# Neuropsychological Trends

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# Evaluation of learning disability performance in children with cognitive neuropsychological assessment study

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ABSTRACT

*A neuropsychological evaluation provides comprehensive insights into children's neurocognitive function. This study assessed learning disability performance in children through neuropsychological assessment, examining cognitive profiles and emotional-behavioural functioning. The data from 271 respondents using self-administered questionnaires, explored mindfulness-based interventions to address cognitive skills, emotional regulation, and academic performance. Employing a quantitative approach with structural equation modelling and SPSS analysis, we found a significant relationship between children's emotional-personality behavior and learning disabilities. The regression analysis indicated a negative impact on cognitive ability and learning disability, suggesting reduced motivation to learn. This study highlights the importance of neuropsychological assessment in understanding and addressing learning disabilities in children, influencing their socialization and adjustment in educational settings. It underscores the significance of such assessments in enhancing educational outcomes for children facing learning challenges.*

*Keywords: neuropsychological evaluation; learning disabilities; cognitive profiles; emotional-behavioral functioning; mindfulness-based interventions*

## 1. Introduction

A learning complaint is a neurodevelopmental disorder that occurs in early infancy and is commonly co-occurring with other neurodegenerative and psychiatric conditions (Colvin, Forchelli et al., 2022). Children with RLD (Reading Learning Disability) show marked difficulty in reading and learning, in addition to problems with rhythm, motor and visual skills (Flores-Gallegos et al., 2022). The common learning disorders include dysgraphia and dyslexia, besides other non-verbal forms of learning disorders (Crow et al., 2022). The common symptoms of dyslexia are difficulty or inability to identify the word correctly or fluently, and poor reading comprehension. The prevalence of this disorder is estimated to be between 5 and 15% (Sabeghi et al., 2022). Moyamoya Infection is a rare neurological condition that results in the reduced bloodstream in the brain. It can also cause temporary ischaemic episodes or strokes, along with other cognitive deficits, particularly in executive function (Mikula et al., 2022). The association between Moyamoya Infection and dyslexia may not be immediately evident, but it underscores the multifaceted nature of learning disorders and their potential interactions with neurological conditions. In cases where a child already grapples with dyslexia, the added burden of Moyamoya Infection and its impact on cognitive function further complicates the learning and reading challenges. This interplay between learning disabilities and neurological conditions highlights the need for comprehensive assessments and tailored interventions to address the complex needs of these children.

Quality of Life (QoL) is a multifaceted concept encompassing various aspects of an individual's well-being, both physical and psychological (Waber et al., 2022). While Moyamoya Infection is primarily known for its neurological and cognitive consequences, it can also profoundly affect a child's overall QoL. The reduced blood flow to the brain, coupled with the risk of ischemic episodes and strokes, can lead to significant challenges in everyday life, particularly in executive functioning. Children living with Moyamoya Infection may face difficulties in academic pursuits, social interactions, and physical activities, which, in turn, can impact their overall well-being and QoL. These challenges extend beyond the cognitive realm and encompass psychosocial and daily life aspects, which are vital considerations in understanding the full impact of neurological conditions like the Moyamoya Infection. A comprehensive assessment of the QoL of children with Moyamoya Infection is essential for developing effective support and intervention strategies, ultimately aiming to improve their holistic well-being and quality of life. For example, children diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) frequently demonstrate behavioural alterations and encounter challenges when

undergoing psycho-stimulation treatments, such as methylphenidate (MPH) (Smith & Jones, 2020). Executive functions (EF) are often recommended for children with ADHD (Attention Deficit Hyperactivity Disorder) and are reflected as valuable in 70% of ADHD-affected children (Hai et al., 2022).

Clinical models suggested more challenges than children with trouble speaking, and it was shown that children with linguistic impairments were more likely to have internalizing problems (Donolato et al., 2022). Although the exact origin of Developmental Coordination Disorder (DCD) is unknown, evidence points to the children's unusual brain structure and function. Short-term improvements in motor competence and motor skill-related fitness can be achieved using interventions designed to support children in adjusting to their activity restrictions (Visser et al., 2020). While activity-oriented therapies can help children with developmental disabilities achieve better motor results, there is an urgent need for high-quality intervention studies and long-term effect evaluation. It's significant to note that DCD-related motor coordination issues also affect exercise-related activities, which discourages play and sports engagement and results in secondary issues with muscle fitness and body composition (Smits-Engelsman & Verbecque, 2022). Pre-existing conditions of ADHD (Attention Deficit Hyperactivity Disorder) and ADHD play a main role in the long-term and more predictive recovery of Traumatic Brain Injury (TBI) in adults. TBI refers to an injury to the brain caused by an external force, such as a blow to the head. TBI can lead to a wide range of physical, cognitive, emotional, and behavioural symptoms depending on the severity of the injury (Martin et al., 2022). ADHD symptoms play a role in the relationship between reading and writing performance and anxiety, besides the relationship between writing/mathematical performance and behavioural issues (Visser et al., 2020). Children with multiple learning disabilities were likely to have more symptoms of ADHD and Oppositional Defiant Disorder (ODD), with more internalising symptoms (incompetence) and miscalculation (Ghislanzoni et al., 2022). There is a gradual relationship between Intellectual Disability (ID) and Executive Function (EF) nonetheless a rate of EF development in ID people compared to non-ID people (Erostarbe-Pérez et al., 2022). The impact of long-term educational disruption and stressors on learning outcomes and emotional well-being should be assessed in neuropsychological assessments in children and adults, particularly marginalized students (Colvin, Forchelli et al., 2022). However, there is a lack of information on the relationship between Learning Disabilities (LD) and Black and Minority Ethnic groups (BME), and the prevalence of BME concerns among girls and boys in different settings (e.g., home and school) (Aro et al., 2022).

This review delves into recent research studies and findings, shedding light on various aspects of child neurodevelopment and behaviour. The studies

referenced here offer valuable insights into how different factors, ranging from nonverbal reasoning levels to neuropsychological complications, digital interventions, and the presence of medical conditions, can significantly impact a child's cognitive and emotional development. Saar et al. (2022) found that the lower the nonverbal reasoning level, the lower the verbal skills. The considerate weaknesses were verbal Short-Term Memory (STM) and receptive language abilities. However, relative strengths appeared for both nonverbal reasoning level groups in fluent intelligence, especially for nonverbal cognitive tasks with no time limit. Benassi et al. (2022) found that understanding changes in parents and children's observations has important academic implications as such difficulties may influence communication and understanding between children and parents and affect children's self-esteem and educational outcomes.

Szentes et al. (2018) proposed that High-dose chemotherapy (stem cell recovery) with higher radiation dose Sex and Diagnosis Period were not statistically significant. Generalised anxiety, compulsive disorder, post-traumatic stress disorder and separation anxiety were significantly higher in the Massive Bereavement (MB) survivors. The Wechsler Intelligence Scale for Children and the Mini International Neuropsychiatric Interview (MINI-KID) was administered to 34 MB survivors to measure cognitive functioning and psychopathological symptoms. No correlation was found between the cognitive deficits and the psychopathological symptoms. Results identify that Massive Bereavement (MB) survivors suffer from cognitive and psychopathological impairments, and these could exist independently from each other.

Arutuinian et al. (2022) offered that language proficiency was linked to the number of kids with normal language abilities, and according to more complicated morpho-synthesis and discourse tests, fewer Autism Spectrum Disorder (ASD) children were in the normal range compared to those who scored higher on more basic phonological and verbal tests. The findings reveal a considerable range of language abilities among children diagnosed with ASD, consistent with prior research. Notably, the prevalence of children exhibiting typical language skills was linked to the complexity of linguistic assessments. More advanced morphosyntax and discourse tests showed a smaller proportion of children with ASD performing within the normal range compared to simpler phonological and lexical tests, highlighting the nuanced nature of language development in this population.

Aita et al. (2022) revealed patients with neuropsychologic complications had a diverse profile with normal intelligence nevertheless selective thinking and/or behaviour disorders that may have long-term consequences on quality of life, particularly in patients with right-sided cysts. This study analyzed cumulative Multiple Behavior Ratings (MBRs), which represent the percentage

of the sample exhibiting one or more elevated scores, for each version of the BRIEF2 assessment (Parent, Teacher, and Self-Report) and across three T-score cutoffs ($T \geq 60$, $T \geq 65$, and $T \geq 70$). Our findings suggested variations in MBRs based on both the diagnostic group (with ADHD-C > ADHD-I > ASD > SLD-R) and the assessment form (with Parent > Teacher > Self-Report). However, it is essential to note that future research with well-defined participant samples is necessary to delve deeper into these trends and provide a more comprehensive understanding.

Ha et al. (2022) proposed that digital interference could promote positive neurodevelopmental and behavioural changes in kids. Mobile app-based treatment offers a great deal of insight for children with neurodevelopmental disorders who want continuous treatment, especially during pandemic conditions like COVID. Mayes et al. (2022) showed dysgraphia (dysphagia) and gross motor coordination (gross motor coordination) evaluated in a sample of elementary school students, along with those previously associated with Sluggish Cognitive Tempo (SCT). Longoria et al. (2022) suggested that persons with Subjective Cognitive Decline (SCD) are vulnerable to neurocognitive dysfunctions throughout their lives, and process speed has been identified as a common weak spot for individuals with SCD. Stedal et al. (2022) found that individuals with anorexia nervosa (AN) performed somewhat worse intellectually than controls, especially in working memory, memory, and visual and spatial processing. After a thorough examination of the literature, the main goal of this learning process is to determine if it would be feasible to carry out an observational longitudinal research to evaluate children's cognitive and emotional development (Nihar Ranjan Kar, 2021a).

Learning disorders present a unique challenge in terms of understanding cognitive and mental disorders in children. It is widely recognized that neuropsychology assessment is extremely helpful for children with neurodevelopmental diseases related to specific learning and attention impairments (Fernández-Alcántara et al., 2022). Cognitive assessment, according to the American College of Neuropsychiatrists (ACN), is a field that combines neurology and psychiatry, focusing on understanding and treating disorders that affect both the brain and behavior (Nihar Ranjan Kar, 2021b). Therefore, a cognitive assessment according to the ACN would be conducted in line with the standards and guidelines set forth by this professional organization, aimed at aiding clinics and therapists in diagnosing and treating neurologic and psychiatric disorders that affect cognitive function (Colvin, Reesman & Glen, 2022; Odermatt et al., 2022). The objective of the neuropsychological test is to determine whether the child has problems with reading, spelling or mathematics (Feyzioğlu et al., 2023). The examination of cognitive function in children with learning difficulties necessity focuses mainly

on memory, attention and problem-solving skills, besides math and language abilities (Mitsea et al., 2022). Neuropsychology occupies a special place in the understanding of the ontogenesis problem in both normal and pathological diseases (Smart et al., 2022). At the practical level, neuropsychological assessment results have overall aim to diagnose and treat brain disorders that affect children and adults alike (Siffredi et al., 2023). However, at the neuropsychological level, peculiarities and the development of mental processes based on personality traits in the adolescence and youth ages are still unexplored areas (Nihar Ranjan Kar, 2021c).

*1.1 Hypothesis*

Ricci et al. (2022) evaluated the feasibility of assessing cognitive, neuropsychological and emotional-behavioural functioning in children with myotonic dystrophy type 1 (DM1), and to estimate prospectively changes in functioning over time. Ten DM1 patients, aged 1.5-16 years (mean 9.1), 5 with congenital DM1, and 5 with childhood DM1, were assessed with standardized measures of intellectual, neuropsychological, and emotional-behavioural functioning. For 6 patients, assessments were repeated 2 years later. At the emotional-behavioural assessment, scores in the clinical range were found, but they remained heterogeneous and no trends could be recognized. Starowicz-Filip (2022) studied the preliminary assessment of executive functions in children with cerebellar lesions, the description of their emotional-social functioning and the selection of sensitive neuropsychological tools to detect the cerebellar cognitive affective syndrome (CCAS) (Nihar Ranjan Kar, 2022a; Nihar Ranjan Kar, 2022b). Statistical analysis showed statistically significant differences between the experimental and control groups in terms of two dimensions of executive functioning. Children from the experimental group were characterized by worse planning and divided attention than healthy controls. The IDS-2 executive functions battery and the Adult ADHD Self-Report Scale (ASRS), Cerebellar ASRS tests are sufficiently sensitive tools to assess elements of the Cognitive Affective Syndrome (CCAS) in children.

Aden et al. (2023) obtained an overview of children with DM1 in our health region and studied their cognitive and behavioural function, quality of life and neurological status. Patients diagnosed with DM1 were recruited to this cross-sectional study through local habilitation teams of our health region. Neuropsychological testing and physical examination were performed for the majority. Most of the participants had only mild neurological deficits. Two with congenital type had hydrocephalus requiring a shunt. A strong focus on support at school and in social communication is needed for children growing up with DM1. Fortunato et al. (2022) provided preliminary data on the validity of the

Coolidge Personality and Neuropsychological Inventory for Children (CPNI), an instrument designed to assess personality pathologies and other clinical conditions in childhood. A sample of 146 clinicians completed the CPNI, as well as the Child Behavior Checklist (CBCL) to evaluate the behavioral problems and social competencies, regarding a child (aged 6-11 years) who had been in their care between 2 and 12 months. The findings seemed to support the validity of the CPNI as a diagnostic instrument, taking children's PDs and behavioral problems into account.

Jones et al. (2023) explored the relationship between self-reported symptoms and performance on neuropsychological measures in a sample of clinically referred school-aged children (n = 47) and adolescents (n = 104) within 4 weeks of sustaining an mTBI. All participants completed their age-respective Post-Concussion Symptom Inventory and a targeted neuropsychological battery as part of their clinical follow-up. Higher self-reported symptoms were moderately associated with reduced cognitive processing speed and poorer verbal recall memory in the adolescent group. These findings suggested that the relationship between self-reported symptoms and performance on neuropsychological measures may vary based on the developmental level of the child. Furthermore, a higher symptom burden may contribute to cognitive inefficiencies that are exacerbated by sustained cognitive exertion (e.g., neuropsychological testing). From this study analysis, the article constructs four hypotheses based on the objective.

### *1.2 Objectives*

Analyzing the children's neuropsychological examination study is the work's goal. In addition to the children's emotional and personality behaviors, the cognitive study's theoretical analysis is used to evaluate the learning disabilities of children. The application of neuropsychological diagnostic tools is used to mitigate the potentially harmful psychological risks associated with personality traits in adolescents and young adults. Neuropsychological examination indicates that personality evaluations are probably predicated on knowledge of children's learning and behavioural issues, as well as educational challenges. An overview of neuropsychological testing used to evaluate children's cognitive capacities, learning challenges, and behavioural issues is presented in this paper.

The hypothesis of this research are presented as follows.

H1: There is an important correlation between the emotional-behavioural functioning and personality-behavioural functioning of children.

H2: There is an important relationship between cognitive skills and the learning disability of children.

H3: There is an important relationship between Neuropsychological

behaviour and the learning disability of children.
H4: Emotional and personality functioning has been positively linked to children's learning disabilities.

## 2. Method

Neuropsychological assessments can help to differentiate neurogenic (Brain-based) conditions from psychogenic (Psychological) conditions, identify issues in one area of functioning that affect another and provide guidance for educational, remedial and psychotherapy interventions. These tools are employed to monitor changes in progress or regressions over time, besides enhancing comprehension of the variations and commonalities that might be intrinsic to a developmental disorder across different children. Currently, it is very important to include Neuropsychological Assessment in educational settings. The challenges lie in the concept of integrating neuropsychological and personality diagnostics practices of adolescents and young adults. In essence, a new approach to the assessment of learning ability should be found in the comprehension of the personal neuropsychological state of children. The theoretic framework is founded on research conducted in the fields of personality, behavioural and clinical psychology that elucidate the mechanisms and neural pathways involved in the improvement of harmful risks and harmful behaviour in children.

Figure 1 depicts the flow diagram of the suggested work. The objective of the study is to investigate the observational longitudinal data to define the adequacy of cognitive, neuropsychology, emotional and personality-behavioural functioning in children. A comprehensive battery of neuropsychological tests was administered to children to assess a range of cognitive functions, including performance velocity, working memory, immediate and delayed memory, attention span, reaction inhibition, cognitive agility, fine motor control, language fluency and recall, set-shifting, inhibitory control, intelligence, and reading and mathematics performance. The LD (learning disability) is a neurobiological disorder of cognition and/or linguistic processing that is caused by abnormal brain activity. As an outcome of abnormal brain activity, a person with LD processes and acquires information differently from the way a normal child or adult learns with ease. An individual with an LD may have difficulty decoding or identifying words, reading, doing math, writing, and/or speaking. Frequently, an LD is associated with atypical functioning in the area of spoken language, as well as disorders in children. This study provides an analysis of neuropsychological assessment applied to assess children's cognitive abilities, educational difficulties and behavioural disorders.

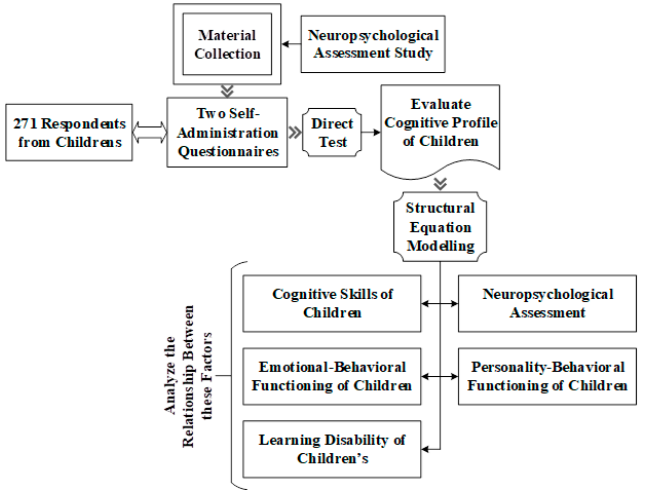


*Figure 1. Flow diagram of the proposed work*

## *2.1 Materials*

As part of the neuropsychological evaluation, a direct test was administered to the children to assess their cognitive profile and 2 self-administered questionnaires were exploited to evaluate the emotional/ personality behavioural issues. The self-administered questionnaire is also given to children with specific educational needs. All participants completed a standardized neuropsychological test to assess cognitive status, in addition to behavioural and emotional issues. Structural equation modelling was employed to calculate the relationship among variables.

### *2.1.1 Questionnaire*

Data from the questionnaire was gathered from children who possess distinct educational requirements. There are a total of 271 respondents to this questionnaire. The questionnaires are designed to measure children's cognitive abilities, neuropsychological performance, emotional and behavioural functioning, Psychophysiological Biomarker Assessment (PBA) functioning, and learning disability. This study examines various factors, including cognitive abilities, neuropsychological behaviour, emotional tendencies, personality traits, and learning disabilities in children. The questionnaire contains different items and there are five types of responses recorded on a Likert scale (1 = Strongly Agree, 2 = Agree, 3 = Neither Agree nor Disagree, 5 = Strongly Disagree and 4 = Disagree).

*2.1.2 Procedure*

Data collection for this study was conducted in a controlled and ethical setting, with the full consent of the participant's parents or legal guardians. Informed consent was obtained from all participating children or their legal guardians, ensuring that they were aware of the study's purpose, their rights, and the confidential handling of their data. The research was conducted in compliance with all relevant ethical guidelines and was approved by the Royal Global University of Science and Technology Ethics Review Board. Participants' identities remained confidential throughout the data collection process, and all data were anonymized for analysis.

The suggestion of this learning is to determine children's neuropsychological and behavioural profiles to calculate the cognitive function, neuropsychological function, emotional function and personality function of children. When evaluating children facing learning difficulties, it becomes crucial to consider aspects such as working memory, concentration, executive skills, and both auditory and written comprehension. This is especially relevant for children who don't show substantial progress through interventions. The correlation between these terms and the effectiveness of interventions requires empirical validation. This study employs two self-administered questionnaires to collect data from the children. A structural equation demonstration is exploited to evaluate the correlation between the factors. The factors analysed in this work are cognitive skills, neuropsychological behaviour of children, emotional-behavioural functioning, personality-behavioural functioning of children, and learning disability of children. The majority of these tests were twisted using a novel neuropsychological tool, the neuropsychological assessment of the children.

*2.2 Demographic information*

Table 1 provides an impression of the demographic information. The LD groups were similar in conditions of age, grade, and IQ indices. There are no statistically important differences in the distribution of men and women within the LD groups. As predicted, there is an important difference among the groups in terms of reading fluency and math skills. The math skills of the children ranged from 0.54 to 0.51.

*Table 1. Demographic information on children's*

| | N | Mean | Standard deviation |
|---|---|---|---|
| Male | 189 | | |
| Female | 82 | | |
| Age | | 10.23 | 5.16 |
| Grade | | 3.73 | 1.48 |
| Reading fluency | | 1.24 | 0.54 |
| Mathematical skill | | 1.05 | 0.51 |

*2.2.1 Participants*

The study involved a total of 271 children, and their demographic information was comprehensively characterized. The age of the participants exhibited a wide spectrum, spanning from 5 to 16 years, with a calculated mean age of 10.23 years and a standard deviation of 5.16. This age diversity within the sample underscored its broad age coverage. In terms of gender distribution, the sample included 189 male and 82 female participants, providing valuable insights into the gender balance within the study. Furthermore, participants were drawn from various grade levels, encompassing elementary through high school. The mean grade level for the sample was determined to be 3.73, with a standard deviation of 1.48, emphasizing the representation of different academic levels within the study. This comprehensive breakdown of demographic information offers a clear and detailed profile of the participant sample.

*2.2.2 Measures*

The assessment of reading fluency was carried out, resulting in a mean score of 1.24 with a standard deviation of 0.54. This information provides a clear understanding of the sample's reading proficiency. The evaluation of mathematical skills yielded a mean score of 1.05 with a standard deviation of 0.51. This data demonstrates the mathematical abilities of the participants in the study. Including this level of detail ensures that the reader has a comprehensive view of the sample demographics, age ranges, gender distribution, and the variability within the sample's age and academic levels.

*2.2.3 Mindfulness-based intervention*

The experimental group in this study participated in the mindfulness-based scheme called GrowingUp Breathing (Andreu et al., 2023; García-Rubio et al., 2023). Developed as a manualized intervention, GrowingUp Breathing is tailored for children aged 7-12 years, and its design is optimized for seamless integration within a school environment. The investigation aims to promote the overall development of the children.

The attendance tracking system ensured the documentation of the count of missed sessions for each student, ensuring the accuracy of their attendance records. Session-specific attendance rates were categorized on a scale from 0 to 3 or more sessions. After the function, children were invited to share their opinions on its acceptability and satisfaction. They were prompted to rate three aspects on a Likert scale ranging from 0 to 10. These aspects encompassed their preferences for the mindfulness/skills for life function, their likelihood to recommend it to a friend, and their perception of its helpfulness. A rating of 0 corresponded to "never," while a rating of 10 indicated "always" Additionally, the children were inquired about their practice of exercises and techniques they had learned during the incident.

In this study, the questionnaire data was broken down into self-reported data from children and reports from teachers (Table 2). Self-reported data did not drop off between pre-intervention and post-intervention. Nevertheless, in the case of teacher reports, questionnaires post-intervention were not completed by three children. In particular, 2 children in the mindfulness group and 1 child in the control did not complete their questionnaires. The study conducted a t-test to examine the baseline differences among the mindfulness gang and the control group for dependent variables based on both children's self-reports and teachers' reports. The study further analyzed the factors of mindfulness mediation, attention, emotion regulation, and overall well-being about their impact on academic performance. The objective was to explore how these factors influenced academic performance positively.

*Table 2. Demographic analysis of both groups*

| Variable | Mindfulness group (n=24) | Control group (n=22) |
|---|---|---|
| Gender (%) | | |
| Females | 14 | 9 |
| Males | 10 | 13 |
| Family structure (%) | | |
| 2 members | 15.3 | 4.5 |
| 3 members | 24.6 | 21.2 |

## 3. Results

The questionnaire data were analyzed with the help of SPSS software. The data collection was structured using SPSS data collection for descriptive, regression and correlation analysis. In the statistics model, the relations between the dependent variables are estimated. The first step was to get the raw scores from each of the sub-schemes. All neuropsychological test scores were converted into mean and standard deviations. The first stage in the statistical analysis was to combine the means of all three groups (Cognitive Profiles, Emotional and Personal Behaviour, and Learning Disabilities of Students) with the help of non-parametrical statistical methods such as the Kruskall-Wallis-H test, from which statistically significant differences emerged. To evaluate significant differences among groups, post hoc analysis was conducted using the U Mann-Whitney test. *p* values below or the same as .05 were considered statistically significant.

This study was conducted on a population of 271 students' data. The data collected are presented in the form of the questionnaire data, which consists of 271 respondents. However, they are structured according to the following categories: cognitive skills (CS), neuropsychological behavior (NA), emotional-behavioural functioning (EB), personality-behavioural functioning (PB), and learning disability of children (LD). The responses to these questionnaire data are presented in the form of the five points Linkert scale, which is strongly agreed, agree, neither agree and nor disagree, disagree and strongly. These analyses are presented based on SPSS software, and the descriptive statistics analysis of the work is presented in the following results.

Descriptive statistics are applied to provide quantitative descriptions in an easy-to-understand format. A large dataset in the investigation study contains a huge amount of measures. The expenditure of descriptive statistics helps to make sense of large quantities of data. Each descriptive statistic simplifies large amounts of data into a simpler summary. This result, presented in Table 3, revealed that the mean values for the proposed work are 19.92 for CS, 19.65 for NA, 18.82 for EB, 19.22 for PB, and 19.53 for LD. However, the skewness and kurtosis values for learning disabilities are 0.953, and 3.672, respectively. Consequently, the standard deviation (SD) for the factors CS, NA, EB, PB, and LD are 5.810, 6.153, 5.989, 6.325, and 6.300, respectively.

*Table 3. Descriptive statistics analysis*

| | N | Min | Max | Mean | SD | Skewness | | Kurtois | |
|---|---|---|---|---|---|---|---|---|---|
| | Statistic | Statistic | Statistic | Statistic | Statistic | Statistic | Std. Error | Statistic | Std. Error |
| CS | 271 | 9 | 36 | 19.92 | 5.810 | .065 | .148 | -1.053 | .295 |
| NA | 271 | 9 | 32 | 19.65 | 6.153 | .103 | .148 | -1.233 | .295 |
| EB | 271 | 8 | 30 | 18.82 | 5.989 | .262 | .148 | -1.162 | .295 |
| PB | 271 | 6 | 30 | 19.22 | 6.325 | .044 | .148 | -1.225 | .295 |
| LD | 271 | 10 | 58 | 19.53 | 6.300 | .953 | .148 | 3.672 | .295 |
| Valid N (listwise) | 271 | | | | | | | | |

### *3.1 Regression*

The regression analysis is underpinned by a range of statistical principles encompassing sampling, probabilities, correlations, distributions, the central limit theorem, confidence intervals, z-scores, t-scores, hypothesis testing, and other essential concepts.

Table 4 portrays the regression test results for the suggested work. The R-squared of the regression is the fraction of the change in the dependent variable as LD that is accounted for or predicted by independent variables CS, NA, EB, and PB. In regression with a single independent factor, it is equal to the square of the correlation between the dependent LD and independent variable. The R-squared is generally of secondary importance unless the main concern is using the regression equation to make accurate predictions, whether the R-square value is represented as .030, and the corrected R-squared values are represented as .015, respectively.

*Table 4. Regression test for the proposed work*

| Model Summary | | | | |
|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | 0.172[a] | .030 | .015 | 6.252 |
| a. Predictors: (Constant), PB, NA, EB, CS | | | | |

Two-factor ANOVA with the replication on the reduced sample data in Table 5 using multiple regression. The ANOVA test is applied to compare the above two groups simultaneously to see is a relationship between them. The F statistic value (2.035) of this ANOVA formula is utilized to combine different groups of data and figure out the differences between and within samples.

*Table 5. ANOVA test analysis results*

| ANOVA | | | | | | |
|---|---|---|---|---|---|---|
| | Model | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 318.188 | 4 | 79.547 | 2.035 | .090[b] |
| | Residual | 10397.354 | 266 | 39.088 | | |
| | Total | 10715.542 | 270 | | | |

a. Dependent Variable: LD

b. Predictors: (Constant), PB, NA, EB, CS

The coefficient results for the proposed work are presented in Table 6. In simple or multivariate regression, the scale of the coefficient on each independent variable indicates the scale of the effect on that dependent variable and specifies the direction of that effect. In a single-variable regression, the coefficient shows the expected increase (positive) or decrease (negative) of the dependent variables when it increases by one. In situations where a regression model involves numerous independent variables, the coefficient reveals the extent by which the linear dependence of the dependent factors magnifies with a unit increase in that specific variable, all the while possessing the remaining independent factors constant. A standard error is an evaluation of the standard deviation of the coefficient, i.e., the degree to which the standard deviation changes over time. It acts as a gauge of the precision of the regression coefficient. If the coefficient is larger than the standard error, it is likely to differ from 0. The constant standard error in this case is 2,308. The t statistic of this work results in a constant value of 8.292.

*Table 6. Coefficient results for the work*

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| | | Unstandardized Coefficients | | Standardized Coefficients | | |
| | Model | B | Std. Error | Beta | t | Sig. |
| 1 | (Constant) | 19.138 | 2.308 | | 8.293 | .000 |
| | CS | -.084 | .068 | -.077 | -1.239 | .216 |
| | NA | -.004 | .065 | -.004 | -.061 | .952 |
| | EB | .160 | .065 | .152 | 2.471 | .014 |
| | PB | -.045 | .060 | -.045 | -.745 | .457 |
| a. Dependent Variable: LD | | | | | | |

There is a strong relationship between emotional and behavioural functioning and personality and behavioural functioning in children.

The statistical relationship or association among two continuous variables is shown in Table 7. The greatest way to measure the relationship among variables is derived from the covariance method and provides information on the size of the association or correlation and the relationship direction. The Pearson correlation between EB and PB is -.18, with a corresponding statistically significant ratio of .766. There is an important relationship between the emotional-behavioural functioning and personality-behavioural functioning of students.

*Table 7. Correlation results for emotional and personality-behavioral functioning*

| Correlations | | | |
|---|---|---|---|
| | | EB | PB |
| EB | Pearson Correlation | 1 | .018 |
| | Sig. (2-tailed) | | .766 |
| | N | 271 | 271 |
| PB | Pearson Correlation | .018 | 1 |
| | Sig. (2-tailed) | .766 | |
| | N | 271 | 271 |

There is a significant relationship between cognitive skills and the learning disabilities of children.

The correlation results for the Cognitive skills and Learning Disability are

presented in Table 8. The correlation coefficient of -.68 indicates a significant relationship at a value of .265. To elaborate on the determination coefficient, squaring the correlation coefficient always yields a positive value, which unfortunately obscures the direction of the relationship, causing some loss of directional information. The conventional Pearson correlation analysis confirms the normal distribution of both variables. It's important to note that the observed values are susceptible to random fluctuations. Cognitive skills exhibit a negative correlation with learning disabilities.

*Table 8. Correlation results for cognitive skills and learning disability of children's*

| Correlations | | | |
|---|---|---|---|
| | | CS | LD |
| CS | Pearson Correlation | 1 | -.068 |
| | Sig. (2-tailed) | | .265 |
| | N | 271 | 271 |
| LD | Pearson Correlation | -.068 | 1 |
| | Sig. (2-tailed) | .265 | |
| | N | 271 | 271 |

There is an important correlation between Neuropsychological scores and children's learning disabilities.

Table 9 illustrates the correlation coefficients for neuropsychological assessment and learning disability, ranging from -1 to +1. A value of -1 signifies a perfect negative correlation, while +1 signifies a perfect positive correlation. The Pearson correlation between NA and LD was found to be .005, with a *p*-value of .932, indicating statistical significance. These findings underscore the significant relationship between neuropsychological assessment and learning disability.

*Table 9. Correlation results for neuropsychological assessment and learning disability*

| Correlations | | | |
|---|---|---|---|
| | | NA | LD |
| NA | Pearson Correlation | 1 | .005 |
| | Sig. (2-tailed) | | .932 |
| | N | 271 | 271 |
| LD | Pearson Correlation | .005 | 1 |
| | Sig. (2-tailed) | .932 | |
| | N | 271 | 271 |

There is a strong relationship between emotional and personality functioning and children's learning disability

Table 10 presents a depiction of the connection between emotional and personality behaviour performance in children and their learning difficulties. The Pearson correlations reveal that the relationship between emotional behaviour (EB) and personality behaviour (PB) is weak, with a coefficient of -.018, while the correlation between EB and learning difficulties (LD) is slightly positive at .149. Similarly, the correlation between PB and LD is negative, with a coefficient of -.041. The statistical significance is observed at levels of .14 for the association between EB and LD, and .503 for PB and LD. These findings underscore the meaningful impact of emotional and personality behaviour functioning on the presence of learning disabilities in children.

*Table 10. Correlation results of children's*

| Correlations | | | | |
|---|---|---|---|---|
| | | EB | PB | LD |
| EB | Pearson Correlation | 1 | .018 | .149* |
| | Sig. (2-tailed) | | .766 | .014 |
| | N | 271 | 271 | 271 |
| PB | Pearson Correlation | .018 | 1 | .141 |
| | Sig. (2-tailed) | .766 | | .503 |
| | N | 271 | 271 | 271 |
| LD | Pearson Correlation | .149* | .141 | 1 |
| | Sig. (2-tailed) | .014 | .503 | |
| | N | 271 | 271 | 271 |

**. Correlation is important at the 0.05 level (2-tailed).

Figure 2 illustrates the distribution of standardized residuals from the regression analysis in the plot. Generally, regression models work best with bell curves. The usage of a normal probability plot diagram of residuals to view if the variance is normal. If the plot results in a linear distribution, continue with the assumption that error terms are uniformly distributed. The work rate is 43%.

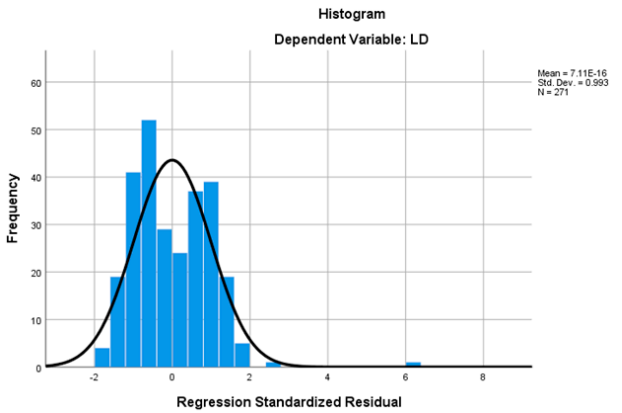


*Figure 2. Distribution plot of regression standardized residual*

Figure 3 shows the P-P plot of the regression standardized residual, which presents the dependent variables as LD. Here, the P-P plot shows the difference between the observed CDF (cumulative distribution function) of the standard residual and the CDF (expected CDF) of the standard distribution.

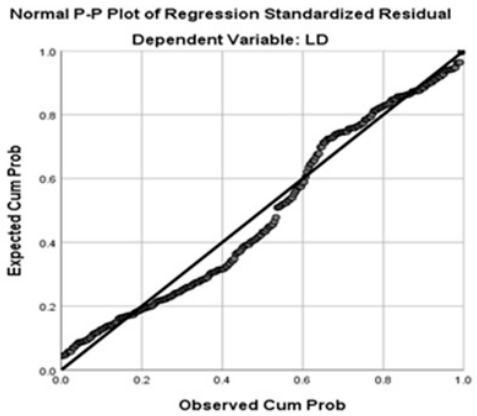


*Figure 3. Normal P-P plot*

Figure 4 shows the scatterplot for the regression standardized predicted value. The scatterplot is composed of the regression standardized predicted values of learning disabilities. The correlation between the learning disability and model residuals is depicted in the graph. The analysis employs solely the average class size and the percentage of full credentials as predictors. The historical inverse correlation between learning disability and standardized residuals is insignificant. Nonetheless, there appears to be a capping phenomenon even as low as LD 60. This could potentially be attributed to the constrained range of percentages in the dataset.

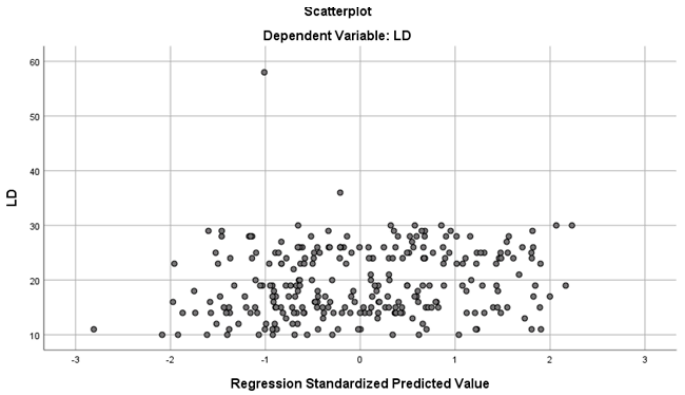


*Figure 4. Scatterplot for regression standardized predicted value*

Figure 5 depicts the histogram illustrating the normality test for the independent variable cognitive skill. The performance result shows that the histogram line is bell-shaped. Similarly, the data value is variable which means that it is normally distributed. The average deviation of the work is -2.06, and the standard deviation is .993.

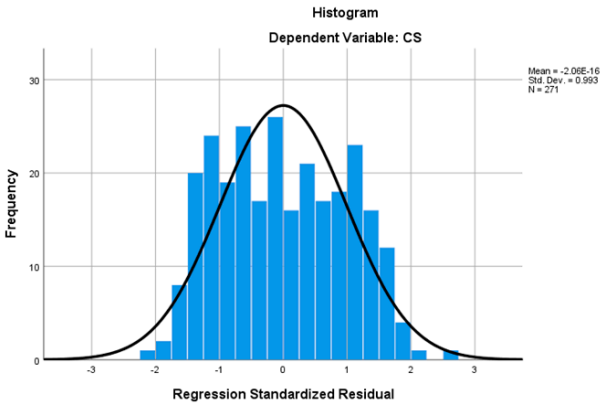


*Figure 5. Histogram-normality test for cognitive skill*

Figure 6 depicts the Normal P-Plot of the normality test for Cognitive Skill with the expected cum probability and the observed cum probability. The P-Plot chart demonstrates that the point cluster is tightly along the diagonal line.

This implies the respondents complete the circulated poll or questionnaires normally distributed. Therefore, it can be concluded that the information about the regression model meets the assumption of Normality.


*Figure 6. Normal probability-plot graph for cognitive skill*

*3.2 Kruskal Wallis*

Kruskal Wallis tests may be calculated using only a few independent random samples that have at least some ordinally scaled properties. Variables do not necessarily follow a distribution curve.

Table 11 presents the analysis results of the Kruskal-Wallis test, including the mean rank for the score values. The ranking process involves ordering all scores without considering their respective groups. This process unfolds as follows: the score with the lowest value receives the lowest rank. In case of two or more identical scores, they are treated as "tied" and assigned the minimum rank they would have obtained if not for the tie. Here, the mean rank for scores 1 and 2 is 10.33, and 8.08, respectively.

*Table 11. Kruskal Wallis test results*

| Ranks | | | |
|---|---|---|---|
| | V2 | N | Mean Rank |
| Score | 1.00 | 3 | 10.33 |
| | 2.00 | 13 | 8.08 |
| | Total | 16 | |

Table 12 reveals the statistical analysis results for the Kruskal-Wallis test. Under the null hypothesis, the chi-square distribution approximates the distribution of H. Here, the Kruskal-Wallis H test has a score value of .548. The degrees of independence (the "df") of the test have a value of 1, and the statistical significance of the test (the "Asymp. Sig.") shows values of .459, respectively.

*Table 12. Statistics analysis for Kruskal-Wallis H test*

| Test Statistics[b] | |
|---|---|
| | Score |
| Kruskal-Wallis H | 0.548 |
| df | 1 |
| Asymp. Sig. | 0.459 |
| a. Kruskal Wallis Test | |
| b. Grouping Variable: V2 | |

Table 13 illustrates the correlation analysis of mindfulness-based intervention. The correlation coefficient (CC) between MIA and ER is .129. This correlation is statistically important at the .01 level (2-tailed), indicated by the ** symbol. It suggests a positive however weak association between MIA and ER. The correlation coefficient between MIA and WB is -.003. This correlation is not statistically significant, as the *p*-value is greater than .05 (the selected significance level). It designates that there is no significant association between MIA and WB. The correlation coefficient (CC) is .100 for WB and .100 for AP. It is statistically significant at a level of .05 (2-tailed). The * symbol indicates a positive and a weak association between WB and AP.

*Table 13. Correlation analysis for mindfulness-based interventions*

| Correlations | | | | | |
|---|---|---|---|---|---|
| | | MIA | ER | WB | AP |
| MIA | Pearson Correlation | 1 | .129** | -.003 | .031 |
| | Sig. (2-tailed) | | .003 | .945 | .471 |
| | N | 535 | 535 | 535 | 535 |
| ER | Pearson Correlation | .129** | 1 | .067 | .023 |
| | Sig. (2-tailed) | .003 | | .123 | .600 |
| | N | 535 | 535 | 535 | 535 |
| WB | Pearson Correlation | -.003 | .067 | 1 | .100* |
| | Sig. (2-tailed) | .945 | .123 | | .020 |
| | N | 535 | 535 | 535 | 535 |
| AP | Pearson Correlation | .031 | .023 | .100* | 1 |
| | Sig. (2-tailed) | .471 | .600 | .020 | |
| | N | 535 | 535 | 535 | 535 |
| **. Correlation is important at the 0.01 level (2-tailed). | | | | | |
| *. Correlation is important at the 0.05 level (2-tailed). | | | | | |

The level of autonomy is determined by the quantity of independent data bits utilized for calculating a statistic. In this illustration, it reflects the sample size minus one, which is 534 in this scenario. The significance (*p*-value) represented as Sig (2-tailed) measures the likelihood that the observed results will be obtained null hypothesis holds. A significance level (SQ) of .000 suggests that the differences observed are unlikely to be due to chance alone. A 95% confidence interval (95% CI) indicates a range within which the actual population difference is expected to decrease with a given confidence level. High and low indicate the limits of this confidence range, providing a reasonable range for the overall population difference. Table 14 shows the t-test results for MIA (Table 1), ER (Table 2), WB (Table 3), and AP (Table 4). The high *p*-values mean that important difference between the sample average and the predicted population mean for each of the variables. Mean differences indicate the size of the difference, while confidence intervals are ranges of values where the true population difference is likely to be.

*Table 14. One-sample T-Test analysis*

| | Test Value = 45 | | | | | |
|---|---|---|---|---|---|---|
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| MIA | -98.497 | 534 | .000 | -25.787 | -26.30 | -25.27 |
| ER | -92.467 | 534 | .000 | -25.460 | -26.00 | -24.92 |
| WB | -100.122 | 534 | .000 | -25.669 | -26.17 | -25.17 |
| AP | -98.566 | 534 | .000 | -25.437 | -25.94 | -24.93 |

## 4. Discussion

The descriptive statistics analysis presented in Table 3 provides an overview of the data. It includes the minimum, maximum, mean, standard deviation, kurtosis and skewness, for each variable. For example, the mean values for CS, NA, EB, PB, and LD are 19.92, 19.65, 18.82, 19.22, and 19.53, respectively. The skewness and kurtosis values indicate the distribution shape of the variables. The regression analysis in Table 4 examines the relations among the independent variables (CS, NA, EB, and PB) and the dependent variable (LD). The R-squared value of .030 suggests that the independent variables explain 3% of the variance to the dependent variable. Adjusted R-squared value of .015, adjusting for predictors in the model. An ANOVA is exploited in Table 5 to compare the variability between and within the groups. F statistic value of 2.035, indicating whether there were important differences between the groups. In this case, *p*-value = .090 indicating that there are no important differences between groups. Coefficient results in "Table 6" shows the findings of the coefficient regression analysis. The coefficient outcomes reveal both the extent and manner in which interactions between each independent variable and a dependent variable manifest. For example, EB has a coefficient of .160 indicating a positive interaction with LD. *p*-values indicate whether the coefficients are statistically significant. Tables 7, 8 and 9 show the correlation results. These tables express the relationship among variables. For example, see a positive relationship between emotional and behavioural working and personality and behavioural functioning. A correlation between cognitive ability and learning disability is observed, indicating a negative relationship. The *p*-values show whether the correlations are statistically significant. The distribution plot of the regression standardized residual in Fig. 2 demonstrates

the supply of the residuals. This plot helps to evaluate whether the regression model predicts normally distributed residuals. Similar to Fig. 2, Fig. 3 shows the normal p-p plot. Fig. 4 shows the scatterplot for the regression standardized predicted value. Fig. 5 shows the normal test for cognitive skills. Fig. 6 shows the normal sharing of the regression model's assumptions and patterns across the data. The histogram above and the standard probability plot below illustrate the distribution and the normality of the data. Finally, the Kruskal-Wallis test in tables 11 and 12 appearances at whether there are statistically important differences between the groups. The *p*-value in this case is .459.

This study compares and contrasts neuropsychological assessments, cognitive function, emotional function, personality function, and learning disability in children. Manuel Fernández-Alcántara et al. (2022) examined the validity of the Computerized Battery for Neuropsychological Evaluation of Children (BENCI) and other measures in assessing cognitive abilities in children. Sustained attention, memory and executive function were found to differ significantly between age groups in their study. These results are in line with the result of the current study, which highlights the importance neuropsychological assessments have in understanding children's learning profiles and abilities. Both studies emphasize the main of assessing various cognitive domains to get a full picture of a child's functioning. Cumbo et al. (2022) evaluated executive function in non-Cognitively Impaired Children and Adolescents. Despite the study's findings not revealing statistically significant differences concerning the mutation site and cognitive level, Cumbo's finding of poor performance on executive function tests concurs with the focus of this study on the association between cognitive abilities and learning disabilities. All in all, these results highlight the main executive function assessments and their influence on learning outcomes in kids with or without cognitive impairment. Colvin et al. (2022) developed the consultation model that aims to efficiently screen for learning disorders, facilitate early intervention, and enhance access to neuropsychology services, aligning with the emphasis on comprehensive assessments and interdisciplinary collaboration in the current study. By implementing such a model, timely detection and intervention for learning difficulties can be realized, potentially mitigating their impact. This model underscores the significance of integrating digital neuropsychological assessments to reveal cognitive functioning, particularly in individuals with epilepsy, thereby enhancing the overall effectiveness of early intervention strategies and support services.

Aynur Fyhizioğlu et al. (2023) utilized digital neuropsychology assessment to assess the cognitive functions of patients with epilepsy. While their study absorbed a particular group of patients, it is important to note that neuropsychological assessments play an important part in the understanding of

cognitive abilities in patients with neurological disorders. Similarly, this study highlights the importance of cognitive skills for children with learning disabilities. In their 2022 study, Eleni Mitsea et al. (2022) examined the effectiveness of mindfulness training strategies in enhancing metacognitive skills among individuals with special educational needs (SEN). The research delved into the application of mindfulness techniques tailored to the unique needs of this population, aiming to improve their self-awareness, self-regulation, and cognitive flexibility. By exploring various mindfulness interventions and their outcomes, the study sheded light on promising approaches for supporting the cognitive development of individuals with SEN, offering valuable insights for educators, therapists, and practitioners working in special education settings. While their study focused on mindfulness interventions, they concurred with the current study's focus on the relationship between Emotional-Behavioural Functioning and Learning Disabilities. Both studies emphasized the advantages of interventions that focus on the emotional and behavioural aspects of learning and cognitive development. Mindfulness-based interventions in neurological populations have been extensively reviewed in a systematic review by Colette M. Smart et al., published in 2022. The outcome of this review has been promising in terms of their potential impact on clinical and neuropsychological symptomatology. While their study was absorbed in a different setting, the outcome of this study on the positive relationship between emotional and personality behaviours and learning disabilities contributed to the best understanding of the multi-faceted mechanisms that lead to learning difficulties. Mindfulness-based interventions have been studied in neurobehavioral functioning (NLP) and white matter (WMB) microstructure in VPT (very preterm) adolescents. In this study, Siffredi (2023) focused on the effects of mindfulness on executive working in VPT (Very Preterm) adolescents. Siffredi (2023) found that mindfulness interventions had a positive effect on executive functioning, along with related changes in white matter (white matter microstructure). This finding was consistent with the current study's focus on the positive relationship between Emotional-Personality Behaviour and Learning Disabilities, which supports the importance of addressing both emotional and cognitive aspects to improve learning abilities.

Overall, while each of these studies focused on different areas of neuropsychology assessment, cognitive function, and learning disability, they all work together to provide the best understanding of the complex interplay among these elements. The present study supplements the existing literature by specifically addressing the following areas of study: cognitive profile in children, emotional and behavioural functioning, personality and behavioural functioning, and mindfulness effect in children with learning disabilities. Through

considering these various perspectives, researchers and educators can attain a comprehensive grasp of the factors behind learning challenges, enabling them to generate tailored interventions that foster children's learning and development.

## 5. Conclusion

The neuropsychological assessment suggests that children may undergo personality evaluations grounded in their comprehension of educational hurdles and behavioural disorders. The cognitive abilities and vocabulary of children were assessed using standardized psychological instruments. This study analyzes neuropsychological assessment among children to evaluate their learning abilities. In this study, two self-administered questionnaires were used to collect data from a total of 271 children. Factors to be analysed include the cognitive skills of children, neuropsychological assessment, emotional and behavioural functioning, personality and behavioural functioning, and learning disability among children. In structural equation modelling, the relationship among variables is analysed. SPSS analysis is utilized to calculate the proposed study. The scores of both groups were matched using non-parametrical statistical methods. Post-hoc analysis was conducted using the Kruskall-Wallis-H test. The comparative analysis focused on the differences and similarities among gangs of children with neurodevelopmental disorders to better identify the cognitive, behavioural and emotional characteristics of the children and the stressors on their parents. The measured skewness for CS, NA, EB, PB, and LD is .065, .103, .262, .044, and .953. The analysed regression value for the work is .172, and the t-values for coefficient results produce a constant value of 8.293. This study reveals that there is an important difference between cognitive skills and learning disabilities. Accordingly, this study also portrays that there is an important relationship between emotional and personality behaviour functioning and children's learning disabilities. However, the Kruskal-Wallis H test portrays a score value of .548 and its statistical significance of the work is .459, respectively. Neuropsychological test outcomes are frequently employed to determine the presence of a disability or to validate eligibility for disability-related services and accommodations within the realm of higher education. Accordingly, the study reveals that the Neuropsychological Assessment procedure in the education environment of school and university becomes a particularly important process to increase the learning ability of children, respectively. According to the findings of the study, mindfulness-based interventions benefit children with learning difficulties. The pre and post-test measurements indicate improvements in attention, emotion

regulation, and overall well-being among the participants. These findings highlight the potential of mindfulness practices, such as mindfulness meditation, as an effective intervention for children with learning disabilities. Enhancements within these areas could potentially result in better academic achievements and enhanced performance in both school and daily activities. These discoveries endorse the application of mindfulness interventions in educational and therapeutic settings, aiming to bolster the mental well-being and academic progress of children with disabilities.

*Conflict of Interest*

The authors declare that they have no Conflict of Interest.

*Data Availability Statement*

Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.

*Ethics Statement*

Not Applicable.

*Author's Contributions*

All authors contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript.

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*Data Collection Setting and Informed Consent*

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