# 919
## Relationships between Spatial Hearing Ability, Speech-in-Noise Intelligibility, Language, and Non-Verbal Intelligence in Children who use Bilateral Cochlear Implants

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## ABSTRACT
In recent years there has been an increasing trend toward providing children with bilateral cochlear implants. A primary reason to implant both ears is to benefit from increased spatial hearing abilities. The current study assessed speech intelligibility and spatial hearing in children who have received bilateral cochlear implants. MAAs were measured at different angles, and signal-to-noise ratios were manipulated. Significant differences were found between the two ears, with MAAs improving with increasing bilateral experience. These findings support previous research indicating that children with bilateral implants have improved spatial hearing abilities.

## INTRODUCTION
- Cochlear implants can provide electric hearing to persons who are deaf; bilateral cochlear implants (BICI) are becoming increasingly common, especially in children.
- Sound processors of cochlear implants are not synchronized, however, which is one of the ways brain processors process information in typically-hearing persons by capitalizing on timing and level differences between the ears.
- Previous research suggests that many children who use BICI have better sound localization abilities than children who are unilaterally implanted (Litovsky et al., 2006).
- It is uncertain how much experience with BICI is necessary to achieve sound localization and spatial hearing, two abilities known to rely on binaural input.
- It is unknown whether children who have increasingly greater amounts of BICI experience can achieve spatial hearing thresholds similar to those of typically-hearing children.

### Purpose
To determine whether the use of bilateral implants improve spatial hearing and localization in children with varying amounts of auditory experience, and whether this ability improves with increasing bilateral experience.

To assess other variables that may contribute to the variability across children, in the present study, chronological age, hearing age, early auditory experience, and cognitive and language variables were assessed.

### Participants
20-47 year-old children who use BICI; 13 F, 7 M
- Unilaterally Implanted by 3.5 years
- Bilaterally Implanted by 6 years
- Native English speakers with oral language instruction

- Children had varying amounts of bilateral experience
- Tested at 3-6 months post 2nd CI activation (n=3); 11-15 months (n=6); 24-27 months (n=6); and 36-56 months (n=6)
- 11 children were implanted unilaterally <18 months of age; 9 implanted >18 months of age
- Hearing age: unilateral experience = any acoustic hearing experience
- 9 typically developing children, 4-5 years old (MIA)
- First year data from a 4-year longitudinal study

## RESULTS: Impact of Early Auditory Experience on Language

### Table 1: Demographic Characteristics and Results of Standardized Measures

<table>
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<th>Age (Yrs)</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
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<tr>
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<td>36.0</td>
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</tbody>
</table>

### Hearing Age (Yrs) (n=6)
- Mean = 2.9
- SD = 1.7

### Non-Verbal Intelligence (n=6)
- Mean = 105.6
- SD = 14.5

### Core Language (n=6)
- Mean = 116.8
- SD = 19.1

### Listening Comprehension (n=6)
- Mean = 117.6
- SD = 19.2

### Speech Comprehension (n=6)
- Mean = 119.0
- SD = 15.5

### Implanted before 18 Months of Age?
- Yes = 11
- No = 9

## CONCLUSIONS
Early implantation impacts receptive and expressive language ability, supporting previous research indicating that children with bilateral experience have improved spatial hearing abilities; 9 children with bilateral cochlear implants could not perform the MAA task.

## REFERENCES


## ACKNOWLEDGEMENTS
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