

# Why Johnny Won't Pay Attention

*Is it possible that he doesn't listen because he can't hear?*

By Carol Flexer

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Normal hearing for children is 15 dB HL or better at all frequencies with normal middle ear function. All else is abnormal and places a child at risk for academic failure. Because the normal-hearing boundary for children is 15 dB HL and a mild hearing loss is typically considered to start at 25 dB HL, most people define a minimal or slight hearing impairment as one that occurs from 16 dB HL to 25 dB HL. Most minimal hearing losses are caused by ear infections.

There are about 39.5 million school children in the United States, and approximately eight million of them have some type and degree of hearing loss. Several colleagues and I recently conducted a longitudinal study and found that one quarter to one third of kindergarten and first-grade children in typical classrooms did not hear normally on any given day. So we're talking about a lot of children!

Children with minimal hearing losses experience problems in the following areas: hearing faint or distant speech (more than 25% of classroom instruction could be missed); hearing subtle conversational cues that could cause a child to react inappropriately; following fast-paced verbal exchanges; and hearing the fine word/sound distinctions that denote plurality, tense, possessives, etc. In addition, a child with a minimal hearing loss may appear immature and become more fatigued than normal-hearing classmates because of the extra effort needed to hear. In fact, when teachers or parents notice attention and behaviour problems, they often do not even consider hearing loss as the source of a child's problems.

In ordinary classrooms, hearing/listening is the cornerstone of the system. If a child cannot clearly hear the teacher, the entire premise of the educational system is undermined. There is a big difference between an "audible" signal and an "intelligible" signal. Speech is *audible* if the person is simply able to detect its presence. However, for speech to be *intelligible*, the person must be able to discriminate the word-sound distinctions of individual phonemes.

It seems as though children ought to know when they are missing verbal information. The problem with “not hearing so good”, however, is that you don’t hear what you don’t hear, and you don’t know that you didn’t hear it – because you didn’t hear it! Moreover, most children (and adults, for that matter) may not know that they “misheard” a message unless they have already had experience with the language and topic under discussion. Even if a teacher asks, “Are you hearing me?”, the child will almost always say, “Yes”.

Hearing loss of any degree can interfere with the development of a child’s spoken language, reading and writing skills, and academic performance. Persons with hearing losses, even minimal ones, cannot receive intelligible speech well over distances. This reduction in earshot has tremendous consequences for classroom performance because distance hearing is linked to passive/casual/incidental listening and learning. Also, the farther away a child is from the sound source, the poorer the speech-to-noise (S/N) ratio.

S/N ratio is the relationship between the desired speech signal and unwanted background sounds. The more favourable the S/N ratio, the more intelligible that speech signal will be for a child. Adults with normal hearing sensitivity and language abilities typically require a S/N ratio where speech is twice as loud as background noise (+6 dB). Children with any degree of hearing impairment need a more favourable S/N ratio of about ten times the level of background noise (+20 dB) – even when they are wearing hearing aids. Because of noise, reverberation and frequent changes in teacher and pupil locations in the classroom, the average classroom S/N ratio is only about 4+ dB and may be worse than 0 dB, which is far from ideal even for children with normal hearing sensitivity.

Noise levels in classrooms can vary tremendously throughout the day, depending on such factors as hall traffic, windows open or shut, blowers of fans on or off, lights humming, overheads in use, not to mention the noise that a roomful of children make. And, don’t forget, the teacher is not nailed to the floor. Unless all children with hearing problems (and there might be as many as 10 per classroom) can remain very close to the teacher at all times, they will not receive a consistently intelligible speech signal. Distance from the primary sound source is also a critical variable.

While it might seem as if teachers can overcome poor classroom acoustics by yelling, actually they can’t. An analysis of acoustic

phonetics shows that when someone speaks loudly, vowel energy is increased but consonant energy is not increased to the same degree. Thus, ironically, loud speech increases audibility but it may *decrease* intelligibility!

The bottom line is: children, especially those with a hearing loss, will be likely to behave better and learn more in quiet classrooms.

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