• If you are viewing this course as a recorded course after the live webinar, you can use the scroll bar at the bottom of the player window to pause and navigate the course.

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Learning Objectives

• After this course learners will be able to identify the increased importance of an improved signal to noise (SNR) for preschool children with a hearing loss.
• After this course learners will be able to describe situations where FM use may provide benefit to preschool children with a hearing loss.
• After this course learners will be able to explain the association of the use of FM with increased conversational turns when used in outdoor settings.
What do we know?

- Younger children (5-6 years) with normal hearing require significantly higher SNR values (>15dBA) and reduced reverberation times for speech recognition compared to older children and adults
- Effects of reverberation and noise have a far greater impact on hearing aid users compared to normal hearing individuals

What does this mean for really young children with hearing loss?
Overarching Questions

How parents and carers of pre-school hearing aided children incorporate the use of FM technology into their daily routines?

What were the potential benefits of FM technology use with pre-school hearing aided children?

What were the views and experiences of parents and carers using FM technology?

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<tr>
<th>P1</th>
<th>P2</th>
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FM LEC (De Conde Johnson, C.)
Scores: listening in quiet, noise, distance, auditory only and total
Total scores improved by 12-48% overtime (after 1 month of FM use compared to end)
Biggest improvements in noise and distance
(after 1 month of FM use compared to end)
Biggest improvements in noise and distance

**LDS (Gilkerson and Richards, 2008)**
Assesses expressive and receptive language skills
No significant change in LDS scores for children (n=4) who started off “Within Normal Limits”
Significant improvements in LDS scores for children (n=3) who started off “At Risk”
Sought to acknowledge parents and carers as the experts and place them in the centre of knowledge generation

8 weekly diaries, 7 semi structured interviews:
Overall 8 ‘cases’ (7 diary & interview, 1 diary only)

Thematic content analysis was carried out using NVivo 9

Codes generated independently and compared in an iterative process. Codes collapsed and clustered into themes
Main themes: 6  
(sub themes: 27)

Access to speech (5)  
Listening (7)  
Language (2)  
Wellbeing (4)  
Ownership (4)  
Practicalities of FM use (5)
Child position: car, pram, walking

P6: “I can talk to him whilst we are walking and point to things and tell him what they are... In the morning on the way in to school we saw a rabbit and I was talking to him about it. He loved it... I also taught him stop, look and listen at the road today”.

Reduced access to HA microphones: winter hats, horse riding and cycling helmets etc.

P4: “we had it in the winter, we started off in the winter. Very useful with the hats on. [My daughter] has hats that cover her ears... so we notice a big difference using the FM outside. She could still hear you.”
Listening

Wellbeing

Attending: improved responsiveness

‘Parents/carers diary entries described the child as being:
“more responsive”,
“joins in more”,
“turns quicker”,
“quicker reactions”,
“answered more”, was
more “interactive”/
“communicative”,
had “more eye
contact”/“focusing”,
going “quiet” and “pausing”
overall being “more alert”
when the FM was in use.
Locating FM user: Parents and nursery staff all commented on their positive observance of how “accurate”, “quick” and “instant” the child was able to locate the FM user:

Nursery: “I said [child]’s name from across the room. He was sat down on a chair. He turned to look at me. As it was dinner time there were a lot of other noises going on in the room”

P4: “My mum was very impressed how instant she was to look round at her whilst outside playing”

Maxon and Brackett (1989): FM+M localisation at normal conversational levels; when no FM, required greatly increased stimulus

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Overhearing

Floor and Akhtar (2006) found children as young as 16 months could learn new words whilst distracted without any form of scaffolding.

Reduced opportunities for overhearing with HA’s

P4: “I was telling my eldest daughter off whilst driving to school when from the back seat [child] said “Shut up, shut up”.”

continued
Social: increased engagement

P4: “At the nursery [my daughter] never joins in with singing. She never sits in the circle just stands and watches from a distance. She sat next to her key worker who was wearing the microphone and joined in”.

P1: “At play centres its very noisy, a lot of children shouting so [my daughter] was struggling whereas with the FM she can hear me even though she can’t necessarily always see me which means she’s a bit more confident at playing on her own or playing with the other children there doing the activities.”
Safety

P7: “It meant that I didn’t have to look at her, both really we didn’t have to have eye to eye contact, like in the car really it’s dangerous to turn round and look at her, so for me personally it was a lot easier so I could speak to her and she could still hear me and we could still chat”
Control of own listening (children):

P7: “If I didn’t have the FM on she would point at her hearing aid and say “Mummy can’t hear” to let me know she wanted the FM on”.

P2: “as he has got a little bit older and he will tell us ‘oh, I don’t want you to wear that’ and we have noticed we don’t wear it as much but it still benefits him because we are using it when he wants us to use it, he is very aware of it.

Increase in consistency of HA use::

P6: “After Day one, [my son] seems to be keeping his hearing aids in more. It was the first time he has ever kept his hearing aids in whilst in the car.

P6: “he has always gone through stages pulling them out and then when we got the FM he started leaving them in”.

P4: “[My daughter] has begun to ask for her hearing aids to be put in now”.

continued
Ease of use

P5: “same as mobile phones, so it is not too hard... it was quite easy”

P3: “It was easy enough to use..., quite self-explanatory, you know the up and down and obviously the soundcheck”.

Nursery: “Head of room is on holiday but the other staff in the room are much more confident with it now”.

continued
Barriers to FM use

P3: “[My son] started with an ear infection on the Sunday so we haven’t used it since... Not used as [my son] isn’t keeping aids in long enough, only 10 minutes at a time as earmoulds are too small... the problems we have had is with earmoulds, getting them back to us quick enough,

P5: “At the time more her age and the moulds going, and her not wearing the hearing aids – that would be the main thing that would stop us and sometimes she would keep the aids in and then take the aids out after a minute or two and we would think what’s the use”.

Remembering to mute

P4: “Remembering to mute it at the times you are supposed to mute it, if you went into another room, the telephone rang”

Acknowledged + Overhearing
Monitors and provides automatic analysis of large amounts of natural child language environment data


Language environment basic reports: AWC, CV, CT

Characterisation of language/acoustic environments: Meaningful, Distant, TV, Noise and Silence & Background

LENA: with vs without FM

Four families participated in this sub-study
Four recordings each: two at home and two outdoors (with and without FM)

Home situation:
No clear trends in AWC’s, CV’s or CT’s

Outdoors:
3 of the 4 showed some increase with AWC’s and CV’s with FM
Clear pattern of increase with CT’s
Language Environment Percentiles

Comparison with normal hearing peers: AWC's and CV's all recordings above 50th percentile

Comparison with normal hearing peers: AWC's and CV's all recordings above 50th percentile

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Comparison with normal hearing peers: AWC's and CV's all recordings above 50th percentile

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Characterisation of Language-Acoustic Environment

Average of all 16 recordings:

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<td>Distant</td>
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<td>Silence and Background</td>
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Characterisation of Language-Acoustic Environment

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<tr>
<td>Silence and Background</td>
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</table>
INFANT SNR's

Batten, A. (2013) SNR's in typical infant listening environments, MSc Dissertation, University of Manchester
Supervisors: Dr Tim Wilding & Dr Imran Mulla
Young children need improved SNR’s

FM can considerably improve SNR’s

Carers can make effective use of FM

What age? As soon as possible!
Carers can make effective use of FM

What age? As soon as possible!

ACKNOWLEDGEMENTS:
Supervisor: Professor Wendy McCracken - University of Manchester
Advisory Team: Dr Graham Sutton, Professor Kevin Munro & Professor John Bamford
A very special thank you to the participants, paediatric audiologists and teachers of the deaf.
The study was funded by the Economics and Social Research Council UK
Phonak: equipment + support throughout

Young children need improved SNR’s
FM can considerably improve SNR’s
Carers can make effective use of FM
What age? As soon as possible!

Thank you for listening!
<table>
<thead>
<tr>
<th>Wireless Technology to Improve Communication in Noise, presented in partnership with Seminars in Hearing</th>
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| Wireless Technology to Improve Communication in Noise  
*Cheryl DeConde Johnson and Linda K. Thibodeau* |
| Cochlear Implants and Remote Microphone Technology  
*Jace Wolfe* |
| Use of Wireless Technology for Children with Auditory Processing Disorders, Attention-Deficit Hyperactivity Disorder, and Language Disorders  
*Erin Schafer* |
| FM for Preschoolers with Hearing Loss  
*Imran Mulla* |
| Use of an FM System for Veterans with Blast Exposure, Perceived Hearing Problems & Normal Hearing Sensitivity  
*Gabrielle H. Saunders* |