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& Developmental Adolescent Health

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JAN-DEC 2025 Volume 5 Issue 1

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Editorial

Dear colleagues,

the seventh issue of the Journal of Developmental and Adolescent Health (JDAH) is now available, presenting a diverse collection of articles that explore critical aspects of child and adolescent health and development. The journal continues to serve as a valuable resource for healthcare professionals, researchers, and educators dedicated to understanding and supporting the well-being of young people.

This issue highlights several contemporary topics affecting children and adolescents. Among them is the growing role of Virtual Reality in education and its potential impact on adolescent learning processes and mental health. Another contribution examines narrative therapy as a therapeutic approach for managing grief in children and adolescents, providing a comprehensive review of the literature on how storytelling and personal narratives can support emotional processing and resilience.

In addition, the issue includes an important review addressing the impact of the Ukrainian war on minors, exploring the psychological, social, and developmental consequences of armed conflict on young populations. Neurodevelopmental conditions are also discussed through an article focusing on the coexistence of Autism Spectrum Disorder (ASD) and Attention Deficit Hyperactivity Disorder (ADHD), highlighting diagnostic challenges and implications for treatment and support. Finally, this edition features a brief review titled Neurodiversity-Affirming Psychotherapy: Challenges and Guidelines, which explores inclusive therapeutic approaches that respect and support neurodivergent individuals.

Further contributions in this issue include Special Education in Childhood Blindness and Visual Impairment: A Review of Current Evidence, which examines educational strategies, accessibility frameworks, and evidence-based interventions supporting inclusive learning for visually impaired children. Additionally, A Review of Emerging Technologies for Children with Blindness and Visual Impairment: Opportunities, Challenges, and Future Directions explores recent technological innovations such as assistive devices and digital accessibility tools, along with their potential to enhance independence, learning outcomes, and quality of life.

The present edition aims to provide meaningful insights into the complex factors that shape child and adolescent development. By staying informed about current research and clinical perspectives, professionals, educators, and policymakers can better advocate for supportive environments and effective interventions that promote the health and well-being of the younger generation.

On behalf of the editorial team and content management of JDAH,

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Review

The Impact of the Ukrainian War on Minors

Antonia Kyrou, Georgia Kotitsa, Theodoros Sergentanis, Artemis Tsitsika

MSc Program "Strategies of Developmental and Adolescent Health", School of Medicine, National and Kapodistrian University of Athens, Greece

ABSTRACT

PURPOSE: This study aims to document and analyze the effects of the war in Ukraine on the physical and mental health of children and adolescents, including those residing within the country, refugees, and minors indirectly affected by the conflict.

MATERIAL-METHODS: A research algorithm was developed to search published studies in online databases (PubMed, Lancet, WHO, UNHCR, UNICEF) using keywords such as "Ukrainian war," "mental health," "impact," "children," and "adolescents." The main inclusion criteria were chronological (studies after 2022) and language-based (English, Greek). The analysis focused on the consequences of the war on the physical and mental health of minors. The final data collection date was 07/05/2024.

RESULTS: Data analysis revealed that the war has multiple negative impacts on children and adolescents: Physical health: injuries from explosives, infections, resurgence of communicable diseases due to interrupted vaccination campaigns, sexually transmitted infections, reduced access to medical care, and worsening of chronic conditions. Mental health: high levels of anxiety, depression, post-traumatic stress, sleep disturbances, emotional distress, social withdrawal, and increased risk of abuse. Children who were internally displaced or fled abroad show increased vulnerability due to loss of parents, family separation, and difficulties integrating into new social environments. Additionally, exposure to digital media amplifies psychological stress and trauma in children not directly in the war zone.

CONCLUSIONS: The war in Ukraine has multi-level negative effects on the lives of children and adolescents. Addressing these impacts requires coordinated humanitarian assistance, strengthening of the healthcare system, psychosocial rehabilitation, promotion of mental resilience, and support for families and communities. Despite the challenges, the crisis also provides an opportunity to enhance health systems and improve conditions for the growth and development of children and adolescents.

KEY WORDS: Ukrainian war, children, adolescents, mental health, humanitarian crisis

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Introduction

General information about Ukrainian War

On 24 February 2022, Russian troops invaded Ukraine by land, sea and air, declaring war, a situation that was the result of an escalation that had begun several years earlier (1).

Refugees and Destructions

According to UNHCR and the Migration Service (2), the Russian invasion of Ukraine has caused, among other impacts, civilian casualties and destruction of vital infrastructure, forcing people to flee their homes in search of safety, protection and assistance. The latest update on 7 May 2023 reports 8,183,357 refugees having crossed the border and taken refuge in other neighboring European countries, adding to the more than 5 million internally displaced people. It is estimated that 90% of these refugees are women and children, as the men have stayed behind to fight (3).

The devastation caused by these armed conflicts to the country's infrastructure has disrupted the lives of millions in Ukraine. Access to electricity, heating, water and telecommunications has been impossible or problematic (3).

Ukraine's already fragile health care system has been put under even more pressure following the attacks by Russian forces on hospitals, health centers, warehouses, ambulances and pharmacies.To date there have been a total of 959 health-related attacks. Of these, 859 were on health facilities, 17 on medical equipment warehouses and 257 on medical supplies, 112 were on ambulances and vehicles, 69 attacks affected medical staff and 27 affected patients. From these attacks, 101 deaths and 136 injuries have been recorded (4). Also, according to the World Health Organization, access to health services has been severely affected, both because of population displacement and difficulty in accessing them, and because of increased costs and limited availability of medicines (5),(6). In addition, there has been a worsening of pre-existing conditions affecting vulnerable social groups such as women and children, the elderly, people with disabilities or chronic diseases (diabetes, heart failure) (7).

Effects on Minors

According to the UN, serious violations of children's rights occur during wartime (8). The most serious of these are: the recruitment of children and their use on battlefields, killing and maiming, sexual violence against children, attacks on hospitals and schools, abduction of children for the purpose of trafficking, and the denial or obstruction of humanitarian aid (9). Children are increasingly exposed to malnutrition, hunger, and in conditions of extreme neglect (10). During wartime children's mortality increases (11), (12).

The war in Ukraine is estimated to have put 7.5 million children and adolescents at extreme risk to their physical and mental health as they have been deprived of development opportunities and many of their basic needs have not met. These are none other than the need for safety, food, shelter, education and social support (12),(13),(14),(15). The purpose of this research is to identify the effects of the war in Ukraine on children and adolescents.

Materials and Methods

An algorithm was created in order to conduct research of published papers, using online databases (PubMed, Lancet, WHO, UNNCHR an UNICEF). Keywords such as, ''Ukrainian war'', ''mental health'', ''impact'', ''children''and ''adolescents'' were used. The main inclusion criteria were a) chronological: research after 2022 and b) language: English, Greek. During the analysis of the studies on Ukrainian War, conclusions were drawn on the impacts of this war on the physical and mental health of minors. The final data survey date was the 07/05/2024.

Results

The analysis of research on the Ukrainian war identified effects of the war on the physical and mental health of children and adolescents, who were divided into 1. those residing in Ukraine, some of whom were displaced internally from Eastern Ukraine, 2. those who have fled to other countries, 3. and minors who did not directly experience the war.

Minors Residing Ukraine- Impacts on Physical Health

Wound infections: Children are much more at risk from explosive weapons than adults. They are much more likely to be injured in the face and head by an explosion and die or live with severe disability for the rest of their lives (7). In May 2022 alone, UNHCR reported 415 cases of children injured in war. The care of these wounds is very often incomplete due to the living conditions. The result is that the wounds have been contaminated (16).

Communicable diseases: Minors living in Ukraine have poor health supervision as the health system is tasked with caring for those injured in the armed conflicts. Thus, there is an upsurge in the transmission of infectious diseases to children. Another reason for transmission is that in the early 2000s in Ukraine there was a reluctance to vaccinate, resulting in low vaccination coverage for communicable diseases. Campaigns that launched in

recent years were abruptly halted due to the war,

increasing the risk of spreading the disease (16).

Sexually Transmitted Diseases: Sexual violence is a common tactic of invaders in times of war to terrorize and displace populations more easily and it affects the physical and the mental health of the victims. Women, children and adolescents are more at risk of becoming victims of sexual violence. This can potentially cause the spread of sexually transmitted diseases including HIV (16), (12). Before the war, Ukraine ranks second in Eastern Europe in terms of HIV prevalence. After the outbreak of war, access to treatment for HIV-positive pregnant women was dramatically reduced, thereby increasing the risk of vertical transmission of the virus from mother to newborn (16).

Covid-19: Since the beginning and during the war, diagnostic tests for covid were dramatically reduced, vaccinations of the population with the third dose were stopped, while vaccines for children under 12 years of age were never supplied. It was also very difficult to adhere to preventive protection measures, as masks were in short supply and overcrowding in shelters for a long time prevented social distancing (16).

Environmental toxicity: Finally, the physical environment of war is an additional aggravating factor for the development of the child's brain. As in every war, so too in the war in Ukraine the exposure to toxic gases, carcinogenic substances and metals affects systems such as the respiratory, reproductive, hematopoietic etc (17).

Minors Residing Ukraine- Impacts on Mental Health

It is well known that children need security, stability and support in order to develop. The latter are dramatically disrupted in times of war, as they are daily exposed to danger (10).

War deprives children of predictability in their lives. The stress of such severe psychological trauma in childhood can cause neurological changes in the brain, affecting the synapses and connectivity of the various centers (17),(13) and intergenerational transmission of psychopathology in the long term (18).

Studies have shown that children who have experienced war, have high levels of insecurity about the future, anxiety about the safety of their adult caregivers, severe emotional distress (12), post-traumatic stress disorder, sleep problems, anxiety, depression, malaise, panic attacks, negative social behavior, aggression, poor school performance, psychosomatic problems and poor quality of life, some of which are likely to persist into adult life (17). One of the symptoms they may experience is withdrawal, children do not cry and do not seek attention. They may also have nightmares or regress to earlier developmental stages. In addition, parental stress can have a significant impact on children, increasing the chances of depression (17).

A common tactic in times of armed conflict is rape. Victims of sexual violence are likely to experience anxiety disorders, depression, PTSD, suicidal ideation and substance abuse. In addition, they experience stigmatization and social isolation and are more likely to suffer gender-based violence in their adult life. Finally, children born from a pregnancy resulting from sexual violence are at increased risk of abandonment and of becoming victims of violence themselves (19).

A Research about the impact of war on adolescents showed that psychological trauma caused by the war and daily stress is higher in children living in the war zone in Ukraine than in those living in more remote areas of the country. They also have an increased risk of developing post-traumatic stress disorder (OR 4.11, 95% CI 2.37-7.13), anxiety (OR 3.10, 95% CI 1.83-5.27) and depression (OR 2.65, 95%CI 1.79-3.92) (20).

On the other hand, people who have been forced into internal displacement in Ukraine due to war conflicts, have suffered high levels of psychological trauma which, combined with unemployment, social isolation and lack of social support, lead to the development of mental disorders such as anxiety and depression. This increases the likelihood of alcohol misuse [(OR) 2.35, 95% confidence interval (CI) 1.33–4.16)]and especially by young adults which seems to lead to difficulty or refusal to seek care from health services. This creates a vicious circle that makes the situation even worse (20), (21).

It is worth noting that increased vulnerability is shown by people who already had mental and neurodevelopmental disorders. Given the timing of this war, immediately after the covid-19 pandemic and the quarantine periods, children and adolescents are likely to show reduced mental resilience and therefore greater vulnerability to trauma, worsening of symptoms and relapses (6). A special reference group are children with or without disabilities who live in an institution either because they have no parents or because their parents are unable to care for them due to poverty or incapacity. These children are particularly vulnerable as they are more likely to be negatively affected by the effects of war. In addition, the number of children living in institutions is expected to increase dramatically due to the loss of one or both parents in armed conflict, but also due to the long-term socio-economic impact on families' ability to care for their children (22). This is important as it seems that whether and to what extent children will be able to survive and overcome the traumatic experience depends to a large extent on the adult caregivers they have by their side (12).

However, the negative impact on children's mental health could be mitigated by focusing on mental resilience, adaptability and the ability to heal and recover (17).

Refugee Minors

From the first months of the war, many children and adolescents were forced to move to neighboring countries in order to find safety. This movement has led to a gap in health monitoring in the host countries. At the same time, the health systems in the host countries are in many cases under considerable pressure and find it difficult to meet the increased demands, thus lowering the level of care provided (23).

Host country records give an overview of the most common issues for which minors visit hospital facilities. Aw found in the records of Poland and Moldova these are mainly infectious and parasitic diseases, respiratory problems discontinuation of medication,. It is estimated that this is due to the difficult conditions of war, the movement of the people, and the lack of vaccination coverage for children combined with the inability to receive effective treatment (24),(25). Finally, there is a need to continue to provide medical care for children suffering from chronic communicable and non-communicable diseases such as HIV and various forms of cancer in the host countries as well (26).

Forced displacement of children in Ukraine, separation from the family and forced migration are factors that aggravate the mental health of unaccompanied minors (13),(27). Other problems they have faced include difficulty in accessing support and health services due to language restrictions. They also experience isolation due to socio-cultural differences in host countries, and separation from family and friends (10), (28). The most common mental health problems experienced by Ukrainian refugee children are PTSD, depression and anxiety disorders (29). In some more serious cases, it is possible that specialist psychiatric intervention may be needed to address the problems that have arisen. Therefore, minors may need psychiatric monitoring or counselling in outpatient psychiatric clinics, or even hospitalization (30).

Risk factors that may affect the mental health of Ukrainian refugee minors include the loss of one or more family members, exposure to violence and abuse, the long duration of the journey under adverse conditions, long delays in settling and obtaining asylum in host countries, financial difficulties, and difficulty in communicating with family, absence of quality time and common activities (31),(32).

Minors who did not experience the war directly

According to Save the Children, even children living in countries far from Ukraine may be affected by the Ukrainian crisis. First, there is the risk of famine as Ukraine is one of the largest wheat producing countries. Equally important is the risk of an energy crisis following the disruption of oil and gas supplies from Russia to the countries of Europe in particular (33). Another fear that the inhabitants of the countries neighboring Ukraine have is that of an escalation of the conflicts and their expansion. The threat of the use of nuclear weapons and the possibility of third countries becoming involved in the conflict increases the feeling of anxiety and insecurity (34).

In addition, children's access to information through digital media and social media exposes them to harsh images and information about war and its consequences, information that they often find difficult to cope with and that creates psychological trauma. The consequences of this trauma on children who have been directly and indirectly exposed to war is estimated to be like those of the Second World War, mainly due to the frequent and widespread reproduction of the horrors of war by the mass media (17).

Similar post-traumatic stress, anxiety and depression due to the war may also be experienced by residents of other European countries, especially those bordering Ukraine. For example, the people of Poland, which is a country that has received the largest wave of refugee flows from the affected areas. Similarly, young people in the Czech Republic and Slovakia experience high rates of being concerned, anxiety and depression, especially those who receive more information about the war on TV or digital social media. (35) However, something similar can also happen to residents of countries that are far from the focus of the war but face similar problems and threats, such as the people of Taiwan who fear a similar attack by the Chinese military forces (35), (36).

Of particular interest is the way in which volunteering is related to the infliction of psychological trauma. It seems that the more one is involved in acts of solidarity and assistance in a time of war, the more anxiety and sense of threat one may feel. At the same time, however, these people also feel a moral satisfaction through this process (37).

Data for Greece

The data available for Greece are limited. According to the United Nations, until 31/3/2023, 22,704 refugees from Ukraine arrived in Greece (38). From research concerning the wave of immigrants of 1990-2000 (39), and one concerning recent inflows (40), it can be seen that both citizens and the country's policy is friendly to Ukrainian immigrants. The two countries have always had friendly relations, mainly due to a common religion, so the integration of immigrants in Greece was easy. There is no data on the effect of the war and refugee influx on children and adolescents in Greece, but it would be interesting

to study their attitudes in relation to this issue.

Discussion

Children and adolescents are at a critical and sensitive time in their lives, each age group with their own needs. In recent years the global context has become increasingly uncertain and threatening. The economic crisis, climate change, the covid-19 pandemic and now war, are disrupting the stability and security that minors need in order to develop into healthy and functional adults (41).

The research revealed the multi-level impact of war in Ukraine on the lives of minors, both those who have experienced war directly and those who have had indirect experience. The findings align with evidence from prior studies conducted in other armed conflicts, such as those in Africa or the Middle East. At this point it is appropriate to make some suggestions, which will contribute to the smoothest possible development of minors.

Humanitarian and financial assistance should be ensured in the countries involved to meet the immediate health and security needs of the citizens (7). With the end of the war, Ukraine's health system need to be strengthened and adapted to the new increased needs. Strengthening primary health care and developing telemedicine are some of the interventions deemed necessary (42). Also, special attention should be paid to the educational system.

Interventions for the psychosocial rehabilitation of children affected by the consequences of war should be geared towards their needs, focus on the immediate healing of the psychological trauma they have suffered and give emphasis on the development of psychological resilience, empowerment, adaptability and the development of social emotional skills (13),(7). Research has shown that among the factors that help manage trauma in children exposed to war are skill development, strengthened relationships, problem-solving abilities, and the development of one strong. therapeutic relationship. Also, the strengthening of the family and the resilience of the community (17).

Limitations

An important limitation of the present review concerns the lack of empirical evidence regarding the reception and integration of Ukrainian adolescent refugees in Greece. Future research addressing this gap would provide valuable insights.

Conclusions

Despite the great difficulties and problems that the war has caused at many levels, it is still, like every crisis, an opportunity for improvement and change. The recent pandemic gave us an idea of what the global community can achieve by acting in cooperation and solidarity to serve a common purpose for the good of all. So now is an opportunity to further strengthen countries' health systems, placing greater emphasis on improving the health of children and adolescents and ensuring better conditions for their growth and development.

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Review

Coexistence of Autism Spectrum Disorder (ASD) and Attention Deficit Hyperactivity Disorder (ADHD)

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ABSTRACT

PURPOSE: This study aims to provide readers with a deeper understanding of autism spectrum disorder (ASD) and attention deficit hyperactivity disorder (ADHD), while promoting an inclusive environment by challenging and reducing biases toward neurodivergent individuals.

MATERIAL-METHODS: The study presents an overview of each disorder, including definitions, historical background, diagnostic methods, prevalence, and the coexistence of ASD and ADHD within the same individual.

DISCUSSION: Both ADHD and autism fall within the broader concept of "neurodiversity," a framework that challenges the binary classification of intelligence as "normal" or "abnormal." Neurodiversity recognizes neurological differences as natural, healthy, and valuable dimensions of human diversity. Individuals with these conditions often approach tasks, problem-solving, and design in ways that differ from neurotypical patterns.

CONCLUSIONS: Promoting awareness and acceptance of neurodiversity in communities, schools, and workplaces enhances inclusion for all individuals. Creating supportive environments that recognize the unique strengths and needs of neurodivergent people is essential for fostering their potential and well-being.

KEY WORDS: autism, ADHD, neurodiversity, coexistence, neurodevelopmental disorder

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Introduction

According to the DSM-V manual of the American Psychiatric Association, and as noted by Sally Ozonoff and Meghan Miller (2024), Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized primarily by difficulties in social interaction and communication, restricted interests, and the presence of repetitive behaviors (2,3). Attention Deficit Hyperactivity Disorder (ADHD) is the most prevalent neurodevelopmental disorder in childhood, impacting the individual's functional capacity and often persisting into adulthood. Its core symptoms include inattention, hyperactivity, and impulsivity. Throughout the 20th century, various terms were used to describe this condition, including 'Minimal Brain Damage', 'Minimal Brain Dysfunction', 'Minimal Brain Disorder', and 'Hyperactive Syndrome' (4).

Historical Retrospective

By 1943, the term "child schizophrenia" was used to describe the phenomenon that would later be recognized as autism. In the same year, Austrian psychiatrist Leo Kanner made the first documented reference to infantile autism. Similar observations were independently reported by Austrian pediatrician Hans Asperger in 1944 (5).

During the 1970s, empirical evidence supporting the validity of the autism diagnosis began to emerge. In 1978, psychiatrist Michael Rutter (born in Lebanon and active in England) proposed a definition of autism based on four criteria: social retardation and impairment not attributable to intellectual disability, communication difficulties not explained by relative cognitive deficits, unusual behaviors such as stereotyped movements, and onset before 30 months of age (6).

Autism was first included in the DSM-III in 1980 under the category of Pervasive Developmental Disorders (PDDs). Since 2013, the term "autism" has appeared in the DSM-V, reflecting the current diagnostic criteria (6). Regarding ADHD, the first well-documented description of attention deficits was published in 1775 by German physician Melchior Adam Weikard. In 1798, Scottish physician Alexander Crichton described the disorder as "the inability to attend with a necessary degree of stability to any object." In 1902, British pediatrician George Frederic Still characterized the symptoms as "an abnormal defect of moral control in children." The theory of "brain damage," later referred to as "minimal brain dysfunction," emerged in 1947. Finally, in 1994, the disorder was officially recognized in diagnostic manuals as "Attention Deficit Disorder with Hyperactivity," now commonly known as ADHD (7).

Diagnosis

According to the American Psychological Association, although autism can be diagnosed as early as 15 to 18 months of age, the average age of diagnosis is approximately 4.5 years, and some individuals are not diagnosed until adulthood. This delay is unfortunate, as early diagnosis is crucial for timely intervention (8).

Due to the complexity of autism diagnosis, which involves behavioral variability, diverse clinical presentations, comorbidities, and early childhood onset, assessment requires a thorough and systematic evaluation by trained specialists. Psychiatrists, pediatricians, and developmental pediatricians are qualified to make the diagnosis, with pediatricians playing a key role in early detection through observation (9).

The diagnostic process primarily relies on structured questionnaires, behavioral observations, cognitive and language assessments, medical examinations to exclude other conditions, and interviews with parents, teachers, or other caregivers who can provide information on the individual's social, emotional, and behavioral development. Standardized assessment tools requiring specific training are also used, such as the Rapid Interactive Screening Test for Autism in Toddlers (RITA-T), the Screening Tool for Autism in Toddlers and Young Children (STAT), and the Autism Diagnostic Observation Schedule, Second Edition (ADOS-2) (9).

The American Academy of Pediatrics recommends general developmental screening at 9, 18, and 30 months, with additional use of validated tools for autism-specific screening at 18 and 24 months. Diagnosis typically involves gathering information from parents, teachers, and the child's environment, followed by a clinical interview conducted by experts to obtain medical and social history (10).

Similarly, ADHD diagnosis involves collecting information from parents, teachers, and the child's environment. A clinical interview is conducted by specialists, and neurological-psychiatric assessment is performed. Diagnostic criteria are based on DSM-IV-TR and ICD-10. Additional assessment tools include BASC, CBCL, ADHDSC4, Comprehensive Rating Scale, CCT, and the Greek Evaluation Scale of AD/Y-IV (11,12).

Frequency of Appearance & Prevalence

Based on estimates from the Autism and Developmental Disabilities Monitoring Network of the Centers for Disease Control and Prevention, approximately 1 in 44 children is diagnosed with Autism Spectrum Disorder (ASD), while globally, the prevalence is about 1 in 160 children (World Health Organization, 2013), as confirmed by Yue Yu, Sally Ozonoff, and Meghan Miller (2024). Autism is four times more prevalent among boys

than girls (13).

According to the Global Autism Prevalence Map, the average number of autism diagnoses per 10,000 individuals is 89.88 worldwide, with regional variations: 105.03 in Africa, 56.56 in Asia, 67.59 in Europe, 146.73 in North America, 46.57 in South America, 209.12 in Australia, and 115 in Greece (14,15). In Greece, children born in 2008 and 2009 were assessed for special educational support through the Educational and Counseling Support Centers until 2019, with a coverage of 87.1% of centers and 88.1% of students born in those years (16). Nationwide research on ASD in Greek children aged 10–11 years reported a total prevalence of 2.27% (1.83% boys, 0.44% girls, ratio 4.14:1), with regional variations ranging from 0.59% to 1.50%. Only 3.8% of diagnoses occurred before the fourth year of life, and 42.7% before the sixth year, with an average age at diagnosis of six years and one month, approximately three months earlier for girls than boys (16).

ADHD manifests across all ethnic, racial, and social groups, most commonly during school age, and can persist into adulthood in approximately 65% of cases. Individuals with ADHD are also at higher risk of developing anxiety disorders and depression (17).

Sex differences are evident: boys are three times more likely to be diagnosed with ADHD than girls, exhibit more aggressive behaviors, and externalize negative emotions, while girls tend to internalize emotions and have an increased lifetime risk of depression, anxiety, and eating disorders, as well as intense emotional reactions (17).

A systematic review by Nader S. et al. included 13 reviews and post-analytical studies comprising 588 primary studies with a total of 3,277,590 participants from countries including Africa, China, Spain, India, Iran, and the USA. Findings indicated that ADHD prevalence in children and adolescents is higher when diagnosed using DSM-V criteria compared to alternative diagnostic tools (17).

Meta-analytic results showed that 40% of children with ADHD experience symptom remission in adulthood, 40% continue to exhibit impairments in emotional regulation, social functioning, and occupational performance, and 20% persist in developing ADHD traits. These findings underscore the high prevalence of ADHD and the importance of management and policy interventions for children and adolescents (17).

Internationally, ADHD prevalence in children and adolescents is approximately 8%, with boys (10%) affected twice as often as girls (5%). Inattentive type is the most common (3%), followed by hyperactive (2.95%) and combined types (2.44%) (16). Incidence rates are 7.6% in children aged 3–12 years and 5.6% in adolescents aged 12–18 years. In Africa, a 2020 study reported ADHD prevalence of 7.47% among children and adolescents, with higher rates in boys. In Spain, ADHD prevalence among children under 18 was 6.6%, and 7% in children under 12 years. In China, prevalence was 5.74% in children and 6.72% in children and adolescents (18).

In Greece, data on ADHD prevalence in children and adolescents are limited. Only a few studies conducted in 1983, 1990, and 2001 exist, with non-representative samples (19). A 2021 study by Kara et al. examined 55 children with ADHD aged 6–11 years, reporting that during the COVID-19 pandemic, children with ADHD spent 5.8% more time on electronic games and video games compared to 5% in children without ADHD, had 7% higher social interactions compared to 6.2% in controls, and 5.5% higher household participation (19).

Coexistence

Autism can be associated with well-known genetic syndromes, as it has been found to overlap with other genetic disorders such as Angelman syndrome, Adenylosuccinate Lyase Deficiency, Tourette's Syndrome, Fragile X Syndrome, Neurofibromatosis Type 1, Down Syndrome, Smith-Lemli-Opitz Syndrome, Cohen Syndrome, Cornelia de Lange Syndrome, Prader-Willi Syndrome, and Phenylketonuria (20).

The co-occurrence of two or more disorders within the same individual is frequently observed in autism. Specifically, ASD may coexist with anxiety disorders, depression, Attention Deficit Hyperactivity Disorder (ADHD), epilepsy, gastrointestinal disturbances, sleep disorders, learning difficulties, Obsessive-Compulsive Disorder (OCD), intellectual disability, sensory processing problems, immune dysfunction, aggressive and self-injurious behaviors, gender dysphoria, and bipolar disorder (21).

Similarly, ADHD can co-occur with other psychiatric or developmental disorders, including Tic disorders, Obsessive-Compulsive Disorder, mood disorders, anxiety disorders, specific learning and developmental disorders, and substance use disorders (22).

AuDHD

Until 2013, international diagnostic manuals such as DSM-IV did not allow for a concurrent diagnosis of autism and ADHD, treating them as distinct conditions. The DSM-5, released in 2013, recognized the possibility of coexistence, permitting both diagnoses in the same individual. Approximately 13% of children with ADHD are eventually diagnosed with ASD (22).

The term "AuDHD" is not officially recognized in diagnostic manuals as a separate condition; it is a convenient abbreviation used to describe individuals who meet diagnostic criteria for both autism and ADHD. Both disorders influence how a person thinks, feels, and perceives the world. Autism is characterized by

differences in communication, thinking styles, and social
interaction, often accompanied by focused interests and consistent behavioral patterns that provide structure and enjoyment (24).

ADHD is characterized by difficulties in attention regulation, impulsivity, and hyperactivity. Individuals with AuDHD vary in the type and severity of these challenges depending on stress levels and the support they receive (25). Consequently, these individuals face difficulties in planning, prioritizing, initiating daily tasks, organizing time and activities, and regulating social interactions. Estimates suggest that 40–70% of children with ADHD may also meet criteria for ASD, a figure partly explained by the prior DSM-IV restriction against dual diagnosis (26).

Both autism and ADHD affect several overlapping domains. Executive functions are impacted, including self-regulation, behavioral organization, planning and execution of ideas, goal attainment, and cognitive flexibility. Social skills (appropriate response to social situations), emotional regulation, attention focus, mental health (anxiety, depression, peer-related challenges), learning difficulties, sensory processing, and genetic factors are also commonly affected (27).

Neurobiological research has demonstrated altered development and function of cortical systems involved in visual attention and ocular control in both ADHD and autism, suggesting shared neural mechanisms (28).

The concept of "masking" describes how individuals with ADHD and autism attempt to hide symptoms in social contexts to avoid negative judgment. This may include mimicking others' social behaviors, suppressing stimulation, or forcing social engagement even when uncomfortable (28,29).

Conceptual models of ADHD and autism increasingly view these disorders as existing along continua. For example, the Simple Spectrum and Far End models describe phenotypic features along network continua, while the Emergent Far End model considers phenotypes as emergent properties of genetic or continuous neural mechanisms (27).

A modern area of research involves interoception, the awareness of internal bodily states, which is negatively associated with symptoms of both ADHD

and autism. Children with ADHD, with or without co-occurring ASD, generally exhibit lower interoception compared to typically developing peers. Similarly, children with higher autistic traits show reduced interoceptive awareness compared to those with lower traits. Difficulties in perceiving and understanding internal bodily signals may contribute to symptom manifestation in both ADHD and autism (30,31).

Conclusions

Autism and ADHD are two neurodevelopmental disorders that affect a substantial number of children and adolescents. The etiological factors for both conditions are primarily genetic, neurobiological, and environmental. Importantly, these disorders can co-occur in the same individual, which complicates diagnosis, as individuals with coexisting conditions often exhibit more severe symptoms than those with a single disorder. In cases of co-occurring ADHD and autism, the diagnosis of ADHD typically precedes that of autism. This pattern is likely because ADHD symptoms often result in earlier observable functional impairments compared to the symptoms of autism. Therefore, early and accurate assessment is critical to ensure timely intervention and support for affected individuals (34).

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Brief Review

Virtual Reality in Education and Its Impact on Adolescent Learning and Mental Health

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ABSTRACT

This study examines the role of Virtual Reality (VR) in education and explores its impact on adolescent learning and mental health. It specifically aims to evaluate the educational benefits of immersive environments, such as increased cognitive engagement, active learning, and the development of empathy, while also highlighting potential psychological and social risks associated with excessive or unsupervised use during adolescence. This narrative literature review analyzes peer-reviewed articles, theoretical papers, and review studies, focusing on cognitive engagement, learning motivation, social-emotional development, and potential risks, including cybersickness and technology overuse. The findings indicate that VR can enhance learning by increasing participation, motivation, and understanding of complex concepts. Additionally, immersive simulations appear to support the development of empathy and social skills and may benefit adolescents with social anxiety or autism. However, risks such as cybersickness, cognitive overload, and technology dependence are also identified, particularly when VR is used excessively or without appropriate supervision. Overall, Virtual Reality emerges as a promising educational tool that can enhance both cognitive and psychosocial aspects of adolescent development when implemented within well-structured pedagogical frameworks. Nevertheless, careful design, supervision, and ethical considerations are essential to minimize potential risks and ensure that immersive technologies contribute positively to adolescent learning and wellbeing.

KEY WORDS: virtual reality, adolescents, education, mental health, immersive learning

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Introduction

Virtual Reality (VR) technologies have increasingly attracted attention within the field of education due to their capacity to create immersive and interactive learning environments. The integration of VR into educational practice aligns with several established theoretical frameworks in cognitive and developmental psychology. Constructivist learning theories suggest that knowledge is actively constructed through interaction with the environment rather than passively received from instructors. Foundational theorists such as Piaget emphasized that learning occurs through active exploration and cognitive restructuring as individuals encounter new experiences and adapt their existing mental schemas (1). Similarly, Vygotsky highlighted the importance of social interaction and guided learning processes in the development of higher cognitive functions (2).VR environments closely align with these theoretical perspectives because they allow learners to actively interact with simulated contexts. Within immersive environments, students can experiment, make errors, and repeat tasks in a safe digital setting that encourages experiential learning (3). Such experiences enable learners to engage with complex phenomena that might otherwise be inaccessible due to cost, safety concerns, or logistical constraints. For example, simulations can recreate laboratory experiments, historical environments, or medical training scenarios that would be difficult to replicate in traditional classrooms.Vygotsky's concept of the Zone of Proximal Development (ZPD) further supports the use of collaborative virtual environments in educational contexts (2). The ZPD refers to the range of tasks that learners can accomplish with guidance from more knowledgeable peers or instructors. In multi-user virtual environments (MUVEs), learners can collaborate with peers, instructors, or intelligent tutoring systems that provide scaffolding and real-time feedback, thereby facilitating skill acquisition and conceptual understanding (4). Situated cognition theory further emphasizes that learning is most effective when knowledge is embedded within authentic and meaningful contexts (5). VR simulations can recreate realistic professional or social situations in which learners must apply theoretical knowledge to practical challenges. For instance, virtual simulations of historical settings or professional environments allow students to engage with complex scenarios in ways that promote deeper comprehension and knowledge transfer. From the perspective of multimedia learning theory, immersive technologies must also be designed carefully to avoid excessive cognitive load (6,7). According to Mayer's principles of multimedia learning, educational materials should be

structured in ways that optimize cognitive processing by balancing visual, auditory, and interactive elements (7). While immersive technologies can enhance engagement, poorly designed VR environments may overwhelm learners with excessive sensory information. Consequently, effective instructional design plays a crucial role in ensuring that immersive environments support rather than hinder learning processes.

Virtual Reality and Adolescents' Developmental Needs

Adolescence represents a developmental stage characterized by profound biological, cognitive, and psychosocial transformations. Neurodevelopmental research indicates that the prefrontal cortex, which is responsible for executive functions such as planning, impulse control, and decision-making, continues to mature into early adulthood (8,17). During this period, adolescents often exhibit increased sensation-seeking behavior and heightened emotional responsiveness due to the ongoing development of neural systems associated with reward processing and emotional regulation. Immersive technologies such as VR may align with adolescents' developmental needs for exploration, experimentation, and experiential learning. By providing simulated environments that encourage interaction and discovery, VR addresses developmental needs for exploration and autonomy while maintaining a controlled educational framework (9). Adolescents may benefit from immersive experiences that allow them to explore complex concepts in ways that traditional instructional methods cannot easily replicate. Research suggests that virtual environments may also contribute to psychosocial development by offering opportunities to practice social interactions and emotional regulation. Simulated social scenarios, for example, have been used to support interventions for individuals experiencing social anxiety or difficulties with interpersonal communication. Such environments allow users to practice social behaviors within safe and controlled settings, potentially reducing anxiety and improving emotional regulation (10). Additionally, immersive environments may enhance motivation by promoting active participation and learner autonomy. Adolescents often respond positively to interactive learning experiences that provide opportunities for decision-making and problem-solving. Educational research has demonstrated that VR-based learning environments can increase student engagement and motivation compared with traditional instructional methods (11). Despite these potential benefits, concerns have been raised regarding the possible negative effects of prolonged or poorly supervised VR use among adolescents. Immersive environments may produce symptoms consistent with behavioral addiction or problematic technology use,

particularly when individuals become highly engaged in reward-based digital environments (24). These risks are especially relevant during adolescence, a developmental stage associated with increased vulnerability to impulsive behavior and reward-seeking. Another commonly reported concern involves cybersickness, a condition characterized by symptoms such as nausea, dizziness, headaches, and visual discomfort during or after VR exposure (12,22,23). Cybersickness occurs when discrepancies between visual and vestibular sensory inputs create sensory conflict within the brain. Although technological improvements have reduced these effects in recent years, they remain a significant consideration when implementing VR in educational contexts. Moreover, immersive multisensory environments may contribute to cognitive overload if they present excessive or poorly structured information. Adolescents with learning difficulties may be particularly susceptible to such challenges, as complex visual and interactive elements may overwhelm cognitive processing capacity (13). In some cases, highly immersive environments may also reduce the perceived boundary between real and virtual experiences. For vulnerable individuals, particularly those with emotional or developmental difficulties, intense engagement with virtual environments may influence perceptions of identity and social relationships (14). Consequently, careful supervision and structured implementation are essential to ensure that VR technologies support healthy developmental processes. Encouragingly, research has also demonstrated positive outcomes of VR interventions for adolescents with developmental conditions such as autism spectrum disorder. Virtual environments have been used successfully to support social skills training, attention development, and understanding of social cues among adolescents on the autism spectrum (15).

Potential Positive Effects of Educational Virtual Reality

One of the most widely recognized benefits of VR in education is its ability to support active learning. Immersive environments encourage students to interact directly with learning materials rather than passively receiving information. According to the ICAP framework of cognitive engagement, active and interactive learning activities are associated with deeper conceptual understanding and improved learning outcomes (18). VR is particularly valuable for teaching complex or abstract concepts that require spatial reasoning or visualization. For example, immersive simulations can enable students to explore molecular structures, astronomical systems, or anatomical models in three-dimensional space, thereby facilitating comprehension of concepts that may be difficult to understand through static images or textual descriptions (19). Another important benefit involves emotional engagement and empathy development. Perspective-taking experiences in VR have been shown to foster empathy by allowing individuals to experience situations from another person's viewpoint. Research comparing traditional perspective-taking exercises with immersive VR simulations has demonstrated that VR can produce stronger and longer-lasting empathic responses (21). Such experiences may contribute positively to adolescents' social development and moral reasoning. Educational environments that align with adolescents' developmental needs can also enhance engagement and academic motivation. According to stage–environment fit theory, adolescents perform best when educational contexts provide opportunities for autonomy, social interaction, and meaningful participation (20). Immersive technologies may support such conditions by enabling collaborative learning experiences and interactive exploration. Repeated successful performance in virtual environments may also strengthen adolescents' sense of self-efficacy. When learners are able to practice skills in simulated contexts and gradually improve their performance, they may develop greater confidence in their abilities. This process can contribute to resilience and persistence when According to the DSM-V manual of the American Psychiatric Association, and as noted by confronting academic challenges (10,21). VR may additionally support inclusive educational practices. For adolescents with attention difficulties or autism spectrum conditions, immersive environments can provide structured and predictable contexts in which to rehearse social interactions or practice academic tasks (15). Such environments may reduce anxiety associated with real-world social situations while providing opportunities for skill development.

Potential Risks and Negative Effects

Despite its educational potential, VR use among adolescents also presents several risks that require careful consideration. The most commonly reported adverse effect associated with VR exposure is cybersickness. Symptoms such as nausea, dizziness, visual fatigue, and disorientation have been documented across a variety of VR applications (22,23). These effects are particularly relevant in educational contexts where students may use head-mounted displays for extended periods. Another potential concern involves technology-related dependence. Immersive environments often incorporate reward systems and interactive feedback that may reinforce continued engagement. For

adolescents who are already vulnerable to excessive digital media use, such mechanisms may contribute to problematic use behaviors (24). In addition, immersive technologies may reduce the perceived boundary between real and virtual experiences. Adolescents who spend excessive time in virtual environments may substitute digital interactions for real-world social relationships, potentially increasing social isolation (14). This risk may be particularly pronounced among individuals who already experience difficulties with peer relationships. Exposure to emotionally intense or distressing virtual scenarios may also place psychological strain on adolescents. Because VR environments create a strong sense of presence and realism, emotionally charged simulations may evoke strong psychological responses (14). Consequently, educational applications should be carefully designed to avoid unnecessary psychological stress. To mitigate these risks, educators and institutions must implement clear guidelines regarding appropriate usage duration, supervision, and content selection. Structured pedagogical integration and monitoring are essential to ensure that VR technologies are used responsibly and effectively in educational settings (16).

Ethical and Deontological Considerations

The implementation of VR in education also raises important ethical considerations. VR should be understood as a non-neutral educational intervention with potential cognitive, emotional, and social implications (14). Decisions regarding the design and implementation of immersive technologies must therefore take into account both educational benefits and potential developmental risks. One major ethical issue concerns data privacy and surveillance. Many immersive systems collect behavioral, physiological, or biometric data in order to enhance user interaction or personalize learning experiences. The collection and storage of such sensitive data raise concerns regarding privacy protection and informed consent, particularly when adolescents are involved. Another ethical consideration involves the psychological effects of immersive role-play experiences. Intense identification with virtual roles may influence adolescents' perceptions of identity and social relationships. Although such experiences may be beneficial in educational contexts, they must be carefully moderated to avoid unintended psychological consequences (8,14). Equitable access to immersive technologies also represents a significant ethical concern. Schools and educational institutions vary widely in their technological resources, and unequal access to VR technologies may exacerbate existing educational and social inequities. Ensuring equitable distribution of technological resources is therefore essential for responsible implementation.

Limitations

This review has several limitations that should be acknowledged. First, the present study follows a narrative review approach and does not employ a systematic search strategy or predefined inclusion and exclusion criteria. As a result, the selection of studies may reflect subjective interpretation and may not represent the full scope of the available literature. Second, potential publication bias may exist because studies reporting positive outcomes of VR-based interventions may be more likely to be published than studies reporting negative or inconclusive findings. Consequently, the literature reviewed in this paper may overrepresent favorable results regarding VR applications in education. Third, the review primarily includes studies published in English-language journals. This limitation may reduce representation of research conducted in other linguistic or regional contexts. Future research should aim to incorporate broader international perspectives, including studies conducted in diverse cultural and educational settings. Finally, VR technology is evolving rapidly, and new empirical findings continue to emerge. As a result, some conclusions presented in this review may require revision as additional research becomes available.

Conclusion

Virtual Reality has created new opportunities for enhancing adolescent learning and psychosocial development. Immersive environments allow students to engage actively with complex concepts, practice skills in realistic simulations, and develop empathy through perspective-taking experiences. When implemented within structured pedagogical frameworks, VR technologies can support active learning, motivation, and social development among adolescents (1–7,18,19). At the same time, potential risks such as cybersickness, cognitive overload, and problematic technology use must be carefully monitored (12,22–24). Adolescence represents a sensitive developmental stage characterized by ongoing neurological and psychosocial maturation, and immersive technologies may exert particularly strong influences during this period (8,17).For these reasons, VR requires critical, ethically informed application to ensure that technological innovation aligns with developmental protection and educational responsibility. With appropriate instructional design, supervision, and ethical awareness, VR has the potential to become a valuable tool for supporting both educational achievement and adolescent wellbeing.

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Brief Review

The Role of Narrative Therapy in Managing Grief in Children and Adolescents

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ABSTRACT

This study evaluates the effectiveness of Narrative Therapy in managing grief among children and adolescents, with particular emphasis on the integration of theoretical and practical knowledge in assessing its impact on this population. A qualitative literature review was conducted using the databases PsycINFO, PubMed, Scopus, and Web of Science, including peer-reviewed empirical studies published between 2015 and 2025 that focus on narrative interventions for grieving minors. The findings are consistent with, and in some cases extend, existing research, highlighting the significant role of Narrative Therapy in supporting grief processing during childhood and adolescence. Overall, Narrative Therapy emerges as a developmentally appropriate and non-pathologizing approach to bereavement, demonstrating effectiveness in fostering resilience; however, further empirical research is required to refine and expand narrative tools specifically designed for younger populations.

KEY WORDS: narrative therapy, grief, bereavement, children and adolescents, resilience, narrative interventions.

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Introduction

Grief refers to the psychological reaction of individuals to the experience of loss [1]. Within the framework of childhood and adolescent development, grief does not simply constitute a state of sadness but rather a complex process involving a range of emotional, cognitive, and behavioral responses that children and adolescents typically adopt in their effort to manage and reconcile with the physical loss of a loved one. The way in which these responses are expressed is determined to a significant degree by the influence of the individuals' internal processes as well as the external environment in which they live. Previously, children and adolescents were perceived by their environment as passive recipients of the emotional distress brought about by loss. However, recent studies indicate that they have an active role as agents who shape the grieving process, which is influenced by developmental, cognitive, and socio-cultural parameters [2,3].

It has been found that the ability of a child or an adolescent to understand and manage a loss is linked to the developmental stage they are in. More specifically, one factor influencing the perception and management of grief in children and adolescents is the level of their cognitive maturity. While children tend to find it difficult to perceive and understand the abstract concept of permanence, adolescents often encounter difficulty in integrating loss within the framework of their developing personal identity [4,5]. Also, studies indicate that the socio-economic environment in which children and adolescents live can constitute a decisive framework in which grief is expressed [6].

Narrative Therapy has begun in recent years to constitute an effective therapeutic approach for the management of grief. Narrative Therapy, unlike other psychotherapeutic approaches, does not pathologize the grieving process but perceives the individuals themselves as the experts of their own lives. Specifically, it supports that individuals perceive and interpret the experiences and events they go through via "stories" that can either limit them or empower them [7]. In the field of grief management, Narrative Therapy plays a decisive role as it helps the individual strengthen their ability to create meaning. The process of dealing with grief includes much more than the management of the emotional distress and pain that a loss entails. Specifically, it involves a significant disruption of the individual's personal identity. Personal stories regarding the deceased persons as well as the circumstances of their death function as mechanisms for reorganizing experience and coherence in a constantly changing environment. Modern theoretical approaches support that an effective adjustment to the new reality entailed by loss is the recreation of a narrative life story that encompasses the loss as part of a continuous sense of self, rather than excluding or ignoring it [8,9].

When loss shatters previous narrative structures, a phenomenon termed a "rupture in the assumptive world", storytelling serves as the primary bridge to overcome psychological instability and emotional chaos. Grief as a state usually threatens the continuity of the personal narrative and pushes individuals to renegotiate their identity in a world without the physical presence of their loved one [10]. This specific process has a complex character as it involves the reconstruction of roles, responsibilities, and self-perceptions that had been created in the individuals' relationship with the deceased. Narrative practices help individuals reinterpret their connection with the person who has died with the goal of maintaining a continuous relationship despite its definitive "erasure." Studies so far indicate the utility of the ability to articulate a coherent narrative of loss in the degree of individuals' emotional adaptability to the new reality. More specifically, the results of studies converge on the view that the making of meaning of loss through narrative allows grieving individuals to balance the reality of loss with the demands of their daily lives [11].

Additionally, it has been found by studies that the degree of structural composition and flexibility of the grief narrative constitute important factors in the successful emotional regulation of individuals in grief. Specifically, individuals whose narratives are characterized by cognitive and emotional complexity tend to develop more effective grief management strategies. In fact, the integration of conflicting positive and negative emotions entailed by a loss within the framework of individuals' narratives has been found to contribute to the reduction of depressive symptoms and emotional distress [12]. Also, long-term studies indicate that the formation of a cohesive narrative regarding grief can lead to significant psychological benefits such as the reduction of cortisol levels and anxiety [13]. Additionally, narrative flexibility, which refers to the ability of individuals to reframe grief through different temporal and relational perceptions, strengthens psychological resilience and helps individuals in grief balance the permanence of loss with the continuation of life's path [14].

In recent years, the importance of Narrative Therapy is indicated by a significant number of studies. Nevertheless, there is a significant research gap. Specifically, the existing literature focuses more on adult populations, resulting in a smaller number of studies focusing on the needs of children and adolescents in grief. Additionally, there is a small number of studies regarding the way specific techniques and tools used within the framework of Narrative Therapy affect the way grief is managed in children and adolescents.

Therefore, there is a significant need to cover this research gap through the investigation of the combination of theoretical and practical knowledge in order to examine their degree of effectiveness in the population of grieving children and adolescents, which is the main goal of the present study. Partial goals of the study are a) the synthesis of the theoretical background of Narrative Therapy with the therapeutic goals of grief management in children and adolescents, such as emotion regulation and the correction of non-functional patterns of thought and behavior, b) the investigation of the role of the social environment and family dynamics in the creation of the narrative reconstruction of loss in children and adolescents, and c) the identification of the deficiencies of the existing literature and the proposal of future research directions for empirical study.

Results

The body of research concerning the adoption of narrative therapy in the management of child and adolescent grief can be categorized into four broad areas: individual narrative interventions, family narrative approaches, group and school programs, and digitally mediated narrative practices. Some of the studies adopt designs based on the pre- and post-application of interventions and indicate that reductions can be achieved in symptoms such as emotional distress, depressive symptoms, avoidant behaviors, and emotional expression. Also, longitudinal studies, although few in number, indicate benefits regarding narrative coherence, and meaning-making can be linked to effective adaptability over time.

Furthermore, several of the conducted studies focus on the use of narrative therapeutic processes more as vehicles for achieving therapeutic change rather than as means of minimizing grief symptoms. This fact is consistent with modern developmental models as well as theoretical models of grief that perceive adaptability during the period of bereavement as a continuous, developing process of integration rather than resolution. Although the existing research evidence does not yet allow for safe conclusions, the consistency of the results across different clinical settings suggests the positive role of narrative practices in managing child and adolescent grief.

Individual narrative approaches in managing child and adolescent grief

Empirical studies of the last decade regarding individual interventions for children and adolescents in grief indicate the significant role of Narrative Therapy in promoting psychological adjustment to a reality brought about by the loss of a loved one. Although there is a limited number of randomized controlled trials (RCTs) to provide more secure conclusions, the results of the majority of existing studies adopting correlational and longitudinal methodologies indicate that there is a connection between narrative therapeutic frameworks and the developmental needs of young populations.

One of the points on which the majority of conducted studies focused is the structural quality of grief narratives. Kaplow et al. [17] focused on the narratives of children who had lost one or both parents and found that the degree of narrative coherence played a significant role in the degree of psychological and emotional distress. Specifically, it was found that when the coherence of children's narratives was high, meaning the children used reflective language, then a lower intensity of depressive symptoms was presented. Therefore, the way in which children and adolescents express their experiences regarding grief also functions as an indicator of psychological adaptability. Also, narrative coherence functions as a key mechanism that facilitates the cognitive integration of loss and, by extension, promotes the emotional processing of loss as an event required for their recovery.

In the field of the adolescent population, a widely investigated narrative intervention program on which existing literature has focused is Trauma and Grief Component Therapy for Adolescents (TGCTA). This specific program uses structured narrative activities to help adolescents organize and manage traumatic experiences such as the loss of a loved one [18]. The results of these studies indicate that adolescents who participated in this specific program showed a significant reduction in emotional distress and sadness, post-traumatic stress symptoms, as well as facilitated improvement in their daily functioning. Also, it was found that narrative elements within the activities allowed adolescents to embed their loss into a broader life story and, by extension, to promote emotional regulation and the formation of a stable personal identity. An additional intervention investigated by existing studies of the last decade is Narrative Reconstruction Therapy (NRT), the results of which have indicated that the autobiographical coherence of grief narratives is linked to the reduction of negative psychological symptoms [19].

Group, school, and community-based narrative interventions

Apart from narrative interventions provided at an individual level, some studies have turned their interest to group-based narrative approaches that usually take place in school and community settings. Within the framework of group interventions, techniques and practices such as collaborative storytelling, peer witnessing, and collective meaning-making are adopted as means of minimizing the sense of loneliness that loss

entails. School settings have been found to be particularly fertile environments for such interventions. The majority of conducted studies have focused on the group application of the TGCTA model. Also, randomized trial studies have found that adolescents participating in group narrative intervention programs tend to show a significant reduction in feelings of intense sadness compared to those receiving standard care or receiving no therapeutic intervention [18,20]. Studies have also found that the most important point of the intervention facilitating positive change is the recognition of "turning points" within the narration of the grief story, as well as the integration of memories of the deceased into future life narratives [18]. Peer support groups within school settings also play a very important role. The results of studies from the last decade indicate that guided storytelling among peers contributes to improving the way and degree of emotional expression, strengthening social bonds between children and adolescents, as well as minimizing feelings of grief.

The contribution of community intervention programs encompassing narrative practices is also significant. Longitudinal studies indicate that the sharing of stories about deceased persons within a supportive community environment contributes to a healthier and more long-term adjustment of individuals after loss [10,21]. Specifically, it was found that children in these specific community settings tended to maintain "adaptive bonds" for a longer period of time, as well as to incorporate the event of loss into their evolving identities. Additionally, some studies have focused on bereavement camps, which constitute spaces where groups of children and adolescents participate in activities involving rituals and memory-sharing activities. The results of the studies indicate that the participation of children and adolescents in these specific camps contributes to the alleviation of symptoms of loss-related anxiety [22]. Also, within these activities, individuals are facilitated in externalizing their grief and constructing shared meanings regarding the loss.

An additional result emerging from the literature review process for the needs of the present study is that there is a limited number of studies focusing exclusively on narrative practices. The majority of studies investigated the effectiveness of narrative practices within broader therapeutic programs. For example, some studies that were randomized trials focused on the effectiveness of Cognitive-Behavioral Therapy (CBT) in the management of grief by children. Within the intervention, they integrated elements of narrative practices and found that there were positive results. Specifically, it was found that the integration of narrative practices such as the creation of a "grief story" led to a significant reduction in

symptoms of grief, depression, and avoidant behaviors [23].

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Brief Review

Neurodiversity – Affirming Psychotherapy – Challenges and Guidelines

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ABSTRACT

Neurodiversity-affirming therapy is a relatively new concept. Neurodivergent individuals face unique challenges in their psychotherapeutic journey, as many mental health professionals do not seem to be neurodiversity-informed. Difficulties such as sensory non-friendly environments, misdiagnosis, biases on the part of therapists, as well as personal challenges like masking, appear to hinder the therapeutic process. This brief review aims to shed light on these difficulties and to suggest practices that can make therapy more neurodiversity-affirming. Future research is needed, along with the inclusion of the voices of neurodivergent individuals, both as professionals and as clients.

KEY WORDS: Neurodiversity-Affirming, Mental Health, Therapy

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Introduction

Neurodivergent individuals often feel—and indeed are—socially excluded (1). This feeling follows them into their therapy, where, as research suggests, they often feel that their therapists cannot empathize with them (2). On the other hand, many mental health professionals do not possess the knowledge needed to support neurodivergent individuals. In fact, they often choose to use therapeutic approaches that may have a negative impact on neurodivergent individuals (3, 4), which may lead to discomfort, masking, or even increased mental health challenges.

In contrast to traditional approaches, the neurodiversity-affirming approach supports the view that neurodivergent individuals do not need to "be fixed." What they need is acceptance, empowerment, and to be involved in a therapeutic process that respects their needs and experiences (5). In orde r to achieve this, mental health professionals need to reconsider which methods and techniques they use. Furthermore, they need to enhance their understanding of neurodiversity and create a safe therapeutic environment tailored to each person's unique needs and strengths. A neurodiversity-affirming approach ensures the adaptation of the therapeutic setting, the use of appropriate language, and the encouragement of authentic self-expression, so as to build a therapeutic rapport based on trust and mutual understanding.

This brief review aims to examine the challenges faced by neurodivergent individuals that professionals should consider for a neurodiversity-affirming therapeutic approach. Furthermore, it aims to give practical guidelines for professionals to create a neurodiversity-affirming therapeutic space.

Neurodiversity

The neurodiversity movement brings into focus the human and not the diagnosis. Autism, ADHD, giftedness, and any other form of neurovariation are not considered as deficits, but rather as different types of human brain construction. The medical model is challenged, and instead of it, the social model is adopted, which supports that the difficulties different neurovariations may face are the result of the barriers society poses on individuals who think and operate in a different way. Thus, the need for societal change is shed under the limelight, rather than the adoption of neurodivergent individuals into societal norms. (6). Neurodiversity includes various neurodevelopmental variations such as autism, ADHD, dyslexia, dyspraxia, misophonia, Tourette's, some mental health conditions (e.g., bipolar disorder), or even neurodiversity resulting from an injury or illness (e.g., traumatic brain injury) (7).

A key goal of the neurodiversity movement is to raise society's awareness and push for adaptations in education and the workplace that recognize and support the strengths and needs of neurodivergent people. For example, ADHDers may perform better in fast-paced environments, while autistic individuals may excel in positions that require attention to detail and structured routines. Recognizing these strengths can lead to more productive, inclusive educational, therapeutic and professional environments (8).

Silberman (8) argues that most cases of neurodiversity (specifically autism) are not mainly due to rare, new mutations but are linked to ancient genes that are widespread in the general population and more concentrated in certain families. This suggests that autism is not a current phenomenon but a legacy from our evolutionary past. Thus, neurodiversity should be viewed as a valuable part of our genetic heritage.

Neurodiversity-Affirming Therapy

The term neurodiversity-affirming therapy does not refer to a new therapeutic approach, but rather to a philosophy that any therapist working with neurodivergent individuals can incorporate into their practice. Being neurodiversity-affirming means recognizing that each neurotype, even those that differ vastly from what is considered the norm, is equally important. This means that therapists evaluate each client's abilities as well as the difficulties they might face. It also includes accepting the fact that there are differences between neurotypical and neurodivergent individuals in their behavior, communication profiles, and ways of learning (9).

Professionals working with the neurodivergent population who wish to incorporate a neurodiversity-affirming philosophy into their approach should bear in mind the unique characteristics of neurodivergent individuals — both their challenges and their strengths.

Challenges

Neurodivergent people face various challenges that may complicate the therapeutic process, which therapists need to consider if they want to create a safe environment where neurodivergent clients can express themselves and work on their therapeutic goals.

Masking

Masking refers to the conscious or unconscious hiding of neurodivergent traits to fit into a neurotypical world. For example, an autistic person might try to maintain eye contact during a conversation even if it is extremely difficult for them because they've learned that this is socially acceptable. Traumatic experiences can lead to masking, which in turn can cause burnout and further trauma, creating a vicious cycle. Neurodivergent individuals have reported that masking makes them feel disconnected from their true selves and negatively affects

them (10). Furthermore, it can lead to delayed autism diagnosis, which, in turn, may lead to not receiving proper care (11).
Masking, which can often become unconscious, might prevent neurodivergent individuals from being their authentic selves during therapy, slowing down or even undermining the therapeutic process.

Misdiagnosis or Lack of Diagnosis

Neurodivergent people are more likely to experience mental health issues. For example, autistic individuals are four times more likely to face depression than general population (12). However, mental health professionals often overlook one or the other (2). This means that an autistic person with depression might have their depressive symptoms recognized, but their autistic burnout misunderstood or missed entirely. In a similar vein, autistic burnout may be mistaken for depression, anxiety, or bipolar disorder (13), or developmental trauma might be mistaken for ADHD (14). Additionally, there is a possibility that neurodivergent individuals may never receive a diagnosis. For instance, autistic girls/women often remain undiagnosed or are diagnosed later in life because they learn to adapt to social expectations (15). As a result, they often do not receive the care and support they might need.

Double minority

Neurodivergent individuals are more likely to be part of the LGBTQ+ community. In a large anonymous online survey conducted with 2,386 participants, of whom 1,183 were autistic, significant differences were found in the sexual orientation of autistic versus non-autistic individuals (Specifically, autistic men (cisgender and transgender) were more likely to identify as bisexual compared to their non-autistic peers. Similarly, autistic females were more likely to identify as homosexual compared to non-autistic females. Finally, autistic individuals were more likely to identify as asexual than non-autistic individuals (16). Likewise, gifted individuals are more likely to identify as LGBTQ+ compared to the general population (17), and it is estimated that up to 75% of people with gender dysphoria may also be ADHDers (18).
Neurodivergent individuals have also higher risk to be of immigrant background. More specifically, research has shown that the prevalence of autism is higher on immigrant populations, especially from developing countries (19). So neurodivergent immigrants face not only the challenges of neurodiversity but also of immigration such as discrimination, limited access to governmental and educational resources, cultural loss, acculturation difficulties, family burdens, and socioeconomic struggles (20 Furthermore, their dual identity may cause them face unique challenges or enhance already existing challenges, such as stigma (21). Neurodivergent individuals are thus more likely to belong to a double minority, something that must be considered in the therapeutic process.

Professional Bias

Research has shown that mental health professionals often hold specific biases against autistic individuals. These biases may include beliefs such as that autistic people lack high intelligence or are incapable of defining their own identity. Moreover, there is often a perception that autistic people are primarily male or that they do not have friends or romantic relationships. In some cases, therapists have expressed stigmatizing views, such as that an autistic person should not seek to have children (2).

Guidelines for Neurodivergent Affirming Therapists

Therapists who work with neurodivergent individuals should always bear in mind the unique challenges this population faces. Furthermore, they should create a friendly and safe space, where neurodivergent individuals can express themselves without barriers. To achieve this, therapists must consider multiple factors that will offer neurodivergent clients the support and comfort they need.

Sensory-Friendly Environment

Since many neurodivergent people face sensory challenges (22), creating a sensory-friendly space is essential. This can be achieved through various tools such as small tents, heavy curtains, soft pillows, weighted blankets, noise-cancelling headphones, as well as materials like sand, rice, and fidgets. These tools meet the sensory needs of neurodivergent individuals, creating a more comfortable and supportive therapeutic environment.

Neurodiversity-Friendly Language

Language choice is important for therapists working with neurodivergent individuals. The language should be friendly to the neurodivergent community. For example, in a study by Chris Bonello (23) with 11,212 participants (7,491 autistic), the majority preferred to be referred to as “autistic person” (identity-first language) rather than “person with autism” (person-first language). Moreover, those who identified as autistic were more likely to feel positive about themselves compared to those who saw themselves as “people with autism. Similarly, the term VAST (Variable Attention Stimulus Trait) has been proposed by Hallowell and Ratey (24) as a positive neurodiversity-affirming term for ADHD. Thus, it is preferable to use terms widely accepted by the

neurodivergent community, unless the person in therapy prefers other words/phrases.

Various Means of Expression

Neurodivergent individuals often struggle to express concerns and feelings verbally. A safe therapeutic space should offer different non-verbal means of expression. As autistic artist Patrick Samuel said in an interview with autism.org.uk: "I know what colour or shape I'm feeling, but I often struggle to express myself with words." Similarly, ADHDers may also have difficulties in understanding their own emotions (25), which may be linked to their challenges in expressing emotions through conventional means. Symbolic tools such as clay, toys, colors, or even the option for the client to write instead of speak can help neurodivergent individuals feel safe and express themselves. The choice of medium clearly depends on each person's unique interests and preferences and is not the same for all clients. Through the use of alternative, symbolic means, masking—which may occur even unconsciously—can be overcome, allowing neurodivergent individuals to explore their identity without the constraints of the neurotypical world.

Stability – Support in Transitions

Neurodivergent individuals often seek stability and routine, but they also frequently face challenges with time management, transitions between activities, unexpected changes, and starting or finishing tasks (26-27). It is therefore important for the time and space of therapy to remain stable. In cases where changes are necessary, it is essential to inform the client in advance of the appointment. Additionally, practices such as notifying the client 10 minutes before the end of the session can be helpful for neurodivergent individuals. Moreover, if books, toys, or other materials are used in therapy, it is important that these remain consistently available in the space and that their availability is ensured from session to session.

Therapists' Attitudes

The attitude of therapists and how they interpret various behaviors of their clients plays a very important role in a neurodiversity-affirming approach. For example, someone who frequently arrives late to therapy might be viewed as resistant to the therapeutic process (28). However, when it comes to a neurodivergent individual, such as ADHDers, tardiness may clearly stem from difficulties with time management, something commonly observed in ADHDers (29). Likewise, special interests of neurodivergent individuals are often interpreted as obsessions, with therapists frequently trying to reduce these interests. However, as already mentioned, the routines and special interests of neurodivergent individuals not only do not hinder their psychosocial development, but when the right conditions are nurtured, they can actually be an advantage (8). It is also very important that therapists avoid rigidly focusing on diagnoses or medicalizing them, and instead believe in the inherent abilities of their neurodivergent clients. This means, among other things, questioning the traditional limitations imposed by IQ tests and avoiding underestimating the client's capabilities (30). On the contrary, professionals working with neurodivergent individuals could actively seek out the perspectives of neurodivergent people—whether professionals, researchers, or clients themselves—on what they want from therapy, in order to form a more comprehensive understanding and tailor their approach accordingly.

Conclusions

Neurodiversity-affirming therapy is still a relatively new concept and many mental health professionals are not familiar with this term or what it stands for. Currently, there are few trainings/specializations or university courses that prepare professionals (whether neurodivergent or neurotypical) working with neurodivergent individuals to address their unique needs or their strengths. Neurodivergent individuals often experience prejudice, misdiagnoses, or even invalidation of their experiences by professionals who frequently adhere to a traditional, medical model that pathologizes neurodiversity. As a result, their therapeutic experience may be unpleasant and lead to broader psychological and emotional distress. It should be highlighted that it is important of developing training programs for professionals that are genuinely neurodivergent-affirming. To achieve this, it is essential that neurodivergent people themselves are involved in both the design and the implementation of these programs. In this way, it is ensured that psychotherapy adopts a truly neurodivergent-affirming approach—one that respects and empowers neurodiversity, rather than treating it as something that needs to be "fixed."

Disclaimer:

1. In this brief review identity-first language was used, as the majority of neurodivergent individuals seem to prefer this. If a neurodivergent person prefers the person-first language, therapists should respect their wish.

2. AI was used to improve grammar and syntax in the text.

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Brief Review

Special Education in Childhood Blindness and Visual Impairment: A Review of Current Evidence

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ABSTRACT

Purpose: To review the principles, educational needs, and evidence-based methods relevant to special education for children and adolescents with blindness, visual impairment, and vision loss.

Methods: A narrative review was performed in Pubmed and Google Scholar, prioritizing systematic reviews, clinical reports, qualitative studies, and key original studies on early intervention, literacy, psychosocial development, assistive technology, cerebral visual impairment, and school participation in childhood and adolescence.

Results: We found that special education for learners with visual impairment must begin early and should not be limited to medical diagnosis. Effective support strategies primarily depend on developmental monitoring, family-centered intervention, individualized literacy planning, access to braille and low-vision tools, assistive technology, and school environments that promote participation and psychosocial well-being. Emerging evidence also shows that cerebral visual impairment is common, under-recognized in schools, and can significantly hinder education. Teacher awareness, interdisciplinary collaboration, and timely correction of treatable vision problems can lead to better access to learning and participation.

Conclusions: Special education in childhood visual impairment is most effective when it is employed early, and has an individualized, literacy-focused, and technologically enabled approach, while also being attentive to mental health and social inclusion. Important gaps remain in high-quality intervention studies, long-term educational outcomes, and implementation research across diverse school systems.

KEY WORDS: Blindness, visual impairment, low vision, special education, education

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Introduction

Childhood blindness and visual impairment constitute important developmental and educational conditions; however, their epidemiology varies strongly by region, income level, and cause (1-3). It is also consistently emphasized that it is not a homogeneous population, as some children have isolated ocular disorders, while others have low vision with usable residual sight, and many have additional neurological, cognitive, or systemic conditions which influence educational needs and prognosis (2, 3). For that reason, special education in visual impairment is currently not considered a uniform package of accommodations, but rather an individualized process that links visual function, development, communication, literacy, mobility, and participation (4).

The educational implications of childhood vision loss emerge early in development. Reviews of early intervention claim that developmental surveillance for children with visual impairment must extend beyond milestone checklists designed for sighted children, as visual loss significantly reshapes social referencing, shared attention, exploration, and access to incidental learning (5, 6). Practically, this means that special education should start well before school entry, beginning in infancy through family guidance, environmental adaptation, support for communication and play, and decisions about how the child will access information most efficiently (5-7).

Material and Method

A narrative review was performed in Pubmed and Google Scholar, from 01 March to 31 May 2025, with relative literature identified through topic-specific searches related to childhood blindness, visual impairment, vision loss, special education, literacy, braille, low vision, assistive technology, psychosocial development, school participation, and cerebral visual impairment. Systematic reviews, meta-analyses, clinical reports, and influential observational or qualitative studies that addressed children and adolescents directly or had immediate relevance for educational planning in pediatric populations were prioritized.

The final selection was intentionally balanced across five domains:

1)early intervention and family processes;
2)psychosocial development and lived experiences;
3)literacy and academic functioning;
4)assistive technology and low-vision rehabilitation; and
5)school participation, including cerebral visual impairment and teacher preparedness.

Given the heterogeneity of the evidence base, our review synthesized findings narratively rather than quantitatively. This review also prioritizes practical educational implications.

Results

The first major finding is that early intervention must be viewed as foundational and not optional. A developmental framework has been proposed specifically for children with visual impairment, arguing that conventional developmental monitoring underestimates visual dependence in early communication and learning (7). Later reviews support this notion and show that early visual intervention, environmental adaptation, and parent-focused support can significantly improve visual function, developmental outcomes, and quality of interactions with the child (5, 6, 8, 9). The strongest message across these studies is that families need structured support in interaction, joint attention, play, and exploration, as these mechanisms help built school readiness and learning (5-9).

An important second finding is that special education for children with visual impairment needs to address psychosocial and neurodevelopmental consequences in parallel with access to the learning curriculum (10). Children with congenital visual impairment may face difficulties in executive functions and self-regulation (11), while adolescents with visual impairment report more loneliness, lower connectedness with peers, and sometimes lower self-esteem or social confidence, even when emotional functioning resembles that of sighted peers (11, 12). Moreover, qualitative studies show that childhood-onset visual disability affects identity, autonomy, participation, and lead to stigma and increased dependence (13, 14). Therefore, it is important that special education must include relational and emotional support, and not only accommodations for learning and classroom access.

A third finding concerns literacy, reading, and academic attainment; visual impairment affects reading speed, the ability to access written materials, reading stamina, and literacy development, even when comprehension is relatively preserved (15, 16). A recent systematic review found that students with vision impairment tend to underperform mainly in reading performance rather than in learning potential, which suggests that access barriers, format, speed, and fatigue are key mediators of school achievement (15). Evidence also indicates that early detection of visual impairment is associated with better academic functioning, while spectacle correction for uncorrected refractive error may improve not only visual access but also academic performance and psychological well-being (17, 18). Thus, where indicated, special education must include early learning-media decisions, high-quality braille teaching, large-print or optical supports, and flexible instructional pacing (15, 17, 18).

Braille remains the backbone of learning for children with visual impairment; however, the literature shows that technology for braille education is still in development.

Another recent systematic review found limited high-quality evidence for current braille-learning technologies, even though these tools show promise in feedback, motivation, and independent practice (19). Prototype work such as BrailleBunny suggests that child-centered design may lead to improved braille learning (20), but stronger comparative studies and implementation evidence are currently needed. It is thus important that technology-based solutions complement explicit literacy instruction by qualified special education professionals (19).

Assistive technology is consistently recognized as educationally valuable, although its availability remains uneven. Studies conducted in school settings show that students use braille books and slates, screen readers, canes, audio devices, tactile tools, and electronic magnifiers for a wide range of academic tasks. Awareness and utilization are substantially greater for traditional tactile aids than for advanced digital assistive technologies, such as screen readers, refreshable braille displays, and electronic accessibility systems (21). Teachers in these settings report a need for improved infrastructure and pedagogical support, while students identify limited availability and cost as major barriers (22). Clinical low-vision and vision-rehabilitation literature further emphasizes that educational planning should routinely incorporate functional visual assessment, low-vision aids, assistive technology trials, and integration of literacy media (22, 23).

Cerebral visual impairment (CVI) has emerged as an important issue for special education. Recent pediatric clinical and school-based studies suggest that CVI is common, underdiagnosed, and strongly associated with reading problems, impaired classroom navigation, reduced attention to visually complex material, and worse school participation (24-26). Additional evidence further shows that awareness and management of CVI among school staff is suboptimal can be improved through targeted education (27). As such, many children who appear inattentive, slow, disorganized, or poor readers may in fact need adapted visual environment, simplified visual clutter, explicit layout instructions, and multidisciplinary assessment including CVI-informed educational planning (24, 25).

Finally, we found that school participation represents a core educational outcome for children with visual impairment. Families report that school experience is influenced not only by academic adaptations but also by acceptance, communication, and the school's willingness to understand and adapt to the child's visual needs (28). Similarly, other studies show that social support at school, opportunities for participation, and everyday routines are decisive for students' well-being and sense of identity (28, 29). Moreover, physical education, which is often treated as secondary, can become either a site of marginalization or inclusion depending on equipment adaptation, task design, and teacher expectations (30). Essentially, special education for visual impairment can be successful only when the student is able to engage socially as well as academically.

Discussion

This review suggests that the most defensible model of special education in children blindness and visual impairment is broad and interdisciplinary. It begins with early developmental guidance, progresses with individualized literacy and learning-media decisions, and ultimately extends to psychosocial support, effective school participation, and transition planning (5-9, 13, 14). A purely medical model is too narrow, since diagnosis alone does not effectively describe how a child reads, navigates, communicates, tolerates visual complexity, or participates with peers (2, 24, 31). Conversely, a purely educational model may also be insufficient, as ophthalmic findings, low-vision assessment, refractive correction, rehabilitation technologies, and diagnoses such as CVI meaningfully shape educational access and thus management strategies (17, 25-27).

Regarding practice, several conclusions can be drawn. Firstly, every child with significant visual impairment should be considered for structured early intervention and family-centered developmental support (5-9). Secondly, schools should make explicit decisions about literacy access, and be able to provide print, enlarged print, braille, tactile graphics, audio support, and digital accessibility tools, which should be used to aid functional vision (15, 19-21). Thirdly, assistive technology should be adequately funded and taught systematically, as the literature shows that underutilization often reflects poor access and weak training rather than lack of need (21). Moreover, psychosocial support must be built into educational planning, especially for adolescents, when friendship patterns, autonomy, and self-esteem become central (10, 14). Finally, teacher education should be improved, particularly in relation to CVI, inclusive classroom design, and participation in subjects such as physical education and group work (24-26, 29, 30).

The evidence base has specific limitations. Reviews repeatedly note limited interventional research, small study samples, heterogenous outcome measures, and insufficient longitudinal follow-up, especially regarding literacy technologies and school-based educational interventions (5, 15, 19). Several influential studies in this field are qualitative or observational, which is useful for describing lived experience and participation but inherently limits causal inference (13, 14, 28-30). An important research gap currently exists regarding rapid adaptation of educational systems to the growing

recognition of CVI, where awareness is improving faster

than service models are being redesigned (24-27). Nonetheless, across different methods and settings, the direction of evidence is consistent and shows that children with blindness or visual impairment benefit from individualized, proactive, family-linked, and participation-oriented special education.

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Brief Review

A Review of Emerging Technologies for Children with Blindness and Visual Impairment: Opportunities, Challenges, and Future Directions

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ABSTRACT

Purpose: To review emerging technologies that support learning, communication, orientation, mobility, and rehabilitation for children with blindness, visual impairment, and vision loss, with emphasis on tools relevant to educational participation and child development.

Methods: Structured narrative review of PubMed and Google Scholar-indexed literature, prioritizing systematic reviews, randomized trials, interventional studies, and clinically relevant observational research on pediatric low-vision rehabilitation, braille and tactile technologies, smartphone-based accessibility, tele-rehabilitation, orientation and mobility systems, and emerging artificial intelligence applications.

Results: The literature shows that technology is moving from stand-alone specialist devices to flexible, multimodal ecosystems that combine optical enhancement, digital magnification, text-to-speech, audio description, tactile access, smartphone accessibility, wearable sensors, and artificial intelligence. Evidence is strongest for tablets and digital magnification in school access, selected electronic visual aids, and structured rehabilitation programs. AI-enabled tools, including object-recognition and reading systems, show promise for functional independence, but the pediatric evidence base remains limited. Tele-rehabilitation and hybrid service models may extend access, especially where specialist services are scarce, while children with cerebral visual impairment need individualized, developmentally informed interventions.

Conclusions: Newer technologies can improve access to print, participation in classrooms, environmental exploration, and independence, but successful implementation depends on training, affordability, contextual adaptation, and integration within educational and rehabilitation services. Future pediatric research should focus on long-term outcomes, school use, and equitable access.

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Introduction

Childhood blindness and visual impairment remain major global public health and educational concerns as they affect not only visual function, but also literacy, mobility, social participation and development, as well as lifelong educational attainment (1, 2). Currently, the primary challenge extends beyond the provision of magnification devices or braille in isolated settings, and it increasingly involves access to mainstream curricula, digital learning environments, communication platforms, through accessible technologies, that are tailored to children's developmental needs and integrated into everyday family life (2, 3). This shift has significant implications for special education, as technologies now influence how children read, write, navigate, communicate, and participate alongside peers.

Technology provision, however, does not necessarily translate to technology use. School-based studies consistently show that the adoption of assistive technologies is often limited by training deficits, increased cost, maintenance issues, mismatch between devices and tasks, and inadequate support from teachers or rehabilitation teams (4, 5). Therefore, it is important to focus on how technologies can be embedded in child-centered educational plans that promote independence, minimize stigma, and remain usable in real environments such as classrooms, homes, playgrounds, and public spaces (6).

Material and Method

This brief review was designed as a structured narrative review. PubMed and Google Scholar-indexed studies were selected, primarily focusing on systematic reviews, randomized and feasibility trials, observational pediatric studies, and clinically relevant adult or mixed-age studies when pediatric-specific evidence was limited but the technology was directly relevant to child use or to educational planning. The review focused on technologies that support educational access, braille and tactile learning, low-vision enhancement, smartphone accessibility, integration of artificial intelligence (AI), navigation and mobility, and tele-rehabilitation.

Results

The first major theme in the literature pertains to access to printed materials, performance of near-vision tasks such as reading and writing, and access to classroom resources. Cochrane reviews indicate that both assistive technology and optical reading aids benefit children and young people with low vision, but the evidence base has historically been limited and heterogeneous (6, 7). This is why the transition from traditional optical devices to portable digital systems is particularly important, as tablet-based magnification, customizable contrast, variable font sizing, and integrated access to digital content help create a platform capable of serving reading, writing, note-taking, and communication needs in school. The most famous pediatric trial in this field is the randomized study of tablet computers for education and rehabilitation of students with low vision, which showed that mainstream digital devices can support real educational tasks when they are utilized properly (8). Similarly, electronic visual aids used together with perceptual learning can improve visual acuity and functional use in visually impaired children, suggesting that technological means work best when paired with structured rehabilitation rather when they are offered solely as a tool (9). Additionally, head-mounted video display systems and newer low-vision wearables are expanding opportunities for distance viewing, contrast enhancement, and hands-free access, although pediatric-specific data are currently more limited than adult data (10). Overall, these studies support the idea that digital magnification tools are most effective when matched to task demands such as reading from the board, accessing worksheets, and sustaining prolonged near work (8-10).

The second major theme is tactile and braille access; braille remains essential for many children with severe vision loss, especially for literacy, spelling, note-taking, and long-term academic performance. Newer braille technologies include refreshable braille displays, braille note-taking interfaces, and hybrid platforms which allow children to combine braille, audio, and digital text. A recent systematic review found that technology can support braille literacy education in children and youth with visual impairments, particularly when it is integrated with explicit instructions (11). Moreover, mainstream smartphones have emerged as powerful assistive platforms through built-in screen readers, magnifiers, voice control, object recognition, and optical character recognition, and their familiarity can reduce stigma, given that they are devices that already belong everyday social life can support both accessibility and participation, especially for adolescents (12).

Haptic and multisensory technologies represent another promising direction in this field. Virtual haptic environments help blind children explore shapes, spatial relationships, and educational content through structured tactile interaction, thereby supporting concept formation where purely verbal description is not sufficient (13). Such methods are very important for special education since many abstract school concepts, from geometry to maps and science diagrams, heavily depend on spatial representation.

Evidence also shows that technology cannot be separated from developmental rehabilitation. Reviews of early visual intervention have supported that infants and

young children with early-onset visual impairment

require timely, individualized, family-centered approaches that link visual stimulation, environmental adaptation, and communication with developmental goals (14). A broader systematic review of interventions for visual impairment found that low-vision device training and structured rehabilitation can improve functioning and participation, however, outcomes vary according to the intervention, age, and subsequent support (15). Practically, this means that technological interventions should be integrated into the child's developmental stage, learning routines, and family capacities.

Newer technologies are especially relevant for children with cerebral visual impairment (CVI). Recent reviews show that interventions for this population include visual stimulation, habilitation methods, task and environmental adaptation, targeted training, and, in some cases, video-game or technology-supported approaches (16, 17). Nonetheless, the evidence remains fragmented, and there is still no universally accepted, evidence-based pediatric protocol for technology-supported intervention in CVI (17). This is important for schools, since several educational technologies designed for ocular visual impairment are not necessarily suitable for children whose primary difficulty involves visual processing, clutter intolerance, latency, or attention (16, 17). Therefore, special education programs need to distinguish clearly between access technologies for ocular low vision and individualized supports for brain-based visual dysfunction.

Another important aspect is service delivery. During and after the COVID-19 period, tele-rehabilitation approaches expanded rapidly, and studies in people with vision impairment demonstrated that remote support may help preserve continuity of care (18). Specifically, visual tele-rehabilitation studies in children with visual impairment suggest that purely remote or mixed models can produce meaningful functional gains (19). For pediatric populations, this has important implications, as tele-rehabilitation improves access to care for families in remote areas, reduces travel burden, and makes training more efficient since therapists are able to work directly within the home or school environment. It is noted that tele-rehabilitation approaches cannot replace in-person assessment when detailed visual evaluation is needed, but can contribute significantly modern pediatric low-vision care (19).

Orientation and mobility technologies constitute another major area of innovation. Systematic reviews of urban navigation systems show that modern assistive mobility tools increasingly rely on sensor fusion, GPS, computer vision, obstacle detection, and mobile connectivity (20). Augmented-reality navigation platforms and multi-sensor tools can improve localization, route guidance, and environmental awareness, especially when they combine multiple data streams to compensate for the limitations of any single sensor (21, 22). These technologies are potentially transformative for children and adolescents, because mobility is foundational for social participation and school inclusion. However, most published studies involve adults, with pediatric training, cognitive load, and safety issues insufficiently explored (21, 22).

AI has revolutionized this trend, since AI and machine learning-driven reading aids and wearable visual assistants are able to recognize text, faces, objects, and colors, in real time. Comparative studies of AI vision aids such as Orcam MyEye and Seeing AI have shown strong performance in reading tasks, especially for flat printed text, although performance worsens with complex layouts or curved surfaces (23). Clinical studies in severe visual impairment demonstrated improvements in reading-related functioning and quality of life, while newer AI-powered smart vision glasses show potential for reading, recognition, and navigation tasks (24, 25). These tools can support classroom participation, independent access to labels and worksheets, and safer exploration of unfamiliar environments in children. Nevertheless, pediatric implementation requires caution given that children need rapid, reliable, and low-latency feedback; as such, systems that are inaccurate, overly verbose, or dependent on network conditions may hinder learning (23-25).

AI should be understood within the broader question of digital accessibility. A recent systematic review of AI and digital accessibility shows that it has enormous enabling potential for people with disabilities, but also raises concerns regarding exclusion, inconsistent accessibility standards, opaque algorithms, and unequal uptake across users and settings (26). For children with blindness or visual impairment, this means that innovation should mainly be judged by accessibility, affordability, privacy, interoperability with school systems, and the extent to which the child can actually learn to use the tool effectively. In this context, earlier reviews of head-mounted display technologies remain relevant because they have shown that promising devices may fail if they produce fatigue, social awkwardness, visual discomfort, or excessive cognitive demand (27).

Discussion

The first message from this review is that visual assistive technology is moving toward convergence. Instead of separate tools for magnification, reading, communication, and mobility, children increasingly use a combination of mainstream devices, specialist interfaces, and cloud-based or AI-enabled functions (4, 8, 23). This convergence is educationally important because it reduces fragmentation, while also increasing the need for structured assessment and collaboration by teachers,

low-vision specialists, occupational therapists, orthoptists, and families (3, 15).

Moreover, the evidence shows that technological means work best when they are embedded within pedagogy and rehabilitation. The strongest pediatric evidence exists for programs in which devices are fitted, taught, practiced, and their use is reviewed over time (3, 8, 9, 15). This is particularly true in CVI, where environmental adaptation and individualized intervention remain central (16, 17). Therefore, special education should view technology as part of a broader habilitation strategy rather than as a stand-alone solution.

Importantly, the evidence base still has important weaknesses and limitations. Many studies have small samples, short follow-up, heterogeneous outcomes, and limited reporting on long-term school performance or psychosocial effects (15-17, 20). The majority of studies on AI wearables and advanced navigation systems have been performed on adults, so direct extrapolation to children warrants caution (20-26). Future research should therefore prioritize pediatric usability, classroom outcomes, literacy trajectories, mobility, family burden, and cost-effectiveness. Considering the rapidly increasing AI use, these priorities are especially urgent to ensure that AI-based methods will become equitable tools for inclusion rather than premium devices available only to a few.

In conclusion, newer technologies for children with blindness, visual impairment, and vision loss have become increasingly capable of supporting access to curriculum, communication, spatial learning, mobility, and independence. The most promising direction points to a multimodal and developmentally informed model in which digital access, tactile literacy, rehabilitation, and AI are integrated into everyday educational life. For clinicians and educators, the key task is selecting technologies that are usable, teachable, and sustainable. For researchers, the next step is to build a stronger pediatric evidence base that measures not only performance in laboratory tasks, but real inclusion in school and community life.

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