

South Australian Royal Commission into Early Childhood Education and Care.

Invited submission by Professor Sally Brinkman, with acknowledgements to my fellow Chief Investigators of the LiLO Study; Professors Sheena Reilly, Edward Melhuish and John Lynch, and PhD student Mary Brushe.

Background:

Language is a critical developmental accomplishment of early childhood, enabling later literacy, education, and employment. There are vast socioeconomic differences in vocabulary, sentence structure and communication styles. These social inequalities in language, have their origins in infancy and predict human capability formation over the life-course [1-3]. Many national birth cohorts have shown that, of the socioeconomic inequalities in child health and development, none are larger than those related to language [4, 5].

Children normally achieve three important language milestones in the first two years of life: (1) understanding words spoken by caregivers around 8 months; (2) saying their first words around 12 months and (3) combining 2-3 words in simple sentences at 24 months. While there are clear patterns in the order of emergence of language milestones, there is striking variability in the precise timing of the achievement of these milestones. In the Early Language in Victoria study (ELVS), 12 month old children spoke an average of 6 words but this ranged from 0 to 123 words. At 24-months, there was an average of 260 words spoken and ranged from 0 to 679 words [6-8]. This inherent variability of language onset often leads to developmental concern among caregivers, with 20% of Australian two-year-olds meeting criteria for expressive language delay [7, 9-12] and wait lists for speech therapy services a concern across the country [12].

Results of the 2021 Australian Early Development Census (AEDC) showed that 7.9% of 5 year old children were vulnerable in language and cognitive skills, and 8.6% developmentally vulnerable in communication skills and general knowledge in South Australia [13]. Of concern is that since the national AEDC data collection commenced in 2009, the triennial picture for South Australia has shown a progressive increase in developmental vulnerability on the Language and Cognitive domain, with that trend being in stark opposition to the other jurisdictions in Australia [13]. AEDC scores have also been shown to have good predictive validity for children's later NAPLAN (National Assessment Program - Literacy and Numeracy) results through primary and into high school [14]. Out of the five AEDC developmental domains, the Language and Cognitive domain is the strongest predictor of later NAPLAN scores [14].

There is little doubt that parents are the most important influence on language development and that language development trajectories are set early in life. Studies consistently show that children of parents who are more socioeconomically disadvantaged engage in fewer verbal interactions with their children compared to advantaged parents [15-18]. Socioeconomic inequalities in parental verbal input (parent talk) to their children are likely to be crucial to the intergenerational transmission of inequality [15, 16, 19]. As such, language is a potentially modifiable mechanism for mediating the large social inequalities in children's health and development [20, 21].

The most influential study of language spoken to the child in the home was conducted in 1995 by Hart and Risley [16]. This study involved a convenience sample of 42 families in Kansas, USA. From the age of 1-2 years children of parents from welfare, working-class and professional occupations heard 620, 1250, and 2150 words per hour, respectively. These figures were then linearly extrapolated to estimate that by 3 years of age the socioeconomic gap was 30 million words. This

“30-million-word gap” is popularly referred to by the media, researchers and policy makers (google hits = >91,000,000). Despite its popularity, the study has some serious flaws, mainly, that they did not use objectively measured language in the natural environment of the home and was based on a very small and highly selected convenience sample. Taken together, the generalisability of their study results to children in Australia is very weak.

Considering these flaws in the Hart and Risley study, we were successful in gaining National Health and Medical Research Council funding for the Language in Little Ones (LiLO) study. The study has collected objective measures of language exposure using speech recognition technology; Language Environment Analysis or LENA. Just as a Fitbit is a health and activity tracker, LENA tracks and measures parent-child talk. A digital language processor (DLP) is placed in specially designed clothing for the child to wear during the 16-hour recording. The LENA computer software is then used to automatically process the audio captured through the DLP. The three key LENA outputs are adult word count (AWC; the number of adult words spoken to the child), child vocalization count (CVC; the number of speech-related sounds made by the child) and conversational turn count (CT; the number of alternations between adult and child occurring within at least 5 seconds of each other).

The specific aims of the LiLO study are to:

1. Establish the temporal associations between trajectories of Parent Talk, Child Talk and Parent-Child Talk from 6 months to 5 years.
2. Determine how trajectories of Parent Talk, Child Talk and Parent-Child Talk differ by socioeconomic groups, parental language ability, and gender.
3. Examine the effects of trajectories of Parent Talk, Child Talk and Parent-Child Talk on child health and developmental outcomes at ages 3 years and 5 years, and differences by socioeconomic group, parent language ability and gender.
4. Simulate how interventions to close socioeconomic gaps in Parent Talk would reduce social inequality and improve overall levels of child health and development for Australian children.

Our study recruited families from birth and throughout the study period. We commenced recording parent-child talk when children were 6 months old, with repeated measures every 6 months until participants reach the age of 5 years. LiLO was explicitly designed to maximize contrasts across maternal education groups, by stratifying recruitment into a low educated group (mothers without any post-secondary school qualifications), and a high educated group (mothers with a bachelor's degree at minimum). At each wave of data collection, families undertook day-long (16-h) audio recordings. Our sample waivered throughout the study, but was in the order of 100 from the low maternal education grouping and 165 in the high education grouping. Families were recruited predominately from South Australia, with some from Western Australia and Queensland.

To date we have published two studies (appended) [22, 23]. Data are still being analysed and we expect further papers to be published over the next few years. Key findings from the papers conclude that:

- There is very large variability in “parent talk” within both of the education groupings,
- at both 6 months and 12 months there was no difference in the average number of words spoken between the two maternal education groupings, however
- at 18 months a gap emerges, and indeed this gap is found for the three LENA outcomes; adult words, child words/vocalisations and conversational turns.

Of particular interest is that for adult word count, children in the low maternal education grouping hear less words at 18 months than they do at 12 months, whereas the opposite is found for the high

educated grouping. It would seem that as the children's own language starts to emerge, adults in the two different education groupings start behaving differently. As such, the socioeconomic gap in parent language input would appear to emerge when the children start communicating themselves.

Our results are consistent with Hart and Risely in identifying a socio-economic "word gap", however they differ in that, we identify that this gap emerges between 12 and 18 months of age. Further Hart and Risely's report that adult words increased over the children's first 3 years of life, but that the higher socioeconomic groups adult word count increases at a greater rate than the lower socioeconomic grouping. We found that the number of adult words in the low maternal education grouping decreases from 12 months of age.

As we continue to analyse the results of the LiLO study, we will determine if these trends continue as the children get older, and most importantly if these indicators of the home language environment actually predict the children's development outcomes. There is existing scientific literature that would suggest that children who experience more child-directed speech have positive language outcomes, although speech simply overheard by the child may be unrelated [24]. This literature would suggest that conversational turns, as measured by our LiLO study, may be the stronger predictor out of the three LENA word count measures. This would be consistent with the general literature behind early child development; those children raised in responsive and stimulating home environments will be more likely to thrive.

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