Developing the Little Kids' Word List app, a fair assessment tool of communicative development for young Aboriginal children in multilingual families in Central Australia

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Assessment of the language development of Aboriginal children in Central Australia is a major challenge, because little is known about the children's language repertoires and paths of development. The Central Australian language context presents a specific challenge for describing what young children are learning and for developing an appropriate vocabulary assessment tool. National Indigenous policies now have a focus on young children's development, and existing monolingual English language assessment tools are bound to be inaccurate and unfair, either under-reporting knowledge that is present, or under-reporting difficulties children may have. In response, a multilingual 'spoken' MacArthur Bates Communicative Development Inventory (CDI) app, the Little Kids' Word List, has been developed for four of the languages spoken by young children in Central Australia: Eastern & Central Arrernte, Western Arrarnta, Warlpiri and English, and another two languages are being added. The Little Kids' Word List app has been intentionally designed for fairer language assessments of the speech production and comprehension of young Indigenous children in Central Australia. The development processes explored the complex linguistic contexts, multilingual repertoires and cultural practices of the children's families. This is reflected in the content and design of the app, making it appropriate for these young Aboriginal children developing their languages knowledge. In contrast to a monolingual English-based tool developed in different cultural settings, the Little Kids'

Word List app can make visible the Central Australian cohort's languages strengths and knowledge base.

Key words: vocabulary, Indigenous, Warlpiri, Arrernte, Communicative Development Inventory

Introduction: The need for an early childhood vocabulary assessment tool in Central Australia

Assessment of the language development of young Aboriginal children (up to four years old) in multilingual contexts in Central Australia is a major challenge because until now there has not been a language assessment tool available in the languages the children speak in their homes, and little is known about very young children's paths of development in the languages spoken. Questions include, for instance, which words children would be expected to know, and which grammatical structures are produced earlier and later.

Adding to this complex language assessment context, children usually know elements of more than one language, but the degree to which different languages are used differs between families. At one end of the range, children know a few words in an additional language, and at the other end, children know many words and grammatical structures in two or more languages. However, in all of these learning situations, if a child's multilingualism is not acknowledged there could be inaccurate interpretations of the child's performance on a monolingual L1 English language development assessment tool.

Non-indigenous health staff members' own language repertoires do not usually overlap with those of children and families, and they might not have demographic data or questionnaires to elicit family language backgrounds, or to interpret family responses accurately. Indigenous staff might not know all of the children's languages fully. In addition, remote communities are dynamic sites of language contact, and the repertoires of speakers in many communities are under-described.

Children learn to speak the way others speak to them, learning the languages that are spoken to them and in their hearing. This means that to assess a child's language

development evaluators need to know how families speak with the children, because speech within a family indicates what the children will be learning, unless there is a speech or language learning difficulty present. Identifying whether or not a child has a learning difficulty relating to language is a key aim of any early childhood language development assessment. Standardised early childhood language assessment tools that are not based on empirical documentation of the children's and families' everyday languages and multilingual ways of speaking are likely to give misleading results, either under-reporting knowledge that is present, or under-reporting difficulties children may have.

The presence of two targets of the National Agreement on Closing the Gap Refresh policy of 2018 (Commonwealth of Australia, 2018) about Indigenous children's early childhood development, indicates that nurturing and measuring children's progress is a national priority. Target 3 of the policy is that "Aboriginal and Torres Strait Islander children are engaged in high quality, culturally appropriate early childhood education in their early years" and Target 4 that "Aboriginal and Torres Strait Islander children thrive in their early years". To engage with "high quality, culturally appropriate early childhood education" and help children to "thrive in their early years" it is necessary to better understand the languages learning contexts in which the children grow up, and the languages they are hearing and learning. The indicator of success for Target 4 is: "By 2031, increase the proportion of Aboriginal and Torres Strait Islander children assessed as developmentally on track in all five domains of the Australian Early Development Census (AEDC) to 55 per cent." However, the AEDC makes an assumption of assessment in English, with a significant reliance on English literacy (Angelo & Hudson 2022; Commonwealth of Australia, 2018). The AEDC acknowledges that children may learn and speak a language other than English, but states that it "cannot always capture more detailed elements of child development that are important across cultures or the skills that children have in other languages" (Commonwealth of Australia: Language Diversity and the AEDC 2012). If children are assessed as developmentally at risk or vulnerable in the early years of schooling due in part to assessments that do not assess the languages they learn and speak, there are negative implications for them engaging with the formal school curriculum. The children's languages strengths may be "invisible" within curriculum assessment tools that do not cater adequately to a child's status as a learner of English as an Additional

Language/Dialect (Angelo & Hudson, 2017: 228; Dixon & Angelo, 2014: 228). Approaches to assessment that assume that a child is learning English as their primary language may lead to unfair and incorrect assessments, that in turn lead to inappropriate actions and curriculum interventions (Angelo & Hudson, 2017; Dixon & Angelo, 2014), as well as a pervasive deficit view of the children's development (Sellwood & Angelo, 2013). It is clear that an increased understanding of the languages learning environments of the children is urgently needed. More comprehensive levels of awareness by early childhood educators would lead to improved delivery of the kinds of learning experiences that are most culturally appropriate for the children.

There is a dearth of assessment tools able to capture the capacities of multilingual children in the years before schooling, and to support their languages and learning development. Tools for L1 English literacy assessment and/or English as an Additional Language/Dialect assessment, which are designed for the early years of schooling, are used or adapted to measure outcomes for the years before schooling, however, they will not provide the necessary support and can potentially be harmful by aiming at language the young children do not hear spoken at home. Development of suitable assessment tools depends on research, such as in the current study, being undertaken into the development of the languages of multilingual children.

Why assess vocabulary?

A young child's knowledge of vocabulary is a useful window onto their language development overall. The vocabulary size of monolingual children has been correlated with later success in reading, and in expressive vocabulary, reading and mathematics outcomes in later primary school (Duff et al., 2015; Bleses et al., 2016). Vocabulary size and the speed of word recognition have been correlated with linguistic and cognitive skills at eight years old (Marchman & Fernald, 2008). These correlations hold even though vocabulary development shows individual variation (Fenson et al., 1994; Heilmann et al., 2005; Reznick & Goldfield, 1992). Therefore, assessment of a child's vocabulary learning provides a window onto their longer term language development. However, it is essential that the assessment tool focuses on the vocabulary a child is actually learning through interactions in their family, featuring words in the languages the child actually hears. It has been shown that counting the total number of words

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known in both of a bilingual child's languages (total summed vocabulary), rather the number of concepts that might be known in one or both languages (total conceptual vocabulary), is likely the best approximant to an assessment of a monolingual child's vocabulary (Core, et al., 2013). When conceptual vocabulary is counted, bilingual children have been seen to have a smaller vocabulary in each language separately (Core, et al., 2013), but there can be differences between receptive and expressive vocabulary (Thordardottir, 2011). In the case of Spanish-English-speaking bilingual children in the USA, Core et al (2013) found that when assessing with total summed vocabulary scores, the bilingual children's vocabulary growth was similar to that of monolingual children. Note, though, that there are very sound reasons for not assuming that monolingualism is the 'gold standard' of language development, and many studies show cognitive and social advantages of bilingualism (e.g. Bialystok, 2007, 2012; Collier & Thomas, 2004; Genesee, 2015).

Until now there has not been a dedicated tool for monitoring children's language development in Central Australia. To monitor combined physical, social-emotional, problem-solving and communicative development for children from 2-66 months of age, some organisations use an international developmental screening tool adapted to be relevant to Aboriginal and Torres Strait Islander children, called ASQ-Trak, adapted from the Ages & Stages Questionnaires®, 3rd edition (ASQ®-3) (D'Aprano et al., 2023). ASQ-Trak includes some questions about communication, but does not include detail about vocabulary or ask which languages are spoken in a family. There are general communication questions, such as whether a young child understands a question, can name objects, or can combine two or three words together. These are valuable diagnostics but do not seek to understand a child's languages knowledge specifically. The CDI tool in focus in this paper would be a useful complement to the ASQ-Trak tool, or a stand-alone language assessment tool. Anecdotal reports suggest that some organisations have at times used word lists created for other populations, reportedly with a sense of frustration. There is therefore an urgent need for a locally-verified language assessment tool that fairly reflects the physical, language and socio-cognitive environments of the children (Angelo, 2013; Cole & Zieky, 2001, p. 40; Khamchuang et al., 2022).

This paper reports on the development of a local, empirically-based early childhood vocabulary evaluation tool, a multilingual MacArthur Bates Communicative Development Inventory (CDI) (Fenson et al., 2007; Fenson et al., 2000) created for four of the languages spoken by young children in Central Australia. It is called the Little Kids' Word List and was developed within the larger Little Kids Learning Languages project (O'Shannessy et al 2022). We also compare the concepts in this and two other Australian CDIs, to investigate whether the early-learned vocabulary of populations with historically similar sociocultural backgrounds show more similarity than those from different sociocultural backgrounds.

Background

First Nations languages use in Central Australia

Languages learning is important to Aboriginal people and differing ways of speaking perform valuable identity functions. Knowledge of languages is valued knowledge in Central Australia (Ross & Baarda, 2017), and children have been shown to have a strong awareness of how people vary their languages, varieties and styles in different situations, as well as a conscious and proud knowledge of elements of more than one language and modality (Browne & Gibson, 2019). Language awareness and languages learning are strengths of Aboriginal families and children. It is important, then, that health and education systems aim to better understand the languages knowledge that children learn and to create tools that measure their language development more fairly (Cole & Zieky, 2001).

Many traditional languages are spoken in Central Australia, in the related Arandic, Western Desert and Ngumpin-Yapa language families, all in the larger Pama-Nyungan language family. Arrernte is the language of Mparntwe, the location of the city of Alice Springs, with Eastern and Central varieties that are very similar to each other (here referred to as Eastern & Central Arrernte), and several Arandic languages are spoken, including, for example, Western Arrarnta, Alyawarra, Anmatyerre, Kaytetye and Pertame. Western Desert languages spoken in the area include Pitjantjatjara/Yankunytjatjara, Luritja and Ngaanyatjarra. Warlpiri is a Ngumpin-Yapa language. A variety of English is spoken in all families to some extent, and for

some people is the main language spoken. Speakers' English recorded in this project has features of General Australian English (Eades, 2012) as well as features of varieties known as Aboriginal English(es), that show some systematic differences from General Australian English varieties (Eades, 2014; Harkins, 1994; Malcolm, 2018; Malcolm & Kaldor, 1991).

Terms used

In this paper the term Aboriginal means the First Peoples whose ancestors have lived on and belonged to the continent for thousands of years; the term Indigenous refers to Aboriginal and Torres Strait Islander peoples of Australia. The term traditional (Australian) language means a language spoken by Aboriginal people since before colonisation. New Indigenous contact languages have emerged in Australia since colonisation, and one relevant to this paper is Kriol, an English-lexified creole spoken in the north of Australia (Sandefur, 1979, 1986; Schultze-Berndt et al., 2013). Three terms refer to English: 'English' means any variety of English spoken in Australia; General Australian English refers to English as spoken as a first language across Australia; and Aboriginal English(es) refer to the varieties of English spoken almost exclusively by Aboriginal people for sociocultural identity and meaning, showing some distinct features (Dickson, 2019; Harkins, 1994; Malcolm, 2018; Malcolm & Kaldor, 1991). Note that varieties of Aboriginal English spoken as a first language in Central Australia are as yet understudied.

The MacArthur Bates Communicative Development Inventory (CDI): An international assessment tool

The MacArthur Bates Communicative Development Inventory (CDI) is a widely-used international tool for assessment of young children's vocabulary development, up to 36 months of age. There are locally-developed CDIs for about 90 languages world-wide, but until now there was only one for an Australian Indigenous language, Kriol (Jones et al., 2020). A CDI, which is authorised by the MacArthur Bates CDI Advisory Board (Fenson et al., 2000), is a list of the most common words that young children up to approximately three years of age are likely to know and say in their home language(s). The CDI presents the words that the children in a specific population hear

addressed to them frequently, and therefore would be expected to have learned if there are no language learning difficulties present.

A CDI is not a standardised test administered to children. It is a self-reporting tool that caregivers complete, providing their own first-hand knowledge of the vocabulary the children understand and produce. It is a very robust model, as primary caregivers know their young children's language repertoires well, and the adults' experience provides a reliable representation of children's comprehension and production (Fenson et al., 2000, p. 95; Heilmann et al., 2005, p. 40). The method allows a relatively rapid evaluation of a child's vocabulary and side-steps problematic performance aspects of eliciting language directly from a young child, such as a child's lack of interest or attention, anxiety, shyness, and so on (Fenson et al., 2000, p. 95). CDIs are used by speech-language therapists and other health clinicians, and researchers, to evaluate a child's vocabulary relative to that of their peer group. CDIs have been used to develop models and assessments for typically and atypically developing populations, and have been used to identify children whose language development is significantly behind that of their peers at as young as two years of age (Heilmann et al., 2005, p. 40). The CDI tool has been found to be useful to practitioners, and accordingly CDIs have been developed for over 90 languages across the world (Fenson et al., 2000), including for Australian English (Jones et al., 2022; Kalashnikova et al., 2016) and te reo Māori in New Zealand (Reese et al, 2018).

A CDI is usually a written list, although there are currently online fillable pdf versions, and these involve reading written words and indicating if a child knows them. CDIs have long and short forms. The long forms contain approximately 500-600 items and caregivers would complete the written form over several days. Short forms have approximately 100-140 words and can be completed in a single session. Some CDIs have one form for younger children, aged up to approximately 18 months, and another form for children aged 18 to 36 months; some have only one form for both age groups.

Specific challenges of vocabulary assessment in the under-documented multilingual context in Central Australia

Developing a CDI for the multilingual context of Central Australia provided specific challenges that the Little Kids Learning Languages project needed to address. First,

one challenge that emerged as the research progressed is that the settings of language development in Central Australia are complex, and different families draw on different languages and use these language resources in dynamic ways. For instance, in some families a traditional Australian language, e.g. Arrernte or Warlpiri, is spoken to the children most of the time, and English is used only a little. In some families a variety of English is used most of the time, and words from a traditional Australian language are used much less often. In addition, speaking more than one language in a family is typical, but CDIs are usually created for a single language. If the focus were to be on only one language, the child's knowledge of words in other languages would not be visible, yet knowing some words in more than one language is typical for these children. All of the children's languages knowledge needs to be recognised.

Second, an adaptation of a CDI is not created by simply translating a word list from another language, as there might be concepts expressed frequently with young children in one language and sociocultural group that are not expressed frequently with young children in another (Dale & Penfold, 2011). Specific sociocultural practices may lead to certain concepts frequently being talked about in families. A requirement of an authorised CDI is that it is adapted and verified as culturally appropriate for each language, not simply translated (Dale & Penfold, 2011; Fenson et al., 2007). Assessing the vocabulary the children are actually learning makes the instrument fair, and the fairness of a test instrument is a crucial aspect of its validity, even though fairness itself can be difficult to evaluate (Cole & Zieky, 2001, p. 375).

However, this raises a question of the role that historically and contemporary shared sociocultural practices across languages may play in shaping the concepts talked about with young children. Two groups might speak a different language but have shared sociocultural practices from generations lived in similar environmental and similar sociocultural contexts as well as from generations of interactions with each other. In cases like this, might the concepts expressed to young children in the two languages be similar? If this were found to be the case, then a CDI developed for speakers of one Aboriginal language might be a useful beginning point for an adaptation for another Aboriginal language. To explore this possibility, we compare the similarities of the concepts and vocabulary items in the languages in the Little Kids' Word List – described in this paper and developed for four languages in Central Australia – with

the CDIs for two other languages spoken in Australia, one the Aboriginal language Kriol, called ERLI (Jones et al., 2020) and the other, Australian English as spoken in Sydney, called OZI-SF (Jones et al., 2022). These are chosen because they are the only other CDIs developed in Australia for Australian children, and because they are designed for three relevant groups of speakers: a) Aboriginal families in Central Australia speaking any of four languages, including a variety of English; b) Aboriginal families in north Australia speaking Kriol and potentially traditional languages and English; and c) General Australian English-speaking families in the major city of Sydney, New South Wales, speaking General Australian English.

The third challenge is that an assessment tool needs to be accessible to its potential users, so the format of the tool is an important consideration. In the Central Australian context Aboriginal adults often do not have opportunities to engage frequently with reading and writing in all of the languages they speak. The formal schooling system might not have provided literacy learning in their traditional languages and might have excluded the use of Aboriginal languages from the classroom, so Aboriginal educators and health staff might not have literacy skills in all of their languages. Non-Indigenous educators and health staff would usually not be able to read and pronounce the items in each of the languages. This presents a specific challenge for creating a vocabulary assessment tool, because a written word list might not be easily accessible to all caregivers, or to early childhood staff working with a child and their family.

Therefore, to respond to the needs and challenges of language assessment for young Aboriginal children in Central Australia, a multilingual adaptation of the MacArthur Bates Communicative Development Inventory (CDI) called the Little Kids' Word List (LKWL) was developed for four of the languages spoken in the area, with two more languages planned to be added. The Little Kids' Word List is an online app, or 'spoken' word list, accessible on tablets, phones and computers cross-platform. There is also a paper version for those who prefer it, and for those in a location without good telephone reception (note that the potential barrier of reading words in a specific language is present in the paper version). The Little Kids' Word List is not a translation of an existing word list created for a different population. It was developed from empirical documentation of 35 children in 22 families in Central Australia, with adults

discussing children's knowledge of words with a researcher, and adults and children interacting with each other.

The Little Kids' Word List is not about one specific language, but about the repertoire of ways of speaking a family draws on; it includes four languages to allow for a child's multilingual vocabulary development. The languages represented so far are Eastern & Central Arrernte, Western Arrarnta, Warlpiri and English. The CDI is a cross-platform online app with audio. Caregivers see a picture and hear the target word spoken, and tap on whether their child understands or also says the word, recording both receptive knowledge and productive behaviour.

The fair-by-design research process in adapting the MacArthur Bates CDI for the Central Australian context

To respond to the challenges outlined above and begin the process of adapting a MacArthur Bates Communicative Development Inventory (CDI), empirical research into the language input to young children in Aboriginal families in Central Australia was needed, and the processes the research team engaged in are presented here. A collaborative research team was formed, consisting of two Arrernte researchers, two Warlpiri researchers and the non-Indigenous project leader. Preliminary work included obtaining Human Research Ethics Committee and local regional approvals. A questionnaire to discuss with caregivers was designed. The Arrernte and Warlpiri research team members led the process of contacting and interacting with 35 children in 22 families, with the project leader and another researcher assisting.

After some initial trials, a three-stage process of interaction with each family was established and recorded on audio and video (Zoom Q8 video and Zoom H5 and H2 audio, with a lapel microphone attached to the caregiver's clothing). Children and caregivers sat comfortably on a blanket on the veranda or in the front yard of their home, or sometimes at a community centre. In Stage 1, the Arrernte or Warlpiri researchers discussed the vocabulary used in the family with the caregivers using the questionnaire as a guide, to identify the most common words spoken to children, in keeping with the semantic domains of other CDIs, for example, foods, body parts, frequent routines, places at home, and so on. In Stage 2 the adults and children interacted using two text-less picture books as prompts (O'Shannessy, 2004). They

were free to use the books how they liked, for instance, telling the story depicted in the images and/or asking the children what was happening. Storytelling is a culturally-appropriate form of interaction in Aboriginal families (e.g. Eickelkamp, 2008; Ober, 2017), and this method has been very successful in setting up a communicative context for child language documentation (O'Shannessy, 2013). In Stage 3 the adults and children interacted with some simple toys as prompts, e.g. toy vehicles, animals, bowls and cups, and dolls. The whole process took between 30 and 60 minutes. Stages 2 and 3 provided naturalistic interactions between the adults and the children that they felt comfortable with and were a means of confirming the vocabulary the caregivers reported on. For instance, caregivers were asked in the interview stage, 'What do you say to tell your child to come back to you?' and later the caregiver might actually call the child back to where they were sitting. Caregivers were thanked for their time with a gift voucher for a local supermarket.

We recorded 22 families, who mainly speak Eastern & Central Arrernte, Western Arrarnta, Warlpiri and English, and also other Central Australian traditional languages, as summarised in Table 1.

Table 1. Languages reported being spoken in families recorded

Eastern & Central Arrernte			✓		✓	✓				
Western Arrarnta		✓		✓			✓			
Pertame								✓		
Alyawarra				✓						
Luritja						✓			✓	
Yankunytjatjara					✓		✓			
Warlpiri	✓		✓			✓				
Kriol			✓							
English	✓	✓	✓	✓	✓	✓	✓	✓	✓	
No. families	9	5	1	1	2	1	1	1	1	22
No. children	16	6	4	1	2	2	1	1	2	35

In Table 1 columns indicate the languages reported as spoken to children in the families, and the number of families who reported a specific combination of languages is given at the bottom, e.g., nine families reported speaking Warlpiri and English, and among those nine families 16 children were present in recordings; five families

reported speaking Western Arrarnta and English, and in those families six children were present in recordings. Two families reported speaking four languages, and in one case three languages were spoken in the recording.

The recordings were transcribed and where needed were translated into English by the core research team. The 130 most common concepts and eight manual actions were identified from the recordings, along with the experiences of the research team members as parents, grandparents and caregivers, keeping in mind the areas that all CDIs include, e.g. foods, body parts, places in the home. Since storytelling involves rich vocabulary and expression (e.g. Cekaite & Björk-Willén, 2018), we needed to guard against choosing less-common words that only appeared in the storytelling segment. For this reason, words that appeared in the prompted stories needed to also appear in the other parts of the sessions, or to be considered common based on the everyday knowledge of the research team, in order to be included as a most common early word. Manual actions included in the CDI are those that were present in the recordings as well as some that the research team agreed are used frequently with young children. These include actions for the concepts of 'what?', 'nothing', 'come here', 'go', and 'food'.

Preliminary findings: Interactional elements shared across languages in Central Australia

The recordings of family interactions described above allowed some observations of families interacting, and these formed preliminary findings that influenced the shape of the CDI. Although families use their languages in different ways, the families recorded in the Little Kids Learning Languages project show some commonalities in how they interact linguistically that have implications for a vocabulary assessment tool and which suggest that a single vocabulary tool for several languages would be appropriate. All of the families who participated in the project show the following communicative elements, some of which are common across other speech communities, and some of which originate in traditional Australian languages practices. We first present those that are known cross-linguistically, then those that are culturally-specific to Australian Indigenous families.

The first commonality is that family members speak to children using words from more than one language at least some of the time. The summary in Table 1 shows that every family reports interacting in more than one language, and for every family English is one of the languages spoken. Second, all families show the use of more than one style of speech to young children, and all of them use a 'child/infant directed speech' style (Ferguson, 1964; Laughren, 1984; Turpin et al., 2014), locally known as 'Baby Talk' to the children. Baby Talk styles have been well documented for many languages across the world, including for Arandic languages (Turpin et al., 2014) and Warlpiri (Bundgaard-Nielsen & O'Shannessy, 2023; Laughren, 1984). Child-directed speech styles help to gain and keep children's attention, teach discourse structures like turn-taking and make an interaction more interesting to the child (Ferguson, 1964; Fernald et al., 1989; Monnot, 1999). Third, all families involve young children in communicative interactions, listening to them, engaging in turn-taking (Donnelly & Kidd, 2021; Wilson et al., 1984) and encouraging them to join in conversational events.

Some interactional behaviours that are common to Aboriginal families in the Little Kids Learning Languages project are culturally-specific to Indigenous Australia. Cultural ideologies and practices involving connections to land, cultural law, languages and relationships are central to Indigenous ways of being and belonging. Family members refer to each other using traditional language kin terms and (where present in their language) relationship 'skin name' terms, or English-derived words with traditional language meanings. For example, unlike in General Australian English usage, the English-derived word 'aunty' might only refer to a father's sister, not a mother's sister, who would be referred to as 'mother'. This follows the pattern of traditional language kin terms that distinguish same-gender siblings of parents from opposite-gender siblings. Another difference in kin term meaning distinctions is that General Australian English has two distinct grandparent terms based on gender (e.g. grandmother, grandfather or equivalents), and they typically refer to only the four biological grandparents. In contrast, in the languages in focus here there are distinct terms for each of the four grandparents, and the meanings of these can be extended beyond a single individual, for example, to same-gender siblings of grandparents or people with a 'skin name' which places them in this category in relation to the speaker (Dobson & Henderson, 2013; Laughren et al., 2022). Warlpiri, Arrernte and Luritja have a complex system of categorical relationship terms known locally as 'skin names'

by which every individual, not only close biological relations, can be assigned a kinship relationship (Dobson & Henderson, 2013; Laughren et al., 2022), and especially in Warlpiri these are used with and taught to children from soon after birth (O'Shannessy, 2011).

Second, all of the families use systems of conventionalised hand actions, or hand signs, to communicate to some extent. In Central Australia there are documented unique alternate sign language systems (Green, 2014; Green & Wilkins, 2014; Kendon, 1988), and some of these hand signs are used to and by young children in everyday communication, as well as gestures that are seen across the world, e.g. pointing (Goldin-Meadow, 2007; Liszkowski et al., 2006). In addition, the languages are historically related, the speakers are Aboriginal people, and they live in a remote desert environment. They have some shared experiences and undertake similar activities, all of which influence common topics of conversation.

The practices described here are only some of those that are shared among speakers of Central Australian Aboriginal languages. These interactional and other shared practices mean that many concepts spoken in families with young children are also shared. We concluded that best practice is to create a single tool with one set of concepts in the range of languages, grounded in empirical observation. Along with this, we concluded that the CDI should include the foundational early oral vocabulary, a small set of hand signs and gestures, and the set of unique 'skin names' used frequently in families.

The fair-by-design outcome: How the Little Kids' Word List app works

The Little Kids' Word List is an empirically-based online app for evaluating the vocabulary of young multilingual Aboriginal children in Central Australia. It is accessible on tablets, phones and computers cross-platform.

The Little Kids' Word List responds to the issue of differential languages use across families by making the words in the four languages visible in the word list at any one time. Users choose which of the languages are relevant to their own family, even if one of them is only used some of the time. In the app, common vocabulary items are

presented by audio with an illustration, removing the potential barrier of difficulty accessing a written assessment tool in the traditional languages. Caregivers hear a word in any or all of the four languages according to their choice, and tap on an icon to indicate if their child understands or says each word. A longer-term goal is to create milestones of the expected number of vocabulary items understood and produced by children of different ages, using data collected from caregiver use of the Little Kids' Word List.

The ability to indicate what the children can understand as well as what they can say provides information about both word comprehension and production, which is important especially when words from more than one language are known by a child. Comprehension usually leads production for both monolingual and multilingual children. A multilingual child might comprehend and produce a word in a specific language but only comprehend it in another language. The Little Kids' Word List has three sections: a) oral vocabulary items, b) eight manual actions, and c) a list of skin names, a set of relationship terms used frequently in Arrernte and Warlpiri. The word list has two sections, 60 words for children up until 18 months old, and 70 words for children aged 18 months to 36 months old. This is so that each session of use is not too long, and it takes 15-20 minutes for a caregiver to complete the task. In keeping with the aim of reading and writing in traditional languages not forming a barrier, all of the preliminary information, including information needed for informed consent, is provided in oral speech recordings in each language in the app. At the end of a section the number of items tapped on for 'understands' and 'says' for each language is calculated and displayed. A screenshot can be taken of the screen for documentation. The result is not sent to the users by text or email so that user anonymity is preserved. The words clicked on are sent anonymously to the project leader, who collates the information according to the children's ages and languages in use. Caregivers can add a word that is not present in the app if they choose to. The paper version is a written list of the same items, and users count the words identified.

The CDI is about the vocabulary that very young children know, so concepts that are regularly expressed with a Baby Talk form are presented with both the adult and Baby Talk forms, e.g. the concept of 'water' is expressed in the Warlpiri component as both *ngapa* (adult form) and *apa* (Baby Talk form). To provide words that are actually used

as far as possible, the English component contains concepts expressed in two styles for some items: a) in General Australian English, and b) in the ways the concept would be expressed in some Aboriginal ways of speaking English, that have overlap with English-lexified contact varieties in northern Australia (e.g.; Disbray, 2008; Dixon, 2013; Harkins, 1994; Koch, 2000). For example, the item for the verb 'get' consists of two forms, *get* and *get-im* 'get-TRANSITIVE'. Both forms of common verbs are present in the speech of families in our recordings, and so are represented in the CDI. If a child knows either form, that knowledge is counted as the child knowing this concept/word.

The research team worked with an app developer, Spinifex Valley, to add illustrations and produce the app. The app was initially trialled with ten families to ensure that it was easy to use and that the words were considered to be common and known by young children, and small edits have been made over time. The app is authorised as a MacArthur Bates Communicative Development Inventory and is now being used by health organisations and by more families, and the data from it increases. Figure 1 shows a screenshot of one page of the app. The sequence of screens presented at the beginning of the app is given in Appendix A. Caregivers tap on the black 'play' button to hear a word, and on the yellow 'ear' button if their child understands that word, or on the purple 'mouth' button if their child says that word.
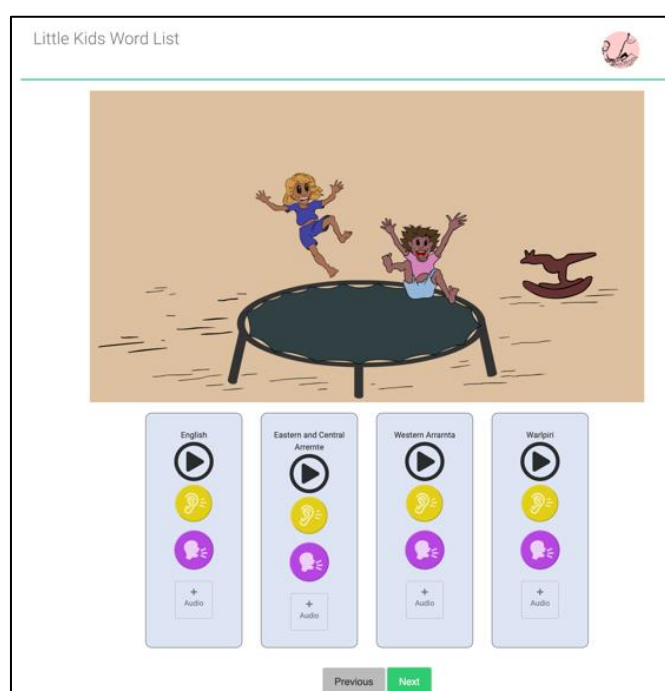

Figure 1: A screenshot of the item 'play' in the Little Kids' Word List.

The hand signs and gestures are presented as short video clips, with no audio, so that it is clear that the focus is on the manual action. Hand signs are counted separately in the results.

The skin names (relationship terms) are presented by audio in a list for each language on a single page of the app. Caregivers listen to each skin name and tap if their child understands or says each one. These are counted as additional to the other lexical items, as they are not comparable across languages of the world, but are important to many of the families using the app. Data from this app might ultimately be included in research drawing on data from CDIs across the world, so being comparable is important for potential informative work.

There is also a paper version for those who prefer it, and/or for those in a location without good telephone reception.

Many concepts are common to languages with shared sociocultural histories

An important feature of a language assessment tool is that it assesses the language an individual has had the opportunity to learn. For very young children's vocabulary assessment this means the words the children hear spoken to them in their families and with the people they interact with most. For this reason each CDI needs to be adapted using empirical research into the concepts a cohort would be expected to hear and learn (Dale & Penfold, 2011; Fenson, et al., 2007). The sociocultural practices of a family will mean that certain concepts are frequently talked about, making the relevant vocabulary common in that family. These concepts might be shared with some families with close connections and differ from others. The empirical data on which this study is based suggest that speakers of different Central Australian languages might have a considerable number of shared concepts that are frequently discussed, and some of these may be common in talk with young children. This raises the question of whether speakers of other languages beyond Central Australia, with historically shared sociocultural practices, are likely to express similar concepts when interacting with young children. There are two other CDIs developed for Australian populations: one for Indigenous children speaking Kriol (and potentially other languages) in the north

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of the Northern Territory, called ERLI (Jones, et al., 2020); and the other for mainstream Australian English-speaking children in Sydney, NSW (Jones, et al., 2022, Kalashnikova, 2016). To investigate the question of shared concepts within locally-developed CDIs, we compare the concepts expressed in the three Australian CDIs, the Little Kids' Word List, ERLI (Jones et al., 2020) and OZI-SF (Jones et al., 2022; Kalashnikova et al., 2016).

The Australian English Communicative Development Inventory (OZI) (Kalashnikova et al., 2016), was developed for middle-class speakers of General Australian English in the area of Sydney. It was developed by adapting the US English CDI forms for infants and toddlers and combining them into one form. The short form (OZI-SF, Jones et al. (2022)), compared in this study, contains a written list of 100 words and allows caregivers to indicate children's speech production only, not comprehension. The other CDI, the Early Language Inventory (ERLI, Jones et al., 2020) was created for speakers of Kriol, an English-lexified creole language that has emerged since the early 1900s. It is a language distinct from English, with its own lexicon, structure and phonology, even though many words might be recognisable as being derived from English. ERLI contains a single list of 120 words for children aged up to 36 months and allows for caregivers to indicate if words are understood and/or spoken by children. It includes conventionalised actions used frequently by Aboriginal people, for instance, indicating 'yes' (head nod), 'want' (hand sign) and 'give' (hand sign). ERLI is a written list available online; it can be completed online with the result calculated automatically. To our knowledge the Little Kids' Word List is the only CDI that is presented by audio, even though literacy levels of caregivers have been identified as a barrier for other populations (Heilmann et al., 2005). A summary of the attributes of the three CDIs is given in Table 2.

Table 2. Attributes of three Australian CDIs

Attribute	Name of CDI		
	LKWL	ERLI	OZI-SF
Assesses words spoken	yes	yes	yes
Assesses words understood	yes	yes	no
Number of items	130 (short form)	120 (short form)	100 (short form)
1 list or 2 lists?	2	1	1
Age range	0 - 36 months	0 - 36 months	12-30 months
Written or audio	audio & written	written	written
Manual actions	yes	yes	no
Includes 'skin names'	yes	no	no
Languages	Eastern & Central Arrernte; Western Arrarnta; Warlpiri; English; can add words	Kriol; can write in other language items	General Australian English

The distribution of concepts shared between the Little Kids' Word List and the other two CDIs is given in Table 3.

Table 3. Proportions of items on the Little Kids' Word List shared with ERLI and OZI-SF

Concepts appear:	%
Only on LKWL	40
Shared with ERLI only	39
Shared with both ERLI & OZI-SF	12
Shared with OZI-SF only	9
Total	100

As shown in Table 3, of the 130 concepts in the Little Kids' Word List, 39% are shared with ERLI alone, while an additional 12% are shared with both ERLI and OZI-SF. 40% of items are unique to the Little Kids' Word List, and only 9% are shared with OZI-SF but not ERLI. Another way to say this is that the proportion shared with ERLI regardless of OZI-SF is 51% (i.e. 39% + 12%), while the proportion shared with OZI-SF regardless of ERLI is 21% (i.e. 12% + 9%).

There are three important findings from this comparison of shared concepts. The first is that the comparison confirms that a CDI needs to be developed locally for each language and context, because the CDIs differ considerably. Young children should only be assessed on the words that they hear spoken to them frequently. The second is that the two word lists that have been developed for speakers of Aboriginal languages

in the Northern Territory have more in common with each other than either has with the word list developed for children speaking General Australian English in Sydney, OZI-SF. The Little Kids' Word List and ERLI share 51% of items, but the Little Kids' Word List and OZI-SF only share 22% of items. This suggests that historically shared sociocultural practices of groups of speakers may indicate similarity in the types of concepts talked about with young children. The two groups of Aboriginal children live far from each other, as ERLI was developed in the Katherine region of the Northern Territory, approximately 1,100 kms from Central Australia, yet there are many concepts in common. We note, though, that Kriol(-like) varieties and other English-lexified contact language varieties are also spoken in communities closer to Central Australia. It is instructive to note that for the Aboriginal Central Australian children, one of the languages is a variety of English. Even though varieties of English are spoken by children that two of the CDIs aim to accommodate, the concepts expressed in the two varieties show some differences. Similarly, Khamchuang et al. (2022) found that Aboriginal speakers of English living in Sydney had higher scores based on ERLI than on OZI-SF, for reasons connected to culture and language – caregivers and children use Aboriginal ways of speaking English with some features that differ from General Australian English. The third notable point is that the Little Kids' Word List and ERLI both accommodate multilingualism, unlike OZI-SF. Note that all groups of children are predicted to learn all of the words on each CDI as they grow up; the CDIs only indicate the most common words that are expected to be learned earliest.

Some of the items that are distinct for the General Australian English speakers in Sydney and different from the Aboriginal languages speakers in two locations in the Northern Territory are due to sociocultural practices. For example, some of the words that appear only in OZI-SF are penguin, sheep, necklace, puzzle, flag, stairs, bear and pretend. Words like 'penguin' and 'sheep' are probably learned from picture books; in mainstream urban Australian culture a teddy bear is a popular toy and nursery songs and stories include bears; and perhaps the children's homes have stairs. For Aboriginal children in Central Australia, known animals are more likely to be a dog and kangaroo (kangaroo is also on the OZI-SF), not animals from picture books; teddy bears are not common, although other toys are; and most buildings do not have stairs. Children do engage in pretend play but typically do not use a lexical equivalent of the word 'pretend' at these early ages. Some of the words uniquely common to ERLI and the

Little Kids' Word List are more words for spatial locations (there, this way, outside, at/on/in) and for family members (grandpa, brother, sister) than OZI-SF has, and different words for parts of the body (ears, eyes, nose, mouth, hand, head, foot). The Little Kids' Word List and ERLI also share opportunities for indicating that actions or hand signs are used for some items. Some words unique to the Little Kids' Word List are: a word that has no exact equivalent in English and expresses affection and connection, often glossed as 'poor thing' or 'dear one'; words for 'monster' common in Central Australian cultural stories and regulation of children's behaviour (Musharbash, 2016); four words for the four unique grandparent relations; and a word meaning 'younger sibling'. Only the Little Kids' Word List has a list of the relationship terms known as skin names. All of these are influenced by Central Australian traditional languages and discourse patterns.

There are further differences not included in the word counts. As mentioned earlier, some kin terms such as 'aunty' have a different meaning in the two varieties of English. Some of the differences between the CDIs for the groups of Aboriginal children are due to their geographic environments, for example, ERLI contains words for the animals 'frog' and 'pig', and for 'river', which are not central to young children's everyday activities in Central Australia. For some words that differ there is no specific sociocultural link, but the word frequency differs for the target age groups, and there are also some differences that are likely due to chance. Nevertheless, the proportion of items that is shared between the Little Kids' Word List and ERLI, in contrast to the number shared with OZI-SF, suggests that the populations that the Little Kids' Word List and ERLI were developed for have more vocabulary concepts in common when talking with young children than does the population that OZI-SF was developed for. This suggests that when adapting a CDI for another Aboriginal language, the concepts in the Little Kids' Word List might be a good beginning point.

To summarise, on the one hand it is best practice for a CDI to be developed locally through empirical research about the ways families talk with young children (Dale & Penfold, 2011; Fenson et al., 2007). This guards against children being measured unfairly against vocabulary that they do not actually hear and therefore could not be expected to learn at an early age. However, on the other hand, in contexts with shared sociocultural histories and practices, speakers of different languages might use a

considerable number of shared concepts with very young children in everyday interactions. The concepts in the Little Kids' Word List and ERLI, both developed for Indigenous children in the Northern Territory, have more concepts in common with each other than do the Little Kids' Word List and the CDI developed for mainstream Australian English in Sydney. This knowledge will be useful for speakers of other Aboriginal languages in Australia who would like to adapt a CDI for their own languages.

Concluding remarks

There is a genuine need for a fair communicative development assessment tool for young Central Australian Aboriginal children. The Little Kids' Word List app has been developed and designed to reflect the multilingual language and cultural practices of this cohort. It is an authorised MacArthur Bates Communicative Development Inventory (CDI) and has been well received by health and education professionals in Central Australia, and by the organisations with whom the research team has consulted. Speech-language pathologists have been enthusiastic about the Little Kids' Word List. There is a great need in their profession for tools that provide insights into children's and families' communication strengths, as they can be called on to assess very young children's language development, and the types of assessment they can undertake is limited by the tools available. Speech-language pathologists in Central Australia are keen to see two more local traditional languages added, and some health professionals have requested a paper version in addition, because in some locations mobile telephone reception is not available or not reliable.

More than an assessment tool

In addition to being an assessment tool, the Little Kids' Word List is potentially a way to support conversations between health and education professionals and caregivers, to help to mediate the interactions between multilingual speakers of Aboriginal languages and staff in organisations who do not speak the local languages. The CDI can be used to talk to caregivers about child language development, even if a formal assessment is not being undertaken. Because the tool is based on empirical observations of family interactions and caregiver reports, both staff and caregivers can

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be confident that the vocabulary items in the CDI are those that children learning these languages hear frequently at a young age. Items can be played to the caregivers by audio so that reading and pronunciation of unfamiliar words is not a barrier for staff. Rather than estimating what might be relevant to a child's home language situation, they can rely on the CDI as a verified representation of the vocabulary adults and children use to communicate. A senior Arrernte educator has suggested that it would be useful for non-Indigenous early childhood educators to use the Little Kids' Word List with a caregiver, so that the non-Indigenous educators could gain a better sense of the languages strengths of the children, especially in terms of their vocabulary knowledge in more than one language. This combats an erroneously deficit view of Indigenous multilingual children's language development which can arise with standardised monolingual English-only tools from a different socio-cultural context.

The Little Kids' Word List app has the potential to make language assessments of the speech production and comprehension of a diverse cohort of young Indigenous children in Central Australia appropriate to the children's developing knowledge of the languages they learn and speak, by making visible the children's languages strengths and knowledge base. It will therefore also help practitioners and clinicians to identify potential developmental needs, if present. Assessments that are not based on empirical documentation of the children's and families' everyday languages and multilingualism are likely to give misleading results, either under-reporting knowledge that is present, or under-reporting difficulties children may have. The Little Kids' Word List app is a tool that adds validity to the language assessment arena through the fairness of including the vocabulary the children hear in their homes everyday and therefore learn in the languages spoken around them.

Acknowledgements

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Appendix 1

The sequence of pages in the app is as follows, presented in each of the four languages on each page, except one. Users can skip pages if they want to, but they need to tap on 'agree' on Screen 2 to proceed.

Screen 1. Listen to Acknowledgement of Country

Screen 2. Listen to information about the project; tap 'agree' or quit.

Screens 3 & 4. Listen to more information if the user wants to

Screen 5. Written advice for health and education professionals in English

Screen 6. Choose any number of the four languages

Screen 7. Choose child's age group: up to 18 months / 18 to 36 months

Screen 8. Choose child's date of birth

Screen 9. Choose child's gender: male/female/rather not say

Screen 10. Listen to how to use the app

Screens 11+. One vocabulary item per page in each language chosen. 60 items in Section 1 and 70 items in Section 2

Later screen. Eight manual actions

Later screen. Skin names (relationship names) for Eastern & Central Arrernte, Western Arrarnta and Warlpiri.

Later screen. Question: Do you have concerns about your child's speech?

Later screen. Submit.

Final screen: numbers of words tapped on for 'understands' and 'says' for each language.

Appendix 2

The lists here give the General Australian English glosses of concepts that are expressed with different words in the different languages in the *Little Kids' Word List*. The lists here are given in alphabetical order, but the words are not presented in alphabetical order in the app or the paper version.

Section 1: Concepts for ages up to 18 months old

all gone	another	baby	boy	come
cry	eat	father	father's father	father's mother
finish	food	get	girl	give
go	good	head	here/this	home
hungry	like that	little	lots	me
meat	milk	mother	mother's father	mother's mother
nappy	no/don't/stop it	oh	older brother	older sister
one	play	puppy	quick	see/look
shoe/boot	shorts/trousers	sit	sleep	take
talk	that/there	toy	tree	two
want	water	what	where	who
yes/ok	you	younger sibling	YouTube	yukky/dirty

Section 2: Concepts for ages 18 - 36 months old

big	bird	blow your nose	bottle	bring
car	chase	cook	dance	don't know
drink	ears	eye	fall	family
find	fire	foot	fridge	gate
get up	good-bye	hand	hit	how
jump	kangaroo	kiss	let's go	listen
man	mine/my	monster	mouth	noodle
nose	open	orange	outside	phone

SiLA

plate	poor thing	potato	push	put
ready/ok	run	she/he/it	shirt	shoo
shop	shout	show	shower	sing
spoon	sun	thanks	table	them/they
this way	throw away	toes	under/down	wait
wash your hands	watch out	woman	yard	yay