

Specific features of psychosocial functioning of children with central auditory processing disorders in the educational environment

Specyfika psychospołecznego funkcjonowania dziecka z centralnymi zaburzeniami przetwarzania słuchowego w środowisku edukacyjnym

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Abstract

Central auditory processing disorders (CAPD) occur in 2–7% of the population of school-age children. They are among the most severe neurodevelopmental disorders that impede learning progress irrespective of the child's intellectual abilities, whether average or above-average. In this paper, the author delineates the unique nature of issues related to CAPD and discusses the special educational and developmental needs of pupils affected by the condition. Difficulties in children's psychosocial and educational functioning, which may result from central auditory processing disorders, are described. In the subsequent section of the study, the author emphasises the role of the school environment in supporting and facilitating effective implementation of the assumptions of the core curriculum during early education. Following that, the author outlines the specific methodology required for working with pupils with CAPD. Children with central auditory processing disorders present with significantly more mental health problems than normally developing children in the general population. Working with children with CAPD at school requires a multifaceted approach, which may include adjustments in teaching, therapy, and emotional support. What is particularly important in this context is a personalised approach that considers individual needs and facilitates the child's attainment of educational success. Teachers, in collaboration with psychologists and other specialists employed at school, should adjust their teaching methods to address the challenges children may face in processing sounds.

Keywords: central auditory processing disorder, child with CAPD at school, support for children with CAPD, educational adjustments for pupils with CAPD, psychosocial functioning of children with CAPD

Streszczenie

Centralne zaburzenia przetwarzania słuchowego (*central auditory processing disorder*, CAPD) występują u 2–7% populacji dzieci w wieku szkolnym. Należą do najpoważniejszych zaburzeń neurorozwojowych, które zakłócają postępy w nauce, niezależnie od przeciętnych lub ponadprzeciętnych zdolności intelektualnych dziecka. W tekście zaprezentowano specyfikę problemów związanych z CAPD oraz specjalne potrzeby edukacyjne i rozwojowe uczniów z omawianymi zaburzeniami. Przedstawiono trudności w funkcjonowaniu psychospołecznym i edukacyjnym, które mogą wynikać z CAPD. W dalszej części opracowania zaakcentowano rolę środowiska szkolnego we wspieraniu ucznia i ułatwianiu mu efektywnej realizacji założeń podstawy programowej na etapie wczesnej edukacji. Scharakteryzowano specyficzną metodykę pracy z uczniem z CAPD. Dzieci z CAPD manifestują znacznie więcej problemów związanych ze zdrowiem psychicznym niż dzieci o prawidłowym rozwoju z populacji ogólnej. Praca z dzieckiem z CAPD w szkole wymaga zatem wieloaspektowego podejścia, które obejmować może zarówno dostosowania w nauczaniu oraz terapię, jak i wsparcie emocjonalne. Kluczowe jest tu zwłaszcza spersonalizowane podejście, uwzględniające indywidualne potrzeby i umożliwiające dziecku osiągnięcie sukcesu edukacyjnego. Nauczyciele, we współpracy z psychologami i innymi specjalistami zatrudnionymi w szkole, powinni dostosować metody nauczania tak, aby uwzględnić trudności dziecka w przetwarzaniu dźwięków.

Słowa kluczowe: centralne zaburzenia przetwarzania słuchowego, dziecko z CAPD w szkole, wsparcie dziecka z CAPD, dostosowania edukacyjne dla ucznia z CAPD, psychospołeczne funkcjonowanie ucznia z CAPD

INTRODUCTION

A well-functioning auditory analyser allows children to effectively engage with the core curriculum in early childhood education. Children who have difficulty hearing and processing auditory stimuli experience an array of learning difficulties, and have special educational and developmental needs. Consequently, they require an individualised educational approach.

Specific problems associated with central auditory processing disorder (CAPD) and consequent special educational needs are still a relatively novel topic in Polish literature in this field of research, and especially in psychological and pedagogical practice. However, CAPD and its implications are highly relevant subjects for school counsellors, psychologists, speech therapists, educational therapists, and audiologists.

The terms “special educational needs” (SEN) and “special developmental needs” (SDN) are typically used in the context of setbacks, learning difficulties, or disabilities that substantially hinder children’s learning, preventing them from achieving outcomes comparable to those of the majority of their peers. Children with SEN and SDN usually require additional assistance or distinctive forms of support. Pupils with CAPD need specialist support in an educational setting because of specific learning difficulties, primarily linked to deficits in verbal skills, encompassing challenges in both oral and written communication. As a result, pupils experience problems with understanding and absorbing information provided by the teacher, reading, writing, spelling, and even doing calculations and solving mathematical problems correctly (Shumka, 2019). Specific learning difficulties associated with CAPD are classified among the most severe neurodevelopmental disorders that impede learning progress regardless of the child’s intellectual abilities, whether average or above-average. CAPD is reported to affect up to 2–7% of the population of school-age children (Ganc et al., 2022).

CENTRAL AUDITORY PROCESSING DISORDER – PROBLEMS WITH DEFINITION AND IDENTIFICATION

The human auditory system can be divided into two parts. The peripheral auditory system consists of the outer ear, the middle ear, and the cochlear part of the inner ear along with the auditory receptor and the spiral ganglion. The central auditory system encompasses the cochlear nuclei in the medulla oblongata, together with the auditory cortical structures in the temporal lobe of the brain (Obrębowski, 2014). Consequently, hearing disorders can be categorised into the peripheral type (cochlear and retrocochlear dysfunction) and the central type (abnormalities in the functioning of the brain stem and cortical centres). The discussions in this paper pertain to the latter type of disorder mentioned above. Effective functioning of the auditory analyser in both

peripheral and central domains is essential for children’s optimal performance in a school setting. The auditory analyser plays a pivotal role in the learning process by influencing cognitive, social, and emotional development. The proficiency with which children process auditory stimuli from the environment is crucial for determining their proficiency in speaking, reading, and writing. The close relationship between speech and writing is the root cause of literacy difficulties among children who do not articulate speech sounds correctly. Because of problems with the perception and articulation of sounds in an accurate, clear, and distinct manner, pupils’ written tasks may contain omissions, rearrangements, additions of letters and syllables, or a considerable number of spelling errors (Hassan, 2013; Kruczyńska-Werner, 2018).

Thus, a well-functioning auditory analyser allows children to successfully accomplish tasks outlined in the core curriculum. On the other hand, children with impaired hearing (especially caused by central hearing disorders) characterised by diminished perceptual sensitivity to auditory information processing, encounter learning difficulties and require a special educational approach.

Over the last decade, several definitions of central auditory processing have been proposed by numerous authors. Despite these attempts, however, there is yet no consensus on whether auditory processing pertains to neural processes within the central auditory structures or to auditory functions and skills (Dajos-Krawczyńska et al., 2013).

The American Speech-Language-Hearing Association (ASHA) defines central auditory processing as “perceptual processing of auditory information in the CNS and the neurobiologic activity that underlies that processing and gives rise to electrophysiologic auditory potentials” (American Speech-Language-Hearing Association, 2005).

According to Wilson et al. (2004), auditory processing refers to “the serial and parallel processing of the auditory system responsible for auditory attention, detection and identification of auditory signals, decoding of the neural message, as well as storage and retrieval of auditory-related information”.

It can be asserted that “central auditory processing disorders represent abnormalities in auditory processing at the neural level. They are not attributed to cognitive and language impairments” (Senderski, 2014, p. 78).

Clinically, CAPD manifests in children through behavioural characteristics, including in particular:

- difficulty in locating sound;
- difficulty understanding language in a noisy background or when speech is delivered at a rapid rate;
- longer response times in oral communication;
- responses that are inaccurate or inconsistent with the question;
- poor attention span, easy distractibility;
- reading, spelling and learning difficulties;
- inability to follow complex instructions or directions (Aristidou and Hohman, 2023).

The absence of consensus regarding the nature of auditory processing disorders contributes to major challenges in diagnosing CAPD despite the availability of numerous diagnostic techniques and tests. Test results are impacted by various individual factors, such as the child's age and corresponding levels of cognitive and linguistic development. The differential diagnosis of CAPD can pose challenges due to symptom overlap with other developmental disorders including attention deficit hyperactivity disorder (ADHD) and attention deficit disorder (ADD) (Dajos-Krawczyńska et al., 2013), specific language impairment (SLI), dyslexia, dyslalia, and aphasia (Kruczyńska-Werner, 2018). This is because CAPD seldom occurs in isolation; it frequently coexists with other neurodevelopmental disorders (Ganc et al., 2022).

Differential diagnosis is even more challenging due to the fact that certain symptoms – auditory attention difficulties, susceptibility to distraction, problems following verbal instructions, and language and learning difficulties – are common across various disorders (Chermak et al., 2002). Furthermore, CAPD is difficult to diagnose in younger children, as they may struggle to perform psychoacoustic test tasks that demand adequate linguistic skills, and memory and attention capacity. The diagnostic process is also complicated in children with developmental delays, brain damage, or intellectual disabilities (Dajos-Krawczyńska et al., 2013).

Consequently, prior to diagnosing CAPD, the diagnostician must assess the child's level of intellectual, psychoeducational, and linguistic development (Dajos-Krawczyńska et al., 2013). Importantly, CAPD can only be diagnosed in children whose intelligence and hearing sensitivity test results fall within the normal range (Ganc et al., 2022).

Establishing the diagnosis requires a multidisciplinary differential assessment of auditory processing disorders. Confirming the presence or absence of comorbid disorders enables targeted therapeutic interventions, helping to minimise the impact of potential auditory and/or cognitive deficits in a variety of everyday situations (Back et al., 2021).

SPECIFIC LEARNING DIFFICULTIES IN CHILDREN WITH CAPD

CAPD is reported to occur in 2–3% of the population of school-age children (Ganc et al., 2022), and some authors report that the problem may affect up to 3–7% state school pupils (Bieńkowska and Polok, 2018). Notably, CAPD symptoms are observed in nearly half of children with learning disabilities, including dyslexia (especially the auditory-linguistic type), ADD, or ADHD (Bieńkowska and Polok, 2018). In Poland, the diagnosis of CAPD is often made in children starting school, as this marks a period of increased demands on the auditory system. The average age at which children are diagnosed with CAPD is 8–9 years. Since the auditory system continues to develop until around the age of 15, many children diagnosed with CAPD can still acquire good communication skills, as long as they

receive comprehensive specialist care and their teachers are well-informed about the specific nature of the condition (Bieńkowska and Polok, 2018).

Delays and disruptions in the development of auditory perception become particularly apparent in the acquisition of reading skills (resulting in a lack of understanding of content and difficulty recalling details from the text, whether read independently or by someone else), writing, and learning foreign languages.

When learning to read, pupils with CAPD struggle with phoneme synthesis (persistently pronouncing sounds represented by letters instead of whole words due to a lack of ability to synthesise words from their separate phonemes). They often read slowly, without rhythmic accuracy, with inappropriate intonation and accentuation, and without observing punctuation marks. Furthermore, they make recurrent errors, such as changing letters; omitting sounds, syllables, or entire lines of text; distorting words; guessing; and confusing words with sounds that are similar in articulation (examples from Polish: 'Basia' – 'bazia', 'koza' – 'kosa', 'jeź' – 'jesz'). Pupils with CAPD are generally reluctant to read, especially aloud (Dajos-Krawczyńska et al., 2013).

Difficulties in the process of learning to write include a very slow writing pace and problems with accurately reproducing and transcribing texts from auditory input. The child may struggle with correct auditory analysis, leading to the omission of letters, syllables, words, or whole sentences. Pupils with CAPD make numerous phonetically-motivated spelling errors. They struggle to differentiate the spelling of similar-sounding sounds, such as nasal vowels (e.g. 'ą' – 'om', 'ę' – 'em'). In addition, they have difficulty writing words with palatalised and devoiced sounds, and digraphs. The written text is frequently so distorted that it becomes nearly impossible to read.

Moreover, CAPD contributes to difficulties in memorising study material. This encompasses challenges in learning multiplication tables and rhymes, reproducing and memorising sequences of words or numbers, such as names of days of the week, months, telephone numbers, dates, and definitions. Furthermore, the ability to understand the teacher's explanations and instructions may be affected (Keith, 2005).

Children with CAPD encounter increased challenges in a school environment which is usually characterised by high demands on the auditory system and suboptimal acoustic conditions.

It is important to keep in mind that pupils with CAPD do not form a homogeneous group, and symptoms of the disorder can vary from child to child. Based on the predominant type of difficulty, three subtypes of CAPD can be distinguished:

- CAPD with a prosodic deficit is primarily characterised by difficulties in distinguishing non-verbal sounds, distorted perception of temporal patterns, and failure to identify the interlocutor's intentions, humour, irony, sarcasm, and metaphors;

- CAPD with an auditory decoding deficit is marked by challenges in the temporal processing of information, an inability to differentiate pitch and recognise differences between similar sounding sounds, and a limited vocabulary;
- CAPD with an integration deficit is characterised by challenges in understanding speech in noisy environments, difficulty locating the source of sound, inability to effectively combine semantic information with prosodic cues, and issues associated with impaired motor and auditory-visual-motor coordination (Zaborniak-Sobczak et al., 2016; cited after Kruczyńska-Werner, 2018).

In practice, the difficulties associated with the three subtypes often overlap. Consequently, all therapeutic interventions, as well as educational support and assistance, should be carefully adjusted to children's specific needs. Considering the broad range of manifestations associated with CAPD, it is essential to take into account the individual child's resources and capabilities when addressing and managing the condition.

SOCIAL AND EDUCATIONAL FUNCTIONING OF CHILDREN WITH CAPD AS AN AREA OF SPECIAL DEVELOPMENTAL AND EDUCATIONAL NEEDS

The term "special educational needs" was introduced to pedagogical literature and practice in 1978 by Mary Warnock in *The Warnock Report: Special Educational Needs* (see Wiszejko-Wierzbicka, 2012).

SEN can be broadly defined as the needs that extend beyond the support provided to all pupils throughout the educational process. These diverse needs arise from limitations in communication and peer relationships or difficulties with concentration. Because of them, children are unable to participate in group activities successfully (Kuutti et al., 2022). In Poland, the Minister of National Education, in the Regulation of 30 April 2013 on the principles of providing and organising psychological and pedagogical assistance in public kindergartens, schools, and other establishments (Dz.U. 2013 poz. 532 – Journal of Laws 2013, item 532), and subsequently in the amending Regulation of 28 August 2017 (Journal of Laws 2017, item 1643 – Dz.U. 2017 poz. 1643), specifies that psychological and pedagogical assistance provided to pupils in kindergartens, schools, and other establishments, aimed at recognising and addressing individual developmental and educational needs, should result in particular from:

- disability;
- social maladaptation;
- behavioural or emotional disturbances;
- specific learning difficulties;
- competence deficits and language impairments;
- crisis or trauma situations;
- educational failures.

It is thus clear that pupils with CAPD have SEN and, as a result, require psychological and educational support within

the educational environment. In school practice, the line between difficulties with auditory perception and CAPD is often blurred (Kruczyńska-Werner, 2018). Nevertheless, children with CAPD experience more mental health problems compared to normally developing children in the general population. This includes a higher prevalence of emotional difficulties, psychomotor hyperactivity, or attention deficit disorders (Rostkowska et al., 2013). These difficulties lead to diminished self-esteem and inadequate self-confidence, as well as a tendency to withdraw from activities relying on auditory-linguistic functions, resulting in difficulties in building and maintaining social relationships. Due to the issues mentioned earlier, children often become shy, frustrated, and withdrawn, and tend to be perceived by those around them as lazy and unruly (Kruczyńska-Werner, 2018).

It is worth highlighting that children with CAPD typically face challenges in psychomotor development from an early age, including low levels of fine motor development and lateralisation, difficulties in acquiring self-service skills and orientation in the surrounding world, impaired communication and speech development, and disruptions in emotional and social functioning. Additionally, deficits in knowledge and learning skills are observed in children with CAPD (Ganc et al., 2022).

As previously noted, CAPD primarily has a negative impact on learning performance, especially in the domains of reading and writing. These issues have a detrimental effect on children's self-esteem, leading to disruptions in their behaviour. Hence, a variety of measures are necessary to support the healthy development of children, which requires cooperation between teachers and a team of specialists (psychologists, school counsellors, therapists). This collaborative effort facilitates the diagnosis of CAPD and allows for the implementation of an appropriate therapy tailored to the specific needs of the child (Kruczyńska-Werner, 2018).

ORGANISATION OF THE SCHOOL ENVIRONMENT AND SUPPORT FOR THE FUNCTIONING OF CHILDREN WITH CAPD

Pupils with CAPD usually face difficulties fitting into the mainstream school education system. In this context, it is important to highlight that appropriate adjustment of the school environment is the most effective way to improve the functioning of children with CAPD. Teachers, school counsellors, and psychologists should employ suitable teaching and therapeutic methods – with due consideration given to the pupils' SEN – to facilitate their access to knowledge from the auditory analyser.

It is both possible and imperative to establish conditions that promote attentive listening in the classroom, provide education to teachers, and leverage the capabilities of systems designed to support hearing and concentration in noisy environments (Kruczyńska-Werner, 2018). At this juncture, it is also important to underscore the role of

specialists employed in schools, particularly psychologists and school counsellors.

Moreover, an acoustically comfortable environment should be created in the child's school, classroom, and immediate surroundings. Unfortunately, schools often lack opportunities to provide a space supporting auditory perception. According to the ASHA, the noise level in the classrooms where children diagnosed with CAPD receive education should not exceed 30 dB, the reverberation noise should not last longer than 0.4 seconds, and the signal-to-noise ratio should not be less than +15 dB. In practice, however, the average level of external noise infiltrating school classrooms from various sources ranges between 53 and 77 dB, surpassing the recommended levels. Excessive noise levels adversely affect the level of comprehension of the teacher's speech. Furthermore, during physical education classes or breaks, sound intensity can reach levels as high as 80–90 dB (Kruczyńska-Werner, 2018; Zaremba, 2020).

Noise has a negative effect on the organ of hearing, and acoustic stimuli affect the entire body, particularly the nervous system. Depending on its intensity, noise can variously impair the sensitivity of vision and hearing, cause headaches, and induce a decline in intellectual and learning performance.

Acoustically unfavourable conditions are often attributable to suboptimal classroom finishes and, particularly, inappropriate furnishings. To create an acoustically comfortable space for pupils with CAPD, it is crucial to prioritise sound insulation and take measures to minimise reverberation. A quieter environment can be created with the use of sound-absorbing materials. It is also important to eliminate the effects of noise-generating devices, such as computers, projectors, or fans, from the classroom.

Teachers should strive to facilitate the reception of information for pupils with CAPD. Furthermore, a suitable seating arrangement in the classroom should be provided to make sure that the child can easily see the teacher's face, preferably at an angle of less than 45 degrees. The distance from the teacher should not be greater than 2–3 meters. Additionally, efforts should be made to minimise the pupil's exposure to distracting visual and auditory stimuli (Kruczyńska-Werner, 2018).

METHODOLOGY FOR CONDUCTING EDUCATIONAL, GUIDANCE, AND THERAPEUTIC SESSIONS WITH CHILDREN DIAGNOSED WITH CAPD

Teaching children with CAPD requires a range of qualities, including commitment, understanding, and flexibility. Every child is different, so it is crucial to tailor the teaching methodology to accommodate children's individual needs and abilities. Collaboration with a psychologist or therapist specialising in CAPD may be particularly beneficial. Addressing the needs of pupils with CAPD requires a specific methodology, which should incorporate the following key elements:

- assessment and diagnosis;
- individualised approach;
- multisensory approach to teaching (incorporating all sensory modalities);
- multiple learning strategies with segmentation of learning material into smaller parts; with elements of music education;
- clear and simple instructions;
- holistic approach to the pupil – development of listening skills (via listening exercises), nurturing language development and social, communicative, and emotional competence;
- modern technology,
- patience, motivation, and attention to building self-esteem;
- auditory training.

The process of assisting children with CAPD should commence with a thorough assessment to identify their specific learning needs, strengths, predispositions, interests, and talents. In addition, the possibilities for implementing pedagogical and psychological support within the school setting should be evaluated. Given that the areas affected by auditory processing problems can vary significantly from one individual to another, it is vital to customise the curriculum to the individual needs and capabilities of each pupil. Lack of proper diagnosis and failure to undertake therapy have a detrimental effect on learning performance and reading and writing skills, which may affect children's self-esteem and lead to behavioural issues.

Pupils with CAPD benefit from multisensory activities and multi-channel (polysensory) teaching. Engaging all the senses (hearing, smell, sight, touch, speech, as well as movement) in the cognitive process contributes to enhancing auditory processing. Therefore, teachers are advised to actively incorporate at least visual stimuli to reinforce the material presented via the auditory medium, thus enhancing attention and comprehension. Available supporting materials include photographs, drawings, diagrams, charts, tables, pictograms, and other visual aids (Kurkowski, 2013).

When working with children with CAPD, active teaching methods through multiple modalities prove effective. Pupils with CAPD require repetition of information and exercises, with a special emphasis on providing extra time for processing auditory information. A beneficial strategy when introducing new topics is to compile a list of keywords. When discussing new topics, teachers are advised to repeat new information several times, occasionally rephrasing the content, utilise visual aids or presentations, and stress the prosodic features of speech (intonation). Moreover, children with CAPD should receive simple and clear instructions, and teachers should additionally verify their level of understanding by asking them to recall what they remember. Complex, overly elaborate instructions should be avoided, while the most relevant information should be highlighted using phrases such as: "this is important", "now watch out", "listen carefully", "pay special attention to this", etc. (Kruczyńska-Werner, 2018).

In this context, it should be noted that during classes pupils are often assigned the task of listening and taking notes or completing exercises concurrently. For children with CAPD, such tasks can be extremely challenging and, at times, nearly impossible to complete. Supportive measures include providing pupils with the text or presentation ahead of the lessons, so that they are able to familiarise themselves with the content beforehand. During the lesson, the focus can then be directed solely towards the auditory information provided by the teacher. Giving pupils instructions in writing can also enhance comprehension for learners. Another approach is to allow students to use a voice recorder during classes, so that they are able to go through the study material again at home and take notes (Kurkowski, 2013). Recording can be beneficial for learning the material, as it allows children to replay lessons several times, adjusting the pace of listening to their individual needs. Every topic and task should be concluded with a brief summary encapsulating the key points and emphasising what needs to be memorised (Kurkowski, 2013). Teachers should also be aware that children with CAPD tend to experience fatigue relatively quickly. Given the fact that they need to put in more effort and concentration into listening tasks, maintaining sustained auditory attention throughout all the lessons can be difficult. Consequently, it is important to distribute the study material appropriately, so that pupils with CAPD are able to process and absorb information more effectively. Implementing a strategy of alternating between topics requiring more auditory effort and “easier” tasks, breaking down the learning material into manageable segments, and offering pupils opportunities to take breaks can also support the learning process. In addition, it is advisable to schedule Polish or foreign language lessons earlier in the school day (Kurkowski, 2013; Mekki, 2022).

Music education – particularly learning to play an instrument – is yet another effective strategy supporting children with CAPD. This approach may provide the necessary stimulation for the development of higher auditory functions, as well as fostering manual dexterity and visual-auditory-motor coordination, and teaching the perception of various aspects of sounds. Combining various types of musical exercises with movement (dancing, music and motor activities), as well as movement improvisations, can bring good outcomes as well. Engaging in such activities enhances the child’s respiratory, phonatory, and articulatory abilities, improving both active and passive speech development. For certain subtypes of CAPD, engaging in activities like juggling, karate, or gymnastics classes may provide valuable support as well (Kruczyńska-Werner, 2018).

In daily interactions with pupils diagnosed with CAPD, it is beneficial to incorporate a variety of listening exercises (e.g. recognising and distinguishing between sounds, reading a text aloud and parallel listening to an audiobook). Such exercises should promote attentive listening and responses to environmental sounds, encouraging pupils to actively

participate in conversations. It is important to adjust tasks to suit the specific situation and the child’s interests.

In addition, modern technology proves valuable in assisting both diagnostic and therapeutic procedures, and supporting educational activities. Various computer programmes and applications offer interactive listening exercises that inspire and captivate pupils’ interest. It may be helpful to equip the classroom with an FM (Frequency Modulation) system, which is a wireless assistive listening device that transmits speech signals via radio. The transmitter facilitates the lossless transmission of sound information, particularly speech, to receivers positioned on the child’s ears. The system makes it easier to understand speech in noisy environments, at a distance, in larger groups, and in situations involving multidirectional sound propagation. Consequently, FM systems are extremely beneficial in a school environment. However, the use of the device should be limited to exceptional situations, specifically when communicating new information, because children with CAPD need to nurture the skill to hear sounds that are relevant to them. Studies show that within just a few months of using FM support, students experience a substantial improvement in speech understanding. This is frequently linked to positive behavioural shifts, with the child displaying reduced anxiety and an increased willingness to form new friendships. Cognitively, the pupils’ reading fluency improves, leading to enhanced school performance which is reflected in better grades (Knychalska-Zbierańska, 2016; Kruczyńska-Werner, 2018).

Throughout the learning process, children with CAPD benefit greatly from their teacher’s patience and positive attitude. Motivating children to work on their listening skills and recognising and rewarding progress can contribute positively to the overall learning experience. Children with CAPD may experience frustration and stress due to their difficulties in listening and understanding. Hence, offering emotional support, fostering self-esteem, establishing a good teacher-pupil relationship, helping the child recognise their strengths, and ensuring that the teacher understands the nature of the disorder are very important. Psychologists and other professionals working in schools have a significant role to play in familiarising children with strategies to compensate for their hearing deficits. Psychological or pedagogical therapy be helpful in areas including communication, memory, and speed of decision-making (Kruczyńska-Werner, 2018).

Teachers, school counsellors, and psychologists should be attentive to the comprehensive development of pupils with CAPD and integrate the principles of holistic pedagogy into their approach. The emphasis should be placed on developing the child’s listening and language skills, while also addressing social, communication, and emotional abilities. Focusing solely on one dimension of development is a mistake; such an approach is regarded as fragmented, insufficient, and ineffective (Knychalska-Zbierańska, 2016; Kruczyńska-Werner, 2018; Kurkowski, 2013).

Consequently, various auditory training methods such as the Tomatis method, Fast ForWord therapeutic programme,

Johansen Individualised Auditory Stimulation (JIAS), the Warnke Method, Neuroflow Active Auditory Training, and GoBrain therapy (Interactive Auditory Training with Sounds) can be employed to develop auditory processing in children with CAPD (Ganc et al., 2022). Interestingly, post-training analysis of selected brain wave ratios revealed a significant reduction in over-expressed slow-wave activity and strengthening of under-expressed fast-wave activity in all children engaged in training. These changes are associated with improvements in cognitive processes, and an increased speed and precision of performing tasks. The normalisation of brainwave activity patterns is accompanied by improved school performance and stimulation of the development of higher auditory functions. Improved outcomes in computerised attention tests were also noted following auditory training (Milner et al., 2012).

CONCLUSIONS

Auditory processing disorders are classified among the most severe neurodevelopmental challenges. They can significantly interfere with affected children's learning process and hinder their school progress regardless of their intellectual abilities. The issue is becoming increasingly relevant nowadays, as the number of children facing learning difficulties due to hearing disorders continues to rise. CAPD has a documented negative impact on communication and social skills, diminishing confidence in verbal expression (Hassan, 2013). Children with CAPD frequently encounter challenges in understanding body language, facial expressions, and other non-linguistic aspects of communication. As a result, they tend to avoid communication situations that require them to rely on their listening skills. It should be pointed out that early diagnosis of CAPD and implementation of therapy provide an opportunity to leverage brain plasticity for inducing cortical and brainstem reorganisation. Intensive interventions and auditory training capitalising on the brain's plasticity have been reported to yield positive outcomes (Aristidou and Hohman, 2023). Supporting children with CAPD in a school setting requires a comprehensive methodology, encompassing both adjustments in teaching and therapy, and emotional support. A personalised approach that considers individual needs and facilitates the child's ability to attain educational success is essential. It is worth noting that learning difficulties resulting from dysfunction of the auditory analyser do not resolve spontaneously. Improvements in children's socioeducational functioning are only possible when appropriate interventions are applied within educational establishments. Teachers, in collaboration with psychologists and other specialists employed at school, should adjust their teaching methods to address the challenges children with CAPD may face in processing sounds. A number of strategies can be useful for facilitating the school experience for pupils with CAPD, such as adopting a slower speaking pace, incorporating visuals or multimedia into lessons, employing

sensory education to improve access to knowledge from the auditory analyser, and ensuring comprehension through the repetition of instructions.

Conflict of interest

The author does not declare any financial or personal links with other persons or organisations that might adversely affect the content of the publication or claim any right to the publication.

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