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# A Randomised Controlled Trial to Test the Effect of Promoting Caregiver Contingent Talk on Language Development in Infants from Diverse SES Backgrounds.

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Abstract

**Background:** Early language skills are critical for later academic success. Lower socio-economic status (SES) children tend to start school with limited language skills compared to advantaged peers. We test the hypothesis that this is due in part to differences in caregiver contingent talk during infancy (how often the caregiver talks about what is in the focus of the infant's attention). **Methods:** In a randomised controlled trial with high and low SES families, 142 11-month-olds and their caregivers were randomly allocated to either a contingent talk intervention or a dental health control. Families in the language intervention watched a video about contingent talk and were asked to practise it for 15 minutes a day for a month. Caregiver communication was assessed at baseline and after one month. Infant communication was assessed at baseline, 12, 15, 18 and 24 months. **Results:** At baseline, social gradients were observed in caregiver contingent talk to their 11-month-olds (but not in infant communication). At post-test, when infants were 12 months old, caregivers across the SES spectrum who had been allocated to the language intervention group engaged in significantly more contingent talk. Lower SES caregivers in this intervention group also reported that their children produced significantly more words at 15 and 18 months. Effects of the intervention did not persist at 24 months. Instead expressive vocabulary at this age was best predicted by baseline infant communication, baseline contingent talk and SES. **Conclusion:** A social gradient in children's communication emerges during the second year of life. A low-intensity intervention demonstrated that it is possible to increase caregiver contingent talk and that this is effective in promoting vocabulary growth for lower SES infants in the short term. However, these effects are not long lasting, suggesting that follow-up interventions may be necessary to yield benefits lasting to school entry.

**Keywords:** Infancy, language, vocabulary, parenting, socio-economic status, intervention.

**Abbreviations:** Socio-economic Status (SES)

# A Randomised Controlled Trial to Test the Effect of Promoting Caregiver Contingent Talk on Language Development in Infants from Diverse SES Backgrounds.

Children's language skills as they enter school are a key determinant of their academic success and social wellbeing (Field, 2010). Even by this early stage, however, children from socio-economically disadvantaged areas tend to have limited language skills (Locke, Ginsborg, & Peers, 2002), with recent evidence suggesting this social gradient emerges from as early as 18 months (Fernald, Marchman, & Weisleder, 2013). While there are many reasons why language and social disadvantage are associated with life outcomes, poor language skills early in life are considered a public health problem (Law, Reilly, & Snow, 2013). It has been suggested that parenting interventions have the most potential to change this (Belsky et al., 2007).

Existing studies of early parenting interventions have tended either to target a whole range of parenting behaviours in order to benefit child development generally, or to focus on children known to have language delays for reasons other than social disadvantage alone. Regarding general interventions, large scale programmes such as Head Start in the US and Sure Start in the UK have promoted a diverse range of behaviours, making it difficult to evaluate their impact (Lloyd & Harrington, 2012), with best estimates suggesting small effects on child language outcomes at age three (Love et al., 2005) that generally are not maintained through the first years at school (Puma et al., 2012). Regarding clinical studies, a recent meta-analysis of interventions targeted at promoting language for children with cognitive impairments suggests that enhancing parental interaction has a positive impact on language developments including vocabulary growth (Roberts & Kaiser, 2011). However, whether parenting interventions would work for children at risk of language delay because of socio-economic disadvantage is not clear. Some studies suggest they would (Suskind et al., 2016; Ward, 1999). However, a

recent population-based study of slow-to-talk toddlers found no evidence that participating in a preventative parenting intervention had any impact on language skills (Wake et al., 2011). Inconsistent findings like this make it important to have a more mechanistic understanding of the aspects of parenting that support early language development, that are associated with SES, and that are open to change through intervention.

Of the successful studies reported in the Roberts and Kaiser (2011) meta-analysis, the largest training effects were found for interventions addressing levels of maternal responsiveness. This, coupled with observational research associating responsive parenting with positive child outcomes (Brady, Warren, & Sterling, 2009; Tamis-LeMonda, Bornstein, & Baumwell, 2001), suggests that this aspect of parenting is a promising candidate for promotion through intervention. A systematic review of the effectiveness of responsiveness interventions concluded that caregiver responsiveness can be promoted, and that this has causal effects on child health, psycho-social and cognitive development, especially in the case of at-risk populations (Eshel, Daelmans, Mello, & Martines, 2006). For example, in a study of children born prematurely with very low birth weights, Landry and colleagues demonstrated that a high-intensity intervention when infants were between 6 and 10 months old could increase global levels of maternal responsiveness (both affective and cognitive), and that this resulted in an increase in a range of infant measures including word production. Of all the maternal behaviours studied, it was the increase in a range of behaviours we term *contingent talk* ("maintaining" and "labelling") that mediated, albeit only partially, associations with word learning (Landry, Smith, & Swank, 2006).

C*ontingent talk* refers to a style of communication whereby the caregiver talks about what is in the infant's current focus of attention. Experimental studies demonstrate

that this facilitates word learning (Tomasello & Farrar, 1986), and that it is likely to be especially effective for infants under 18 months, who cannot yet redirect their attention to interpret others' communicative intentions (Baldwin, 1991). Longitudinal studies show that infants whose parents frequently engage in contingent talk go on to have substantially larger vocabularies as toddlers (Akhtar, Dunham, & Dunham, 1991; Carpenter, Nagell, & Tomasello, 1998; Masur, Flynn, & Eichorst, 2005; McGillion et al., 2013; Rollins, 2003). Hoff (2003), found that less educated mothers tend to engage in less topic-continuing talk with their 2-year-olds, suggesting that a similar quality of child directed speech is on a social gradient. However, whether SES differences in contingent talk exist in infancy and what impact this has on development is not currently known.

In summary, contingent talk is a correlate of infant language development, and potentially explains its social gradient. Studies with parents of premature, very low birth weight infants suggest interventions can promote contingent talk. Experimental studies suggest doing so would be especially helpful between 11 and 18 months, although it is not currently known whether there is a social gradient in parent contingent talk or infant communication this early. Nor is it known whether increasing parental contingent talk at this early stage is feasible with low SES families, or whether it would have a causal effect in promoting language for socially disadvantaged children.

The current study tested the degree to which social gradients exist in infant and parent communication in the first year of life in a British sample, and whether a parenting intervention to promote contingent talk would have an effect on both parent contingent talk and child language outcomes. Eleven-month-old infants (N=142) and their primary caregivers from across the SES spectrum were randomly allocated to either a low-intensity intervention to promote contingent talk or a matched intervention to promote dental health. The language intervention involved showing caregivers a video and asking

them to practice contingent talk for 15 minutes a day, keeping a diary of how often they did so. We predicted that, one month later, caregivers in the language intervention condition would engage in more contingent talk than those in the control group, and that their children would have improved language ability at 15, 18 and 24 months. We planned to test for interactions with SES as secondary analyses.

## Method

-------- Figure 1 here ---------

### Participants

The CONSORT diagram is reported in Figure 1 and checklist in Appendix A. Inclusion criteria were that infants were 1) first born, singletons; 2) birth weight over 2.5kg, 3) monolingual, raised as English-speaking. Exclusion criteria were 1) infant born more than three weeks premature; 2) primary caregiver worked more than 24 hours per week; 3) infant or primary caregiver had a disability that prevented participation.

Of the 142 primary caregivers, one was male. Fifty-one percent of infants were female ($n$ = 73). Infants were 11 months at the first home visit (Mean age = 334 days; Range: 327 to 344 days). Dates defining recruitment and follow-ups are presented in Appendix B. Families lived in areas spanning the full range of the 2015 English Indices of Deprivation (IMD), a measure provided by the UK Office of National Statistics based on neighbourhood employment, income, health provision, and housing. One third of families lived in areas with a score in the bottom three IMD deciles, a further 30% lived in deciles 4-6, with the remaining 37% living in deciles 7-10. Caregivers' level of education spanned the full range of the European Qualifications Framework: 62% of primary caregivers had a degree, while the remainder did not. Thirty-four percent of families

reported incomes below £28,000 (UK median). A principal components analysis (N=138) confirmed that IMD rank, primary caregiver education and annual income collapsed onto one factor and this factor (centered, scaled and reversed such that a positive score represents higher SES) is used in secondary analyses.

This study received ethics approval from the Department of Psychology Ethics Sub-Committee at the University of Sheffield. All participating caregivers gave informed consent. Children were given a small gift at each time point, and caregivers were given a £10 gift voucher at the end of the study.

**Materials**

Videos were created to introduce the interventions to caregivers. These were approximately 10 minutes long and included clips of caregivers engaging in contingent talk (or tooth-brushing). The following questionnaires were used: 1) demographic questionnaire including: annual household income before tax; weekly household income after tax, including benefits but after housing costs (a measure not used due to missing data); postcode (for English Indices of Deprivation; Smith et al., 2015) and education of both caregivers; 2) a composite of the MacArthur-Bates Communicative Development Inventory: Gestures Part I & II (MCDI. Fenson et al., 1994) to measure gestural ability, and the Lincoln UK adaptation of the MCDI (Infant Words and Gestures Form and Toddler Words and Sentences Form) to measure vocabulary (Meints, 2000); 3) Parent Goals, a measure of caregivers' goals for their infant's future from a list of nine academic, socio-emotional and developmental focused statements; 4) Dental Health (Huebner & Riedy, 2010); 5) Parental Self Efficacy Scale (adapted from Teti & Gelfand, 1991); 6) Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983); 7) Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983).

LENA audio recorders were used to collect audio recordings (LENA Pro, 2012). LENA audio recorders are lightweight devices that are worn by the infant. LENA software analyses these recordings to provide quantitative estimates of speech events in the infant's environment, including the number of adult words and infant vocalisations.

**Procedure**

Families were visited in their homes twice when their infants were 11, 12, 18 and 24 months old. Questionnaires were also collected by post at 15 months.

On the first, *baseline visit*, a full questionnaire pack was given out. Caregivers were given two LENA audio recorders to make two recordings. A test of gaze following was conducted (Matthews, Behne, Lieven, & Tomasello, 2012) and the primary caregiver and their infant were video-recorded together in free play for 30 minutes to provide measures of the quantity and quality of caregiver talk and infant vocalisations. Following the first visit, families were randomly assigned to either the language or dental health intervention according to CONSORT guidelines (Schulz, Altman, & Moher, 2010. See Appendix A).

On the second *intervention visit,* the researcher collected the audio recordings and questionnaires and the intervention was introduced. For the language intervention, contingent talk was introduced to caregivers as a two-step process: (1) noticing what your child is attending to and (2) talking to them about it. Caregivers were shown a short video identifying ways that 11-month-olds indicate what they are interested in, along with examples of contingent talk. Caregivers were asked to set aside 15 minutes a day to practise contingent talk (an amount previously established as feasible by Matthews *et al.*, 2012). The control condition focused on infant dental health and healthy eating. This was a real intervention designed to engage families with child development without increasing contingent talk. To rule out Hawthorne effects (behaviour change simply due to the

process of being observed), this control was closely matched to the language intervention. Caregivers were shown a video about healthy eating and tooth-brushing practices and asked to spend 15 minutes a day making these a habit. For both conditions, after watching the video, the researcher summarised the main intervention message, and provided caregivers with a summary leaflet and diary to record practice each day. After two weeks, the researcher called participants to consolidate the intervention message and answer any questions.

A month after the intervention (infant mean age = 365; range: 357 to 373 days), naturalistic recordings (video and LENA) were repeated following the same procedure as at baseline to provide post-intervention measures of caregiver contingent talk.

Post-intervention caregiver reports of expressive vocabulary were obtained at 12 months (range: 351 to 391 days), 15 months (range: 441 to 520 days) and 18 months (range: 551 to 613 days) using the Words and Gestures form, and at 24 months (range: 708 to 924 days) using the Words and Sentences form. Note that receptive vocabulary is not reported here as it has been suggested that it is less reliable as a caregiver report measure, especially with socio-economically diverse samples (see Kalashnikova, Schwarz, & Burnham, 2016 for a recent review). Dental health and parental self-efficacy questionnaires were also completed at all time points.

When the infants were 18 and 24 months old, a researcher blind to intervention allocation repeated naturalistic recordings (video and LENA) following the procedure at baseline to obtain post-intervention measures of infant vocalisations and word production. Two standardised tests were also administered at 24 months: the Reynell Comprehension Scale (Edwards, Garman, Hughes, Letts, & Sinka, 1999) and the Early Repetition Battery (Seeff-Gabriel, Chiat, & Roy, 2008).

**Coding**

All transcriptions of caregiver speech and infant vocalisations were made by a researcher blind to condition and were fully checked by a second researcher (also blind). Discrepancies were resolved by the first author. Video recordings were coded in ELAN (Sloetjes & Wittenburg, 2008). Transcriptions were made following CHAT guidelines and extracted using CLAN (MacWhinney, 2000). Caregiver speech was coded for the number of word tokens and types produced (in 10 minutes) and the proportion of these that were contingent on the infant's interest (contingency coding scheme in Appendix C). Adult word contingency was double-coded for a randomly selected 11% of the sample across baseline and post-test video recordings (15/138). Cohen's Kappa was .87, indicating excellent agreement. The number of infant vocalisations, and the proportion of these that were responded to within 1 second (on video), were extracted using ELAN.

The number of words children produced on video (in 30 minutes) was coded at 24 months. A randomly selected 10% of participants (13/128) were double-coded, revealing a high level of reliability ($r = .96$, $p < .001$). This procedure was repeated at 18 months for the children whose caregivers did not have a degree (due to the cost of coding the naturalistic speech of children this young, this group were targeted to explore whether naturalistic measures were correlated with parental reports – see results section).

LENA recordings were analysed automatically to provide Adult Word Counts and Infant Vocalisation Counts. To allow for the fact that infants spent differing amounts of time asleep, we took an average for each of these measures from parents' and infants' 8 most vocal hours respectively.

## Results

### Social gradients at the 11-month baseline

Table 1 reports descriptive statistics for caregiver speech and infant communication at the 11-month baseline along with correlation coefficients for their

relation with SES. There was no association between SES and how many words caregivers produced, but there was a positive correlation with the proportion of caregiver speech that was contingent on infants' attention (both token and type measures). There was a marginally significant correlation with how often infant vocalisations met with a vocal caregiver response within 1 second. Since the amount of contingent talk infants heard was the target of the intervention, only measures of number of words heard and the proportion of these that were contingent are considered further. Infant communication measures were not correlated with SES.

------Table 1 here -----

**The effect of intervention on caregiver language**

Caregivers reported completing intervention activities most days (M = 22 days) between the 11-month baseline and the 12-month post-test and this did not differ as a function of condition or SES. Table 2 presents descriptive statistics for measures of caregiver speech at these time points. To test for an effect of the intervention on caregiver language, we built linear regression models with the given measure of caregiver language at the 12-month post-test as the outcome variable and intervention condition plus the equivalent baseline measure of caregiver language (grand mean centered) as predictors. Full models are reported in Appendix D and t values for condition are reported in Table 2. There was a significant effect of condition on the number of word tokens caregivers produced and the proportion of word tokens that were contingent. There was no significant effect of condition on the number of word types caregivers produced, but there was on the proportion of word types that were contingent. Effect sizes (Hedges' g, table 2) were calculated while controlling for baseline using the R package eefAnalytics. (Xiao,

Kasim, & Higgins, 2016). Hedges' g is an effect size calculation for continuous variables (like Cohen's d), with an added correction factor to provide better estimates in smaller samples. The effect size can therefore be interpreted as Cohen's d is: 0.2 as a small, 0.5 as a medium and 0.8 as a large effect. Finally, we tested whether intervention effects interacted with SES. In no case did adding an interaction term improve fit.

------Table 2 here ------

**The effect of the intervention on child language**

The full set of child language outcome measures was collected at the final 24-month point (Table 3). A principal components analysis revealed that all measures except for number of vocalisations produced (estimated using LENA) loaded onto one component. This reflects the fact that LENA is a measure of infant vocalisations, whereas all other measures assess conventional language use.

To test the effect of the intervention on 24-month language outcomes, we fitted linear regression models to each child language measure in turn with condition and the baseline measure of expressive vocabulary at 11 months as predictors. There was no effect of condition on any of these outcome variables at 24 months (Table 3). Adding SES to the models significantly improved model fit except for the model fitted to LENA vocalisations. Adding an interaction between condition and SES did not improve fit for any of the models.

To test whether the intervention had an effect on language prior to 24 months, we looked at caregiver reports of expressive vocabulary on the words and gestures CDI form collected at 11, 12, 15 and 18 months. Since each child contributed multiple observations, we fitted mixed effect linear regression models with participant as a random effect on the intercept. A model including time, condition and the interaction between the two

indicated the expected growth in vocabulary over time but no effect of condition or interaction of condition and time. When SES and its interaction terms were added, this resulted in a significantly better fit ($\chi^2(4) = 24.7$, $p < .001$; See Table 4). To better understand this interaction, we divided the sample into two SES groups, low and high (based on a median split) and for each group ran a model including time, condition and the interaction between the two (Appendix E). In the high SES group, time was the only significant predictor. In the low SES model, there was an additional interaction between time and condition. This reflects the fact that, as can be seen in a plot of the data in figure 2, lower SES caregivers reported significantly higher expressive vocabularies in the intervention condition compared to the control condition. For the lower SES infants, reported vocabulary grew at a rate of 6.64 words per month in the control condition, and at a rate of 10.57 words per month in the intervention condition. So, by 18 months, infants in the intervention condition were reported to be the equivalent of 4 months ahead of the control condition (an advantage that, as we have seen, did not last).

To check the reliability of lower SES caregiver reports ($n$ =31), we transcribed the speech of 18-month-olds whose parents did not have a degree and calculated how many word types each infant produced per minute (See Appendix F for descriptive statistics). There was a positive correlation between this measure and caregiver reports of expressive vocabulary ($r(29) = .74$, $p < .001$). To investigate whether the effect of the intervention at 18 months could be explained in terms of a change in parental reporting bias, we fitted a regression model to the caregiver report values that predicted them from naturalistically observed vocabulary size, and then tested whether adding condition explained additional variance (intervention n = 18; control n = 13). If the intervention led to a systematic change in reporting bias, we would expect to see a significant, positive beta for condition.

Once naturalistic measures were accounted for, no additional variance was explained by condition.

----- Tables 3 & 4 & Figure 2 here ------

**Longitudinal relations between caregiver contingent talk and later child language**

Since there was considerable variance in caregiver contingent talk at baseline (more than could be experimentally induced through intervention), we tested whether this natural variance was associated with child expressive language at 24 months. Measures of expressive vocabulary at this stage were collapsed onto a single component. We then fitted a model to 24-month expressive vocabulary with 11-month expressive vocabulary as a predictor. The model was not improved by adding the number of word types caregivers produced at 11 months. However, it was improved by adding the proportion of word types that were contingent. Fit was further improved by adding SES as a predictor (Appendix G). The same pattern of results held if a measure of word tokens was used instead of word types.

## Discussion

This study demonstrated that, from the first year of life, children from lower SES families hear less contingent talk, and that this property of child directed speech is open to change through a low-intensity intervention. Caregivers from across the social spectrum who were allocated to the language intervention produced significantly more contingent talk after one month than those in the control intervention. Lower SES caregivers who received the language intervention reported significantly higher expressive vocabularies for their infants at 15 and 18 months than those in the control intervention. However, this effect did not persist at 24 months. Instead vocabulary at this

age was predicted by natural variance at baseline in infant communication, caregiver contingent talk, and SES. Since no association was found between SES and communicative ability at 11 months, this suggests that the social gradient in language ability emerges during the second year of life for British infants.

Baseline analyses revealed a social gradient in caregiver contingent talk but not in quantity of talk generally. This contrasts with findings such as those of Hart & Risley, (1995) where differences in quantity were observed. This may be due to UK-US cross-cultural differences, to the fact that we studied younger infants, or to differences in SES measures. Future studies will need to examine why the observed social gradient in contingent talk exists at a very early stage, for example, by examining childrearing beliefs and goals (Heath, 1983; Rowe & Casillas, 2011), and caregivers' confidence in the ability to influence their child's outcomes (Hoff et al., 2002).

The intervention increased contingent talk across the SES spectrum and increased reports of vocabulary up to 18 months for the lower SES infants. Why these infants alone benefitted is not clear but it may reflect a threshold effect, in that high SES caregivers were already using as much contingent talk as would benefit child language. It is also possible that parents in the control condition reacted differently as a function of SES. The control was an active dental health intervention that was matched in terms of delivery and intensity. Parents in this group completed the same baseline language reports and thus may have adapted some behaviour (not observed on the videos) in response to this that later benefitted language. However, there was nothing in caregivers' exit questionnaires to suggest this was the case.

One challenge with assessing early interventions is that there are very few measures of child vocabulary for this age range. Between 11 and 18 months, we relied on the most sensitive measure available, caregiver report of expressive vocabulary. A

possible concern with such reports is that interventions could introduce a parental reporting bias. However, transcriptions of low SES children's speech at 18 months provided no evidence of such a bias. This is in line with meta-analyses that find no effect of measurement type on estimates of expressive vocabulary size (Roberts & Kaiser, 2011). While future work should focus on providing alternative infant language measures, potentially through semi-automated transcription of recordings, and through the development of comprehension measures (Chiat & Roy, 2008), we conclude that caregiver report is a valuable tool at an age when standardised tests tend to assess social cognition rather than knowledge of conventional language forms.

Given the empirical support for the hypothesis that contingent talk affects infant vocabulary development, it is worth considering the practical implications of this study. On the one hand, the efficacy of a low-intensity intervention in increasing caregiver contingent talk in lower SES families has been demonstrated. Infant language can be promoted in the short term. On the other hand, effects were limited to a 6-month period following the intervention. No effects on parent reported or directly observed measures were observed at 24 months. This fade-out would suggest that the intervention worked to promote contingent talk and thereby the acquisition of first words, but unless this caregiver support was continued and adapted as children's language grew, then development stagnated and reverted to the original trajectory. It suggests that if long-term benefits are to be achieved, age-appropriate follow-up sessions would be needed (Ramey & Ramey, 1998). For example, follow-up sessions might introduce techniques such as recasting and expanding children's utterances (Cleave, Becker, Curran, Van Horne, & Fey, 2015; Taumoepeau, 2016). Parenting interventions would probably also need to be combined with preschool interventions (e.g., Fricke, Bowyer-Crane, Haley, Hulme, & Snowling, 2013) to lead to lasting benefits, something that would be inescapably costly.

Whether infancy is the best time to intervene given limited resources therefore remains an open question (Norbury, 2015). Likewise, whether early interventions like the current one would be effective if delivered in real world settings for the wider population (either alone or as a component of a larger programme) still needs to be tested.

## Conclusion

The amount of contingent talk children hear in the first year of life varies as a function of SES. It is possible to intervene to increase contingent talk in a way that promotes lower SES children's vocabulary when measured via parental report. However, the effects of this low-intensity intervention were short lived. Testing follow-up low-intensity interventions would be a promising place to continue work in order to improve language development across the SES spectrum.

**Key points**

1. Early language development is associated with SES, with disadvantaged children tending to have poorer language skills when they enter school, putting them at risk of educational disadvantage.
2. As early as the first year of life, the extent to which parents engage in contingent talk is associated with SES.
3. Caregiver contingent talk can be promoted through a low-intensity intervention and this affects caregiver reports of language learning for lower SES children in the short term.
4. Effects of the intervention did not last one year after intervention, suggesting follow-up interventions would be necessary to maintain any benefits.

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Table 1

*Descriptive Statistics for Caregiver Speech and Infant Communicative Ability at Baseline and correlations with SES.*

| | N | Minimum | Maximum | Mean | SD | r |
|---|---|---|---|---|---|---|
| Caregiver Speech | | | | | | |
| Word Tokens | 140 | 26 | 1151 | 509 | 190 | .11 |
| Word Types | 140 | 23 | 318 | 156 | 47 | .11 |
| % Tokens Contingent | 138 | 12% | 90% | 61% | 12% | .19* |
| % Types Contingent | 138 | 13% | 95% | 73% | 12% | .26** |
| % Infant Vocs Responded | 140 | 6% | 74% | 34% | 15% | .17· |
| LENA Adult Words/ Hour | 140 | 1230 | 4875 | 2633 | 854 | .10 |
| Infant Communication | | | | | | |
| Vocalisations (Video) | 140 | 4 | 172 | 45 | 29 | .09 |
| Vocalisations (LENA) | 140 | 76 | 406 | 193 | 65 | .16 |
| Pointing | 140 | 0 | 1 | .61 | .49 | .04 |
| Gaze Following | 102 | 0 | 4 | 1.90 | 1.54 | .16 |
| Expressive Vocabulary | 139 | 0 | 30 | 4 | 6.06 | -.05 |

Note: . $p = 0.05$, *$p < .05$, ** $p < .01$.

Table 2

*Quantity and Quality of Caregiver Speech at 12 months as a Function of Intervention (with effect sizes).*

| | Language Intervention | Dental Intervention | *t* | Hedges' g |
|---|---|---|---|---|
| | M (SD) | M (SD) | | |
| Word Tokens | | | | |
| (N = 135 ) | | | | |
| Baseline | 503 (180) | 509 (204) | 2.56 | 0.44 |
| Post-test | 530 (172) | 478 (196) | | |
| Word Types | | | | |
| (N = 135) | | | | |
| Baseline | 155 (43) | 156 (52) | 1.57 | 0.27 |
| Post-test | 163 (44) | 155 (49) | | |
| % Tokens Contingent | | | | |
| (N = 132) | | | | |
| Baseline | 60% (10%) | 61% (15%) | | |
| Post-test | 62% (15%) | 57% (13%) | 2.16 | 0.37 |
| % Types Contingent | | | | |
| (N = 132) | | | | |
| Baseline | 73% (9%) | 73% (15%) | 2.04 | 0.35 |
| Post-test | 73% (14%) | 68% (13%) | | |

Table 3

*Descriptive Statistics for Child language at 24 months as a Function of Intervention (with effect sizes controlling for baseline).*

| | N | Dental Intervention | | Language Intervention | | *t* | Hedges' g |
|---|---|---|---|---|---|---|---|
| | | M | SD | M | SD | | |
| Expressive Vocabulary (CDI WS form) | 119 | 370.98 | 177.35 | 348.67 | 178.53 | -.94 | -0.17 |
| Naturalistic Word Types/Minute | 128 | 3.81 | 1.72 | 4.51 | 2.63 | 1.57 | 0.28 |
| Reynell | 109 | 13.61 | 9.84 | 13.45 | 8.58 | -.33 | -0.06 |
| ERB | 101 | 12.35 | 9.88 | 11.75 | 8.83 | -.71 | -0.14 |
| LENA vocalisations | 122 | 293.38 | 181.37 | 296.38 | 181.67 | -.21 | -0.04 |

Table 4.

*Summary of fixed effects for CDI expressive vocabulary (intervention coded as 1,control as 0).*

| | *B* | SD | *t* | Df | *p* |
|---|---|---|---|---|---|
| Intercept | -2.72 | 3.94 | -0.69 | 293 | .49 |
| Condition | 1.88 | 5.50 | 0.34 | 290 | .73 |
| Time: 11 | 10.44 | 0.91 | 11.47 | 380 | < .001*** |
| SES | -4.10 | 3.92 | -1.04 | 296 | .30 |
| Condition* Time | 0.40 | 1.24 | 0.32 | 374 | .75 |
| Condition * SES | 2.98 | 5.55 | 0.54 | 295 | .59 |
| Time * SES | 4.12 | 0.90 | 4.58 | 382 | <.001*** |
| Condition* Time* SES | -4.05 | 1.24 | -3.27 | 373 | <.01** |

$R^2 = .56$

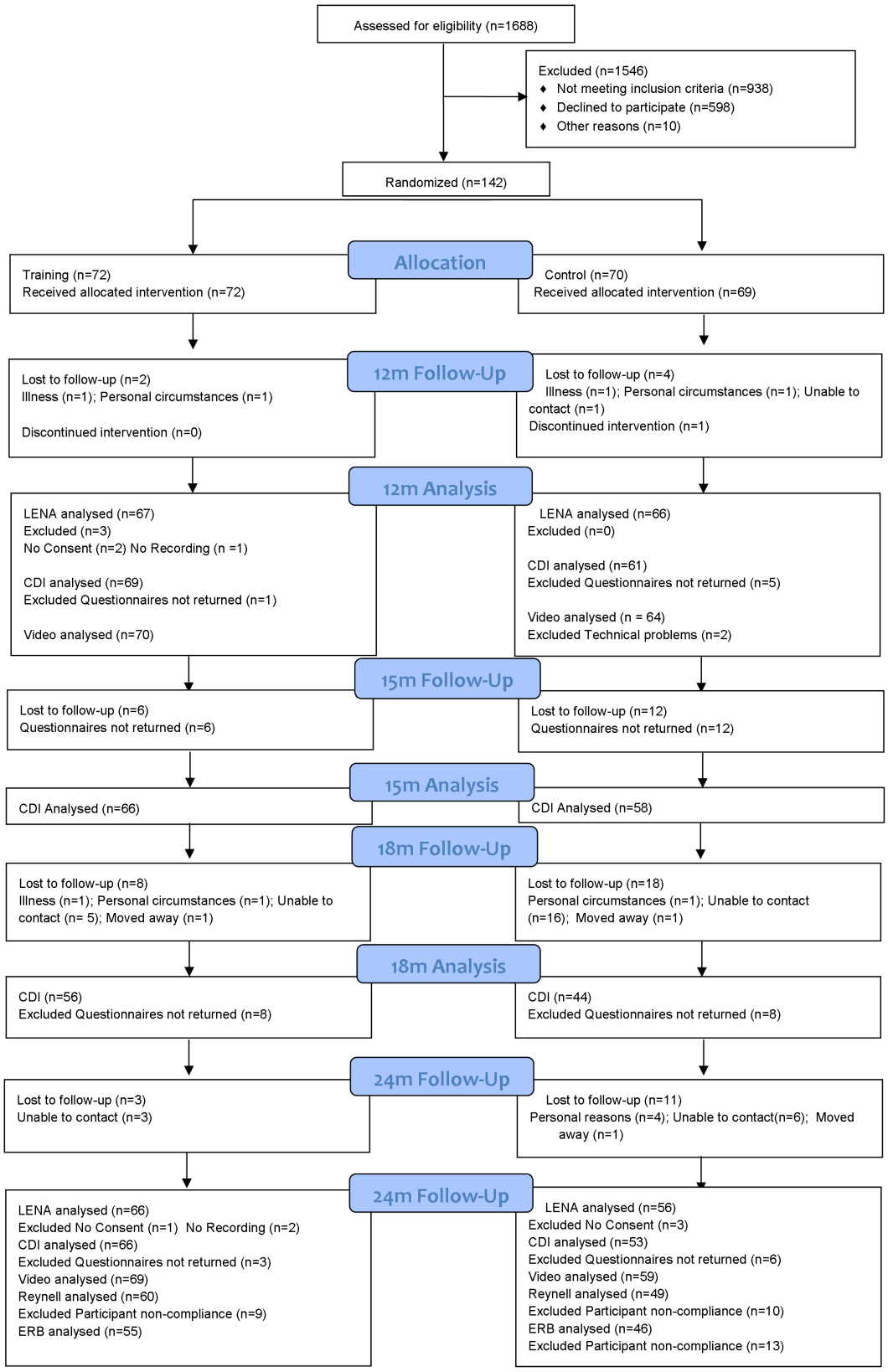


Figure 1. *CONSORT diagram.*

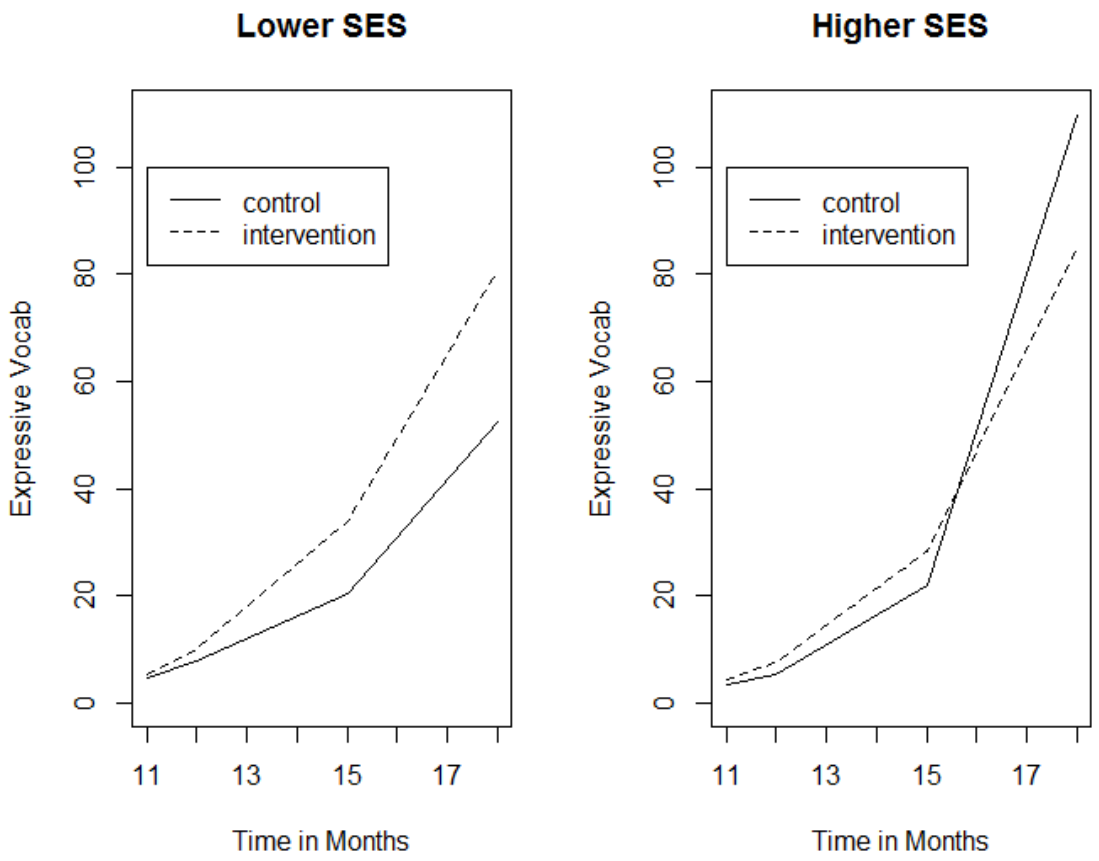


Figure 2. *Expressive vocabulary (CDI Words and Gesture form) as a function of condition and caregiver SES*