

# EARLY CHILDHOOD INTERVENTION AND STUDENT SERVICES 2016 OUTCOMES RESULTS

NO LIMITS FOR CHILDREN WHO ARE DEAF



—  
**95%**

of Cora Barclay Centre students complete mainstream schooling

## ABOUT THE CORA BARCLAY CENTRE

**The Cora Barclay Centre is the oldest and most comprehensive dedicated Listening and Spoken Language (LSL) program in Australia providing intensive, evidence-based intervention through Auditory-Verbal Therapy (AVT).**

The aim of the Cora Barclay Centre is to help children who are deaf or hearing impaired, achieve life-long social and emotional well-being and economic independence.

The Centre provides evidence-based, multi-disciplinary services for children who are deaf or hearing impaired, the majority of whom are fitted with hearing aids, cochlear implants or other listening devices. Programs include early childhood intervention, student services, social participation programs, and ongoing monitoring and assessment to children from birth to 18 years and their families.

Thanks to early diagnosis and continuing advances in hearing technologies, the vast majority of children attending the Cora Barclay Centre (and other First Voice centres\*) who have no additional disabilities, achieve speech, language and comprehension that is comparable to children of the same age by the time they go to school.

\* First Voice is the national voice for six centres providing listening and spoken language early childhood intervention for children with hearing loss in Australia and New Zealand. Members are the Cora Barclay Centre (SA), Hear and Say (QLD), The Shepherd Centre (NSW/ACT), Taralye (VIC), Telethon Speech and Hearing (WA) and the Hearing House (NZ). First Voice champions the right of all deaf people to listen and speak.

—  
**1 in 300**

children are affected by hearing loss by the age of 5 years<sup>1</sup>

## HEARING LOSS

Permanent childhood hearing loss can be congenital, late-onset, progressive, or acquired in nature.

Congenital hearing loss refers to hearing loss that is present at birth and is often identified through Universal Newborn Hearing Screening conducted shortly after birth.

The Cora Barclay Centre defines late diagnosis as congenital hearing loss diagnosed after 12 months of age.<sup>2</sup>

The Cora Barclay Centre 2016 Outcomes report highlights the positive outcomes for children who are deaf or hearing impaired who are identified early and commence an appropriate early childhood intervention program in a timely manner. However, the report also emphasises the additional challenges for children late diagnosed or late in commencing Early Childhood Intervention services at the Cora Barclay Centre. In addition to late diagnosis and/or commencement of service, other factors can contribute to outcomes below the average range. Including:

**Presence of an additional disability**

**Culturally and Linguistically Diverse background**

**Family engagement to early childhood intervention and capacity to implement strategies in all communication settings**

**Presence of an additional speech and language disorder not related to hearing loss.**

**Length of time optimally aided with hearing aids or cochlear implants**

**Consistency of wear of amplification device/s**

The Cora Barclay Centre supports many children who experience one or more of the above factors and their assessment results have been included with the exception of those children who were unable to participate in standardised testing.

<sup>1</sup> 2 per 1,000 live births is the estimated rate of permanent childhood hearing loss that is identified at, or very close to, birth. By the time each 'birth cohort' has reached 5 years of age, this rate has risen to approximately 3 per 1,000 children.

<sup>2</sup> [www.asha.org/Practice-Portal/Clinical-topics/Permanent-childhood-Hearing-Loss/](http://www.asha.org/Practice-Portal/Clinical-topics/Permanent-childhood-Hearing-Loss/)

# 92%

of children with permanent hearing loss are born to hearing parents.

*Mitchell & Karchmer, 2004*

## CORA BARCLAY CENTRE ASSESSMENT PROTOCOLS

In February 2010, the Cora Barclay Centre introduced a new standardised assessment protocol as part of the First Voice early childhood intervention outcome measures. This protocol assesses the speech, language and vocabulary development of children aged 9 months to 5 years enrolled in the Early Childhood Intervention Auditory-Verbal Therapy (AVT) Program.

From 2015, the Cora Barclay Centre extended the standardised assessment protocol to include students of school age from 5 years to 18 years measuring progress at different ages as part of the First Voice research.

### The purpose of assessment is:

- To obtain objective measurements** of each child's speech and language development to form their individual therapy plan.
- To enable objective comparisons** between children who are deaf or hearing impaired undertaking the Cora Barclay Centre AVT Program and children with normal hearing of the same age in order to determine if their spoken language skills are equivalent to the general population.
- To monitor and evaluate** the effectiveness of Cora Barclay Centre therapy programs.

78 children aged between 6 months and 12 years who were enrolled in the AVT Early Childhood Intervention (ECI) or Student Services (SS) program at the Cora Barclay Centre were assessed from January 2016 to the end of December 2016.

The key assessment tools used by the Cora Barclay Centre were:

Preschool Language Scale Edition 5 (PLS-5)

Clinical Evaluation of Language Fundamentals Preschool Edition (CELF-P2)

Peabody Picture Vocabulary Test Edition 4 (PPVT-4)

Clinical Evaluation of Language Fundamentals Edition 4 (CELF-4)

Goldman Fristoe Test of Articulation (GFTA).

### The assessment protocols are as follows:

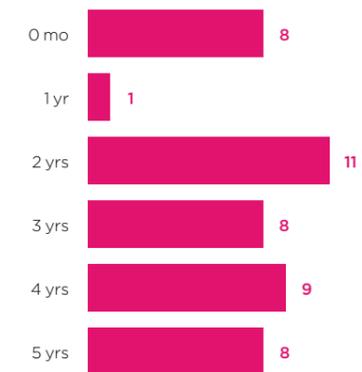
	6 months post fit	12 months post fit	24 months post fit	3;0	4;0	5;0	9;0	12;0
Language	PLS-5	PLS-5	PLS-5	PLS-5	CELF-P2	CELF-4	CELF-4	CELF-4
Vocabulary				PPVT-4	PPVT-4	PPVT-4		
Articulation				GFTA	GFTA	GFTA	GFTA	GFTA

## EARLY CHILDHOOD INTERVENTION

### Number of Children by Assessment Age

**Figure 1:** Number of children in the Early Childhood Intervention (ECI) program assessed by assessment age.

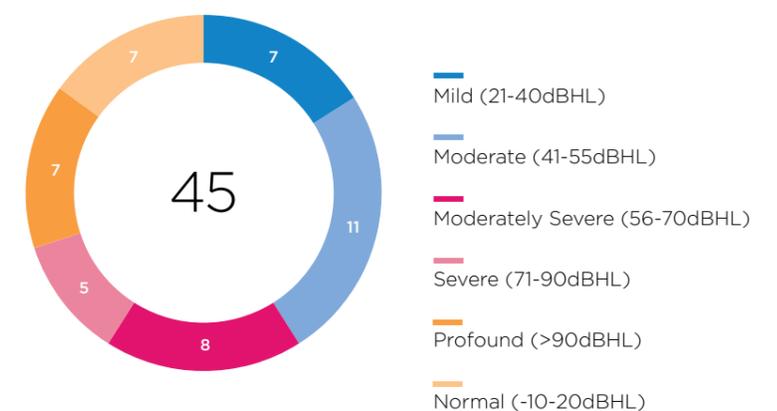
A total of 45 children in the Early Childhood Intervention program were assessed.



### Severity of Hearing Loss in the Better Ear

**Figure 2:** Degree of hearing loss based on 4 pure tone average of children assessed in the Early Childhood Intervention (ECI) program.

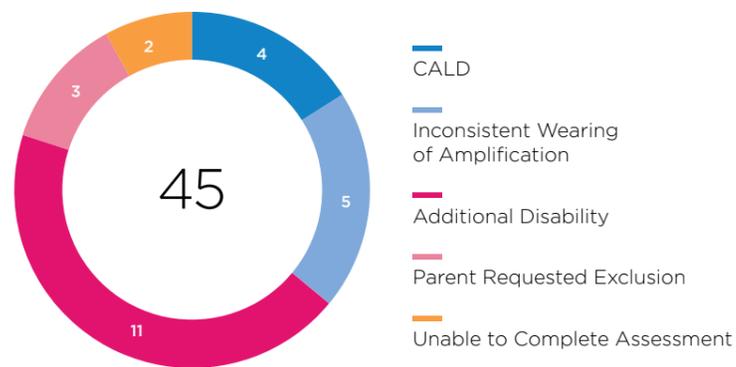
The percentage of children with either a profound or mild hearing loss was equal (15.5%). The majority of children had a moderate loss (25%) with the second largest group being children with a moderately severe loss (17.5%). Children with a severe loss were the smallest group (11%). Children with normal hearing in one ear were the third largest group (15.5%).



**Children Not Included in Assessment Results**

**Figure 3: Breakdown of children unable to be assessed in the Early Intervention (ECI) program.**

25 children in the Early Childhood Intervention program were not included in the results for a number of reasons:	Eleven children had additional disabilities. Some of these children were able to complete sections of the assessments to inform clinical practice and celebrate their growth but required additional scaffolding, such as repetition, in order to participate. Some children with additional disabilities could not participate in formal assessment.
Four (4) children were from a Culturally and Linguistically Diverse background (CALD) and had completed a standardised assessment but the results could not be formally reported as the assessment instructions were interpreted into the child's first language by the parent.	Three parents requested that their children did not have standardised assessments.
Five (5) children were inconsistent wearers of amplification devices so did not have their assessment results included in the data.	Two children were not able to participate in standardised assessment due to late optimal amplification and were at the very beginning stages of learning to listen and speak.



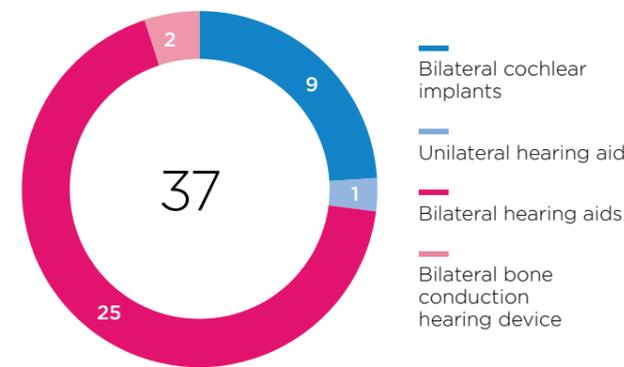
**Hearing Devices**

**Figures 4 and 5: Hearing devices worn by children in the Early Childhood Intervention (ECI) program who were assessed.**

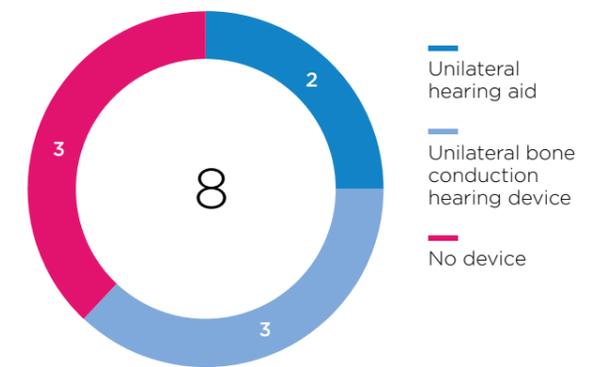
The percentage of the different hearing devices worn by children in the Early Childhood Intervention program who were assessed is as follows:

Bilateral hearing aids	55%
Bilateral cochlear implants	20%
Bilateral bone conduction hearing device	4%
Unilateral hearing aid	7%
Unilateral bone conduction hearing device	7%
No device	7%

**Bilateral**



**Unilateral**



# PRESCHOOL LANGUAGE SCALE EDITION 5 (PLS-5)

The PLS-5 is divided into 2 parts:

**1**  
Auditory Comprehension which assesses the understanding of spoken language; and

**2**  
Expressive Communication which assesses the child's verbal language.

Both parts of the assessments are used to calculate the total language score.

The PLS-5 is a norm-referenced assessment which provides standard scores, percentiles, and age equivalent scores for children from birth to six years. Standard scores have a mean or average of 100 and one standard deviation is a difference of 15. Therefore children who score between 85 and 115 fall within one standard deviation of the mean of 100. Sixty-eight percent (68%) of the population fall within one standard deviation of the mean.

**Figure 6:** Total Language Standard Scores for children aged between 6 months and 4 years who were assessed using the PLS 5 in Early Childhood Intervention.

29 (64%) children were assessed using the PLS-5.

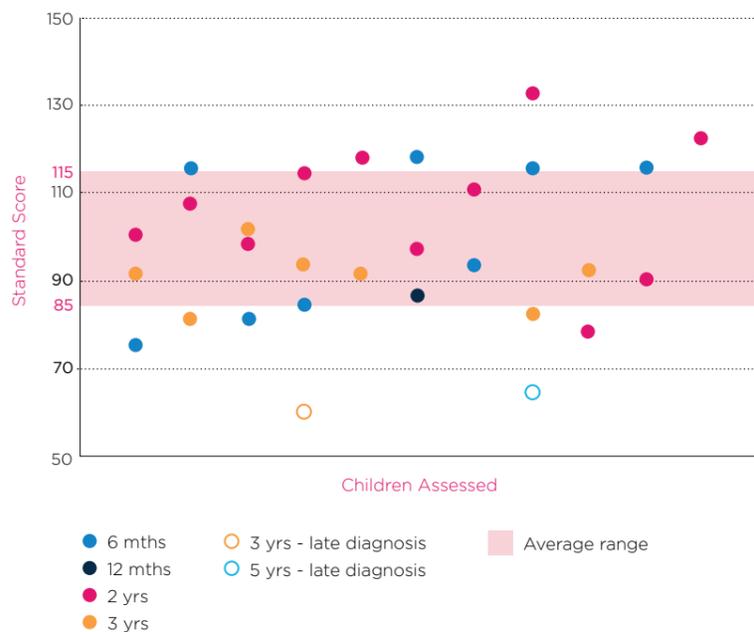
**Results found:**

72% of the children assessed scored within the average range or above.

47 children were of eligible assessment age however of this group:

21% had additional disabilities and could not be included as they were unable to participate in standardised testing.

4% were late to optimal amplification and could not be assessed due to not meeting the minimum language requirements.



# CLINICAL EVALUATION OF LANGUAGE FUNDAMENTALS - PRESCHOOL EDITION 2 (CELF-P2)

The CELF-P2 Australian identifies children with delayed or disordered language from ages 3 to 6.11 and assists in determining the student's language strengths and weaknesses in:

- Receptive Language
- Expressive Language
- Language Structure
- Language Content

The test provides information about a child's understanding and use of spoken language by assessing the components of spoken language such as following instructions, sentence formulation, grammar, vocabulary and understanding of basic concepts.

The standard score system for the CELF-P2 is similar to the PLS-5, in that it has a mean or average of 100 and one standard deviation is a difference of 15. Therefore, children who score between 85 and 115 fall within one standard deviation of the mean of 100 and are within the 'average range'. Sixty-eight percent (68%) of the population fall within one standard deviation of the mean.

**Figure 7:** Core Language Scores for children aged 4 to 5 years who were assessed using the CELF P2 in the Early Childhood Intervention (ECI) program.

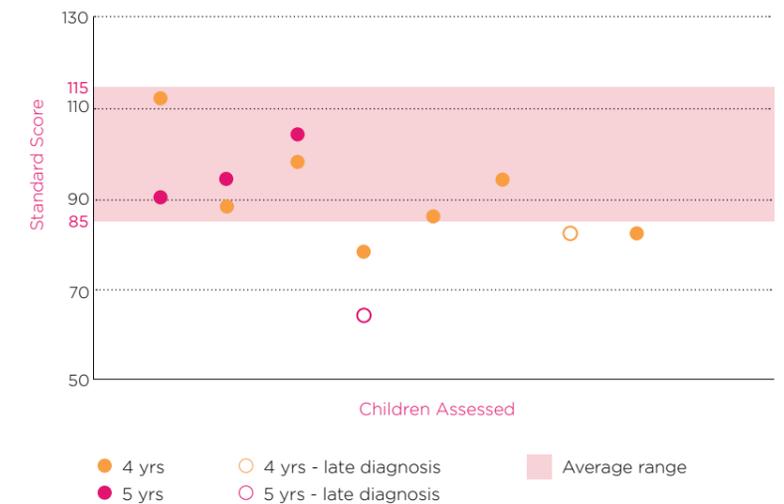
12 (27%) children were assessed using the CELF-P2

**Results found:**

67% of children scored within the average range or above.

2 of the 12 children in the assessment group (17%) were late diagnosed. Two of these children fell below the average range.

A total of 28 children were of eligible assessment age however of this group, 17% had additional disabilities and could not be included as they were unable to participate in standardised testing.



## PEABODY PICTURE VOCABULARY TEST EDITION 4 (PPVT-4)

The PPVT-4 tests a child's understanding of words used to name objects and describe actions and attributes. It is a norm-referenced assessment of vocabulary which provides standard scores, percentiles, and age-equivalent scores from early childhood to adulthood.

The standard score system for the PPVT-4 is similar to the PLS-5, in that it has a mean or average of 100 and one standard deviation is a difference of 15. Therefore, children who score between 85 and 115 fall within one standard deviation of the mean of 100 and are within the 'average range'. Sixty-eight percent (68%) of the population fall within one standard deviation of the mean.

**Figure 8:** Receptive vocabulary aged 3 to 5 years who were assessed using the PPVT-4 in the Early Childhood Intervention (ECI) program.

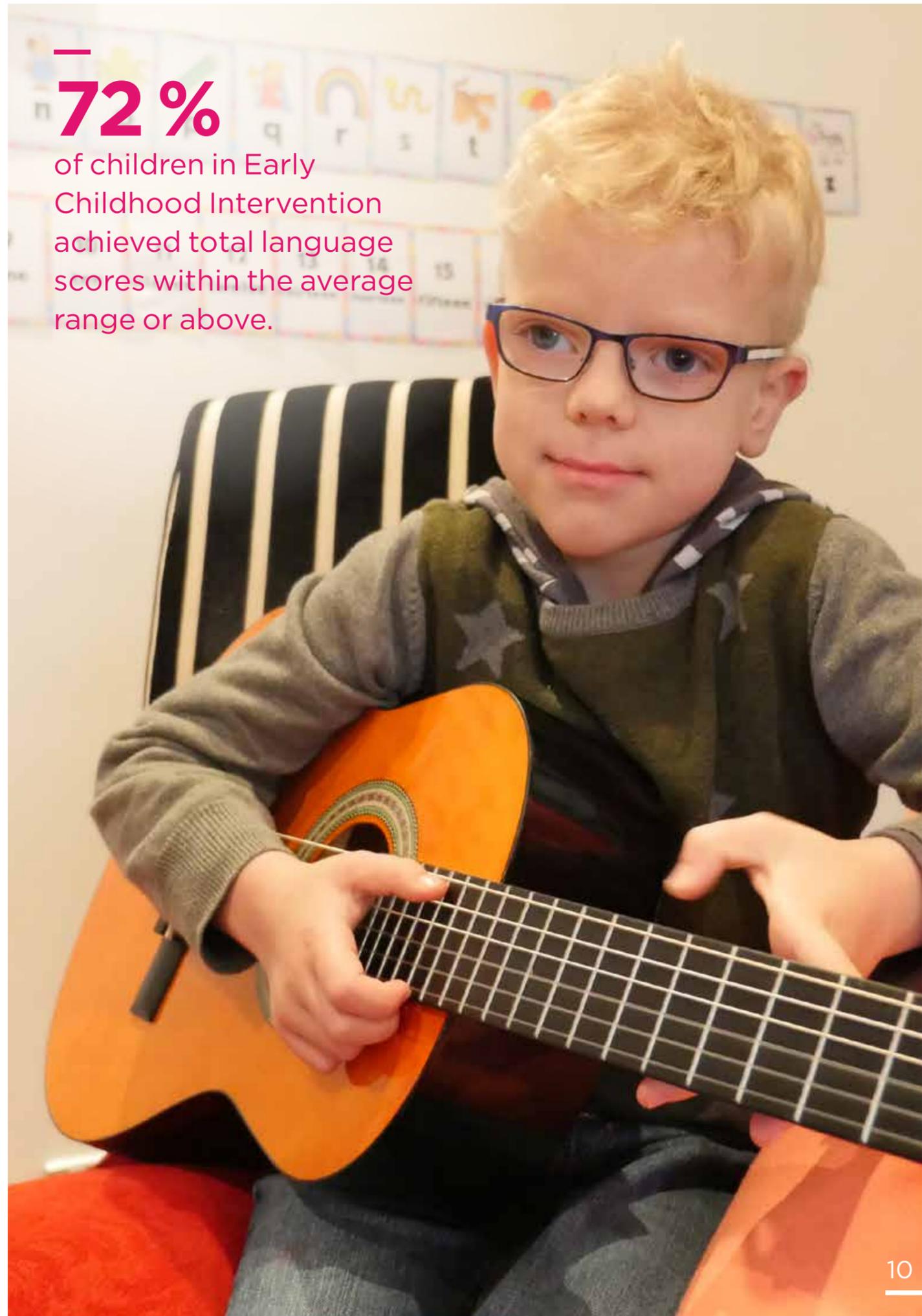
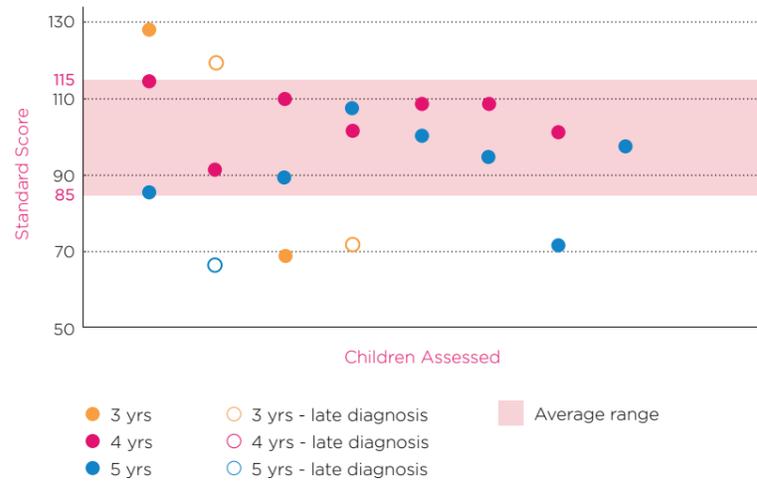
19 (42%) children were assessed (Ages 3 to 5 years) using the PPVT-4.

**Results found:**

79% of children scored within the average range or above.

3 of the 19 children were late diagnosed of which 1 scored within the average range and 2 fell outside the average range. An additional 4 children could not be formally assessed due to not meeting the minimum language requirements.

6 of the 37 children in the eligible assessment age group (16%) had an additional disability and could not be included as they were unable to participate in standardised testing.



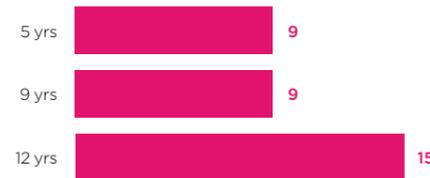
**72%** of children in Early Childhood Intervention achieved total language scores within the average range or above.

# STUDENT SERVICES

## Number of Children Assessed in Student Services by Assessment Age

**Figure 9:** Number of children in Student Services (SS) assessed by assessment age.

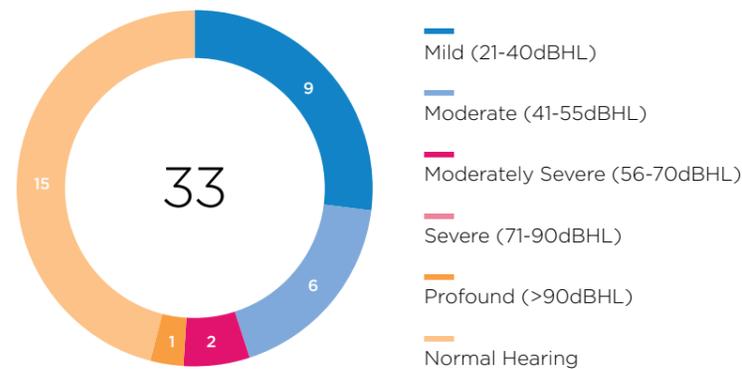
A total of 33 children in Student Services were assessed



## Severity of Hearing Loss in the Better Ear

**Figure 10:** Degree of hearing loss of children based on 4 pure tone average of children assessed in Student Services (SS).

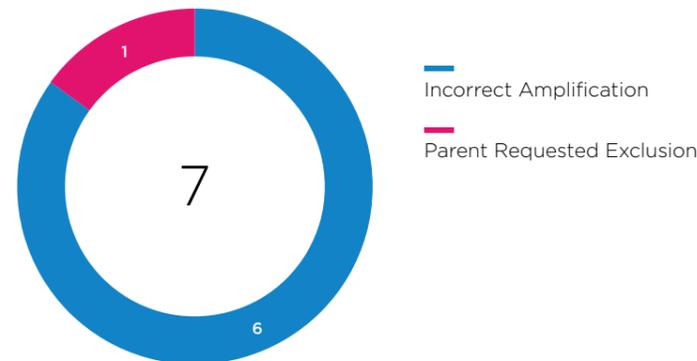
A large proportion of children had a mild (27%) or moderate (18%) loss. No children had a severe loss, 6% had a moderately severe loss and 3% of the children had a profound loss. The majority of the children (46%) had normal hearing in one ear.



## Children Not Included in Assessment Results

**Figure 11:** Breakdown of children in Student Services (SS) who were not included in the assessment results.

A total of 7 children in Student Services were not included in the assessment results because six of the children were not consistent users of their hearing devices and the parents of 1 child requested their child be excluded.



# STUDENT SERVICES

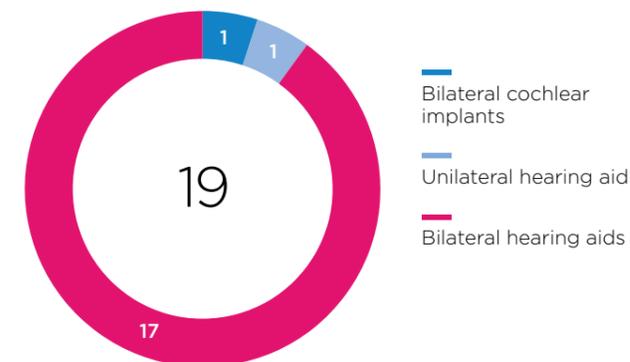
## Hearing Devices

**Figures 12 and 13:** Hearing devices worn by children in Student Services (SS) who were assessed.

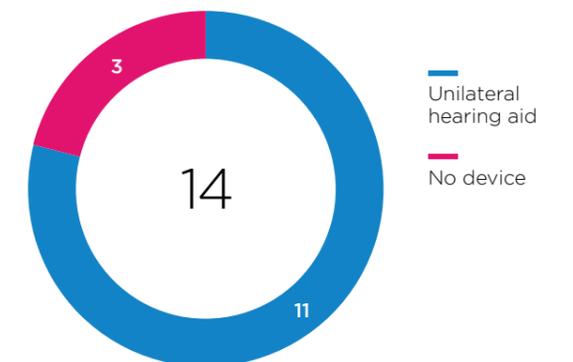
The percentage of hearing devices worn by children in Student Services who were assessed is as follows:

Bilateral hearing aids	52%
Bilateral cochlear implants	3%
Bilateral loss, unilateral hearing aid	3%
Unilateral hearing aid	33%
No device	9%

### Bilateral



### Unilateral



# CLINICAL EVALUATION OF LANGUAGE FUNDAMENTALS - 4 (CELF-4)

The CELF-4 Australian identifies children with delayed or disordered language from ages 5 to 21 and assists in determining the student's language strengths and weaknesses in:

- Receptive Language
- Expressive Language
- Language Structure

### Language Content

### Language Memory

### Working Memory

The test provides information about a child's understanding and use of spoken language by assessing the components of spoken language such as syntax, semantics, vocabulary, memory and comprehension.

The standard score system for the CELF-4 is similar to the PLS-5, in that it has a mean or average of 100 and one standard deviation is a difference of 15. Therefore, children who score between 85 and 115 fall within one standard deviation of the mean of 100 and are within the 'average range'. Sixty-eight percent (68%) of the population fall within one standard deviation of the mean.

**Figure 14:** Total Language Standard Scores for children aged 5, 9 and 12 years who were assessed using the CELF-4 in Student Services (SS).

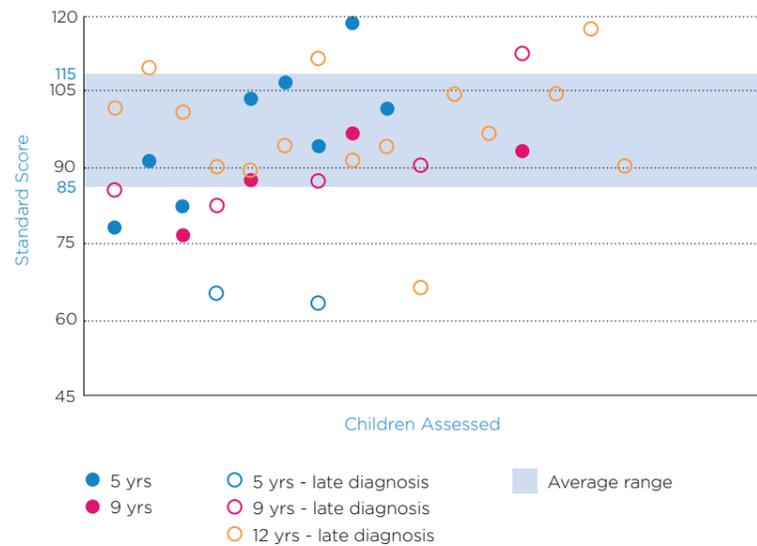
Of the 34 children assessed 4 (12%) were in Early Childhood Intervention and transitioning to school and 30 (88%) were in Student Services.

**Results found:**

76% of children scored within the average range or above.

65% of those assessed were late diagnosed

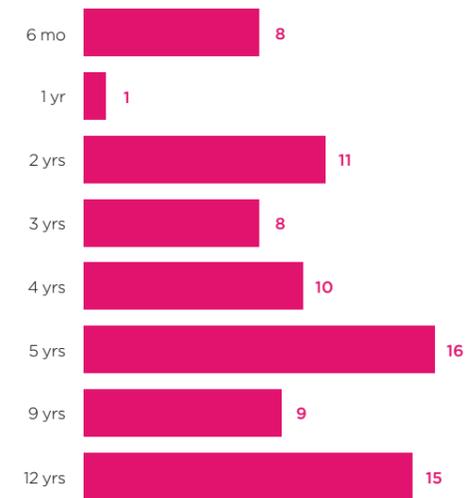
All children in Student Services met minimum language requirements and could participate in assessments regardless of late diagnosis and/or commencement of service, consistency of amplification use or additional disabilities.



# TOTAL ASSESSMENT COHORT

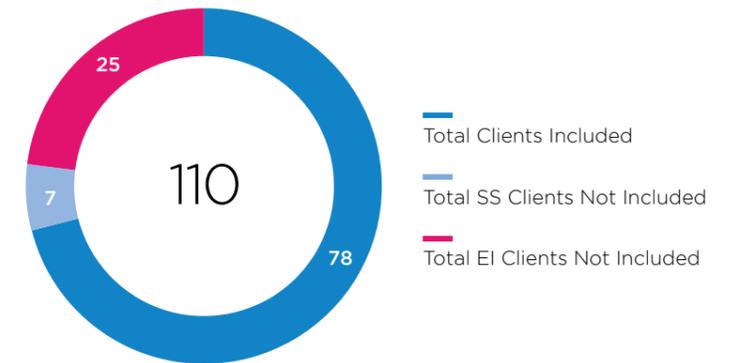
**Figure 15:** Number of children assessed in 2016, grouped by assessment age.

A total of 78 children were assessed using standardised assessments in 2016. Not all children were assessed using the entire battery of assessments. 45 children were in Early Childhood Intervention and 33 were in Student Services.



**Figure 16:** Total number of children receiving services that were included or not included from the 2016 outcome report.

Of the 110 children eligible for assessment 78 (71%) were included for analysis.



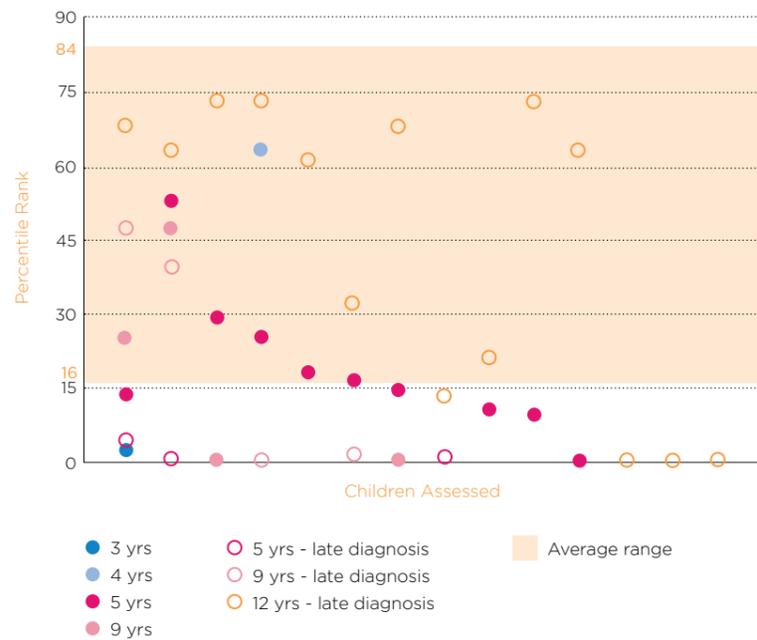
# GOLDMAN FRISTOE TEST OF ARTICULATION

The GFTA is a norm-referenced assessment of articulation which provides standard scores and percentiles from early childhood to adulthood. The test provides information about a child's articulation ability by sampling both spontaneous and imitative sound production of consonants. The distribution of errors is greatly skewed across ages and does not approach a normal distribution at most ages. Therefore it is better to refer to the percentile rather than the standard score when interpreting results for this particular assessment.

A percentile is a way of comparing a child's score to scores obtained by other children of the same age. For example, a percentile rank of 5 indicates that out of 100 of the same age children, that child is performing at the same level or better than 5 out of 100 children. A percentile between 16 and 84 indicates abilities that are within the average range. Percentiles below 16 represent some developmental delay or impairment. Percentiles below 3 indicate a significant degree of delay or impairment.

**Figure 17:** Percentiles for children aged 3 to 12 years who were assessed on the GFTA.

37 (47%) children were assessed (ages 3 to 12 years) with the Goldman Fristoe Test of Articulation.



# GOLDMAN FRISTOE TEST OF ARTICULATION CONT.

**Results found:**

54% of children had a percentile rank within the average range.

21 (57%) of the 37 children assessed were late diagnosed. Of those, 9 (43%) scored below the average range. An additional 2 children could not be formally assessed due to not meeting the minimum language requirements.

1 (3%) of the 37 children assessed had an additional disability. This child fell outside the average range. An additional 11 children could not be formally assessed due to not meeting the minimum language requirements.

Children who are deaf or hearing impaired require optimal auditory access in order to develop their speech. The age that a child is fitted with hearing aids or cochlear implants directly impacts on the time taken to achieve the same speech outcomes as their peers. A child may be 4 years of age but only have a hearing age of 2.5 years, as a result, it would be expected that their speech production would be that of a 2.5 year old. Given the appropriate amount of time, children with a hearing loss can develop expected speech outcomes.

Hearing loss is one physical cause for delayed or disordered speech production. Errors for the students aged 5 to 12 who scored lower than 16th percentile revealed lower scores for the following reasons:

Delayed phonological process was the most common reason for a lower score due to typical developing speech processes (tat for cat) continuing to be used beyond the expected age. Most frequently in the children aged 9 and 12 the /w/ for /r/ sound (wed for red) and /f/ for /th/ sound (fwee for three) were still used.

An interdental or a lateralised lisp was another common error produced by 5, 9 and 12 year olds. There is not a clearly known cause for lipping but a high frequency hearing loss may impair a child's ability to hear and correctly imitate the /s/ sound. Mouth breathing as a result of frequent upper respiratory illnesses can cause children to speak without closing their mouths completely resulting in a lisp developing.

Less frequent, but contributing to lower scores, were atypical speech errors such as backing - "wed" for "web" or "jebwa" for "zebra".

# 2016 ASSESSMENT RESULTS

72% of children formally assessed in Early Childhood Intervention achieved spoken language outcomes consistent with the general population.

Within the Early Childhood Intervention Program 35% of children were unable to be assessed as they did not meet minimum language requirements for assessment. However, by the commencement of school, the entire Cora Barclay Centre cohort met minimum language requirements and could be formally assessed according to international standards.

79% of children formally assessed in Student Services achieved spoken language outcomes consistent with the general population.

Timely commencement of Early Childhood Intervention services is a critical factor for children's development to follow a typical pathway. Children at the Cora Barclay Centre, when given the intensive support required in early childhood intervention and at school, can bridge the gaps to reach their full potential.

## National Comparison

First Voice is an Australian and New Zealand association for centres providing listening and spoken language early childhood intervention services for children with hearing loss, of which the Cora Barclay Centre is a member. First Voice advocates for world-class early childhood intervention services that give deaf children the listening and spoken language skills necessary to achieve mainstream education, employment of choice and social integration within the hearing world.

At the national level, all five Australian First Voice centre's follow the same standardised assessment protocols yielding a consolidated national outcomes database of over 700 children in our listening and spoken language programs. Analysis of the First Voice clinical database shows outcomes very similar to those reported above, providing further validation of the effectiveness of listening and spoken language early childhood intervention as practiced in Australia.

## SUMMARY

These outcomes demonstrate that children who are deaf or hearing impaired and who participate in listening and spoken language early childhood intervention programs have excellent prospects of learning to listen and speak fluently which can lead to attendance in mainstream schools; completion of secondary education or other vocational pathways and ultimately attainment of high levels of social and emotional well-being and economic independence.

The results reinforce the critical importance of early diagnosis and early childhood intervention on listening and spoken language outcomes and the continuing need for ongoing intervention at school age to ensure any gaps in language are addressed. The data demonstrates that a higher percentage of students diagnosed after 12 months of age are now performing with a standard score within or above the average range and the critical importance of ongoing intervention.

These results have identified a need to develop an assessment protocol for children with additional disabilities to ensure that progress is appropriately measured and programs can be tailored accordingly. Individualised programming at the Cora Barclay Centre ensures that progress is achieved at a rate appropriate to each child.





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