Structure of MLU: prediction from tense and non-tense morphology

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Summary

The structure of MLU and its growth in early language development is analyzed in this study. Using random-effects (multilevel) modeling of the relationships between MLU and measures of grammatical morphology usage, the study investigates the hypothesis that growth of MLU is primarily driven by morphosyntactic development. The results demonstrate that productive use of inflectional morphology improves prediction of MLU compared to the prediction based on the age only. Although original analyses suggested that tense-related inflection is a better predictor or MLU than inflection unrelated to tense, the final results are not consistent in this respect. The findings confirm the MLU is a valid indicator of syntactic development, and that development of sentential syntax is the primary correlate of MLU growth in typically developing children.

Introduction

Mean length of utterance is widely used in child language research as an approximate measure of language developmental level. Many researchers expressed concerns about validity and reliability of the measure (e. g. Klee & Fitzgerald, 1985; Eisenberg, Fersko, & Lundgren, 2001). Some concerns about MLU include:

- it is not clear what aspects of language development MLU reflects
- utterance length is determined by the context to a large extent
- the observed variability in MLU values is large, and the relationship between MLU and age is not always clear

One problem is that most data on MLU development comes from cross-sectional studies. The observed range of MLU values in children at a particular age is due both to the measurement error and to the true differences in developmental level. This study attempts to address these problems:

- if MLU reflects morphosyntactic development, indicators of morphology use should improve prediction of MLU compared to predictions made from age alone

Data and Method

Two longitudinal corpora of spontaneous language transcripts, available from CHILDES (MacWhinney, 2000), were used:

- Manchester corpus (Theakston, Lieven, Pine, & Rowland, 2001) – a total 798 transcripts from 12 children aged 20 – 36 mo. used for this study
- Wells corpus (Wells, 1981) – total of 279 transcripts from 32 children were used here; age range 17 – 43 mo.

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Measures

MLU-referenced (Smolík, 2004) age was used as the time variable. This method highlights the similarities in the growth curves across children, largely removing the variability due to differences in absolute timing of the onset of language development.

- tense inflection – number of verb forms in the transcript inflected with irregular past tense, regular past *-ed* suffix or 3rd person singular *-s*
- nontense inflection – number of noun forms in the transcript inflected with plural *-s*, possesive *-s*, or verb forms inflected by progressive *-ing*
- number of forms (types) was used to minimize the influence of frequent but not productive forms
- see Figure 1 for plots of the raw data of inflectional measures
- the numbers of inflected word types were counted using custom-written Perl routines; the morphological coding provided with CHILDES data was used
- MLU *in words* also calculated using Perl routines
- MLU in words was used throughout the study because it is not directly related to the morphology-related measures used as predictors; most correlations of MLUw with MLUm in the samples were over 0.99

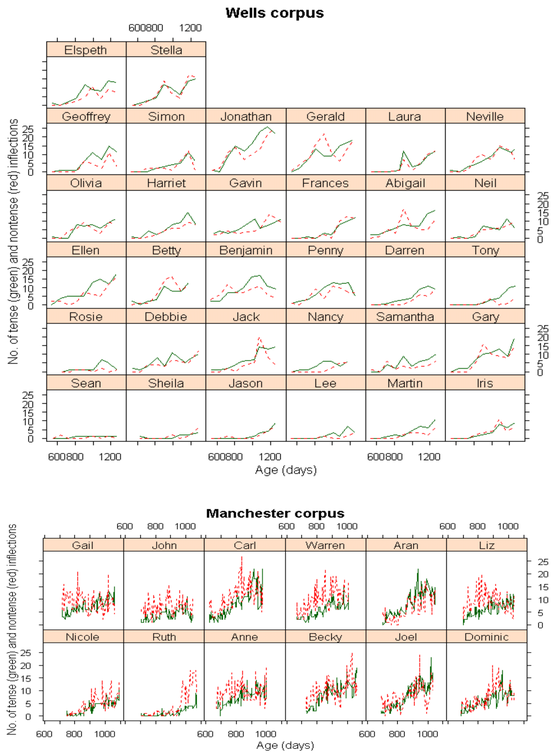

Figure 1: Numbers of tense and non-tense inflected word types per language sample; these values were used as measures of the use of inflectional morphology.

Analyses

The data was analyzed using mixed-effects modeling (Bryk & Raudenbush, 1992; Pinheiro & Bates, 2000). All models were fit separately for each corpus.

- first step was finding the best model for prediction of MLU from MLU-referenced age (reported Smolík, 2004, , this meeting)
- number of tense or nontense inflections in a transcript was added as time-changing (level 1) covariate to the above models
- resulting models compared by overall fit indices and by effect sizes of the inflection variables (using value of $t-$statistics as an estimate of effect size)

Results

Adding the inflection measures resulted in clear improvement in fit for both corpora, both both for the tense and nontense inflection measures. The effects of inflectional variables were always significant with $p < 0.001$.

Wells corpus

- model with referenced age only as predictor: $BIC = 272.11$, $logLik = -110.71$
- model tense inflection added: $BIC = 244.61$, $logLik = -94.15$, comparison with age-only model $\chi^2(1) = 33.13$, $p < 0.001$;
- nontense inflection as predictors: $BIC = 202.64$, $logLik = -73.16$, comparison with age-only model $\chi^2(1) = 75.10$, $p < 0.001$
- adding tense inflection results in worse model than adding nontense inflection (cf. the BIC values)

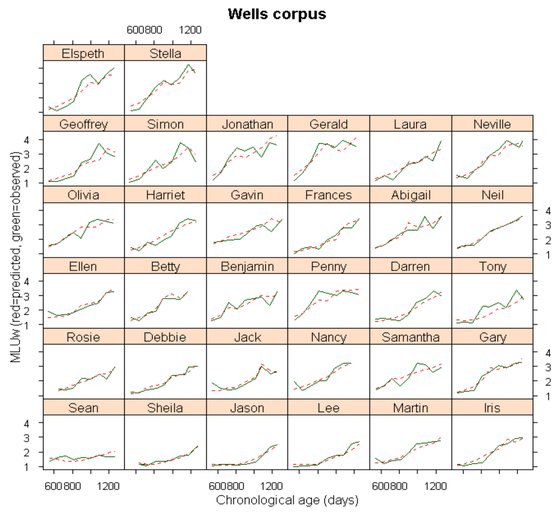

Figure 2: Comparison of actual MLU values with values predicted by the model inlcuding age and non-tense inflection; Wells corpus

Manchester corpus

- model with referenced age only as predictor: $BIC = 0.2$, $logLik = 40$
- tense inflection added: $BIC = -34.2$, $logLik = 60.5$, comparison with age-only model $\chi^2(1) = 41.07$, $p < 0.001$; nontense inflection added: $BIC = -4.00$, $logLik = 45.43$, comparison with-age only model $\chi^2(1) = 10.86$, $p < 0.001$
- BIC values show that model including tense inflection fits substantially better fit than model including nontense inflection

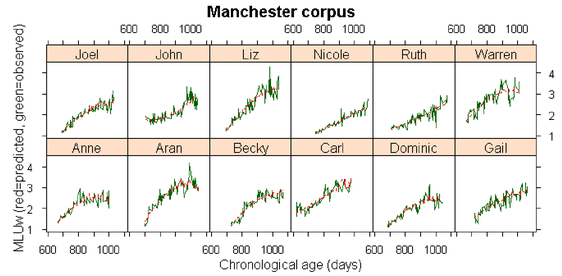

Figure 2: Comparison of actual MLU values with values predicted by the model including age and tense inflection; Manchester corpus

Conclusions

MLU can be predicted more precisely if the prediction takes into account indicators of inflection mastery.

- validity of MLU as a measure of language development is supported
- the consistent growth and sensitivity to inflection variables indicate that MLU reflects some latent characteristic of language growth
- the exact nature of this latent trait is not known; analyses suggest that MLU is sensitive to the development of morphosyntactic knowledge

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