td>
<td>Camouflage and Noli me tangere</td>
<td>1.98</td>
<td>0.89</td>
<td>2.24</td>
<td>0.03</td>
<td>7.23</td>
</tr>
<tr>
<td>ADHD</td>
<td>Intercept</td>
<td>-2.17</td>
<td>0.69</td>
<td>-3.14</td>
<td>0.00</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>Oppositional Defiant Disorders (ODD)</td>
<td>-0.50</td>
<td>0.65</td>
<td>-0.77</td>
<td>0.44</td>
<td>0.60</td>
</tr>
<tr>
<td></td>
<td>Conduct Personality Disorders (CPD)</td>
<td>0.67</td>
<td>1.13</td>
<td>0.59</td>
<td>0.56</td>
<td>1.95</td>
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<tr>
<td></td>
<td>Anxiety Disorder</td>
<td>1.66</td>
<td>1.20</td>
<td>1.38</td>
<td>0.17</td>
<td>5.25</td>
</tr>
<tr>
<td></td>
<td>Depression</td>
<td>0.41</td>
<td>1.37</td>
<td>0.30</td>
<td>0.77</td>
<td>1.50</td>
</tr>
<tr>
<td></td>
<td>Phobic Disorders</td>
<td>1.87</td>
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<td>1.72</td>
<td>0.09</td>
<td>6.50</td>
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<td>Obsessive-Compulsive Disorder (OCD)</td>
<td>0.68</td>
<td>0.98</td>
<td>0.69</td>
<td>0.49</td>
<td>1.98</td>
</tr>
<tr>
<td></td>
<td>Aggressiveness</td>
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<td>0.73</td>
<td>1.11</td>
<td>0.27</td>
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</tr>
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<td></td>
<td>Reactive Sensitivity</td>
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<td>0.59</td>
<td>-1.12</td>
<td>0.26</td>
<td>0.52</td>
</tr>
<tr>
<td></td>
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<td>-0.07</td>
<td>0.95</td>
<td>0.93</td>
</tr>
<tr>
<td></td>
<td>Camouflage and Noli me tangere</td>
<td>1.09</td>
<td>0.92</td>
<td>1.19</td>
<td>0.23</td>
<td>2.98</td>
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<td>-1.93</td>
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<td>0.31</td>
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<td>0.29</td>
<td>0.52</td>
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<tr>
<td></td>
<td>Conduct Personality Disorders (CPD)</td>
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<td>0.63</td>
<td>1.73</td>
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<td>0.40</td>
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<td>Depression</td>
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<tr>
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<td>0.96</td>
<td>-0.63</td>
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https://doi.org/10.52291/jse.2024.39.10
of a particular trait within a specific disability group as compared to the reference group of normal children.

In Table 5, the odds ratios for significant psychological trait predictors across various disability types are outlined. The results yield notable insights into the relationships between these predictors and distinct disabilities. Key findings from the analysis are as follows:

For individuals with Autism, the odds of experiencing Phobic Disorders are notably higher (OR = 21.71, p < .001). Additionally, there is a significant elevation in the odds of “Camouflage and Noli me tangere” (OR = 7.23, p = .03).

In the ADHD group, a significant increase in odds is observed for “Phobic Disorders” (OR = 6.50, p = .09) and “anxiety disorder” (OR = 5.25, p = .17). Among those with Intellectual Disability, higher odds are associated with “Phobic Disorders” (OR = 19.57, p = .01), followed by “Depression” (OR = 6.37, p = .16). Within the Learning Disability group, the odds ratios of significance encompass “Phobic Disorders” (OR = 14.78, p = .01) and “anxiety disorder” (OR = 6.29, p = .12).

DISCUSSION

Common trends seem to reveal OCD comorbidity with ASD (Griffiths et al., 2017), ADHD and SLD (Bandla et al., 2017). Additionally, aggressiveness comorbidity with SLD was also reported (Sahu et al., 2019) and Reactive sensitivity with IDD as well (Summers et al., 2017). Although our study reflects higher means among these traits, yet careful examination of our study did not support these trends. The findings of our study offer a detailed insight into the psychological traits present in children with Neurodevelopmental Disorders (NDDs). Notably, individuals without any diagnosed disability showed consistent scores across the NDDS scales. Those with Autism were particularly characterized by traits associated with Phobic Disorders, a trend also observed in the Intellectual disability and Learning disability group. This emphasis on Phobic Disorders aligns with existing literature, reflecting the noted comorbidity of ADHD with disorders like Phobic Disorders (Gnanavel, 2018; Hansen et al., 2018) and the camouflaging behaviors common in autism (Dell’Osso et al., 2021).

The research uncovers distinct psychological trait patterns across various Neurodevelopmental Disorders (NDDs). Specifically, individuals with Autism showed a pronounced propensity for Phobic Disorders and exhibited traits of “Camouflage and Noli me tangere.” This observation aligns with previous studies that have noted camouflaging behaviors in autism, often seen as spanning across multiple disorders (Dell’Osso et al., 2021). This can be speculated as an avoidance behavior and a means of self-protection to compensate autistic features to mirror their social surroundings (Alaghband-Rad et al., 2023).

The ADHD cohort revealed a notable inclination towards Phobic Disorders and anxiety traits. This finding is consistent with the literature that highlights ADHD’s extensive comorbidity with various disorders, including OCD and anxiety (Gnanavel et al., 2019; Hansen et al., 2018; Quenneville et al., 2022).
Those with Intellectual Disability demonstrated a heightened likelihood for Phobic Disorders and Depression. This observation resonates with research indicating that individuals with intellectual disabilities are frequently exposed to trauma and adverse events, making them more susceptible to such psychological traits (Venkatasubramanian & Ranalli, 2022; Wigham & Emerson, 2015).

Lastly, individuals within the Learning Disability category were significantly inclined towards Phobic Disorders and anxiety traits. This can be contextualized with the broader understanding of Specific Learning Disorders (SLD), which are characterized by impairments in foundational academic skills and often associated with anxiety (American Psychiatric Association, 2022).

Overall, these insights emphasize the complex associations of psychological traits within different NDDs, underscoring the need for specialized therapeutic approaches and interventions. The results not only align with the existing body of knowledge but also pave the way for further research in this domain.

**IMPLICATIONS FOR PRACTICE**

- **Diagnostic Precision:** Recognize obsessive-compulsive traits in Autism and ADHD for accurate diagnosis and tailored interventions, considering the overlap with OCD and camouflaging behaviors.
- **Trauma-Informed Approach:** Given the heightened Reactive Sensitivity in those with Intellectual Disability, adopt trauma-aware care due to their exposure to adverse events.
- **Comprehensive Care for Learning Disabilities:** Address both academic challenges and psychological traits in the Learning Disability group, emphasizing their multifaceted needs.
- **Interdisciplinary Collaboration:** Given the overlap of ADHD with disorders like ASD, adopt a team-based approach for holistic care.
- **Ongoing Research and Training:** Stay updated with the evolving knowledge on NDDs to ensure best practices in diagnosis and intervention.

**STUDY RECOMMENDATIONS**

Considering our findings, several actionable recommendations emerge. Clinicians should consider a comprehensive evaluation process that incorporates the specific traits highlighted in our study, especially when diagnosing children with Neurodevelopmental Disorders (NDDs). This comprehensive approach can pave the way for more accurate diagnoses and, subsequently, tailored interventions. Moreover, it is imperative to update training programs for clinicians. These programs should emphasize the importance of understanding the intricate comorbid psychological traits observed in children with NDDs, aiming to enhance diagnostic precision.

There is also a pressing need for further research. Given the observed complexities in psychological traits across NDDs, initiating more longitudinal studies could provide deeper insights into how these traits evolve and interact over time. In educational settings, the importance of our findings cannot be overstated. Educators, school psychologists, and other stakeholders should be apprised of the diverse psychological landscape of children with NDDs. Such an informed approach can lead to the formulation of more effective academic and behavioral interventions tailored to these students’ unique needs. Lastly, public awareness initiatives should be amplified. By raising public consciousness about the nuanced nature of NDDs, we can hope to reduce associated stigmas and foster a more inclusive and understanding society.

**STUDY LIMITATIONS**

While our study offers valuable insights, it comes with inherent limitations. Firstly, the findings are based on our specific sample, and a broader or more diverse sample might yield different insights. The cross-sectional nature of our research captures the traits at a specific moment in time. A more longitudinal approach could offer a richer understanding of how these traits manifest and evolve. Our interpretations, while rooted in our findings, also rely heavily on the existing body of literature. As the field of psychology and neurodevelopment is ever-evolving, new research could offer additional or even contrasting perspectives.

Another significant consideration is the potential for diagnostic overlaps. Given the intricate nature of comorbid psychological traits in children with NDDs, overlapping diagnoses could influence our results. Lastly, the measurement tools employed in our study might have their biases or limitations, potentially affecting the granularity and accuracy of our results.

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None

**DECLARATIONS OF INTEREST**

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