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Current Trends in Neurodevelopmental Disorders: A Thematic Review of Advances and Challenges

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Abstract

Neuropsychology is the field of psychology that studies the relationship between human brain and behaviour. In DSM-5, NDDs are defined as a group of conditions with onset in the developmental period, inducing deficits that produce impairments of functioning. NDDs comprise intellectual disability (ID); Communication Disorders; Autism Spectrum Disorder (ASD); Attention-Deficit/Hyperactivity Disorder (ADHD); Neurodevelopmental Motor Disorders, including Tic Disorders; and Specific Learning Disorders (Morris-Rosendahl, D. J., & Crocq, M. A., 2020). With advancements in the field of neuropsychology as a varied field, the recent trends and patterns followed in the field are important to consider to be updated about the rising progression in the field of neurodevelopmental disorders. In the present paper, the most recent trends, patterns and advancements in the field of neurodevelopmental disorders namely, Attention-Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD) and Learning Disorders (LDs) for the past five years have been studied including but not limited to academia, diagnosis and technology orientation is reviewed as per research with thirty papers as evidence. The paper will give a thematic review about the foreshadowing essence found in the critical analysis of the papers which will elaborate

on the research gaps found and the challenges faced along with the progression in the said field. The analysis indicates that there are gaps, criticisms and commonalities in the understanding of the population sample, neuropsychological profiling, shifting perspectives, technological adoption and the academic incorporation in the understanding of the disorders. However, scope for further research is still found in the future directions for most of the papers.

Keywords: *Current Trends, Neuropsychology, Neurodevelopmental Disorders, Attention-Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD), Learning Disorders (LDs).*

Introduction

Human development involves biological, cognitive, emotional, and social changes throughout life, shaped by genetic and environmental factors (Berk, 2014). Developmental disorders, such as autism spectrum disorder (ASD), attention-deficit/hyperactivity disorder (ADHD), and intellectual disabilities, disrupt typical milestones, emerging before age 18 and often persisting due to neural, genetic, or environmental causes (Thapar et al., 2015; American Psychiatric Association, 2013). These early deficits can cascade into later developmental challenges (Shonkoff & Garner, 2012).

Neurodevelopmental disorders (NDDs) impact cognitive, emotional, and motor milestones due to disrupted brain development, affecting >3% of children globally and lasting for life. Major NDDs include ASD, ADHD, learning disorders, motor disorders, and intellectual disabilities. The DSM-5 classifies NDDs as involving significant difficulties in intellectual, motor, or social functions (Khandelwal & Singhal). Comorbidity is common; for example, 22%–83% of children with ASD meet ADHD criteria, and vice versa (Khandelwal & Singhal). Specific learning disorders (SLD), defined by DSM-5 as impairments in reading, writing, or math, affect 5%–15% of school-age children, with dyslexia being most common, impacting 20% of the population (Psychiatry.org). SLD often co-occurs with other NDDs, such as ADHD and anxiety.

With regard to occurrence and severity of these neurodevelopmental disorders namely, ADHD, ASD and learning disorders (LD), a thematic review over the current and latest trends followed in the field of neuropsychology has been conducted to understand these better over the past five years from 2020 to 2025 in the process to find out gaps and patterns that have had an impact. The most recent literature have been synthesized into this review to contemplate the present demands leveling in neurodevelopmental disorders and how it has evolved to encompass wider ranges of approaches rising in the field.

Review Of Literature

Attention-Deficit Hyperactivity Disorder (ADHD)

Birtalan et al. (2024) studied ADHD awareness and diagnosis in Hungary, emphasizing the integration of global epidemiological studies and DSM-5 parameters. At Semmelweis University's an ADHD Treatment Centre, diagnostic protocols included DSM-5 interviews (SCID-5-PD, M.I.N.I.-PLUS-5.0), Conners' Adult ADHD Rating Scales, self-report questionnaires, heteroanamnesis, neuropsychological tests (e.g., Rey Auditory Verbal Learning Test, Stroop Test, Conners-CPT3, Trail Making Test), and WAIS-IV intelligence tests. The study aimed to enhance ADHD diagnostics by reviewing international literature and Hungarian empirical findings. Despite general concordance in methodologies, disagreements between neuropsychological and other assessments, particularly with the Rey Auditory Verbal Learning Test and Trail Making Test, highlight the need to revise neuropsychological criteria for adult ADHD.

Montgomery (2024) has characterized Attention-Deficit/Hyperactivity Disorder (ADHD) in a transitional process toward the shift from strict attention deficit and more toward a form of unique neurodevelopmental variation. Using predictive coding and active inference theories, investigators suggest that ADHD individuals have unique mechanisms for generating and updating environment predictions. Such differences affect sensory processing, attention allocation, and motor control. The article proposes

a redefined clinical approach toward ADHD that embraces its complexity and neurodiversity in diagnosis and treatment tailored to individual cognitive profiles. A challenge in the understanding of ADHD pathology is posed by the diversity in different individual presentations as well as the clinical assessment tools available that can have limited success at differentiating contributions from sensory, attention, arousal, and motor processes. It is critical to identify objective approaches to further research into the aetiology of ADHD in order to potentially develop personalized interventions.

Biabani et al. (2023) found that by making use of an EEG decision-making paradigm, the current investigation evaluated key neuropsychological components of ADHD, isolating distinct neural signals along the information processing pathways from sensory input to motor responses. Results show that, in comparison with their typically developing peers, children with ADHD exhibited slower, less accurate behavioural performance, due to atypical dynamics in the electrophysiological signatures associated with attention allocation, sensory evidence accumulation, and urgency to respond. These results integrate current understanding of the ADHD deficits, and establish neural markers for further research into the mechanisms of the disorder, guiding future diagnostics and treatment customizations for individuals with ADHD. This approach highlights the importance of recognizing the complexity of ADHD in both research and clinical practices.

Herrera-Morales et al. (2023) explored how varying ADHD symptoms affect treatment effectiveness. They found that ADHD subtypes, identified through QEEG studies, may have distinct neurophysiological characteristics, especially in children. The study focused on young adults with ADHD symptoms and cognitive performance, specifically theta/beta ratios. Those with ADHD symptoms and poor working memory showed higher theta/beta ratios than controls, while those with good working memory showed no differences. These findings suggest that neuropsychological profiling could help categorize ADHD subtypes and optimize treatment strategies, highlighting the need for further research into

ADHD's neurophysiological correlates.

The paper "Automated Detection of ADHD: Current Trends and Future Perspective" by Loh et al. (2022) explores advancements in using technology, particularly machine learning and AI, for early ADHD diagnosis. The authors emphasize that these methods can improve accuracy and efficiency compared to traditional approaches. However, challenges such as data privacy, large datasets for algorithm training, and variability in symptoms across individuals hinder success. The paper calls for collaboration between clinicians, researchers, and technologists to address these issues and build reliable detection systems. Ultimately, the study highlights technology's potential to enhance ADHD diagnosis and treatment while acknowledging current limitations and future research directions.

The relevance of employing neuropsychological assessment in a school setting is most conspicuous for teens and young adults. One of the burning questions is how to combine neuropsychology with personality diagnostics to see what amalgamates in each case regarding learning abilities. This represents a multivocal approach to discovering destructive youth risks by identifying their personality neuropsychology. Stepashkina&Akhetshina (2022) discusses current trends in neuropsychology in the context of Russian and global experience with an emphasis on behavioural, personality, and affective disorders. It highlights cognitive impairments accompanying personality dysfunctions that lead to odd risk-taking behaviour and interfere with emotional and motivational development, which may cause lowered schooling motivation and consequent school failure.

Castellanos & Pereira-Sanchez (2021) review neuroimaging research on ADHD, highlighting recent studies and trends. They found 40 publications from January 2019 to September 2020, including four meta-analyses with contradictory results. A study by the Enhancing Neuroimaging Genetics Through Meta-Analysis consortium found small but significant structural brain differences in children with ADHD. Increasing international collaborations are using open-science and multimodal data to study ADHD's genetics, environment, and

pathophysiology. Machine learning and predictive science are emerging areas for identifying ADHD biomarkers. While neuroimaging hasn't yet guided clinical ADHD treatment, large-scale studies offer hope for improving understanding and applications.

Baader et al. (2020) examined two commercial continuous performance tests (CPT) for the diagnosis of Attention-Deficit/Hyperactivity Disorder (ADHD) in a clinical sample of 29 adult patients. The aim was to compare the tests and see whether they correlated with any clinical parameters. A positive correlation for inattention was found between the two tests ($r = 0.49$, $p = 0.01$), but neither showed any significant association with the clinical measures of inattention. The results were mixed for hyperactivity, with present ADHD symptoms positively correlating with motor activity on the Nesplora Aquarium ($r = 0.52$ to 0.61 , $p < 0.05$) and with hyperactivity on the Qb-Test ($r = 0.52$ to 0.71 , $p < 0.05$). Overall, the tests were found to be not reasonably comparable and to correlate poorly with clinical parameters. While interesting correlations between clinical symptoms and test sub-scales were found, this suggests that these tests are unsuitable for regular use in a clinical setting for ADHD diagnosis. The need for more research into more pertinent and reliable diagnostic tools is warranted for ADHD intervention.

The high prevalence of ADHD has provided strong impetus to research into its pathophysiology. O'Neill et al. (2018) found that most prominent models of ADHD related neuro-cognitive deficits, especially executive dysfunction, with symptomatology. The continued significant heterogeneity found in cognitive and adaptive functioning in persons with ADHD thus challenges the validity of current theories. Meanwhile, existing models do not satisfactorily account for the trajectory of symptoms and impairments through development. Neuropsychological functioning in ADHD within developmental perspective will hence be addressed in this chapter as commentary on literature and open questions guiding research in this direction. Finally, we will discuss the implication of the knowledge gathered for the designing of effective, lasting interventions for ADHD individuals.

Kataoka (2016) in his article underscores the rising prevalence of ADHD diagnoses and subsequent treatment, especially within the adult population, with particular attention to the prescription of stimulant medications. It stresses the necessity for enhanced detection methods and training for primary care practitioners, alongside the importance of monitoring for possible medication misuse. The summarized abstract says that ADHD is common in children and adults and that the treatment for ADHD is increasing. However, the limitations stand to talk about the potential misuse of stimulants prescription which has been noted and the need for accurate ADHD diagnosis and treatment options. However, the utilization of the treatment for adults remains unclear and requires investigation.

Autism Spectrum Disorder (ASD)

Patil (2024) provides a review of recent neuroimaging studies aimed at elucidating the biological underpinnings of autism spectrum disorder (ASD). The analysis focuses on findings from structural magnetic resonance imaging (sMRI), which indicates that individuals with ASD often exhibit reduced grey matter in crucial brain regions, such as the amygdala and superior temporal sulcus. Additionally, concerns regarding white matter connectivity within the brain are highlighted. Functional magnetic resonance imaging (fMRI) studies reveal diminished connectivity within essential brain networks and atypical activation patterns during social information processing. Intervention studies suggest that targeted training can enhance brain function related to social skills. Furthermore, postmortem research has identified cellular and synaptic alterations, including a reduction in Purkinje cells and changes in neuronal organization. These findings underscore the significance of investigating the social brain network in individuals with ASD and point to the necessity for more extensive, long-term studies. Ultimately, this review aims to contribute to the development of advanced diagnostic tools and therapeutic strategies that could improve the quality of life for those affected by ASD.

Sloan-Pena et al. (2024) examined neuropsychological assessment practices for autism spectrum disorder (ASD) in

Black and Brown children, incorporating behavioural ratings from parents and teachers. The study highlighted disparities in diagnosis and treatment due to gender, ethnic, racial, and linguistic differences, which influence symptom endorsement and assessment outcomes. Despite the growing need for neuropsychological services for minority children in the U.S., there is a shortage of culturally competent neuropsychologists. The findings emphasize the importance of culturally sensitive assessments to ensure equitable behavioural health services and improve early intervention outcomes for this population.

Georgescu (2023) presents a comprehensive survey of recent machine learning (ML) and deep learning (DL) approaches for the detection of autism spectrum disorder (ASD) using brain magnetic resonance imaging (MRI). The paper emphasizes the methodologies employed, feature extraction techniques, classifiers, databases, and evaluation metrics associated with various ASD detection strategies. The study validates the performance of several ML systems, including K-Nearest Neighbour (KNN), Support Vector Machine (SVM), and Classification Tree (CT), using the ABIDE-I dataset. In addition to detailing the methodologies, Georgescu discusses the challenges and limitations faced in the field, as well as potential future directions aimed at enhancing the effectiveness of machine and deep learning-based ASD detection methods. The review highlights the importance of addressing these challenges to improve diagnostic accuracy and ultimately contribute to better outcomes for individuals with ASD.

Jiang (2023) conducted a bibliometric analysis of autism spectrum disorder (ASD) research from 2011 to 2022, analysing 57,108 studies from the Web of Science Core Collection. Using Bibliometrix, Cite Space, and VOS viewer, the study revealed a 181.7% growth in publications, from 2,623 in 2011 to 7,390 in 2021. Research focused on genetics, immunology, and clinical psychology, with keyword clusters in “causative mechanisms,” “clinical features,” and “intervention features.” Emerging topics since 2015 include immune dysbiosis and gut microbiota. The study highlighted the importance of neuroscience, genetics, brain imaging, and the microbe-gut-

brain axis for advancing ASD research.

Wang (2023) provides a comprehensive review of the applications of Transcranial Magnetic Stimulation (TMS) and transcranial Direct Current Stimulation (tDCS), alongside the key recording technique of Electroencephalogram (EEG), in treating individuals with autism spectrum disorder (ASD). The study selects ten representative research articles published on PubMed over the past five years, analysing their methodologies, results, and new findings. Additionally, the review addresses potential challenges and future directions for these therapeutic approaches. The organization of the review is based on different stimulation sites, with a focus on commonly targeted areas such as the dorsolateral prefrontal cortex (DLPFC) and the right temporoparietal junction (rTPJ). Wang concludes by proposing expectations for future research and treatment strategies for ASD. The author anticipates that future scientific trends in ASD therapy will include homogeneous subgroup analyses and broader accessibility to therapeutic research, which could enhance treatment efficacy for individuals with ASD.

Wu et al. (2023) conducted a bibliometric analysis of global trends in digital therapeutics (DTx) for autism spectrum disorder (ASD) from 2002 to 2022. Analysing 509 articles from the Web of Science using Cite Space, the study found the U.S. and Vanderbilt University to be the leading contributors. Key researchers included Warren, Zachary, and Sarkar, Nilanjan, with the Journal of Autism and Developmental Disorders as the most cited journal. Influential works included Scassellati's (2012) research on robotics in autism and Adolphs' (2001) study on social information processing. Emerging technologies, such as AI, machine learning, virtual reality, and eye-tracking, were identified as driving innovation. The study emphasized rapid growth in this field, particularly in developed nations, and called for cross-regional and interdisciplinary collaborations to enhance accessibility and progress.

Roba (2022) investigates the impact of various educational technology trends on the education of children with Autism Spectrum Disorder (ASD) by analysing peer-reviewed studies. ASD is characterized as a neurodevelopmental disorder that

results in significant deficits in social skills and persistent behavioural patterns, which can hinder social interactions. The increasing prevalence of ASD diagnoses globally, with the Centres for Disease Control and Prevention (CDC) estimating a rate of 1 in 59 children affected (Pliasa&Fachantidis, 2019), underscores the need for effective educational strategies. The study emphasizes the importance of “augmentative and alternative communication” (AAC) systems, which enhance communication capabilities through high-tech solutions like electronic speech-generating devices (SGDs) and low-tech options such as the picture exchange communication system (PECS) (Gilroy et al., 2018). Additionally, Roba’s analysis includes assistive technology (AT) and its benefits for children with ASD, highlighting how these tools can facilitate learning and improve social engagement.

Zhao et al. (2022) conducted a bibliometric analysis of childhood autism spectrum disorder (ASD) research from 2012 to 2021 using Cite Space and VOS viewer. Analysing 7,611 articles, the study identified the U.S. as the leading contributor. Key research clusters included the COVID-19 pandemic, gut microbiota, and physical activity, with rising keywords like “disabilities monitoring network,” “United States,” and “caregiver” (2018–2021). The Autism and Developmental Disabilities Monitoring (ADDM) Network was highlighted as a global reference. The study emphasized developing intelligent medical assistant systems and urged more research to address caregiver challenges in ASD care.

Gupta et al. (2021) examined autism spectrum disorder (ASD), a group of neurodevelopmental disorders marked by deficits in social behaviours and nonverbal communication, such as diminished eye contact, facial expressions, and body language, typically observed within the first three years of life. The primary objective of the study was to investigate recent trends in diagnostics and management strategies for ASD. A comprehensive literature search was conducted, utilizing both electronic databases like PubMed and manual searches. The findings indicate that the main therapeutic objectives focus on enhancing core behaviours to foster improved social interactions and communication. Additionally, treatment

aims to mitigate irritable and disruptive behaviours while implementing strategies to facilitate integration into educational settings and the development of meaningful peer relationships. Long-term goals also include equipping individuals with skills necessary for independent living.

Carmona-Serrano et al. (2020) conducted a bibliometric study using the Web of Science database to analyse autism-related research in education, aiming to identify trends and guide future studies. Analysing 5,512 documents, they found fluctuating research output, with a significant increase starting in 2007. The study highlighted two main research areas: one focusing on mothers of children with autism spectrum disorder (ASD) and the other on young individuals with ASD. Since 2012, new research has emerged on ASD diagnosis and the inclusion of affected students in educational settings.

Learning Disorders (LDs)

Reading, writing, and language processing skills are all greatly impacted by learning disorders such as dyslexia and dysgraphia. Dyslexia mostly impact reading, showing itself as problems with phonological processing (the ability to associate letters with sounds) and word recognition. On the other hand, dysgraphia impairs writing skills and causes issues with letter alignment, spacing, and construction. When these illnesses coexist, diagnosis becomes more difficult. This calls for a sophisticated method that can adjust to these modifications while maintaining the ability to recognize and distinguish between these illnesses. Recurrent neural networks (RNN) and sophisticated geometrical patterns are used in this study by Alevizos et al. (2024) to detect handwriting abnormalities suggestive of dyslexia and dysgraphia. To find abnormalities, handwriting standardized characteristics are extracted, with an emphasis on baseline deviations, letter connectedness, stroke thickness, and other anomalies, and then fed into an RNN-based autoencoder. Preliminary findings demonstrate the difficulty of adapting complicated patterns. Cultural-historical neuropsychology analyses neurodevelopmental disorders by identifying the neuropsychological factors impacting cognition and academic performance. This study by Bonilla-Sánchez (2024)

aims to present clinical experiences from neuropsychological interventions in unique educational cases. Qualitative assessment reveals developmental strengths and weaknesses, indicating children's potential self-sufficiency. It evaluates the zone of proximal development beyond current capabilities. Neurodevelopmental and learning disorders exhibit unique life manifestations, allowing qualitative analysis to capture subtle developmental changes. Intervention principles serve as the methodological framework for tailoring programs to children's needs. The case study enhances clinical expertise by contributing to empirical knowledge on neuropsychological interventions. This approach emphasizes qualitative evaluations of neurodevelopmental abnormalities and underscores the finding of neuropsychological determinants that explain academic success. Through focused assistance, it enhances children's learning capacity by promoting intervention programs that are customized to meet their developmental requirements.

Iqbal et al. (2024) reviewed deep learning (DL) applications in clinical imaging for neurological diseases (NDs), focusing on advancements in processing multimodal neuroimaging data. The study evaluated DL models, including CNNs, LSTM-CNN, GAN, and VGG, to assess their performance across various NDs. Key benchmarks and datasets for DL model training and testing were identified, alongside challenges and opportunities in clinical neuroimaging research. The review highlighted DL's potential to revolutionize ND diagnosis and treatment, offering insights into its current status and paving the way for developing more efficient, accessible algorithms to improve patient care and advance neurology research.

Schultheis (2023) discusses emerging technologies in neuropsychological evaluation and therapy, including brain-computer interfaces, virtual reality, neuromodulation, and portable brain imaging. These innovations, combined with machine learning, offer new insights into brain-behaviour interactions. The program aims to teach students to identify three neuropsychological technologies, compare the pros and cons of brain-behavior interface technology, and understand the clinical use of neuromodulation and portable brain

imaging. These advancements provide opportunities to expand research and improve the understanding of cognitive mechanisms related to learning problems.

Turza (2023) studied neuroanatomical causes of developmental dyslexia (DD) by assessing grey matter (GM) volume and cortical anomalies in adults with DD using advanced neuroimaging techniques. The study found reduced GM volume and cortical thickness in the left insula, globuspallidus, putamen, parahippocampal gyrus, and left superior temporal gyrus. Better reading and phonological abilities were linked to higher GM volumes and cortical thickness in these regions. Brain volume overall did not differ between groups. These findings support theories linking phonological processing difficulties in DD to brain region anomalies.

Wypych (2023) summarizes research on machine learning for identifying dysgraphia, a handwriting condition that impairs writing and is difficult to diagnose. The study highlights the challenges in diagnosing dysgraphia due to varying symptoms among individuals. It reviews machine learning methods such as Support Vector Machine, AdaBoost, K-Means Clustering, Random Forest, and Convolutional Neural Networks, noting mixed results in their effectiveness. The authors call for further research to improve algorithm accuracy and reliability by using more complex models and larger datasets, though a cure for dysgraphia remains elusive.

The study of brain functions is advancing significantly in modern neuroscience, which may have major educational implications. Nevertheless, there is a disconnect between the direct use of neuroscientific findings in classrooms and the present understanding of how the brain learns. What steps can educators, psychologists, and neuroscientists do to enhance the relationship between neuroscience and education? In order to answer this question, Храмова et al. (2023) looks at the fundamentals of educational neuroscience, an interdisciplinary field of study at the nexus of cognitive science, pedagogy, and neuroscience that aims to understand how education affects a learner's brain and translate research on the neural mechanisms of learning into educational

practice. The article's first section outlines the history and current state of neuroscience in education, discusses terminology ambiguity in the Russian scientific literature on the subject, and outlines potential – and, in our opinion, the most promising interactions between psychology, pedagogy, and neuroscience. Based on the Scopus database of scientific data, we examine the primary avenues of current neuroscience research in the second section of the paper.

Developmental dyscalculia (DD) is a learning impairment characterized by poor numerical processing and cognitive deficits. Wang et al. (2022) used event-related potentials (ERPs) to study negative priming (NP) effects in children with and without DD. Both groups showed similar mean response times under prime and control settings, but the NP magnitude was significantly smaller in the DD group. ERP data revealed that the TD group had higher P100, P200, and P300 amplitudes, while the DD group had slower N100 and P300 latencies. These findings suggest that typical inhibitory difficulties in children with DD may contribute to their impaired numerical processing skills.

People in their middle or older years are most frequently affected by neurological disorders, which are illnesses of the central and peripheral nervous systems. Prompt diagnosis and treatment of such illnesses depend heavily on accurate categorization and early-stage prediction. In order to help doctors stop potentially irreversible brain alterations, Anoop&Sreelakshmi (2021) presented a novel paradigm for identifying neurological illnesses using image processing techniques. The recently suggested framework guarantees accurate and dependable machine learning methods for processing brain magnetic resonance imaging (MRI) by utilizing visual saliency algorithms. For researchers interested in using visual saliency traits for illness diagnosis and prediction, the authors also offer a wealth of guidance and information. Future studies demonstrate improving machine learning methods for precise categorization and using visual saliency characteristics for illness prediction.

Dyslexia, a lifelong neurobiological reading deficit, causes academic, cognitive, and emotional challenges, underscoring the need for early intervention. However, identifying dyslexia before reading acquisition is challenging. Farah et al. (2021) used diffusion tensor imaging, brain mapping, and behavioural measures to show executive function (EF) anomalies in dyslexics from infancy onward. EF, essential for language and reading, is impaired in both behavioural and neurobiological domains before reading difficulties emerge. The study recommends including EF assessments in neuropsychological tests and incorporating EF training for early intervention. Limitations include the potential influence of other cognitive processes on EF tasks and a narrow age focus, which may overlook EF complexities across the lifespan. More prospective research is needed to address contradictory findings and gaps in understanding EF and dyslexia.

Method

The objective of the current review paper is to check on the current trends followed in the field of neuropsychology with respect to neurodevelopmental disorders namely, ADHD, ASD and LD over the past five years (2020-2025). The paper synthesizes and analyses 30 previous studies equally divided into the three chosen disorders in a thematic review. With regard to the objective mentioned, the review paper follows a thematic analysis of the various trends common and overlapping to the neurodevelopmental disorders and how it has impacted the growth and preciseness of the field in various segments. The aim is to provide an outline for given research question in an analytical manner to segregate the patterns followed in the field of neuropsychology with the coming time. In the early stages, keyword surfing for words such as "ADHD trends", "ASD trends", "Learning Disorder Trends", "Trends in Neuropsychology", and "latest trends in neurodevelopmental disorders" were used to search for the target literature from the past 5 years. The sources for surfing included databases like Google Scholar, Science Direct, ResearchGate, and SciSpace. The papers that were published between 2020 and 2025 were selectively collected based on the inclusion criteria of whether they define recent researches

of neurodevelopmental disorders and follow the keyword “current trends”. Out of 60 articles, 30 were excluded as per the criteria since they did not support the review progression. Therefore, the left 30 papers were examined thoroughly in the final phase of the review and data has been interpreted as required in a qualitative basis.

Discussion

Understanding neurodevelopmental disorders requires a multifaceted approach that integrates diagnostic advancements, technological innovations, and inclusive educational strategies. Recent research has highlighted several key themes that reflect current trends and ongoing challenges in the field.

Expanding Diagnostic Criteria and Personalized Profiling

Diagnostic frameworks for disorders like Attention-Deficit/Hyperactivity Disorder (ADHD) have broadened to encompass wider age ranges and symptom variability, increasing reliance on clinician expertise (Birtalan et al., 2024). Personalized profiling, such as subtyping ADHD based on neurophysiological markers using quantitative electroencephalography (QEEG), has shown promise for targeted treatment approaches (2023). Neuroimaging studies have highlighted structural and functional brain abnormalities in disorders such as ASD and dyslexia (Patil, 2024; Turza, 2023). Additionally, biomarker-based approaches, such as EEG and functional magnetic resonance imaging (fMRI), are gaining traction for subtype classification and personalized treatments. Despite these advances, the clinical translatability of such findings remains limited (Pereira-Sanchez & Castellanos, 2021). However, many diagnostic tools, such as the Rey Auditory Verbal Learning Test for ADHD, show inconsistencies, leading to false positives and negatives (Birtalan et al., 2024). Moreover, there is no unified framework for integrating neurophysiological, behavioral, and cognitive assessments into comprehensive diagnostic protocols. Significant disparities in diagnosis and treatment persist among ethnic and racial minorities, highlighting the need for culturally sensitive diagnostic tools and equitable healthcare

access (Sloan-Pena et al., 2024). Also, most research focuses on childhood presentations of neurodevelopmental disorders, with insufficient studies examining adult manifestations, transitions, and neuroplasticity. This gap is particularly evident in ADHD and ASD research (Kataoka, 2016). Socioeconomic factors further compound these challenges. Comorbidities such as anxiety and executive function deficits are often overlooked. Additionally, longitudinal studies exploring developmental trajectories and the interplay of comorbidities are scarce (Farah et al., 2021). Neuroimaging studies frequently yield inconsistent results, limiting their utility for clinical interventions. For example, structural differences identified in ASD and dyslexia have yet to inform diagnostic or therapeutic practices (Patil, 2024; Turza, 2023).

Technological Integration in Diagnosis and Treatment

Technological advancements such as machine learning and artificial intelligence are transforming diagnostics, particularly for Autism Spectrum Disorder (ASD) and dysgraphia, by increasing accuracy and efficiency (Georgescu, 2023; Loh et al., 2022). However, challenges like data variability, privacy, and accessibility persist. Moreover, portable neuroimaging and neuromodulation tools, such as transcranial magnetic stimulation (TMS), are providing innovative methods for understanding brain-behavior relationships (Schultheis, 2023). However, while machine learning and neuroimaging hold great promise, their clinical applications remain constrained by scalability and interpretability challenges (Georgescu, 2023; Schultheis, 2023). Although machine learning models have demonstrated potential, they face issues of bias, dataset variability, and limited generalizability, making real-world applications challenging (Loh et al., 2022; Wypych, 2023). The use of AI and machine learning raises ethical questions, including concerns about data privacy, algorithmic bias, and potential misuse of sensitive health information (Loh et al., 2022).

Shifting Perspectives

Disorders like ADHD are increasingly being reframed as variations in neurodevelopment rather than deficits,

emphasizing unique cognitive and sensory profiles. This shift toward neurodiversity highlights the importance of tailored interventions that respect individual differences (Montgomery, 2024). However, research often adopts a deficit-based perspective, which can stigmatize individuals with neurodevelopmental disorders. A strengths-based approach, as suggested by neurodiversity paradigms, is necessary to foster inclusion and understanding (Montgomery, 2024).

Educational and Developmental Support

Bridging neuroscience and education has become a key focus, with efforts to translate research findings into classroom practices. Augmentative and alternative communication (AAC) systems are especially impactful in supporting children with ASD, enhancing their learning and social skills (Roba, 2022; Храмова et al., 2023). However, the integration of neuroscience, psychology, and education remains inadequate. Many studies fail to translate neuropsychological findings into actionable educational or clinical practices (Храмова et al., 2023).

Conclusion

While research in neurodevelopmental disorders has made significant strides, substantial gaps remain. Future studies must prioritize standardization in diagnostics, address cultural disparities, and focus on translating findings into practical interventions. The adoption of neurodiversity perspectives and interdisciplinary collaboration will be key to developing inclusive and effective treatments. Additionally, ethical considerations must guide the integration of advanced technologies into clinical and educational practices.

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