

THE NULL EFFECT OF SOCIO-ECONOMIC STATUS (SES) ON THE LANGUAGE AND GESTURES OF INFANTS LEARNING ENGLISH AND POLISH

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Abstract: *This study examined the effect of socio-economic status (SES) on the language and gesture use of 8- to 18-month-old infants, using two large, demographically diverse samples of children living in the UK and Poland. There was no systematic evidence for slower vocabulary or gesture growth in children from lower SES families in either sample, suggesting that substantial SES-related differences in language development do not emerge until after the first year of life.*

Keywords: *Socio-economic status, vocabulary acquisition, infancy, cross-linguistic investigation*

INTRODUCTION

Robust evidence for socio-economic status (SES) related differences in language development comes from children 3 years and older (e.g., Dearden et al., 2011), but the evidence we have for younger children yields inconsistent results: some studies find an SES effect, others none, and others report different effects depending on age or the language skill assessed (Andonova, 2015; Arriaga et al., 1998; Bavin et al., 2008). There are at least three reasons for the inconsistency: 1) lack of demographic diversity in the samples studied, 2) too few studies from diverse languages/culture, and 3) reporting biases when parents are asked to provide information that requires more nuanced observation, especially regarding the language of very young children (Alcock et al., 2025; Feldman et al., 2000).

Here we use CDIs of 2346 parents to assess SES-related effects on the early language develop-

ment of 8-18-month-olds using two demographically diverse, large samples: children acquiring English in the UK (Alcock et al., 2020), and children acquiring Polish in Poland (Smoczyńska et al., 2015). We also take advantage of the fact that the CDIs have both gesture and vocabulary subscales to assess the effect of SES across language domains; in particular, whether the reporting bias is less likely to apply to gesture than vocabulary (Alcock et al., 2025; Feldman et al., 2000).

METHOD

Participants

UK data (N = 997) comes from the UK-CDI Words & Gestures norming study (Alcock et al., 2020). This stratified sample matched the SES of families in the UK in 2011, with approximately 50 boys and 50 girls at each age month. Children who heard more than 10 hours of a language other

than English per week were excluded. Children with a disability, medical or family history of language/literacy disorder were included in proportion to their prevalence in the population.

Polish data (N = 1349) comes from the Polish CDI Words & Gestures norming study (Smoczyńska et al., 2015). The distribution of maternal education almost perfectly matched that of mothers of children born in 2013 in Poland, with approximately 50 boys and 50 girls at each age month. Children with health conditions that impact language development were excluded but a small number of children exposed to other languages were not, as their results did not differ from the monolingual majority.

Materials

The UK-Communicative Development Inventory Words and Gestures (UK-CDI W&G) contains a Word List of 395 vocabulary items and an Actions and Gestures scale of 63 items, and has good test-retest reliability and validity (Alcock et al., 2020). The Polish CDI Words and Gestures contains a Word List of 380 items and an Actions and Gestures scale of 63 items, and has high test-retest reliability and internal consistency (Smoczyńska et al., 2015).

Coding

Analyses were conducted in R version 4.4.0. Production scores were calculated by summing all items for which parents had ticked ‘understands & says’, comprehension scores by summing all items for which parents had ticked ‘understands’ or ‘understands & says’, and gesture scores by recoding answers into either two (1 = yes, 0 = no) or three (1 = yes/often, 0.5 = sometimes, 0 = no/never/not yet) categories and summing the scores. Age was coded in months.

A composite SES measure was calculated for the English data, using Principal Component Analysis to extract a single SES score from the following four factors:

- Household income before tax (4 levels from Below poverty bracket to Higher income tax bracket)
- Maternal education (5 levels from No formal qualifications to Postgraduate degree/similar)
- Maternal occupation code (3 levels, coded according to the UK Standard Occupational Classification manual)
- Index of multiple deprivation (IMD) (5 levels, coding relative deprivation according to geographic areas of the UK)

Maternal education was used as a proxy for SES for Polish, coded into five categories: (1 = no education, 2 = primary, 3 = secondary, 4 = college, 5 = graduate and above). To facilitate direct comparison with Polish results, we re-ran the UK analyses using maternal education as an SES proxy but the results were identical to those for the composite so are not reported. In fact, UK composite SES and maternal education scores were highly correlated ($r = .86$).

RESULTS

For each language, we fitted three robust generalised linear models using the R package *robustbase*, with two predictor variables and their interaction: SES (composite (centered scaled) SES for English, maternal education (centered scaled) for Polish, and Age in Months (centered, scaled)). For each model, outcome variables were raw scores for vocabulary comprehension, production and gesture respectively.

For both UK English and Polish, there was a positive significant effect of age for comprehension, production, and gestures, such that all three slowly grew with age (see Figures 1 & 2, Table 2). Contrary to expectations, there was no main effect of SES on any scale for either language. However, there was a significant interaction between SES and age in comprehension for English and in production for Polish. Early on, parents with lower SES scores tended to report that their children comprehended (English) or produced (Polish) more words than parents with higher SES scores. But this changed as the children aged, such that, by the time the children were 18 months, the parents with higher SES scores reported that their children knew/produced slightly more words.

Table 2. Robust regression results for UK English and Polish

	UK-English			Polish		
	Comp.	Prod.	Gesture	Comp.	Prod.	Gesture
Intercept	115.75*** (110.43, 121.07)	10.31*** (9.03, 11.59)	27.25*** (26.67, 27.82)	130.32*** (124.90, 135.73)	8.75*** (7.96, 9.54)	30.55*** (29.96, 31.14)
SES/MatEd	-0.47 (-3.70, 2.76)	-0.44 (-1.01, 0.14)	0.10 (-0.28, 0.47)	0.07 (-4.73, 4.87)	0.37 (-0.18, 0.93)	0.18 (-0.42, 0.79)
Age in months	68.48*** (63.64, 73.33)	6.64*** (5.52, 7.77)	11.83*** (11.30, 12.37)	71.59*** (67.09, 76.09)	5.23*** (4.56, 5.91)	12.87*** (12.33, 13.41)
Interaction	7.10*** (4.01, 10.19)	0.58 (-0.03, 1.19)	0.17 (-0.19, 0.54)	2.92 (-1.59, 7.43)	0.79** (0.23, 1.34)	0.26 (-0.30, 0.81)
N	978	955	975	1349	1349	1349
Adjusted R ²	0.54	0.37	0.67	0.44	0.32	0.61
Residual SE	58.11	8.03	8.06	74.74	7.24	10.24

Note: * $p < .05$, ** $p < .01$, *** $p < .001$. 95% confidence intervals in parentheses. Comp. = comprehension, Prod. = production.

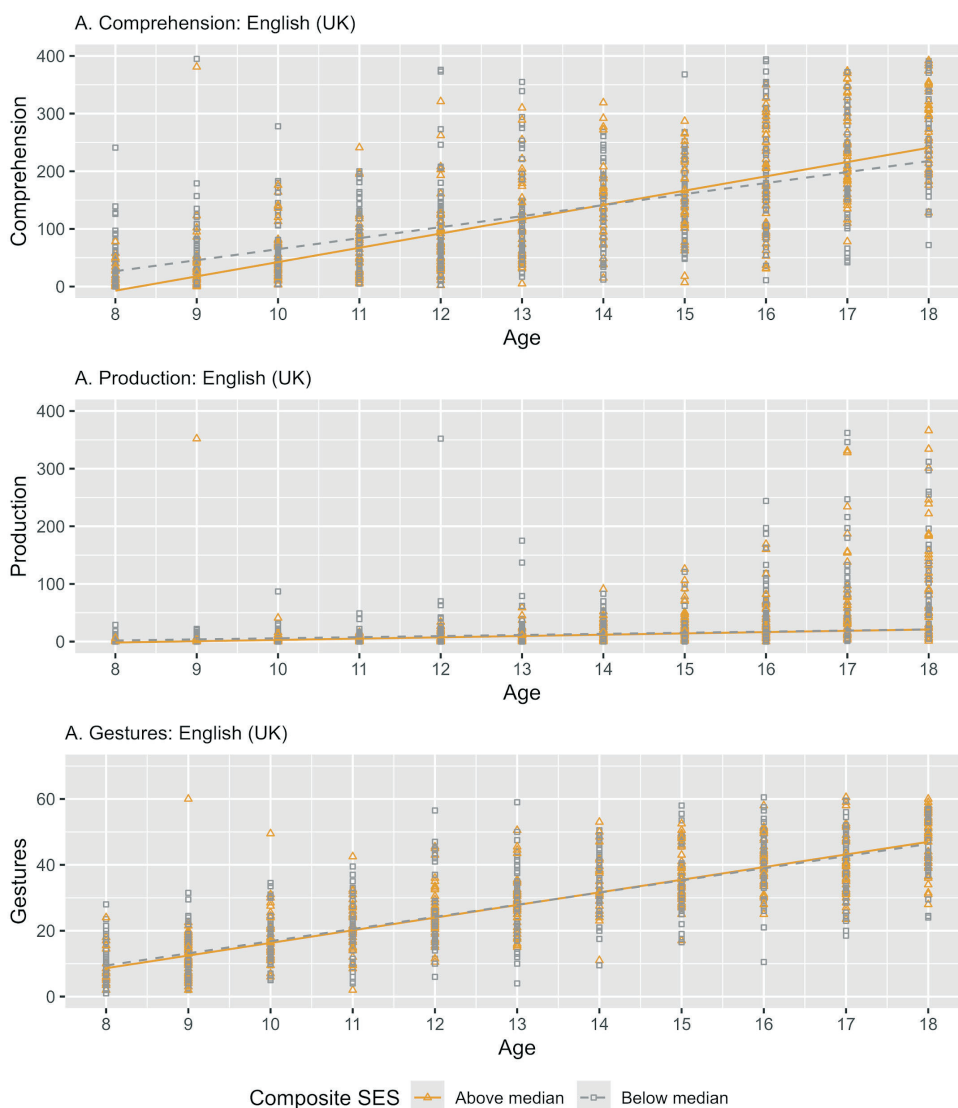


Figure 1. Effect of composite SES on vocabulary comprehension (A), production (B) and gesture (C) for UK English.

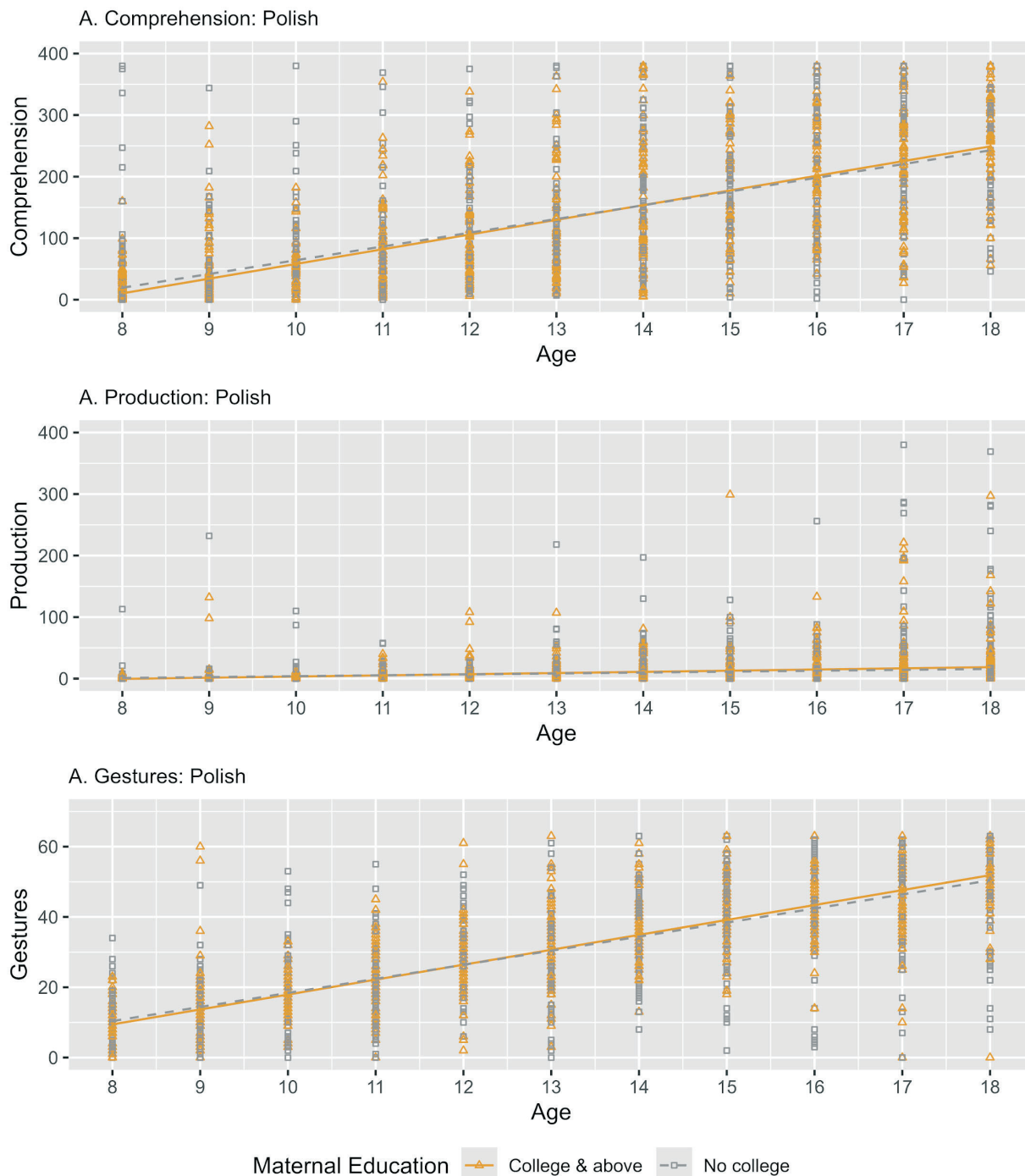


Figure 2. Effect of maternal education on vocabulary comprehension (A), vocabulary production (B) and gesture (C) scores between 8 and 18 months in Polish.

DISCUSSION

There was no main effect of SES on comprehension vocabulary, production vocabulary or gesture use in either Polish or English. There was, however, a significant interaction between SES and age in comprehension in English and in production in Polish. Early on, parents with lower SES scores tended to report that their children knew more words than parents with higher SES scores. However, this changed as the children aged. By the time the children were 18 months old, parents with higher SES scores were reporting that their children knew (in English) and produced (in Polish) slightly more words.

The lack of the predicted main SES effect in production could be due to a floor effect but this cannot be the reason for the lack of effect in the comprehension and gesture data. We think it is more likely that the results are due to a reporting bias. This may occur because parents with lower levels of education in both countries may understand the instructions differently to those with higher levels of education, or because parents of children who know very few words may over-report if they think having more vocabulary is desirable. In support is the fact that the reporting bias was not present in gesture scales in either language. Gesture reporting is less likely to elicit a social desirability bias for a number of reasons: because gestures are more discrete and easily observable behaviors, because parents can tick off a greater proportion of the total number of gestures since gestures emerge earlier, and because there is less societal stigma surrounding gesture data.

However, the discrepancy between this study (no SES effect) and the findings of some previous studies (SES effect) still need to be explained. Since the children in our study are younger than those for whom SES effects are most often found,

one explanation is that environmental factors that cause SES-related differences (e.g., differences in parental input quantity or quality) are slow-acting in both Polish and English, having a cumulative effect over time. This would mean that SES-related effects would only be predicted to emerge at later timepoints. Alternatively, there may be two distinct, genetically-mediated, phases in language acquisition; Verhoef et al. (2022) reported that there were two independent genetic factors that contributed to vocabulary learning, one underlying early-phase (infancy) and one underlying late-phase (toddler) vocabulary, with only the late phase vocabulary sharing a genetic association with educational attainment.

CONCLUSION

In sum, we found no consistent evidence that children from better-resourced backgrounds were at an advantage during the earliest stages of language acquisition in either Polish or English. For vocabulary, there was an interaction between SES and age, which indicated that parents with lower levels of education may have a reporting bias when recording the vocabulary of their very young children. This reverse SES effect was not present in the gesture scale datasets, suggesting that gesture may not be subject to the same reporting bias. The lack of SES effects at the younger ages also raises the question of whether early parent education and intervention could play a role in diminishing later, negative SES-related effects.

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