Classroom Solutions and Modifications for Children with Listening Challenges

Disclosures

- **Lisa Dyre, MA**

  Lisa Dyre has been with Phonak US for several years and is currently a member of the Phonak Pediatric team. She is responsible for the states of Texas, New Mexico, Oklahoma, and Louisiana. Her primary focus is pediatric amplification and Roger/FM fittings in both clinical and school settings. She attended the University of Texas at Austin, where she received a Master of Arts in Audiology. Lisa’s previous experience includes Pediatric Audiology and Educational Audiology, Private Practice, and Hearing Aid Manufacturing.

- **Financial** – Phonak employee who receives a salary for teaching/speaking.
- **Nonfinancial** – No relevant nonfinancial relationship exists
Learning objectives

- Participants will be able to identify 2 pre-post questionnaires/surveys that assist in establishing benefit from classroom modifications for children with listening challenges.

- Participants will be able to name a minimum of 4 populations that may benefit from classroom modifications that boast signal to noise ratios.

- Participants will be able to describe 3 classroom modifications that may have significant benefit for children with listening challenges.

Agenda

1. Who is at risk?
2. What can we do about it?
3. How do I know my interventions are helping?
Hearing and listening

- School-age children spend as much as 45-75% of the day engaged in listening activities (Dahlquist, 1998., Smaldino, & Crandell 2000)
- Classroom acoustics can affect how a child is hearing which in turn can affect the access to the auditory signal needed to learn
Hearing and listening
Hearing and listening

<table>
<thead>
<tr>
<th>CHILDREN AND NOISE: SETTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise at home</td>
</tr>
<tr>
<td>50 - 80 dB A</td>
</tr>
<tr>
<td>Home appliances</td>
</tr>
<tr>
<td>78 - 102 dB A</td>
</tr>
<tr>
<td>Noise in incubators</td>
</tr>
<tr>
<td>60 - 75 dB A, peak sounds 120 dB A</td>
</tr>
<tr>
<td>Noise in hospitals</td>
</tr>
<tr>
<td>&gt; 70 dB A</td>
</tr>
<tr>
<td>Day-care institutions</td>
</tr>
<tr>
<td>75 - 81 dB A</td>
</tr>
<tr>
<td>Noise from toys peak sounds</td>
</tr>
<tr>
<td>79 - 140 dB A</td>
</tr>
<tr>
<td>Background noise in schools</td>
</tr>
<tr>
<td>46.5 – 77.3 dB A</td>
</tr>
</tbody>
</table>

These ranges represent excessive everyday exposures of children to sound.

References:
Hearing and listening

<table>
<thead>
<tr>
<th>Reference</th>
<th>Number of classrooms (n)</th>
<th>Mean L (range) dB</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sato &amp; Bradley 2004</td>
<td>41</td>
<td>44</td>
<td>No student activity</td>
</tr>
<tr>
<td>Shield &amp; Dockrell 2004</td>
<td>110</td>
<td>56</td>
<td>Silent reading / exam</td>
</tr>
<tr>
<td></td>
<td></td>
<td>61</td>
<td>One person speaking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>65</td>
<td>Individual work (most common)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>72</td>
<td>Individual work and movement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>73</td>
<td>Group work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>77</td>
<td>Group work and movement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>72</td>
<td>Overall average</td>
</tr>
<tr>
<td>Picard &amp; Bradley 2001</td>
<td>1</td>
<td>71 (39-87)</td>
<td>28 pupils in co-operative instruction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>61</td>
<td>Written exam (including instructions)</td>
</tr>
<tr>
<td>Mackenzie &amp; Airey 1995</td>
<td>56</td>
<td>56 (31-68)</td>
<td>Pupils silent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>77 (52-101)</td>
<td>Pupils working</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70 (42-84)</td>
<td>Teacher talking</td>
</tr>
</tbody>
</table>

Greenland (2009)

Hearing and listening

- Speech recognition without FM
Hearing and listening

- What story do you hear?

Who is at risk?
Peripheral hearing loss

Who is at risk?

- Auditory processing disorders
Who is at risk?

- Students with significant hearing loss or diagnosed \textbf{auditory processing problems} are not the only students facing listening challenges.
Audibility in the classroom for all children

- All children need an adequate SNR
- All students benefit with reducing from Noise, Distance, and Reverberation in the modern classroom.
Classroom acoustics
Reduce reflective surfaces

High ceilings

Windows

Hard walls

Hard floors

Reduce reflective surfaces

[Images of classroom settings showingReduce reflective surfaces]
Be aware of additional noise sources

- HVAC or AC unit
- Classroom technology
- Classroom furniture
- Classroom pets
- Hallway noise
- Outside noise when windows are present

Be aware of additional noise sources

- Students
Classroom acoustics – classroom management

- Create a respect for the importance of quiet and calm in the classroom
- Insist on one speaker at a time
- Flexible seating with rewards for self initiative
- Buy a sound level meter app so the class understands the concept of soft, medium and loud sounds
- Monitor the classroom

Classroom acoustics - Classroom management

- Create a better signal to noise ratio through technology
- HAT: DM and FM
Classroom acoustics – technology benefit

- Qui
t

- Improvement

- Improvement over Dynamic FM

- Roger
- Dynamic FM
- Traditional FM

54% Improvement over Traditional FM

35% Improvement over Dynamic FM
Classroom distribution systems

- **ASA Panel on Public Policy, 2013 (CADs)**
  - Emphasizing sound distribution rather than amplification
  - Understanding that CADS cannot substitute for poor acoustics
  - Providing training in the use of CADS to classroom teachers
  - Conducting validation procedures to document that the system is providing an appropriate speech-to-noise ratio

Results: speech recognition without soundfield or Dynamic FM
Normal hearing children with soundfield

![Graph showing percentage correct vs noise level for different soundfield conditions.](image)

Classroom distribution systems

- Roger DigiMaster 5000 and 7000 speakers
- 12-loudspeaker array
- Adaptive behavior
- Floor stand or wall mounted
- Audio input - connect to smart board

- Microphones:
  - Roger inspiro (Roger/FM/SoundField)
  - Roger inspiro SoundField only
Soundfield <-> Soundfield + Dynamic FM Receiver

- No soundfield or personal FM
- Phonak Dynamic Soundfield
- Phonak Dynamic + Personal FM

Personal devices

- Compatible with:
  - hearing instruments
  - cochlear implants
  - Bahas
- Via:
  - Design-integrated receivers
  - Universal ear level or inductive neck-loop receivers
  - Streamer receivers
Classroom Distribution Systems with Personal DM/FM

- Roger and FM receivers

Personal devices for children with normal hearing
Maximum Performance: Roger Focus Evidence

Speech-in-noise testing revealed an average improvement of 53% with Roger Focus compared to no device.

N=15  BKB-SIN, -5dB SNR  noise at 65dBSPL
Note: with the exception of subjects 3 and 9 all individual scores showed significant improvement.
Subjects 2, 4, 12, and 14 scored 0% without any device and almost 100% with Roger Focus.

HAT – additional considerations

- Roger DynaMic
  - Handy pass-around microphone
  - Works as a secondary microphone alongside Roger inspiro in a MultiTalker Network
  - Allows the comments of students and secondary teachers to be heard by everyone
  - Roger DynaMic is capable of transmitting speech simultaneously to Roger, FM and soundfield listeners
HAT – additional considerations

Roger AudioHub picks up audio from multimedia sources

Roger inspiro delivers the speech from the teacher
Measuring benefit

- The Functional Listening Evaluation (FLE)
- LIFE – R

**The Functional Listening Evaluation**

**Purpose of the Functional Listening Evaluation**

The purpose of this evaluation is to determine how hearing abilities are affected by noise, distance, and visual input in an individual's natural listening environment. It is designed to simulate listening ability situations that are more representative of actual listening conditions than can often be replicated in sound level assessment, phonovocological observation of the administrator of the evaluation, the student's teachers, parents, and others may discuss the effects of adverse listening conditions encountered by the student. This evaluation will provide a valuable tool for assessing the student's ability to adapt to different listening conditions, such as classrooms, capturing, special seating, and other acoustic modifications. This protocol is based on a paradigm suggested by Ving (1990), and by Reese, Brooker, and Mazar (1993).

**Equipment Needed**

- Tape Recorder or CD player
- Timer
- Weighted scale (can be purchased inexpensively from Radio Shack)

**Procedure**

1. Set-up of Test Environment

   a. The test environment is the room in which the student is seated. The room should be free of noise and distractions that may interfere with the student's ability to perform the test.

2. Administration of the Test

   a. The test consists of a series of listening tasks that are designed to measure the student's ability to adapt to different listening conditions.

3. Scoring

   a. The test is scored using a standardized scoring sheet that includes the student's name, date, and score.

**Pros:**

- Addresses room acoustics
- Addresses child performance in various situations

**Cons:**

- Although very easy to perform, it can be daunting to first time users and those who are not familiar with it.
FLE continued

- The Functional Listening Evaluation can be found on www.phonakpro.com in our CHAT assessment tool.

Listening Inventory for Education Revised (LIFE-R)

- Pros
  - Easy to understand and administer
  - Many categories in the revised version
  - No measurement of acoustics

- Cons
  - Time and attention in filling out
  - No measurement of acoustics

- Available at Successforkids.com
Summary

- Who is at risk?
  - All students not just those with Hearing impairment need positive SNR
- What can we do about it?
  - Modify the room acoustics and use Hearing Assistive Technology
- How do I know my interventions are helping?
  - Measure Benefit!

Thank you