# MLU and the order of morpheme acquisition in Russian 2–5-year-old children using cross-sectional data

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## Background

1. Children typically follow a very similar path in their **morphosyntactic development**, acquiring grammatical morphemes is the **same order** and by a certain **age** (Brown, 1973).

2. This correlates with how long children's sentences tend to be – which is often estimated using the **Mean Length of Utterance** (MLU). MLU is typically calculated as the average number of morphemes (MLUm), words (MLUw) or syllables (MLUsyl) in a sample of 100 sentences.

3. **MLU** has been extensively used for decades **in research** and for **clinical purposes** (de Villiers & de Villiers, 1973; Rice et al., 2006). It is particularly important in the absence of standardised tests, which is the case for many languages.

4. However, several research questions are unclear about how it should be adjusted for **cross-linguistic** studies (Allen & Dench, 2015) and also about **nature of MLU** measures in general.

## Current problems & research questions

### 1. MLU as a cross-linguistic tool
**a.** In languages with **rich morphological systems** like Russian, which version of MLU (i.e., in words, morphemes, syllables) is a better estimate of children's linguistic development?

**b.** Could differentiating between **derivational** (e.g., *run–runn**er***) and **grammatical** markers (e.g., *runner–runner**s***) give a better insight into children's morphosyntactic development?

### 2. Nature of MLU and its possible alternatives
**a.** Despite its original introduction as a measure of morphosyntactic ability, it has been suggested that MLU is better be viewed as a **global measure of expressive language** (Dethorne et al., 2005).
Do the MLU values in Russian correlate with the measurements like total number of unique words/grammatical forms – as they do in English?

**b.** Are there **other quantitative measurements** which correlate with children's age, such as **distributions** of different word classes in the same sample (e.g., average number of nouns, verbs, etc.)?

## Present study

1. **Participants** were two groups of children
   - **Younger**: 9 children aged 2;9–3;3 (mean = 3;0, SD=0;2)
   - **Older**: 7 children aged 4;0–5;3 (mean = 4;7, SD=0;7)

2. **Data**
   - **Audio-recordings** of **15–20-minute** one-on-one play sessions between the child and the experimenter.
   - **Topics**: current activity, daily routines, likes/dislikes, family, etc.
   - The first **100 intelligible utterances** for each participant were used for analysis.

3. **Coding. Each 100-utterance sample** was coded and averaged for the same set of variables:

   ❖ **MLU-related**
   - *MLUm* = mean length of utterance in morphemes
   - *MLUw* = … in words
   - *MLUsyl* = … in syllables
   - *MLUderiv* = … in derivational morphemes (semantics)
   - *MLUinflec* = … in grammatical markers (morphosyntax)

   ❖ **Word classes**
   - *AvN* = average number of nouns
   - *AvPron* = … of pronouns
   - *AvV* = … of verbs
   - *AvPrep* = … of prepositions      etc.

   ❖ **Unique grammatical forms**
   - *AvUniqF* = average number of unique grammatical forms

## Analysis & Results

1. How well do the **various types of MLU measures** correlate?

Table 1. Pearson correlations between MLUm and other sentence length measures as well as average number of unique forms in children (N = 16).

|  | MLUw | MLUsyl | MLUderiv | MLUinf | AvUniqF |
|---|---|---|---|---|---|
| MLUm | 0.98 | 1.00 | 0.99 | 0.93 | 0.97 |
| *p*-values | <.001* | <.001* | <.001* | <.001* | <.001* |



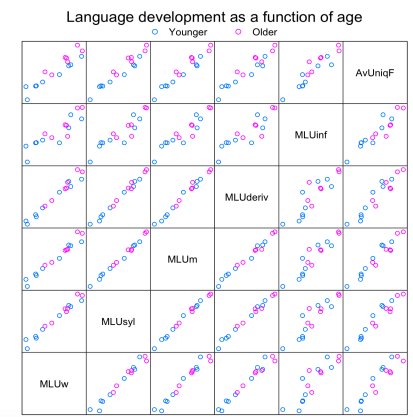Language development as a function of age

Figure 1. Pearson's correlations between sentence length measures.

2. How well do **other quantitative measures** correlate with MLUm?

Table 3. Pearson correlations between MLUm and distributions of word classes (N = 16).

|  | Nouns | Pron | Verbs | Adject | Adv | Prepos | Conj |
|---|---|---|---|---|---|---|---|
| MLUm | 0.81 | 0.84 | 0.94 | 0.44 | 0.49 | 0.75 | 0.77 |
| *p*-values | <.001* | <.001* | <.001* | 0.09 | 0.06 | <.001* | <.001* |

3. What are the best **quantitative estimates** of children's linguistic development **in Russian**?
**Final model**: Age ~ MLUm + AvUniqF + AvN + AvPron + AvPrep
F-statistic 15.69 on 5 and 10 DF; $R^2$ = 0.83

Table 3. Linear regression model output.

| Variables | Coefficient estimate | Std. Error | *p*-value |
|---|---|---|---|
| *MLUm* | -1.7 | 0.3 | <.001* |
| *AvUniqF* | 5.9 | 0.9 | <.001* |
| *AvN* | -3.6 | 1.0 | <.001* |
| *AvPron* | 3.4 | 1.0 | <.001* |
| *AvPrep* | 7.7 | 1.9 | <.001* |

## Discussion

### 1. MLU as a cross-linguistic tool
**a.** In Russian, the various types of **MLU measures** have a **very strong correlation**. Thus, any type of MLU could be used for analysis.

**b.** However, the average number of grammatical markers – *MLUinf* – seems to have the weakest correlation with *MLUm*, suggesting that
1) it is best to **avoid using *MLUinf***;
2) MLU does **not** seem to indicate the level of **morphosyntactic development**.

### 2. Nature of MLU and its possible alternatives
**a.** Like in English, Russian MLU measures have a very strong correlation with the number of unique words/grammatical forms (*AvUniqF*), suggesting that MLU should indeed be viewed as a **global measure of expressive language** (see also finding in 1b).

**b. Distributions** of word classes in a sample significantly contribute to the model and should be included in any quantitative analysis of children's spontaneous speech.

## References

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