

# NEW ZEALAND GUIDELINES ON AUDITORY PROCESSING DISORDER 2019: SUMMARY FOR MEDICAL PRACTITIONERS

## Definition and prevalence

Auditory processing disorder (APD) is a generic term for hearing disorders that result from atypical processing of auditory information in the brain. APD results in persistent limitations in the performance of auditory activities with resultant significant consequences for participation. APD can affect psychosocial development, academic achievement, participation, and career opportunities. The overall prevalence in children in New Zealand (NZ) is estimated at 6.2%, with higher rates in some populations. Prevalence rates are higher in the elderly population, exceeding 50% above age 75.

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## Symptoms

The symptoms of APD bear many similarities to other types of hearing disorder, but APD differs in that it is not detected by standard audiometric assessments. APD should be suspected when there are reports of poor hearing and auditory comprehension in some circumstances despite normal pure tone hearing test results. The following checklist of symptoms and comorbidities provides a simple and effective method of identifying children and adults who should be referred for diagnostic assessment.

**Referral for APD assessment should be considered when there are symptoms of hearing or listening problems not consistent with the results of basic hearing assessment, or when there are frequently associated comorbidities:**

- difficulty following spoken directions unless they are brief and simple
- difficulty attending to and remembering spoken information
- slowness in processing spoken information
- difficulty understanding in the presence of other sounds
- being overwhelmed by complex or “busy” auditory environments e.g., classrooms, shopping malls
- undue sensitivity to loud sounds or noise
- poor listening skills
- preference for loud television volume
- insensitivity to tone of voice or other nuances of speech

Frequently associated comorbidities;

- brain injury
- neurological disorders affecting the brain
- history of frequent or persistent middle ear disease
- difficulty with reading or spelling
- dyslexia
- language disorder or delay
- autism spectrum disorder.

## Causes

Some causes of APD are listed below:

- hereditary developmental abnormalities
- maturational delay
- antenatal, perinatal and postnatal factors including prematurity and low birth weight, prenatal anoxia, prenatal exposure to cigarette smoke or alcohol, hyperbilirubinemia
- diseases, toxins and neurological conditions affecting the brain, including space-occupying lesions and stroke; Moyamoya disease and other cerebrovascular disorders; multiple sclerosis and other neurodegenerative diseases; bacterial meningitis; herpes simplex encephalitis; Landau Kleffner Syndrome and other seizure disorders; Lyme disease; metabolic disease; heavy metal exposure; solvent exposure
- traumatic brain injury
- blast injury
- auditory deprivation (including auditory deprivation secondary to otitis media during critical early developmental periods)
- aging.

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**Auditory deprivation secondary to otitis media during critical early developmental periods can cause auditory processing disorder.**

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## Subtypes

The wide variety of functional deficits seen in APD reflects the variety of possible underlying structural deficits and involved loci in the central auditory nervous system (CANS); e.g., cortical microgyria, atypical (reduced) myelination, connectivity differences. There is no definitive classification of subtypes of APD but three commonly seen problems are amblyaudia, spatial perception disorder, and temporal processing deficits.

Amblyaudia is an abnormal interaural difference on tests in which differing stimuli (words) are directed simultaneously to the two ears. Similar to amblyopia, the CANS inhibits input from the non-dominant ear.

Spatial perception disorder is poorer than normal ability to hear speech against competing auditory stimuli from different spatial locations, e.g., hearing one conversation in a roomful of people talking.

Temporal distortions encompass dis-synchronous firing of neural elements at brainstem level in response to speech stimuli; poor ability to perceive slow (rise time) and rapid (formant transition) acoustic events in speech; and poor ability to process temporal and rhythmic patterns necessary for optimal language comprehension.

## Common comorbidities

APD is frequently comorbid with developmental language disorder and reading disorder/dyslexia. There is growing evidence that APD may be an underlying cause in these frequently associated conditions, especially dyslexia. Poor phonological perception, a common consequence of APD, is implicated as an underlying cause of dyslexia.

APD is commonly seen in people with autism spectrum disorder (ASD), probably as a direct consequence of the structural brain differences observed in ASD.

APD is sometimes seen as a co-existing disorder with attention deficit (hyperactivity) disorder.

Auditory processing is likely to be one of the brain functions affected by global developmental delay.

## Diagnosis

A diagnosis of APD is made by an audiologist using specific audiological tests. Although evidence of APD can be observed in electrophysiological and imaging studies, these methods are not sufficiently precise for diagnosis of individual cases hence behavioural tests are typically used clinically. Tests and diagnostic criteria suitable for use in NZ are recommended in the New Zealand Guidelines on Auditory Processing Disorder (Keith, Purdy, Baily & Kay, 2019).

Early detection of auditory processing difficulties and subsequent early intervention are recommended. The NZ Guidelines encourage APD testing below the traditional age of seven years, using validated assessment tools that have been developed for younger children.

## Multidisciplinary approach

Management of APD is best carried out by a multi-disciplinary team, with relevant pre-assessment information from medical practitioners, psychologists and speech-language therapists (SLTs) being particularly helpful in interpreting APD test results. SLTs, teachers, learning support personnel and other professionals may need to be involved in treatment along

with audiologists. As the professionals responsible for diagnosis and some key treatments, audiologists should take the lead role in APD case management.

## Treatment

Because of the neuroplasticity of the brain, APD can be significantly ameliorated by treatment. For children, the three main recommended approaches to treatment are amplification with remote microphone hearing aid systems (RMHAs), auditory training with selected evidence-based programmes, and language therapy including phonological processing therapy. Adults can also be assisted with hearing aids and auditory training.

**Remote microphone hearing systems** consist of a wireless microphone worn by the speaker (e.g., parent, teacher, coach, friend) and wireless receiver hearing aids worn by the child. They dramatically improve ability to hear in difficult listening situations including classroom environments. Over time the mild amplification engenders neuroplastic change, leading to enhanced hearing abilities and improved performance on diagnostic tests. Consequently, assistive hearing technology is not usually required long term. Two to three years of use is common.

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**Auditory training** designed to enhance non-dominant ear performance can correct amblyaudia in many cases in as few as four in-clinic auditory training sessions. Longer training is necessary to develop other skills such as ability to hear against background noise. Audiologists prescribe and fit RMHA systems and carry out most auditory training.

**Language therapy** may need to be provided by an SLT, and phonological perception and phonemic awareness training may need to be provided by an SLT or education personnel. Psychologists may need to be involved in cases where psychosocial effects of APD are severe.

Alternative purported APD treatments offered by providers without audiological qualifications and involving listening to processed music lack scientific basis and a credible body of peer-reviewed evidence and are not endorsed by professional organisations. Conversely, formal musical instrument (including voice) training is beneficial for auditory processing skills.

*Summarised from:*

Keith, W. J., Purdy, S. C., Baily, M. R., & Kay, F. M. (2019). *New Zealand Guidelines on Auditory Processing Disorder*. New Zealand Audiological Society. <https://www.audiology.org.nz/>

The New Zealand Guidelines on Auditory Processing Disorder are located on the New Zealand Audiological Society website under Menu/For the Public/Other Hearing Conditions/Auditory Processing Disorder or can be downloaded from the following link. [NZ APD GUIDELINES 2019](#)

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