

## RESULTS FROM A STUDY OF CHILDREN USING COCHLEAR IMPLANTS AND COMFORT DIGISYSTEM

# Improving speech intelligibility for children with Cochlear Implants (CI)

By Anna K Lejon, December 2012

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### Abstract:

To be able to follow spoken instructions in a school environment is a challenge for children with hearing loss even when they are using hearing aids, bone anchored hearing aids or cochlear implants. Combining a cochlear implant with a wireless transmission system from Comfort Audio, Comfort Digisystem, offers greatly enhanced speech comprehension during teaching sessions.

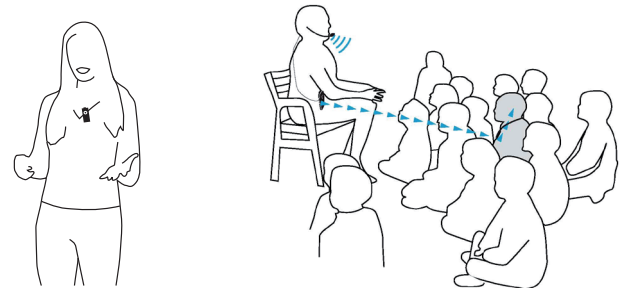
### Hearing loss and the school environment

There is a difference between adult and children's ability to hear and understand speech. In Bradley and Sato's article "Speech intelligibility test results for grade 1, 3 and 6 children in real classrooms", they show that from the age of 6 to the age of 12 years, the ability to hear in a noisy environment is improved by 5dB. The study considered only children with normal hearing. For a child with a hearing loss, it can be a struggle to comprehend the same information as their hearing peers. As much education is imparted orally, to be able to comprehend what is said, children with hearing loss need a quiet environment offering a good signal-to-noise ratio.

### Minimizing distance

The easiest way of improving a signal-to-noise ratio is for the listener to move closer to the desired sound source. Moving from 4 meters distance to 1 meter can improve the signal-to-noise ratio up to 12 dB. [1] However, moving closer to the sound source is not always possible or convenient.

Moving closer to the sound source can be achieved technically using a close range microphone from Comfort Audio. A close range microphone is placed 30 to 40 cm from the desired sound source, commonly fitted as a lapel, it may be attached to a boom. Close range microphones from Comfort Audio have a built-in antenna and external microphones are not needed.



The illustrations are showing how the close range microphone can be used: with a lapel microphone and with a boom microphone.

### Improvement of signal-to-noise ratio for a cochlear implant user using a close range microphone

At the ASHA meeting 2012 in Atlanta, Georgia, Julie Martinez Verhoff, Kelli Billups and Jennifer Lightfoot presented a study of 18 children aged between 5 and 10 years with cochlear implants (CI).

The study undertook to examine the differences in signal-to-noise ratio (SNR) using the CI only, and comparing it to using the CI in combination with the Comfort Digisystem. The products used in this study were the Comfort Digisystem Receiver DT10, a mini receiver connected directly to the CI processor, and a Comfort Digisystem Microphone DM10, a close range microphone.

## Method

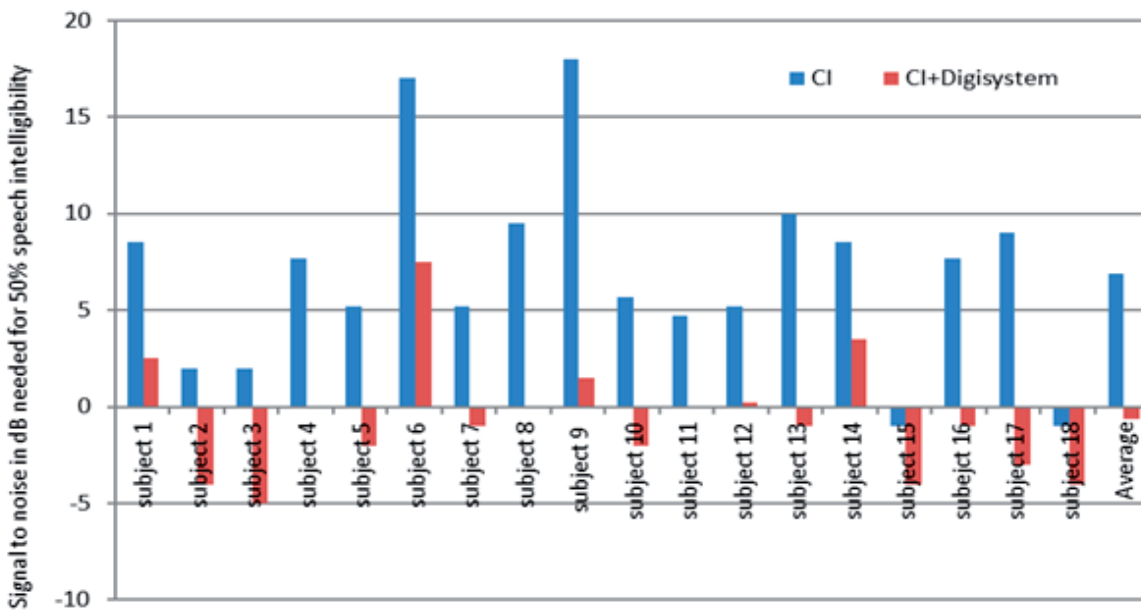
Signal-to-Noise Ratios were determined using the Bamford-Kowal-Bench Speech-In-Noise (BKB-SIN) test. [2] The test is a measure of sentence recognition for use with children aged five years and older. Children were tested using the cochlear implant alone followed by a second test using the combination DT10 and DM10.



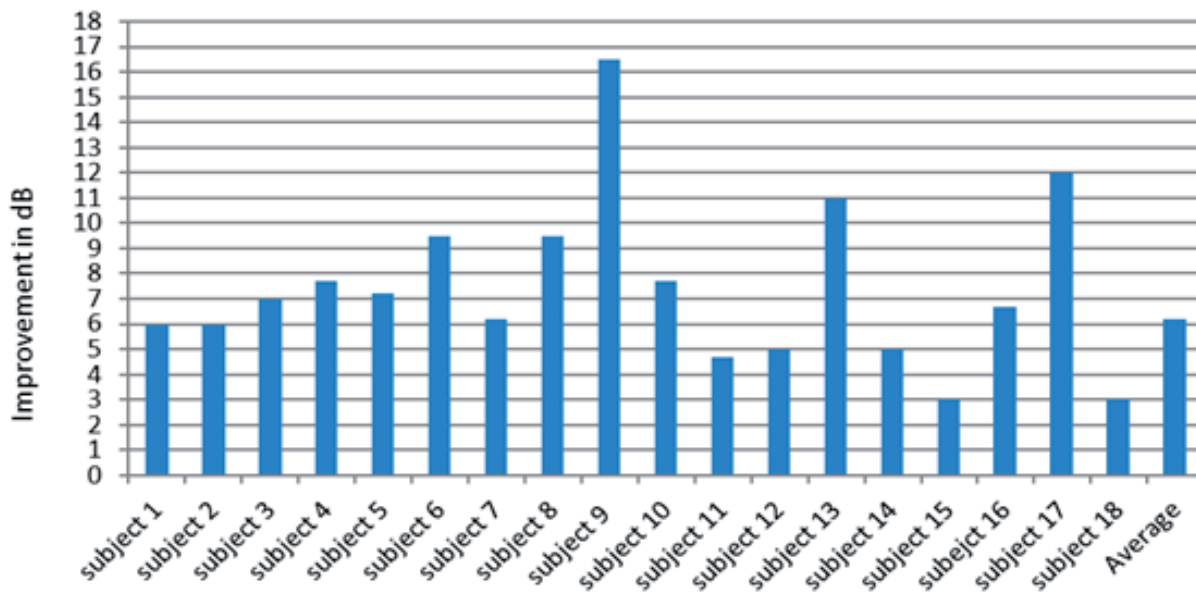
The Receiver DT10, the near level receiver that connects directly to the cochlear implant, and the DM10, a close range microphone designed to be placed 30-40 cm from the sound source.

## Results

Over-all results indicate that many of the children comprehend well in noise using their cochlear implant alone displaying results similar to a mild to moderate hearing loss. However, results show that all children benefited from an improvement in signal-to-noise ratio using the Comfort Digisystem. Individual improvement varied between 3dB and 16.5dB, with an average improvement of 6dB.



Graph of results of using cochlear implants alone and cochlear implants in combination with Comfort Digisystem. The signal-to-noise ratio describes the relationship between the signal (speech), and noise. The larger the difference between the blue and the red bars, the greater the benefit the person experienced using the Comfort Digisystem.



Graph showing the improvement in dB using the cochlear implant in combination with Comfort Digisystem over using the CI alone. The average improvement is 6.2dB.

The results indicate that using Comfort Digisystem together with a cochlear implant can give the user better speech intelligibility in a noisy environment. For children with cochlear implants, Comfort Digisystem makes it easier to follow what is being said during a lesson.

## References

1. Gustavsson, Arne: *Att höra i skolan- om hörteknik i undervisningen Förutsättningar och möjligheter*, 2009
2. John S. Bradley\* and Hiroshi Sato: *Speech intelligibility test results for grades 1,3, and 6 in real classrooms*; National Research Council, Montreal Road, Ottawa, Canada, K1A, 0R6 Tohoku University, Japan /IRC-NRC, Canada.