Spatial Listening in Children with a History of Otitis Media with Effusion
SAROUSH KAPADIA, DANIELLE GODDEN, JANELLE HARVEY, NEETU SATYANARAYAN AND ANTHONY MORLEY
Flinders University, Adelaide, Australia

ABSTRACT
The spatial listening abilities of seventeen 6 year-old children with a history of otitis media with effusion (OME) were assessed. A specific performance deficit in identifying target sentences in the presence of spatially separated competing speech was found. Conversely, sentence recognition in the presence of spatially coincident competing speech was not significantly poorer than age-appropriate norms. The results may have important implications for auditory processing difficulties in young children with a history of OME.

INTRODUCTION
“Spatial listening” refers to the ability of a listener to attend to a signal of interest (e.g. speech) from a particular location, in preference to interfering signals (e.g. competing speech) from other spatial locations. Spatial listening relies on central auditory processing (CAP) of inter-aural time and inter-aural level differences and other cues available in the acoustic signal. Spatial listening abilities are of particular importance in a classroom environment, where children are often faced with the task of listening to a speaker, i.e. the teacher, in the presence of competing background noise. Accordingly, deficits in spatial listening have been suggested to be a major cause of classroom listening difficulties in children with no other cognitive or sensory impairments (Cameron & Dillon, 2008).

Otitis media with effusion (OME) is a common childhood condition associated with inflammation and fluid build-up in the middle ear and consequent conductive hearing loss. It has been suggested that childhood OME may have long-term effects on some aspects of CAP and language development even after the condition and consequent hearing loss has resolved, though the issue is somewhat controversial (see e.g. Roberts et al., 2004; Gravel et al., 2006). However, the spatial listening abilities of young children with a history of OME have not been extensively studied.

The Listening in Spatialized Noise–Sentences (LiSN-S) test assesses the spatial listening abilities of children as young as 6 years (Cameron & Dillon, 2007). It was originally designed for use with children suspected of having a central auditory processing disorder (CAPD), and has been normed for use in both North America and Australia. The test measures speech reception thresholds (SRTs) for target speech in the presence of competing speech that is either spatially separated from the target or spatially coincident with the target. Further, the competing speech may either be spoken by the same speaker or a different speaker from the target. This permits the derivation of difference (or “advantage”) measures, which separately assess the listener’s ability to exploit “spatial” and “talker” (voice) cues in performing the task. Cameron & Dillon (2008) reported that the ability to exploit spatial, but not talker, cues was impaired in children with suspected CAPD, and concluded that spatial listening deficits could be a major cause of CAPD in children.

AIMS and HYPOTHESIS
To assess the performance of young children with a history of otitis media with effusion (OME) in a speech-in-competition task with competing speech that was either spatially separated from or spatially coincident with the target.

It was hypothesised that such children would exhibit a particular deficit in performance when the competing speech was spatially separated from the target.

METHODS
Participants
- Seventeen 6 year-old children with a history of OME sufficient to meet criteria for surgical insertion of ventilation tubes (two medically documented episodes of OME at least three months apart)
- English as first language
- No known history of cognitive delay or neurological disorders
- No known history of otitis media or effusion
- No known history of cognitive delay or neurological disorders
- No known history of otitis media or effusion
- No known history of cognitive delay or neurological disorders

Procedures
- Parent-completed questionnaire, brief case history, otoscopy, tympanometry, pure-tone (air conduction) audiometry
- Administration of the LiSN-S test in all four standard conditions
- The conditions of primary interest and the measures derived from them are illustrated in Figure 1
- Test results were converted to age-adjusted standard scores using published norms incorporated into the test software

RESULTS
Figures 2 - 4 show distributions of three key measures relating to speech-in-competition performance of the tested participants, represented as age-adjusted standard scores. Tests of normality indicated all three measures were normally distributed. Results were compared to the norms using one-sample t-tests with a test value of 0.

DISCUSSION and CONCLUSIONS
The results support the hypothesis that young children with a history of OME exhibit a particular deficit in recognising target speech in the presence of competing speech when the competing speech is spatially separated from the target, but not when it is spatially coincident with the target.

These findings are consistent both with past studies that have reported deficits in some aspects of CAP and/or language development in young children with a history of OME, and with studies that have reported deficits in “spatial advantage”, but not in “talker advantage”, in children with suspected CAPD.

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REFERENCES