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Central Auditory Processing Disorder – Currently Available Therapies in Poland

SUMMARY

Central auditory processing disorder (CAPD) or difficulties with information analysis in the higher stages of the auditory pathway (with peripheral part of the auditory system functioning properly) is the major issue of either children or adults. Crucial to providing assistance for these patients is detailed diagnosis which can, *inter alia*, rule out hypoacusia or mental disability. It provides grounds for proposing appropriate auditory training adjusted to the current needs and capabilities of the patient.

The article reviews currently available therapies in Poland and presents various therapeutic approaches such as: traditional (using exercises of various auditory functions) and special auditory trainings (Tomatis method, Individual Auditory Stimulation by K. Johansen (IAS), Warnke's method, PSPS (Polish: SPPS) – Polymodal Sensory Perception Stimulation, Neuroflow – active hearing training and GoBrain – playing with the sounds).

Key words: central auditory processing disorder, higher hearing functions, auditory training

INTRODUCTION

The problem of Central Auditory Processing Disorders (CAPD) is still a new issue in Polish science. However, the problem has been the object of interest of many specialists: audiologists, logopedists, psychologists, or teachers. New devices enabling accurate diagnosis have been appearing all the time, and new forms of therapy keep being improved and introduced.

The possibility of using auditory therapy in patients who have difficulties in processing sounds was introduced by Alfred Tomatis in the 1950s. The French

otolaryngologist was the first to suggest the use of processed music and sounds as support in conducting therapy of children with problems in learning, behavior or autism.

As technology develops and increasingly large knowledge about central auditory processing disorders is gained, next therapy programs and specially developed hearing trainings are devised. Some of them are still based on Tomatis' theories, while others use active hearing exercises.

Not all parents know the possibilities of therapies and it is often very difficult for them to choose the best form appropriate for their child.

TERMINOLOGY

The problem of central auditory processing disorders is an issue that has been of interest to scientists in the world since as early as the nineteen-fifties. There are many definitions of hearing deficits but most scholars investigating this problem have adopted the one formulated by the American Speech-Language-Hearing Association (ASHA): "Central Auditory Processing Disorders are deficits in the neural processing of auditory information. They are not due to higher order language and cognition disorders although they often co-occur with them" (Kurkowski, 2013; Zaborniak-Sobczak, 2016).

When investigating the subject of auditory processing it is necessary to distinguish between two significant terms: hearing and listening. Hearing is a passive process that depends on the condition of the hearing organ while the ability to listen denotes an active ability consisting in focusing on sound, being interested in it, listening attentively to and consciously perceiving it (Kurkowski, 2013).

The problem of central auditory processing disorders affects persons who are characterized by normal hearing sensitivity (i.e. they do not have problems with hearing), do not suffer from cognitive disorders, but have a problem with listening, nevertheless.

In 1996, ASHA published a list of difficulties whose occurrence may indicate the CAPD problem. Scholars argue that it may occur in the case of one or more of the following disordered hearing abilities:

- auditory localization and lateralization;
- auditory discrimination (discrimination between two or more auditory stimuli and perception of similarities and differences between them);
- recognition of sound characteristics;
- perception of temporal aspects of signal (temporal resolution, masking, integration, temporal organizing);
- ability to receive a signal with the co-occurrence of acoustically competing signals;

- ability to receive a signal with lowered redundancy, i.e. a reduction in the amount of information necessary for transmission and comprehension of a message by subjecting speech to filtering, temporal compression, or presenting a signal in noise (Keith, 2004).

Those difficulties are most often reflected in daily life, and in the case of children – in their functioning at school. A patient with a suspicion of CAPD may exhibit the following symptoms:

- difficulties with understanding speech in acoustically adverse conditions (noise, reverberation);
- difficulties with learning to read and write, learning difficulties;
- problems with foreign language learning;
- poor musical skills;
- confusing syllables and words that sound similar;
- difficulties with locating the source of sound;
- problems with maintaining listening (auditory attention) in situations which require listening for a prolonged period of time (lecture, school lesson, listening to audiobooks, narrated stories, etc.);
- problems with full understanding of commands (especially longer and more complex ones).

The above-listed symptoms are only a few of the difficulties that may indicate the occurrence of problems with auditory processing. It needs to be highlighted that the difficulties enumerated above may but do not have to be experienced by a child (Senderski, 2014).

DIAGNOSIS

Diagnosing the child correctly is the starting point in planning auditory therapy. A lack of a proper diagnosis and failure to provide appropriate therapy may significantly impede the child's functioning at school. Children may experience learning difficulties, problems with reading and writing, which, in turn, could lower their self-esteem or even cause behavioral disorders.

It is also important to diagnose the disorder early and to identify the specific auditory difficulties that the child encounters (to build a clinical profile of APD – auditory processing disorder) so that the best form of therapy can be selected for the child (Majak, 2013).

A reliable diagnosis should be made by an interdisciplinary team of specialists, consisting of a doctor, an audiologist, a logopedist, an educator, a psychologist, a teacher and the child's parents.

The diagnostics of central auditory processing disorders is based upon behavioral tests, which assess higher hearing functions. While the tests are being performed, it is necessary to actively cooperate with the person being examined.

A. Senderski (2014) claims that three groups of tests have the greatest clinical significance:

- low redundancy speech tests;
- auditory temporal processing and patterning tests;
- binaural interaction tests (dichotic).

Senderski recommends that the minimum test battery for assessing higher hearing functions should include:

- adaptive speech in noise (ASPN) test;
- frequency pattern test (FPT);
- gap detection test (GDT);
- dichotic digits test (DDT).

Electrophysiological tests in the form of cortical auditory potentials MLR¹ and P300² can be used for objective assessment in order to confirm the occurrence of CAPD (Senderski, 2014). The same tests should be repeated after each stage of auditory training in order to confirm whether or not it is effective (Weihsing et al., 2015).

Senderski distinguishes three clinical profiles of central auditory processing disorder, depending on the dominant difficulties:

1. hearing disorders on the phonological level and on the level of perception of temporal aspects of sound;
2. disorders of auditory attention and understanding speech in noise;
3. disturbances in information exchange in the corpus callosum.

Different forms of assistance directed at the main deficit are specifically recommended depending on the dominant symptoms (Senderski, 2014).

FORMS OF ASSISTANCE

Specialists in the field of central auditory processing disorder list three areas of assistance for children affected by such disorders:

1. changing the quality of acoustic conditions in the school environment (improvement in the quality of classrooms, creating conditions that are conducive to listening, education of teachers, utilization of FM – frequen-

¹ MLR (middle latency responses) is a test providing information on thalamocortical tracts and primary auditory cortex (Majak, 2013).

² P300 refers to registering event related potential (ERP) evoked by a cognitive event. P300 wave is registered if the person being examined recognizes an appropriate auditory stimulus. The test assesses listening and auditory information processing (Keith, 2004).

- cy modulation systems – i.e. personal systems which aid hearing, consisting of a receiver placed in the patient's ear and a transmitter microphone to which the teacher speaks);
2. therapy intervention in the form of auditory therapies based on brain plasticity (auditory training);
 3. pedagogical and psychological therapy facilitating learning and communication (teaching the use of strategies compensating for hearing deficits) (Senderski, 2014).

M. Zaborniak-Sobczak et al. (2016) took a stand on the forms of assistance, the basis for organizing them and sources of funding in cases of diagnosed central auditory processing disorders. The authors believe that, depending on the degree of the disorder, the patient should either be officially certified as disabled and issued with a statement of special educational needs (for patients with CAPD accompanied by organic damage to the central nervous system, confirmed by imaging tests) or should receive a specialist opinion diagnosing him/her as one with specific learning difficulties (for a milder form of CAPD, without visible macroscopic or demyelination changes to the central nervous system). The proposed solution would certainly make it easier for the parents of children with CAPD to access the appropriate forms of therapy at no cost. In cases of patients with CAPD, certified as those in need of special educational, the school they attend would receive additional funding necessary for organizing appropriate educational provision for a student.

THERAPY

When planning therapy for a child with central auditory processing disorder, it is necessary to consider the degree of the intensity of hearing difficulties and to identify the dominating clinical profile of CAPD that is characteristic of the given patient. In some cases it is sufficient to supplement the logopedic or pedagogical therapy with appropriate exercises stimulating specific hearing functions. Such a form of therapy sensitizes the patient to the sounds which reach him/her, develops his/her listening concentration, improves his/her auditory memory and enhances his/her ability to discriminate and identify sounds.

E. Kwaśniok and M. Ławecka (2016) as well as B. Odowska-Szlachcic and B. Mierzejewska (2013) provided examples of relevant exercises in their studies. The exercises must be chosen individually for each patient, depending on this/her deficits; the difficulty of tasks must be increased gradually and the patient's age, degree of difficulties and perception abilities must be taken into account.

Auditory therapy relies on regularity and intensiveness of therapeutic effects, which necessitates appropriate cooperation with the parents. What is done in session should be systematically repeated at home (Kwaśniok, Ławecka, 2016).

The authors propose that hearing functions should be improved by means of the following range of exercises:

- locating the source of sound;
- reacting to sound;
- discriminating sounds of different loudness, pitch;
- discriminating and recognizing sounds in the environment;
- repeating words in an appropriate order;
- auditory memory exercises;
- dictation exercises;
- imitating a melody;
- phonemic hearing exercises;
- auditory resolution exercises;
- rhythm-based exercises;
- focused and distracted attention;
- auditory analysis and synthesis;
- understanding speech in the presence of interfering stimuli;
- using prosodic features of speech;
- auditory exercises combined with a movement sequence;
- phonetic decoding;
- exercises stimulating the development of phonological awareness (Odowska-Szlachcic, Mierzejewska, 2013; Kwaśniok, Ławecka, 2016).

Unfortunately, such therapeutic measures will not always be effective and sufficient. In some cases, additional therapy support, such as selecting appropriate auditory training, will be necessary.

AUDITORY TRAINING

Several kinds of auditory training are currently available, both around the world and in Poland. Alfred Tomatis is believed to be a pioneer in this field; however, several other people who played a significant part in the development of auditory therapy, such as, among others, Temple Fay, Guy Berard, Ingo Steinbach, are worth mentioning.

Studies conducted by G. Berard and A. Stehli show that auditory training positively affects, *inter alia*, concentration and the ability to maintain attention, spontaneous initiation of purposeful activity, the level of stimulation and sensory modulation, balance and perception of movement, gravitational inse-

curity, the development of speech and language, social-emotional maturity, praxia and sequencing, and eyeball movement control (Odowska-Szlachcic, Mierzejewska, 2013).

The forms of auditory training currently available in many institutions in Poland are:

- the Tomatis Method;
- K. Johansen’s Individual Auditory Stimulation – IAS;
- the Warnke Method;
- Polymodal Sensory Perception Stimulation;
- Neuroflow – active auditory training;
- GoBrain – playing with sounds.

Sources also mention other kinds of auditory training, such as Auricula TM – Auricula Training Method, Samonas Advanced Auditory Training by Ingo Steinbach, Listening Fitness by Paul Madaule, the Berard Method of Auditory Integration Training (AIT), Fast for Word, Interactive Metronome, Therapeutic Listening (Skoczył et al., 2012; Odowska-Szlachcic, Mierzejewska, 2013); in Poland, however, there are no institutions offering these forms of therapy.

THE TOMATIS METHOD

The kind of auditory training proposed by Alfred Tomatis is also known as audio-psycho-linguistic therapy. It is based on permanent modification of the way of listening through stimulating various cortex areas (Szymańska, 2008).

The diagnosis is made on the basis of a listening test, a test of auditory laterality and attention and a thorough interview with the child’s parents. The method requires the plotting of listening curves (for both bone and air conduction) and the examination of auditory laterality as well as of the ability to distinguish sound pitch (selectivity) and to locate sounds.

If abnormalities are discovered in any of the tests, an individual audio-psycho-linguistic therapy is recommended so as to improve the disturbed functions.

The therapy consists in listening to the individually selected sound material, based on, *inter alia*, Mozart’s music, through special headphones (using both air and bone conduction). Tomatis chose Mozart’s instrumental music due to the great dynamics of the pieces (fast changes of sound intensity – increases and decreases in loudness – as well as the abundance of high frequencies). Such music is the most energizing – it provides plenty of stimuli activating the cortex. Tomatis believed that the brain needs a constant supply of activating stimuli, which consequently prepares it for further activity. According to the French otolaryngologist, the greatest number of such stimuli can be provided via hearing (Szymańska, 2008).

Tomatis also chose Gregorian chants for his therapy as they are rich in both middle and low frequencies but contain no high-pitched sounds. The sequence Mozart's music – Gregorian chants is frequently used in therapy programs (Szymańska, 2008).

The music material undergoes filtration and so-called gating. The training consists of two phases. The first one – the passive phase – only consists in listening to the processed music material; in the second phase – the active phase – the patient is additionally stimulated by speech sounds; speaking, reading aloud and repetition are also used. Such listening training allows the stimulation of cortex centers, which improves the perceptual abilities of the brain and reception of external stimuli (Mularzuk et al., 2012; Kurkowski, 2001; Skoczylas et al., 2012).

The positive effects of the Tomatis therapy method are described by both foreign and Polish researchers, who claim that their patients' listening ability has improved considerably. In her article K. Ożańska-Ponikwia (2016) offers an overview of the studies regarding the effectiveness of the Tomatis method. She quotes research results obtained by, among others, T. Gilmor, D. Ross-Swain, J. Ratyńska and Z.M. Kurkowski, who describe the positive effects of listening stimulation on learning difficulties (*inter alia*, reading and writing problems, communication and behaviors) (Ożańska-Ponikwia, 2016). M. Mularzuk et al. (2012) describe improvement in all the measured parameters of tests for listening (auditory attention), discrimination of sound pitch, locating the source of sound and auditory laterality, in comparison with the results of tests conducted before the beginning of the therapy. E. Mojs et al. (2011), who conducted a study on a group of children with various developmental disorders (*inter alia*, specific articulation disorders, developmental dyspraxia, ADHD, childhood autism), noticed statistically significant changes: a decrease in auditory oversensitivity, an increase in reaction speed and in accuracy of sound localization (Mularzuk, et al., 2012; Mojs et al., 2011; Malak et al., 2017).

The Tomatis method training is currently conducted with the use of TalksUp devices. The therapy takes place in a therapist's surgery and is administered by a qualified specialist, who has completed appropriate courses. The therapy itself is intensive – the listening program lasts 13 days, during which the patient listens to the sound program for ca 2 hours every day. After each program it is necessary to pass on the so-called “integration phase”, i.e. a break of from 4 to 8 weeks before the next program starts (www.tomatis.com).

In the Tomatis method, it is emphasized that, depending on the disorder, the patient has to simultaneously undergo a logopedic therapy, pedagogical therapy or psychotherapy; the Tomatis method is therefore classified as a supportive therapy (Kurkowski, 2001).

JOHANSEN'S INDIVIDUAL AUDITORY STIMULATION (IAS)

The method was created by Kjeld Johansen, a Danish teacher and psychologist. The diagnosis is based on history-taking, an introductory questionnaire concerning auditory processing and the results of: Pure-Tone Audiometry (PTA), speech in noise tests and a binaural interaction test.

The program is chosen individually for each patient, depending on his/her tests results. The patient receives a CD with recorded sound material (filtered instrumental music), to which s/he is obliged to listen at home for about 10 minutes every day. No special equipment is needed for listening to the material: the patient uses traditional over-ear headphones. Depending on the problems which the patient experiences, the therapy may last from 6 to 10 months. Every 4–8 weeks (depending on the patient's age) a control test is performed, after which the patient receives a new set of recordings on a CD. The therapy ends gradually and slowly: the time of listening to recordings is steadily shortened and the number of training days is decreased. The therapy can be given to patients from the age of 3; its modified version can even be administered to infants (Skoczylas et al., 2012; Kurkowski, 2013; Odowska-Szlachcic, Mierzejewska, 2013).

Unfortunately, so far no studies have been conducted in Poland to confirm the effectiveness of the method; one can only hear positive opinions on it from parents and practicing therapists. The effects of the method have been described in foreign articles, mainly presenting the results of studies conducted in Sweden (where the method is known as Auditory Discrimination Therapy) and the United States (where the method is known as Hemisphere Specific Auditory Stimulation). Among others, the results of large-scale research projects carried out in Mjölby (Sweden), Helsinki (Finland) and Minneapolis (USA) are generally known; they show improvement in the results of auditory tests for laterality, auditory discrimination, auditory memory, and understanding low redundancy speech (including understanding speech in noise). Researchers also emphasize improvement in auditory attention and behavior (Johansen, 2008).

POLYMODAL SENSORY PERCEPTION STIMULATION (PSPS)

The therapy is based on multisensory stimulation; it uses the sense of hearing, sight and touch to improve their mutual integration and coordination. Patients are qualified for the therapy on the basis of the results of higher hearing functions tests and detailed history-taking. Therapy can take place in a therapist's surgery or the patient's home. The sound material is provided via headphones (for air and bone conduction). The patient receives sounds modified with the use of filtration (including phonetic filtration) and changes in the sound intensity and duration.

The therapy is additionally supplemented with a psychological component. Other forms of auditory training lack emotional stimulation. At the beginning of the therapy the patient learns to recognize his/her own and other people's emotions. S/he becomes aware of the symptoms of emotions which come from the body, recognize situations evoking specific emotions and learn about the thoughts accompanying such situations. The next step is learning to control one's own thoughts, find mistakes in them and change the way of thinking to a more constructive one. The final stage includes learning to control one's own behavior, mastering techniques of managing one's own emotions and work on communication.

The authors of the PSPS (Polish: SPPS) believe that incorrect emotional interpretation of the information heard is one of the aspects of central auditory processing disorder. Such misinterpretation of the received verbal messages may involve numerous misunderstandings, frustration, and rise in misbehavior; sometimes it may even cause the occurrence of psychological disorders. The combination of auditory and psychological components may positively influence, among others, behavioral problems, which could be the secondary result of auditory processing disorders (www.csim.pl).

The training consists of two phases: a passive one and an active one. The second phase involves the use of a multimedia device with over 70 games which engage various senses.

The therapy is divided into levels, of which each consists of 15 sessions (held daily and lasting for ca. 2 hours). Moving to the next level depends on the results of tests for auditory abilities, administered after each stage of the therapy (www.csim.pl).

Since the PSPS is a relatively new method of auditory training, there are still only a few publications concerning its effectiveness. However, what are available are reports from researchers from the Institute of Physiology and Pathology of Hearing in Kajetany (Poland), who have been providing the PSPS training. K. Bieńkowska et al. cite improvement in the results of individual behavioral psychoacoustic tests: sound pitch discrimination test, sound length discrimination test and dichotic digits test, among children aged 6–13. The study revealed improvement in the results already after the first therapy cycle; the results after the second cycle showed improvement in comparison with the first cycle. Therefore, the authors claim that the therapy is effective already after the first training cycle in the age groups of 6–8 and 9–11. In the age group of above 11 years improvement in test results was observed after the second training cycle (Bieńkowska et al., 2017).

THE WARNKE METHOD

The method was created by Fred Warnke, whose professional activity encompassed issues in the fields of psychoacoustics and psycholinguistics. For more than forty years he dealt with problems related to hearing and auditory processing. The therapy method he invented is meant for people with reading, writing and speaking difficulties.

The diagnosis is made on the basis of 14 tests measuring the levels and degree of automation of visual, auditory and motor functions. Eight of the tests assess the so-called primary functions using a device called Audio4Lab – Brain Audiometer. The tested primary functions are: the visual order threshold, auditory order threshold, spatial hearing, pitch discrimination, visual and auditory timing, choice reaction time, frequency pattern recognition and duration pattern recognition.

The results are expressed as percentile ranks and compared to the reference values established for children from 5 to 12 years of age. The therapy is provided for patients over 6 years old and older.

The therapy is programmed on the basis of tests results. The first part of the training consists in working on the automation of the processing of visual, auditory and motor perceptions; this is done with the help of Audio4Lab device. Training with a therapist improves, among others, spatial hearing, sound pitch and length discrimination, visual and auditory pattern recognition, and the correct reaction to the sound stimulus heard. It is possible to supplement the training by borrowing a device called Brain-Boy Universal, loaded with exercises which facilitate auditory processing. The patient should do the exercises at home for about 20 minutes a day. Depending on the results, the first part of the training can take from 2 to 4 months.

The second part of the training is offered to those patients who have already achieved the anticipated levels in the first part of the therapy. It includes exercises on the automation of coordination between the brain hemispheres using lateral training with the help of a device called Audio4Lab – Alpha Trainer. This form of therapy consists in listening to a text being read and to one's own voice reading the same text alternately in the left and right speakers of the headphones. Warnke proposed such exercises, explaining that in dyslexic patients the corpus callosum is smaller in size and impaired in function. The lateral training positively influences the synchronization of the hemispheres by strengthening the existing neuronal connections and forming new ones. It is assumed that the number of months the second stage of the training should take is equal to the child's age in years. The training also includes the facilitation of visual perception through attempts at visual spelling, exercises based on pseudo-texts and short-term remembering of syllables (Skoczylas et al., 2012; Kurkowski, 2013; Warnke, 2014).

The most exhaustive studies on the effectiveness of the Warnke method therapy were conducted by U. Tewes in two research projects at Hanover University. The researcher concluded that in the tested group of children there was considerable improvement in reading and writing skills after four months of the Warnke method therapy (Michalski, Tewes, 2014).

In Poland, the method is gaining in popularity and articles are published confirming its effectiveness among children with developmental dyslexia. M. Lipowska, P. Pawlicka and A. Łada from Gdańsk University present preliminary results concerning the effectiveness of the Warnke method therapy. They notice better results in terms of primary functions and, consequently, the improvement in phone/phoneme discrimination, phone/phoneme analysis and synthesis, phonological memory, visual-auditory integration, long-term verbal memory and fast and automatic recollection of words in patients who have undergone the Warnke method therapy (www.biomed.com). Currently, research is being carried out on the effectiveness of the method among children with central auditory processing disorder in the Department of Logopedics and Applied Linguistics of Maria Curie-Skłodowska University in Lublin.

NEUROFLOW – INTERACTIVE AUDITORY TRAINING

The interactive auditory training, created by Andrzej Senderski, an otolaryngologist, is designed for patients at the age of 4 and older. The therapy is programmed on the basis of the results of a diagnosis (higher hearing functions tests) made by a certified therapist qualified to use the Neuroflow method. Once the tests have been carried out, the patient is assigned to one of the APD profiles, which allows the programming of the therapy focused on the dominant deficit.

The training can take place either in a therapist's surgery or in the patient's home. The therapy is divided into two stages, each of which lasts for about 12 weeks. The sessions are held three times a week and last for about 20–25 minutes. The Neuroflow method uses active listening exercises, consisting in, *inter alia*, text-based work, exercises with competing sounds (for example, the singing of birds, conversation, the sound of an electric toothbrush, etc.). Additionally, on the days when sessions are not held, the patients do exercises for strengthening the body scheme, spatial orientation, balance, visual-auditory-motor coordination and other motor exercises (www.neuroflow.pl).

GOBRAIN – PLAYING WITH SOUNDS

GoBrain Fast Learning & Fun (playing with sounds) is also a form of interactive auditory training. It is recommended for working with children aged 5–12.

The diagnosis includes an interview with the parents, a questionnaire regarding hearing, a laterality test and a test measuring phonemic hearing, auditory memory, auditory processing (in respect of sound feature discrimination). The exercises are performed at least 3 times a week for about 30 minutes a day (daily sessions are recommended). The training requires using over-ear headphones. The therapy, depending on the patient's results (the diagnostic tests are repeated) can take from 3 to 8 weeks. Each stage consists of 20 training sessions. In the program, the difficulty level of the tasks is continuously tailored to the patient's abilities. GoBrain is used as a supplement to other forms of therapy, for instance, logopedic therapy (www.gobrain.pl).

CONCLUSIONS

Each of the presented above forms of CAPD therapy has its supporters and detractors. The critics focus primarily on auditory training that utilizes passive listening to processed music. They argue that such training is inadequate because, in order to notice significant changes in the auditory pathway, it is necessary to perform active exercises tasks. The mere filtering of sounds is insufficient. Thus, to achieve the anticipated goal of therapy, the patient should do listening exercises that use individual hearing functions or focus on the functions that cause difficulties for the patient (for example, sound pitch discrimination). On the other hand, the supporters claim that everything depends on the individual in question and that not every one of the described methods will be appropriate for every patient. The factors that are significant when selecting the appropriate training definitely include the patient's age, perceptual abilities and co-occurring disorders, as well as the family's financial possibilities. Not every patient can receive active auditory training as for many such training can be too difficult and the instructions can prove incomprehensible. In such a case, if the child is diagnosed with difficulties with auditory processing, it is advisable to get to know the forms of training that will first teach the patient to listen and – thanks to using filtered music (in which some frequencies are softened and others – enhanced) train his/her auditory system to perceive a broader range of sounds that were not perceptible to him/her before the training.

The active forms of training arouse less controversy and their formula is more comprehensible; however, also in this case everything depends on the patient and his/her capabilities. Active training forms are more demanding since the patient must be focused on performing individual tasks and his/her tiredness, irritability and lapses in concentration will influence the results obtained in the exercises practiced.

Therefore, the selection of the appropriate form of therapy should be made by a team of specialists in collaboration with teachers and parents. This is also connected with introducing adequate modifications to the school and home environment so as to enhance the effects of the therapeutic measures.

Before initiating the therapy it is necessary to make a thorough and reliable diagnosis on the basis of behavioral and sometimes also electrophysiological tests. The tests should be repeated after each stage of the therapy and the patient's parents should be informed about their results (in order to determine whether or not the training is effective). In some cases, it may be necessary for the patient to undergo several different forms of therapy; however, it is then advisable to introduce adequate intervals between them so as to avoid overstimulating the child.

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