

Comfort Focus and auditory sequencing

By Anna K Lejon, April 2014

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Abstract:

To hear what the teacher says is essential for all students in school; children with concentration problems, however, are even more dependent on clear speech signals. This white paper will tell more about a study of 17 children in the age 10-11, using Comfort Focus to improve their auditory sequencing in order to be more focused understanding and remembering instructions in school.

Background

Today's curriculum and life in school requires students to be focused on instructions which should lead later on to their own knowledge acquisition. This way of learning is demanding for students and has not been like this before. In Sweden and the Nordic countries we can see a dramatic increase in the number of children who have problems following mainstream classes. These children are often diagnosed with a concentration problem, for example ADHD. Researchers' opinion is that the number of children with ADHD has not increased but the knowledge and resources are more focused on the related problems. According to the Swedish Social Board, the medication with Ritalin or similar medicine with the active substance methylphenidate hydrochloride for children with ADHD has increased fivefold in seven years.

The reason for being unfocused can be that the ability of auditory sequencing and short term memory is less than normal. Auditory sequencing is the ability to remember the detail of what is heard and the order in which it was communicated.

Problems with auditory sequencing are found in a number of diagnoses, such as:

- APD/CAPD
- Autism
- ADHD
- Learning disabilities
- Dyslexia
- A wide range of speech and language disorders

How and why use Comfort Focus?

Since 2008, Comfort Audio has been offering digital hearing products to children and adults with hearing loss. The products that are offered to these groups can also be used for children with concentration problems or other problems keeping the focus on a specific task or speaker.

Comfort Focus is a wireless assistive device that transfers sound digitally between the teacher's microphone and the student's receiver. Using digital transmission, disturbing

background noise is reduced and the student can more easily concentrate and focus on the teacher for a longer time.

Students diagnosed with the problems above have in common that they need a clearer signal in order to receive and understand information. In literature it is often mentioned as a need for a better signal-to-noise ratio, SNR.

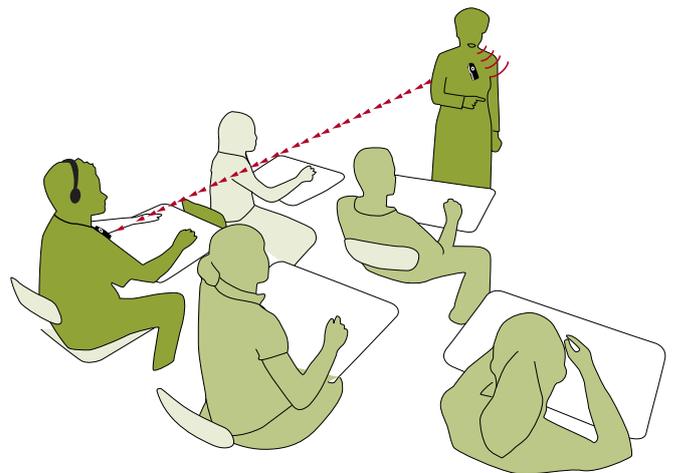


Figure 1:
The illustration shows how sound is transmitted from the microphone worn by the teacher to the receiver worn by the student.

Using Comfort Focus, the SNR will be dramatically improved: from plus/minus 0 dB SNR, that is common in a classroom 5-6 meters away from the teacher, to 25 dB SNR with Comfort Focus. The SNR improves so much because the only sound transmitted to the student is the teacher's voice, while background noise is significantly reduced.

Microphone



Microphone DM10
Versatile microphone that attaches to the clothes with a clip.

Receiver



Receiver DH10
Listen with headphones or earphones



Figure 2:
The picture shows which products can be included in a Comfort Focus set.

Study

Twenty children, between 10 and 11 years old, were tested; they attended a mainstream school with focus on communication and language acquisition. Children with special needs, for example speech and language disorders, are integrated in mainstream classes, showing a positive impact on the language acquisition of all children.

Method of study

Twenty children from two classes were picked out. The children were tested with the ITPA auditory sequencing test and had normal hearing. Three of the children were removed from the result since they missed two of the three test sessions.

The children were tested three times;

- First test for baseline test.
- Second test after using Comfort Focus for five weeks, tested without Comfort Focus.
- Third test with Comfort Focus after five weeks use + scale of appreciation of Comfort Focus system and subjective level of concentration.

After the baseline testing, teachers and students were instructed how to use Comfort Focus. The Comfort Focus should be used in the classroom when the teacher was giving instructions or lecturing.

The test was repeated after 5 weeks using Comfort Focus - at this test the students were listening with the Comfort Focus.

The ITPA test was conducted in a small room next to the classroom. According to a noise level meter app, the background noise was around 50-55 dB: background noise was mainly coming from the classroom next door or from outside.

ITPA test

In this study, one subtest of the ITPA, Illinois Test of Psycholinguistic Abilities, was used. ITPA is a test that has been standardized in Sweden since 1983. ITPA is a test that relates the results with what is normal to the child's age. The ITPA test is divided into 12 different subtests. All of the subtests measure some aspect of language, including oral language, writing, reading, and spelling.

The subtest used here tested auditory sequencing, meaning how effective a child's short term working memory is. Auditory sequencing can be used as a measurement of the learning ability of a child.

Results

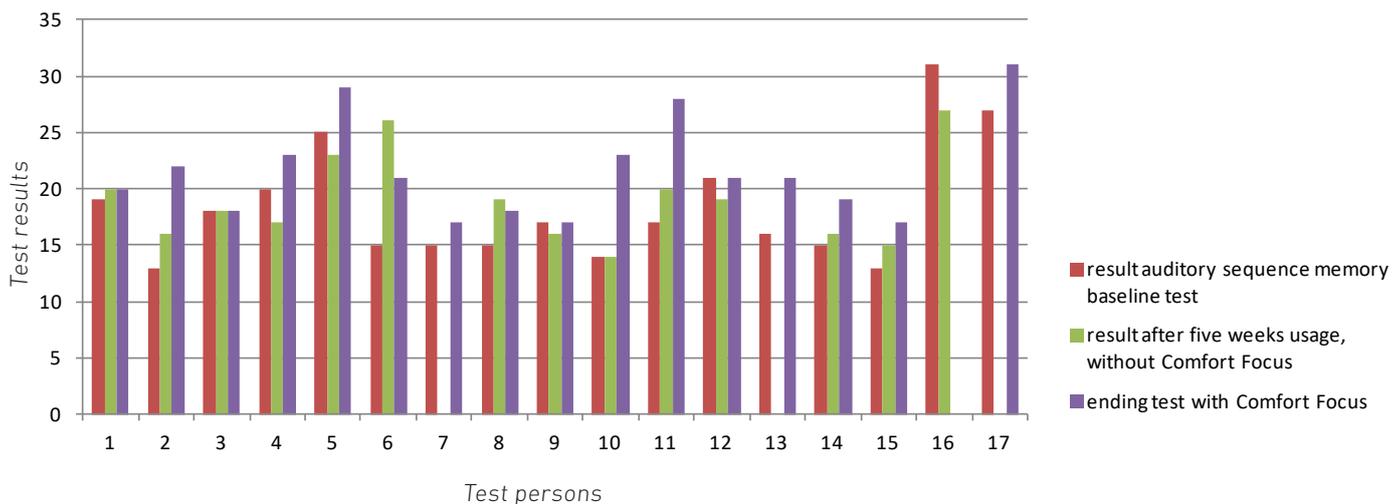


Figure 3:
The red bars represent the result of the baseline test and the green bars represent the test result with Comfort Focus.

A test result of 19-23 is considered normal for this age group. In the baseline test (red bars in figure 3), eleven children show results that are considered lower than normal and can be explained with a speech and language disorder. Only six children ended up in the normal level groups or higher.

when the final test was done, therefore no ending test was done.

Thirteen of the sixteen children improved their test results using Comfort Focus; the remaining three achieved the same result with and without the Comfort Focus system.

Eleven children achieved a result that is considered to be normal when they were using Comfort Focus.

Six children went from weak results (under 19) to normal results using Comfort Focus. One test person, no 16, was ill

As a subjective part of the study, the children were also asked to rate how it was to use Comfort Focus system in school. They were asked to rate it on a scale from 1-10, where 1 was very bad and 10 was very good. The answers are shown in figure 4.

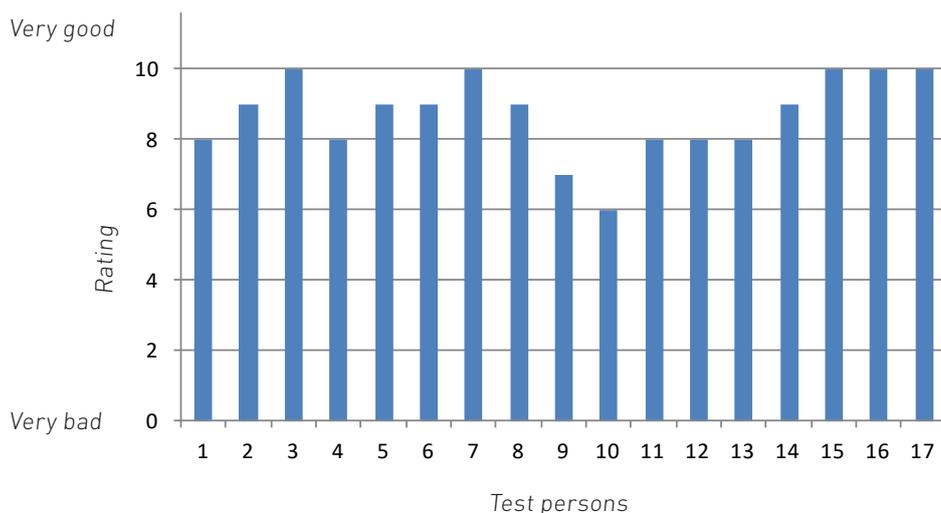


Figure 4:
This graph shows the students' subjective rating of how it was to use the Comfort Focus system.

During the test, the children's concentration level was rated subjectively by the test leader, using the following scale (this scale is not validated and only used by the test leader for comparing the different sessions):

1. Very low concentration level , very short spans of concentration, fiddles with things, gets distracted by the environment, kicks on the chair, no eye-contact, eyes are looking around in the room.
2. Low concentration level for more than half of the test session, fiddles with things, sits still when the test starts, short moments of eye-contact.
3. Concentrates during half of the test session, leaves things on the table, remarks on that the task calls for concentration, sits still and makes sure to find a good way to sit, looks at the test leader half of the time.
4. Concentrates for $\frac{3}{4}$ of the test session, concentrates during whole test procedure, repeats the instruction to make sure that they are understood, looks at the test leader to get feedback.
5. Very concentrated for the whole test session, both for small talk, instructions and test procedure, repeats instructions to make sure that they are understood, sits very still.

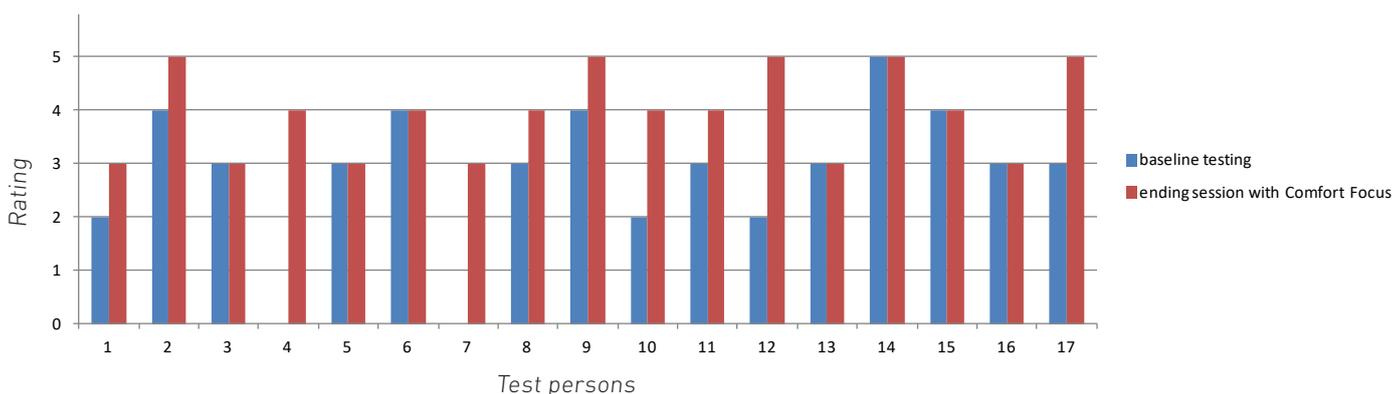


Figure 5: This graph shows the test leader's subjective rating of the children's concentration level during the test sessions.

Discussion

The children in this study benefited from using the Comfort Focus system. It is interesting to note that children who benefit most, do not rate it the highest - have a look at test person 10, for example.

The most important thing to remember from this study is that Comfort Focus can help children with low results of auditory sequencing to achieve results that resemble what is expected for this age group; moreover, children with normal results improve their results in accordance with their age group. Auditory sequencing measures in some degree the child's short term working memory and the efficiency of the child's strategy for remembering what is heard. Auditory sequencing can be a measurement of the child's learning ability when it comes to non-meaningful content, such as numbers, the sound of letters and letters.

The subjective rating of the concentration level done by the test leader and shown in figure 5 may not be scientifically adequate; however, the students' behaviour seems to change when using Comfort Focus. With headphones on and better SNR, the students were more alert and responded more to the test leader compared to when not using Comfort Focus.

After this study, we know how Comfort Focus affects the auditory sequencing positively in a normal school environment.