

## **PLUM and HATS: Helping to detect children with hearing loss from otitis media**

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Children are born ready to learn. How their brain develops is strongly affected by their early experiences with other people and the world around them. There is good evidence on the importance of the first thousand days on lifetime outcomes (Moore et al, 2017). It is also clear that chronic stressors in early childhood can have cumulative lifetime effects on learning and health. Even one chronic condition in early childhood reduces a child's readiness for school (Bell et al, 2016). Language differences associated with socioeconomic status have been documented as early as 18 months (Fernald et al, 2013). The NSW first 2000 days framework reported that about 42% of Aboriginal and Torres Strait Islander children are at risk of developmental delay at school entry (NSW Health, 2019).

A chronic condition that occurs in many Aboriginal and Torres Strait Islander children is otitis media (OM). Although middle ear infection is one of the most common childhood infections, OM tends to occur earlier in life, tends to be more severe and persists longer in Aboriginal and Torres Strait Islander children than in non-Indigenous children (Williams & Jacobs, 2009; State of Queensland, Australia, 2016). Chronic, severe OM at an early age with associated hearing loss reduces access to sounds. Inconsistent or deficient inputs to the ears at a critical period of development impair the formation of neural circuits in the brain for cognitive and language development (Werker & Tees, 1984).

### **Identifying vulnerable children and informing action**

The presence of childhood hearing loss has a negative impact on children's development and lives. Early identification of permanent childhood hearing loss enables early intervention to reduce the impact of the hearing loss. To detect infants born with hearing loss, universal newborn hearing screening is implemented in Australia, as in many other parts of the world. Once diagnosed, hearing intervention including hearing assessments and rehabilitation are provided by Hearing Australia, a government funded organisation, to all families of children at no cost in Australia. There is now solid evidence to show that early detection and intervention for hearing loss are effective for improving children's language outcomes at a population level (Ching et al, 2017). Early hearing promotes cognitive development that underpins early language development (Ching et al, 2019).

In Aboriginal and Torres Strait Islander communities, many children born with typical hearing suffer from OM, some as early as 8 weeks old (Bowell et al, 1995; Kong & Coates, 2009). This can present as a readily detectable and severe form of OM, chronic suppurative otitis media. More commonly, OM presents as the less readily detectable form, otitis media with effusion (OME). As OME persists, the viscosity of the fluid increases. Children who have OME for more than 12 months almost certainly have high viscosity fluid or glue ear (Pichichero 2018). This condition can last up to 2.7 years on average in Aboriginal and Torres Strait Islander children (Williams & Jacobs, 2009). Despite the ongoing condition with associated hearing loss, it can go undetected and untreated until a child exhibits learning deficits in school (Hearing Australia, 2018). Post-UNHS hearing assessments at a population level are not available, and standard hearing assessments for young children require skilled

audiologists and special equipment that are often not readily accessible. Screening, early identification, and linkage to services at an early age can prevent vulnerable children at low risk from progressing to levels of higher risk.

Primary health and early education workers are well-positioned to screen and identify children with listening problems early, promote family strengths, and refer to services. Timely referral and early treatment can help children at risk to reach their full potential by returning them to healthy development of listening and communication skills. In current practice, primary health practitioners ask parents whether they have concerns about their child’s hearing during annual child health checks. Anecdotal evidence suggests that parents and caregivers may find this question difficult to answer, particularly in the context of communities that have experienced ear and hearing trouble over generations. Further, the signs of not hearing well may sometimes be misinterpreted as misbehaviour or ‘normal naughtiness.’

Primary health and early education workers need to have valid and reliable tools that empower them to work with parents of young Aboriginal and Torres Strait Islander children to screen and identify children who may be at risk. The tools need to be simple, quick, and easy to interpret (Fletcher & Hall, 1992). They need to be validated for use with families of young Aboriginal and Torres Strait Islander children. The tools need to be culturally appropriate, and normative data need to be available. There were no such tools (Gan et al, 2018). We addressed this gap by developing and validating the PLUM and HATS tools ([www.hearhappy.nal.gov.au](http://www.hearhappy.nal.gov.au) ).

### Hearing and Listening: The PLUM

The PLUM, or Parents’ evaluation of Listening and Understanding Measure, is an adaptation of the Parents’ Evaluation of Aural/oral performance of children (PEACH). The PEACH has been developed and validated for use with young children who have typical or impaired hearing in the general population. Normative data and test-retest reliability are available (Ching & Hill, 2007). There is research evidence to show that the PEACH scores at 12 months after amplification was a significant predictor of later language abilities of children with hearing loss (Ching et al, 2013).

A co-design approach was employed to adapt the PEACH for use by early education and primary healthcare workers with Aboriginal and Torres Strait Islander families. Together with primary health workers and early childhood teachers from urban, regional and remote Aboriginal and Torres Strait Islander communities, the PLUM was devised. Eighty families in urban and remote Aboriginal and Torres Strait Islander communities participated in the study aimed to collect normative data and to validate the scale. Audiologists conducted standard audiometry



The PLUM

for children whose parents completed the PLUM. The accuracy of the PLUM as a tool for checking hearing of young children exceeds 80%.

## Hearing and Talking: The HATS

The ability to use a spoken language to communicate can be associated with hearing difficulties. The Hearing and Talking Scale (HATS) was developed by drawing on language milestones from the literature to create a simple scale for capturing hearing and talking abilities observed by parents of children at a young age.

A co-design approach was adopted to ensure that the items were culturally appropriate. The HATS was validated in urban and remote Aboriginal and Torres Strait Islander communities by relating the score to standardised language assessments of the same children administered by speech pathologists. The accuracy of the HATS as a screening tool exceeds 80%.

### HATS | Hearing and Talking Scale

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Choose the child's age group. Ask the parent / carer how often they see their child doing these five things: not yet / a little, sometimes or a lot. Circle the best option. Score using the tally box over the page. Use the scoresheet to interpret results.

Child's name \_\_\_\_\_  
DOB \_\_\_\_\_ Date \_\_\_\_\_

0 - 6 MONTHS	7 - 12 MONTHS	1 YEAR
 <p>Does your child react to loud sounds or toys that make sounds? e.g. turns to sound; startles, opens eyes wide</p> <p>NOT YET / A LITTLE   SOMETIMES   A LOT</p>	 <p>Does your child turn to where familiar voices or sounds are coming from? e.g. someone talking on other side of room</p> <p>NOT YET / A LITTLE   SOMETIMES   A LOT</p>	 <p>Does your child understand simple instructions? e.g. 'sit down' or 'kiss now'</p> <p>NOT YET / A LITTLE   SOMETIMES   A LOT</p>
 <p>Does your child show you they can hear your voice? e.g. looks at you, turns to voice</p> <p>NOT YET / A LITTLE   SOMETIMES   A LOT</p>	 <p>Does your child understand words you say a lot? e.g. bye-bye, up, ta</p> <p>NOT YET / A LITTLE   SOMETIMES   A LOT</p>	 <p>Does your child understand simple questions, like 'where's your nose?' or 'who's that?'</p> <p>NOT YET / A LITTLE   SOMETIMES   A LOT</p>
 <p>Does your child make sounds to show that they are happy? e.g. giggles, squeals</p> <p>NOT YET / A LITTLE   SOMETIMES   A LOT</p>	 <p>Does your child use gestures to communicate? e.g. waves or points to show you things</p> <p>NOT YET / A LITTLE   SOMETIMES   A LOT</p>	 <p>Does your child enjoy playing games and taking turns with you? e.g. peekaboo, rolls a ball back and forth</p> <p>NOT YET / A LITTLE   SOMETIMES   A LOT</p>

The PLUM and HATS can be administered via either face-to-face or tele-methods to parents or caregivers of young children below 6 years of age. The tools can be used as part of an assessment battery to indicate whether a child's score is within the normal range, borderline, or in a range requiring clinical referral and intervention.

## Summary

The PLUM and HATS tools help primary care and early childhood practitioners work with parents to detect the presence of a hearing and communication problem in a child. Together with the child's ear health history, otoscopy and tympanometry results, the information help practitioners to determine the hearing healthcare needs of an individual child. Furthermore, the tools can be used not only to detect the presence of hearing problems in a child that may otherwise go unnoticed, but also to engage parents to collaboratively monitor the child's development over their first few years of life.

**Further information and training:** [www.plumandhats.nal.gov.au](http://www.plumandhats.nal.gov.au)

The PLUM and HATS tools and resources are available for free download on the website. Resources include a video on the tools, the PLUM and HATS forms, and a Talking at Home booklet. Webinars for training are also available.

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