APPENDIX A: CHILDES CORPORA

The aggregated corpora of transcribed adult- and child-produced speech used in this study contain material from all (British and North American) English corpora on the CHILDES data base (MacWhinney, 2000a) where the target children were normally developing (available online: `https://childes.talkbank.org/`). The BE corpus is based on ten CHILDES corpora, and the NA corpus is based on 41 CHILDES corpora (data were downloaded August 2018).

1. CHILDES corpora used for the BE corpus:

   Belfast (Henry, 1995), Fletcher (Fletcher and Garman, 1988), Forrester (Forrester, 2002), Howe (Howe, 1981), Lara (Rowland and Fletcher, 2006), MPI-EVA-Manchester (Lieven et al., 2009), Manchester (Theakston et al., 2001), Thomas (Lieven et al., 2009), Tommerdahl (Tommerdahl and Kilpatrick, 2013), Wells (Wells, 1981)

2. CHILDES corpora used for the NA corpus:

   Bates (Bates et al., 1991), Bernstein-Ratner (Ratner, 1986), Bliss (Bliss, 1988), Bloom 1970 (Bloom et al., 1974), Bloom 1973 (Bloom, 1976), Bohannon (Bohannon III and Marquis, 1977), Braunwald (Braunwald, 1971), Brent (Brent and Siskind, 2001), Brown (Brown, 1973), Clark (Clark, 1978), Cornell (no reference provided), Demetras-Trevor (Demetras, 1986), Evans (no reference provided), Feldman (Feldman and Menn, 2003), Garvey (Garvey and Hogan, 1973), Gathercole (no reference provided), Gleason (Masur and Gleason, 1980), HSLLD (Beals, 1993), Hall (Hall et al., 1984), Higginson(no reference provided), Kuczaj (Kuczaj, 1977), MacWhinney (MacWhinney, 2000b), McCune (McCune, 1995), McMillan (no reference provided), Morisset (Morisset et al., 1995), New England (Ninio et al., 1994), Post (Demetras et al., 1986), Providence (Song et al., 2013), Rollins (Rollins, 2003), Sachs (Sachs, 1983), Sawyer (Sawyer, 1997), Snow (MacWhinney and Snow, 1990), Soderstrom (Soderstrom et al., 2008), Sprott (no reference provided), Suppes (Suppes, 1974), Tardif (no reference provided), Valian (Valian, 1991), Van Houten (Van Houten, 1986), Van Kleeck (no reference provided), Warren-Leubecker (Warren-Leubecker and Bohannon III, 1984), Weist (Weist and Zevenbergen, 2008)

APPENDIX B: CHILD-PRODUCED SPEECH STATISTICS

measure	BE	NA
# children	247	743
mean child age (months)	32.66 (SD = 9.25)	41.39 (SD = 23.45)
# utterances	873,623	846,894
mean utterance length (words)	3.45 (SD = 2.95)	2.51 (SD = 1.88)
# tokens	3,016,863	2,130,946
# types	43,510	24,322

Table 4. Statistics for child-produced speech used to estimate corpus-derived AoFP.

APPENDIX C: CORRELATIONS BETWEEN PREDICTORS

Table 5 shows pairwise correlations between the predictors used in the linear regression analyses. Correlations between $\#MSU$ counts and the co-variates are mostly weak to moderate, but we also find a few stronger correlations (e.g. word frequency is strongly positively correlated with all $\#MSU$ counts). Including collinear predictors in regression models can lead to unstable results. It is thus important that similar results are obtained when the co-variates are excluded. Results for analyses without co-variates are reported in appendix H.

corpus	1. S	2. F	3. P	4. Freq	5. Con	6. Nsyl	7. PhonN
BE	1. —	0.65 ***	0.62 ***	0.69 ***	0.04 ***	-0.24 ***	0.26 ***
	2. —	—	0.69 ***	0.69 ***	-0.07 ***	-0.08 ***	0.14 ***
	3. —	—	—	0.62 ***	-0.02	-0.03 *	0.02 *
	4. —	—	—	—	-0.04 ***	-0.18 ***	0.22 ***
	5. —	—	—	—	—	-0.03 **	0.01
	6. —	—	—	—	—	—	-0.74 ***
NA	1. —	0.64 ***	0.59 ***	0.70 ***	0.03 **	-0.26 ***	0.27 ***
	2. —	—	0.68 ***	0.71 ***	-0.07 ***	-0.08 ***	0.16 ***
	3. —	—	—	0.62 ***	-0.01	-0.01	0.02 *
	4. —	—	—	—	-0.06 ***	-0.20 ***	0.26 ***
	5. —	—	—	—	—	-0.02	-0.01
	6. —	—	—	—	—	—	-0.74 ***
BE + NA	1. —	0.76 ***	0.61 ***	0.81 ***	-0.38 ***	-0.63 ***	0.59 ***
	2. —	—	0.83 ***	0.92 ***	-0.46 ***	-0.25 ***	0.34 ***
	3. —	—	—	0.81 ***	-0.43 ***	-0.11 ***	0.19 ***
	4. —	—	—	—	-0.52 ***	-0.33 ***	0.40 ***
	5. —	—	—	—	—	0.20 ***	-0.18 ***
	6. —	—	—	—	—	—	-0.72 ***

Table 5. Pairwise correlations (Spearman's ρ) for predictors used in regression analyses. S = $\#MSU$-S, F = $\#MSU$-F, P = $\#MSU$-P. ***: $p \leq 0.001$. **: $p \leq 0.01$. *: $p \leq 0.05$.

APPENDIX D: AGE OF FIRST PRODUCTION STATISTICS

part-of-speech	BE	NA	CDI
Nouns	55.0 %	57.0 %	54.0 %
Verbs	24.0 %	23.0 %	19.0 %
Adjectives	12.0 %	12.0 %	0.9 %
Adverbs	0.4 %	0.3 %	0.5 %
Function words	0.5 %	0.4 %	13.0 %
Other	1.0 %	1.0 %	0.0 %

Table 6. Part-of-speech proportions for words in the three different AoFP data sets (AoFP from BE children, AoFP from NA children, CDI-derived AoFP.) Part-of-speech tags correspond to the most frequent part-of-speech for each given word, according to Brysbaert et al. (2014).

AoFP data set	min	max	mean (SD)
BE	1.0	5.54	2.08 (0.73)
NA	1.0	8.31	2.52 (1.05)
CDI	16.0	31.0	24.97 (3.76)

Table 7. Minimum, maximum, and mean AoFP values for the three different AoFP data sets. Note that values for the BE and NA data correspond to mean length of utterance (MLU) at first usage; whereas for the CDI data, values correspond to the children's age in months (parents reported child productions for months 16 to 31).

APPENDIX E: BASELINE MODELS (COVARIATES ONLY)

corpus + AoFP data	Effect (ΔR^2 in %)
BE corpus + NA-AoFP	43.2 %
NA corpus + BE-AoFP	37.2 %
joint BE-NA corpus + CDI-derived AoFP	24.2 %

Table 8. Amount of variance in AoFP (ΔR^2 in %) that can be explained by regression models which only include the covariates.

APPENDIX F: PROPORTION OF TARGET WORDS CONTAINED IN CHUNK SETS

BE corpus			NA corpus			BE + NA corpus		
freq.	pred.	short	freq.	pred.	short	freq.	pred.	short
19.1 %	21.0 %	29.6 %	24.6 %	25.1 %	36.8 %	74.4 %	72.0 %	85.7 %

Table 9. Proportion of target words contained in chunk sets consisting of the 10,000 most frequent, 10,000 most internally predictable, and 10,000 shortest MSUs. Chunk sets are taken from the BE corpus (paired with target words from the NA-AoFP data), the NA corpus (BE-AoFP), and the age-restricted joint corpus (CDI-derived AoFP).

APPENDIX G: AGE OF FIRST EXPOSURE FOR MULTI-SYLLABLE-UTTERANCES

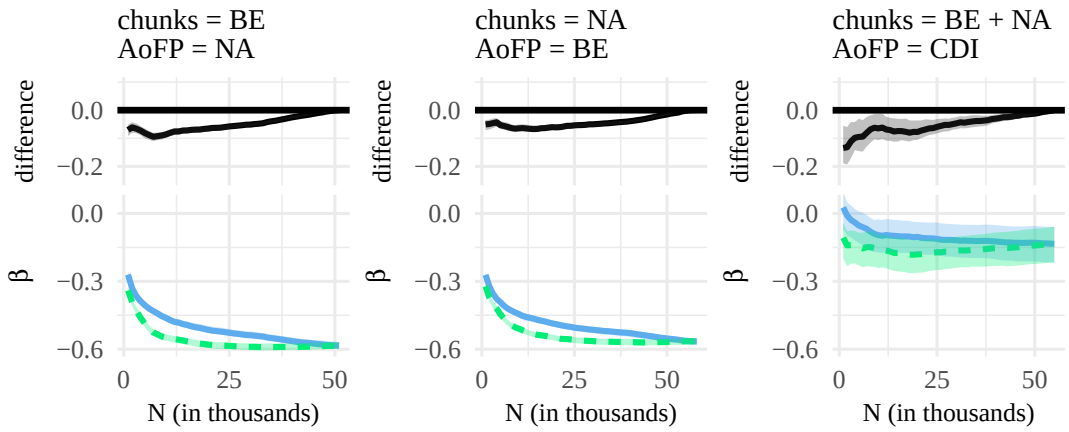
It is possible that the results presented in analysis III are due to children being exposed to short MSUs before they are exposed to particularly frequent or internally predictable MSUs. Table 10 below contains the minim, maximum, and average age (in months) at which children were first exposed to the items in the chunk sets containing the 10,000 shortest, 10,000 most frequent, and 10,000 most internally predictable MSUs. The average age of first exposure for short MSUs is either similar to (BE + NA corpus) or larger than the age of first exposure for the other two MSU types (BE and NA corpus). Thus, the stronger effect for $\#MSU\text{-}S$ in analysis III is unlikely to be a result of earlier exposure to short MSUs.

measure	BE corpus			NA corpus			BE + NA corpus		
	freq.	pred.	short	freq.	pred.	short	freq.	pred.	short
min	17.7	17.7	17.7	3.0	3.0	3.0	3.0	3.0	3.0
max	61.1	86.1	86.8	114.8	228.0	228.0	30.0	30.0	30.0
mean	24.3	28.2	28.4	16.2	25.6	26.0	22.1	22.5	22.4

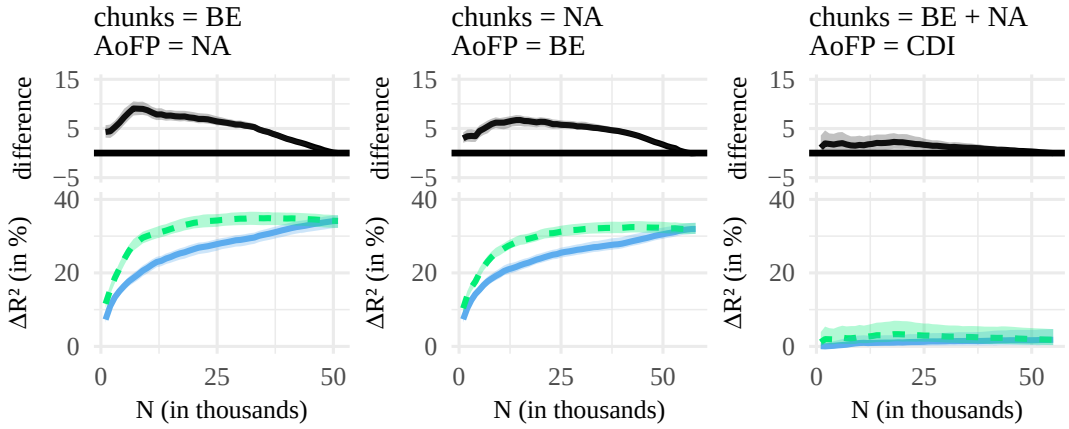
Table 10. Minimum, maximum, and average age (in months) at which children in the three corpora first heard the items contained in chunk sets covering the 10,000 most frequent, 10,000 most internally predictable, and 10,000 shortest MSUs. Note that the BE + NA corpus was restricted to only contain MSUs produced in the presence of children aged 30 months or less.

APPENDIX H: RESULTS WITHOUT COVARIATES

Figures 7, 8, and 9 are fashioned after figures 4, 5, and 6 from analysis III, except that we do not control for co-variates. In contrast to analysis III, we find that $MSU\text{-}F$ performs slightly better than $MSU\text{-}P$ when the co-variates are excluded (figure 9). Importantly, however, we replicate the key finding from analysis III: As long as N is not very small or very large, high $MSU\text{-}S$ counts are more strongly predictive of early AoFP than either high $MSU\text{-}F$ (figure 7) or high $MSU\text{-}P$ (figure 8) counts.

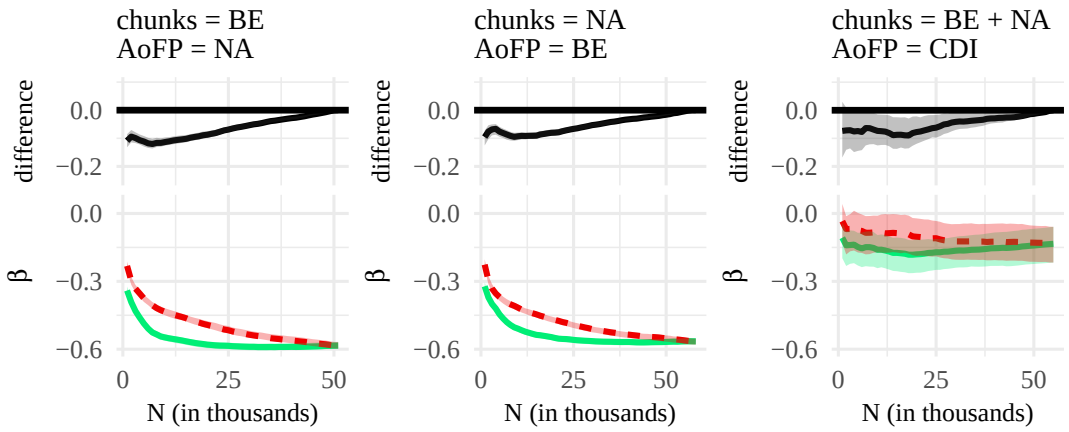


(7a) Bottom: Regression coefficients (β). Top: difference between coefficients.

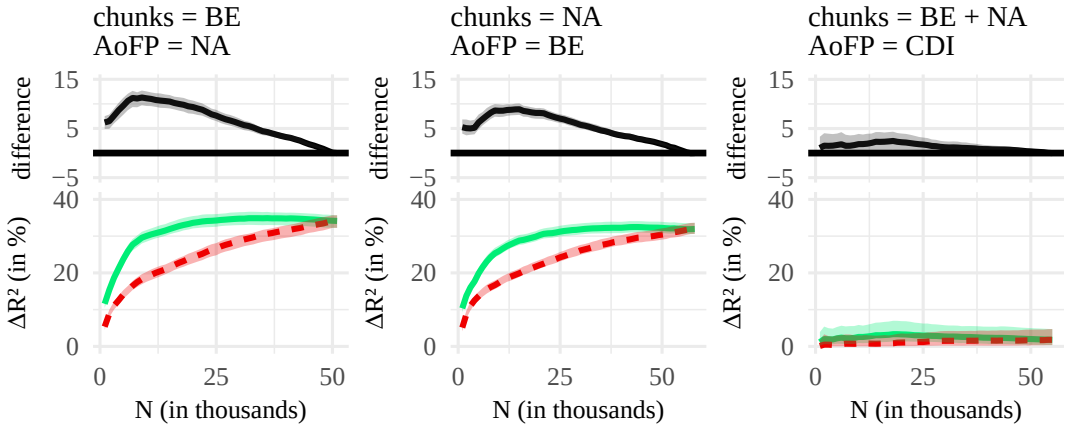


(7b) Bottom: amount of variance in AoFP (ΔR^2 in %) . Top: difference between R^2 values.

Figure 7. Comparison of $\#MSU\text{-}S$ (green line) and $\#MSU\text{-}F$ (blue line).

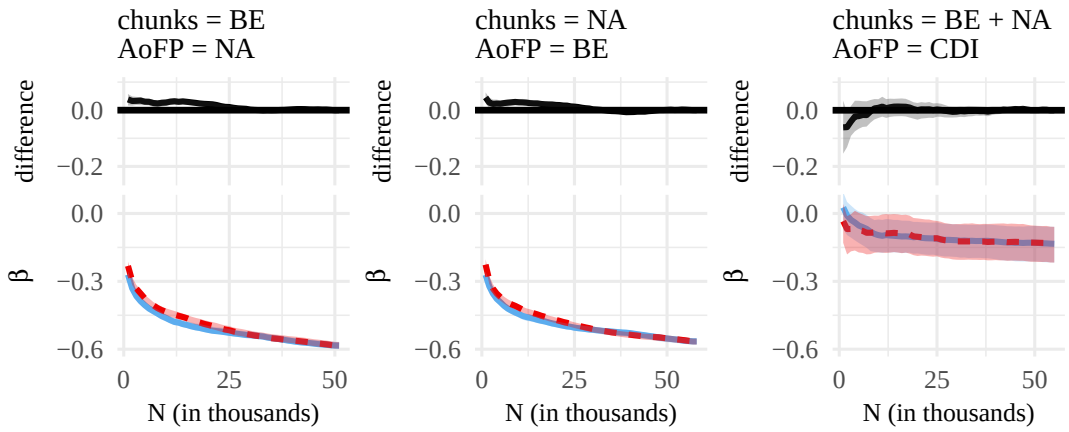


(8c) Bottom: Regression coefficients (β). Top: difference between coefficients.

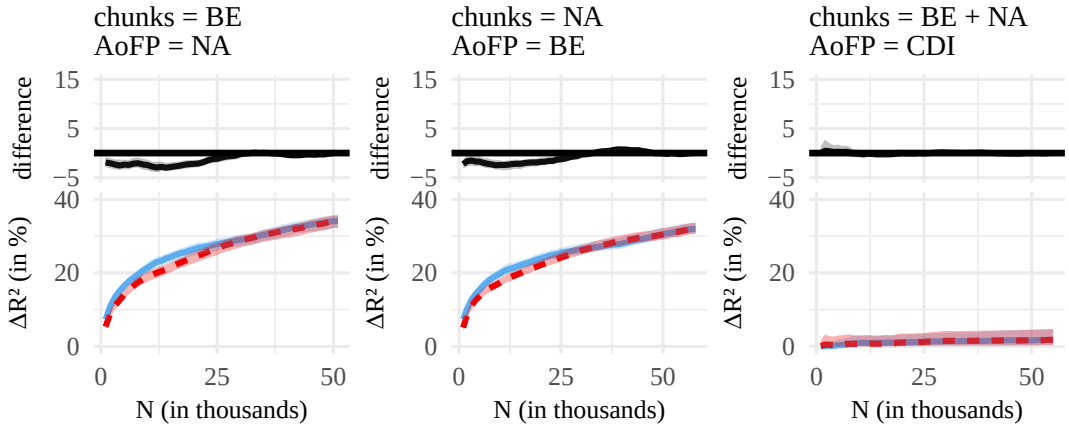


(8d) Bottom: amount of variance in AoFP (ΔR^2 in %) . Top: difference between R^2 values.

Figure 8. Comparison of $\#MSU\text{-}S$ (green line) and $\#MSU\text{-}P$ (red line).



(9e) Bottom: Regression coefficients (β). Top: difference between coefficients.



(9f) Bottom: amount of variance in AoFP (ΔR^2 in %) . Top: difference between R^2 values.

Figure 9. Comparison of $\#MSU\text{-}P$ (red line) and $\#MSU\text{-}F$ (blue line).

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