Parental report evidence for toddlers' grammar and vocabulary in Bulgarian

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Abstract

This is the first study of a large sample of Bulgarian-speaking toddlers and their communicative development. A Bulgarian adaptation of the MacArthur–Bates Communicative Development Inventory Words and Sentences was used to obtain parent report data on 153 children between the ages of 20 and 30 months. Lexical and grammatical development were examined as a function of age, gender, and maternal education. While evidence was found for both lexical and grammatical developmental changes with age even in this age-restricted sample, gender had little effect on developmental levels, especially on the grammar components of the instrument. Maternal education was a significant predictor of children's developmental achievements and there was considerable individual variability. The development of lexical and grammatical knowledge was found to be correlated significantly.

Introduction

Much research has been conducted into charting the acquisition of American and British English, and Western European languages such as German, French, Spanish, and Italian, in early childhood. Less is known, however, about the processes, stages, and mechanisms of communicative development in the languages of Central and Eastern Europe. This disparity needs to be overcome for reasons beyond pure

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academic interest. The pace with which children acquire language can be indicative of a number of social, pragmatic, cognitive, and academic problems that emerge at a later stage of development (Clegg, Hollis, Mawhood, & Rutter, 2005; McCormack, McLeod, McAllister, & Harrison, 2009). Therefore, early detection and prevention of communicative problems can make a significant change in the lives of individual children and their communities as a whole.

A clear research gap exists in this respect in the case of Bulgarian. Previous work on early language acquisition for Bulgarian has relied on a handful of time-limited longitudinal corpora of children, such as, for example, tracing the development of five children in child–caregiver interactions in the work of Stoyanova (2011), due to lack of a reliable instrument and resources to examine and assess language and general communicative development adapted to the specific characteristics of the Bulgarian language and cultural context.

Many countries faced with a similar problem have found it useful to work on an adaptation of a well-known instrument of research and assessment of communicative development in early childhood first launched in the US in the 1990s called the MacArthur–Bates Communicative Development Inventories (CDIs). MBCDI-1 is designed for work with infants in the 8–16 month age bracket, and MBCDI-2 is for toddlers in the 16–30 month age bracket (Fenson, Dale, Reznick, Bates, Thal, & Pethick, 1994; Fenson, Marchman, Thal, Dale, Reznick, & Bates, 2007). By now adaptations to the local language and communicative features have been carried out for a large number of languages (Bleses, Vach, Slott, Wehberg, Thomsen, Madsen, & Basbøll, 2008; Kovačević, Kuvač, & Cepanec, 2005; Szagun, Steinbrink, Franik, & Stumper, 2006, among others). These instruments have proven to have high validity and reliability and have become a prerequisite for conducting basic and applied research, including detection of delayed development and its consequences, the design of clinical assessment and interventions, and so on.

The CDIs are parent report measures of vocabulary, grammar, and other aspects of communicative development in very young children (Fenson et al., 1994). The CDI Toddler form (Words and Sentences: CDI-2) is designed to measure English language production in 16- to 30-month-olds; it consists of a 680-word vocabulary production checklist as well as measures of morphological and syntactic development, including utterance length and grammatical complexity.

There have been over 40 adaptations of the CDIs for use with different languages worldwide (see http://www.sci.sdsu.edu/cdi/adaptations_ol.htm). In the last several years, our work on the adaptation and piloting of a Bulgarian version of the MBCDI resulted in a revised version currently in use for data collection and norming with a view to producing a reliable research and assessment tool. The Bulgarian CDIs have been constructed so as to adhere to the same principles and main categories of analysis as those originally included in the US version of the MBCDI (Fenson et al., 1994). Culturally and linguistically different adaptations have striven to maintain the general structure and content of the original US version in order to allow for more comparability. The same applied in the case of the Bulgarian *CDI: Words and Sentences* which includes two parts. Part 1 consists of a checklist of 637 vocabulary items distributed into 22 categories and a section on Past and Future activities and Absent Things and People. Part 2 examines grammatical development in several ways. It includes measures for, among others: (a) the use of noun and verb inflections (grammatical affixation), (b) grammatical complexity of phrases as a binary choice, (c) assessment of mean length of utterance on the

basis of the three longest child produced sentences as provided by parents, (d) grammatical complexity on a graded assessment scale.

As a language, Bulgarian belongs to the South branch of Slavic and shares many features with other Slavic languages. However, it has also been influenced by neighboring languages throughout centuries of contact in the so-called Balkan *Sprachbund* both in terms of grammatical system and lexicon. Unlike other Slavic languages, for example, Bulgarian has lost its nominal case system almost entirely, while at the same time allowing for relatively free word order (Stoyanov, 1983). In the context of the adaptation of the CDIs for Bulgarian, several critical decisions had to be made regarding the most common citation form to be used for the items listed in the questionnaires. Grammatical gender variation for adjectives had to be eliminated and the neuter gender forms were used throughout. There are no verb infinitives in Bulgarian, and much consideration went into choosing the best citation form for the CDIs such that would be frequent in mother–child interactions, thus resulting in the use of 1st and 3rd person singular forms for verbs, e.g., *искам/иска* ('want_1st_Pers_Sg'/'want_3rd_Pers_Sg'). After careful consideration and piloting a longer CDI form earlier, verb aspect was also eliminated as a variable of verb forms. The over-generalization of syntax rules section was not extensive because little reliable information exists on typical over-generalizations by Bulgarian children with the exception of an unpublished longitudinal corpus of child language development (Andonova, unpublished). In fact, the most challenging part of the adaptation effort was the construction of the grammar assessment components in Part 2 of the Toddlers' CDI. Otherwise, the adaptation for Bulgarian preserved the structure of the assessment instrument. For example, in Part 1, the same number of vocabulary categories was included, although the exact number of items in each category and the semantic content of individual items differed to a small extent. Cultural specificity and similar considerations led to the replacement of items by culturally appropriate materials. General information on the child, parents, and child's environment was also collected.

Here we present a pioneering study of early language acquisition in Bulgarian based on data for a large sample of toddlers whose parents completed an adaptation for Bulgarian of the MacArthur–Bates Communicative Development Inventories, in particular, the CDI: Words and Sentences scale (Fenson et al., 1994), which is suited to the age under examination here. This study focuses on three main demographic characteristics of the children involved – age, gender, and maternal education. The data for this study covered an age period starting towards the end of the second year and continuing until the middle of their third year of life. The onset of this period marks a significant increase in the communicative abilities of young children, both in terms of expanding their lexicon and in the acquisition of knowledge about the grammar of their native tongue, including word combinations and the use of affixes, a rapid enrichment of their language skills which continues throughout this age bracket (Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991). Therefore, the expectation was that age-related differences could be traced in the data set for Bulgarian toddlers under analysis. The rapid progress made at this time may also be more revealing about the influence of demographic factors. Previous studies have revealed the impact of maternal education on language acquisition (Arterberry, Bornstein, Midgett, & Putnick, 2007; Dollaghan, Campbell, Paradise, Feldman, Janosky, Pitcairn, & Kurs-Lasky, 1999), and a replication of such findings was expected tentatively, although the sample did not include a broad spectrum of education levels.

The third demographic characteristic investigated in this study is the child's biological gender. Child gender has been examined in numerous studies of language acquisition with mixed results (see Eriksson, Marschik, Tulviste, Almgren, Pérez Pereira, Wehberg, & Gallego, 2012, for a recent review). While much of the research has found a small but consistent advantage favoring girls, this is by no means a universal outcome. The opposite trend has also been reported by Simonsen, Kristoffersen, Bleses, Wehberg, and Jørgensen (2014) who found that boys had a higher score than girls on the Infant CDI measure of 'Imitating of other adult activities.' However, exceptions apart, the main issue concerns whether gender differences exist reliably and consistently across languages and populations researched. Studies of French-speaking infants (Kern, 2007), Quebec-French children (Trudeau & Sutton, 2011), English-speaking children (Bornstein, Hahn, & Haynes, 2004; Farrant & Zubrick, 2012; Huttenlocher et al., 1991), and Cantonese-speaking preschoolers (Li, Tse, Wong, Wong, & Leung, 2013) report female superiority on language acquisition measures, mostly vocabulary production but also others. For example, Simonsen et al. (2014) found that boys lagged behind girls in vocabulary production and vocabulary comprehension as well as grammatical complexity in a large sample of 6574 children learning to communicate in Norwegian. Girls' productive vocabulary was larger than that of boys overall but closer to their third birthday boys appeared to catch up. Eriksson et al. (2012) report a female advantage in early gestures, productive vocabulary, and in combining words in an aggregated data set of more than 13,000 children from 10 languages other than English, and that the gender gap increased with child age, for example on the measure of word production. At the same time, boys' lagging behind was not accounted for by the greater male variability hypothesis as boys were not more variable than girls.

Other studies, however, have produced a different set of findings concerning gender differences in language acquisition. Most notably Eriksson and Berglund (1999) found no gender differences in their sample of 228 Swedish-speaking children for comprehension and productive vocabulary or early gesture use, for the Infants CDI (ages 0;8–1;6). Similarly, Tulviste (2003) reports no effect of gender on 2-year-olds' speech for Estonian. In Wehberg et al.'s analysis (Wehberg, Vach, Bleses, Thomsen, Madsen, & Basbøll, 2008) of the first 100 words of 182 children in a Danish longitudinal CDI study, girls used more words referring to objects to be cared for and boys produced more words for objects to be acted on. However, overall the data did not support their initial hypothesis of structurally different vocabularies as a function of child gender.

In sum, the analysis of child language data from Bulgarian in terms of age, gender, and maternal education offers a welcome cross-cultural comparison with a language and culture that have not been explored before. The expectation was that all three variables would influence the verbal abilities of Bulgarian toddlers as reported by their mothers in this sample.

Method

Participants

The sample included parent reports on the language development of 153 toddlers aged from 20 to 30 months. Their mean age was 27.59 months (*SD* = 2.39). Information was

provided by the mothers of these children. All were learners of Bulgarian as a mother tongue. The children were closely balanced by gender – there were 78 girls and 75 boys. Four boys' data were excluded due to very low vocabulary scores (see Results). Maternal education fell into one of two categories: high school graduates (*n* = 50) and mothers who either had or were in the process of obtaining a university degree (*n* = 101). Maternal education level for two of the children was not available. This distribution is not nationally representative; it is closer to the profile of the young urban-dwelling mother.

Procedure

The toddlers' mothers were recruited via preschools, pediatricians, and social contacts. They filled out the parent report questionnaires on a voluntary basis and on printed handouts. Data were subsequently entered in digital form.

Results

Before proceeding to the results of the statistical analyses, four children's data were excluded from the analyses because the estimates in the parent report for their vocabulary size placed them in the category of outliers from the overall distribution. They were at the ages of 24 (*n* = 2) and 30 months (*n* = 2) and were reported to have expressive vocabulary between 0 and 4 words.

Lexical development

In this section, we look at the development of expressive vocabulary in toddlers aged 20–30 months by examining the size of their lexicon as attested by parent report with respect to their age, gender, and maternal education level. On average, parents reported that their children produced a good amount of words at this stage of their development, *M* = 315.88, *SD* = 159.74. The average number is comparable with previous findings on languages such as American English, Italian, Slovenian, and others. Around their second birthday, children produced on average 208 words (*SD* = 39), and at two and a half years of age children produced 392 words (*SD* = 25). Significant individual variation was observed at this stage of toddlers' language development in Bulgarian, as it has been previously in many other languages and cultures (Fenson et al., 1994). There was a 10-fold difference between the child with the lowest vocabulary count (*n* = 61) and the child with the highest vocabulary count (*n* = 618) at the age of 30 months, for example.

Overall vocabulary was found to increase with age even in this rather age-restricted sample (see Figure 1). There was a significant positive partial correlation between age and total vocabulary score after controlling for gender and maternal education, *r* = .50, *p* < .001.

The analyses of partial correlations between age and individual vocabulary categories after controlling for gender and maternal education revealed that vocabulary growth was observed in all of the 22 categories with one exception (*animal sounds*). The correlations were positive, moderate, and ranged from *r* = .34 (*connecting words*) to *r* = .54 (*places*); all correlations were significant at *p* < .001.
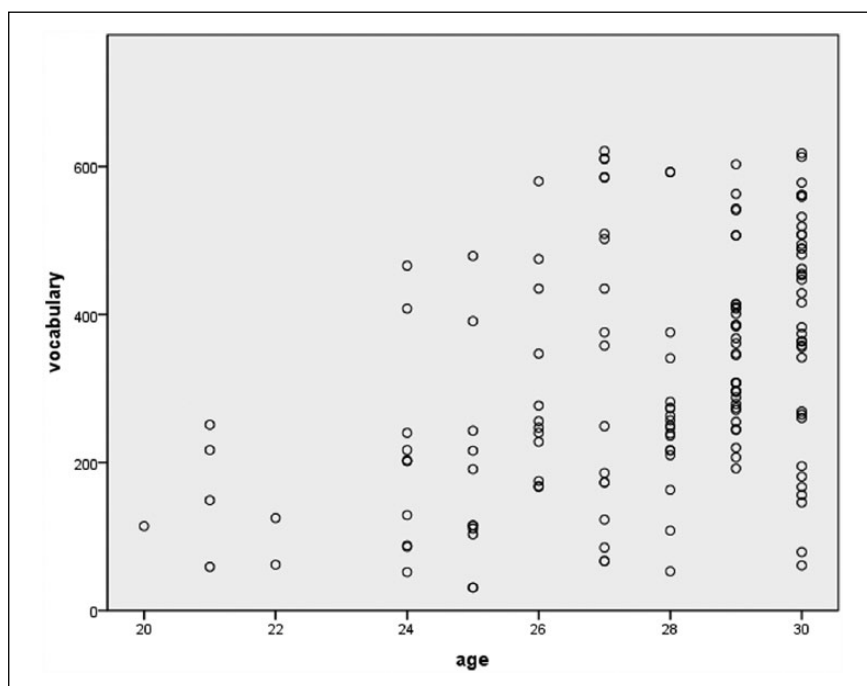
Figure 1. Growth of expressive vocabulary (number of words) with age (in months) for Bulgarian-speaking toddlers.

A *t*-test for independent samples revealed no gender difference for total vocabulary score. Boys (*n* = 71) produced 295 words on average, *SD* = 158, and girls (*n* = 78) produced 335 words on average, *SD* = 159. At the level of individual vocabulary categories, no significant gender differences were found, either (significance was set at the more conservative level of *p* < .01). Gender differences on vocabulary were examined in a series of *t*-tests for the individual month-age categories of the children in the sample for which sufficient numbers of observations were available per age/gender combination. At the age of 27 months gender differences in favor of girls emerged on multiple vocabulary categories and on the overall number of words produced. With that exception, there were no gender differences at any of the other ages (24, 25, 26, 28, 29, 30 months).

Next, a *t*-test for independent samples looked at vocabulary scores as a function of maternal education. Maternal education in this sample was either high school (*n* = 48) or university level (*n* = 99). There was a significant effect of maternal education on expressive vocabulary, *t* (145) = 3.89, *p* < .001. The children of mothers with higher education were reported to be producing more words, *M* = 352, *SD* = 162, than the children of mothers with a high school diploma, *M* = 248, *SD* = 129.

Including all three demographic variables in a combined regression analysis gives a clearer understanding of the relative contribution of each to the variability found in

toddlers' vocabulary size. A standard multiple regression analysis found that they accounted for a considerable amount of this variability, $R^2 = .34$. All three variables made a significant unique contribution to the prediction of the dependent variable vocabulary size. The largest unique contribution was made by age (beta = .48). Maternal education level also contributed to the variance in vocabulary size (beta = .36), and gender had a modest unique contribution (beta = .21) that did not reach the significance level set at .001, however. Thus, 23% of the variability was attributed to *age* differences, a result that emphasizes the rapid growth during the 20- to 30-month period of toddlers' age. Maternal education accounted for 13% of the unique variance in this measure.

Grammatical development

The acquisition of Bulgarian grammar by toddlers was assessed by means of several measures. The most important are: (a) two complexity measures – one was a binary choice as in the MacArthur–Bates CDI, and the other was a set of four items with a graded complexity response; (b) the use of common grammatical affixes; and (c) mean length of utterance (MLU). These variables were significantly positively, and moderately to highly inter-correlated, with correlation coefficients ranging from .40 to .67, the latter for the two measures of complexity used. This pattern of results reveals an underlying common set of related grammatical knowledge in toddlers at this age.

The analyses of partial correlations between age and grammatical development measures after controlling for gender and maternal education revealed that grammar development was underway for all measures used here. The correlations with child age were significant, positive, though relatively weak, ranging from $r = .23$ (*complexity binary choice*) to $r = .39$ (*use of grammatical affixes*), though only the correlations of age with use of grammatical affixes and the graded complexity measure reached the conservative .001 significance level criterion.

The next round of analyses included all three demographic variables in a series of multiple regression analyses for each of the grammatical development measures.

Grammatical affixes. A standard multiple regression analysis found that age, maternal education, and gender accounted for a modest amount of variability in the use of grammatical affixation, $R^2 = .18$. All three variables made a significant, if somewhat modest, unique contribution to the prediction of the dependent variable. The largest unique contribution was made by age (beta = .39). Maternal education level also contributed (beta = .15), and so did gender (beta = .19). Here 15% of the variability was accounted for by *age* differences, once again revealing significant growth in the use of morphology during the 20- to 30-month period. Maternal education accounted for 2% of the unique variance in this measure, and gender contributed 4% to the variance, although these two did not reach the .001 significance level criterion and made a significant contribution at $p < .05$ only.

Mean length of utterance. Out of the three demographic factors that predicted MLU as well, $R^2 = .10$, it was only age that was a significant contributor by 7% to MLU variance (beta = .27). MLU for these children ranged from 2 to 8 words, $M = 3.84$, $SD = 1.53$.

Grammatical complexity (binary choice). Here again, it was only *age* that made a significant 5% contribution (beta = .23) to the variance in grammatical complexity, in a standard multiple regression, $R^2 = .07$.

Grammatical complexity (graded choice). A standard multiple regression analysis found that age (beta = .35) and maternal education (beta = .28) contributed 12% and 8% respectively to the variance in this measure, $R^2 = .19$.

The relationship between lexical and grammatical development

Previous studies have found that toddlers' grammatical and lexical development are not independent of each other but rather go hand in hand (Bates & Goodman, 1997). This relationship was examined in the Bulgarian sample in terms of vocabulary size and the four different grammatical development measures listed above. Moderate partial correlations were found after controlling for gender, age, and maternal education between toddlers' vocabulary size and their MLU, $r = .64$, grammatical complexity as a binary variable, $r = .65$, graded grammatical complexity, $r = .53$, and use of grammatical affixes, $r = .61$. All correlations were significant at $p < .001$.

Discussion

The Bulgarian toddlers' data and analysis presented here support the findings of previous authors in several respects. First, we have shown that an adaptation of the MacArthur–Bates CDI for a yet unstudied language/culture has been able to produce internationally comparable data. A direct comparison between the vocabulary scores for the Bulgarian-speaking toddlers and the available data on US English-speaking toddlers in the original CDI reveals similar levels of lexical development. It is hard to draw conclusions in a direct comparison, however, given that the content of the categories differs and may not be sufficiently exhaustive.

The significant correlations with age indicate that between 20 and 30 months of age there is considerable growth in both vocabulary and grammar acquisition. The correlations are lower for the grammar components of the CDI than for the vocabulary categories. This may be explained in two ways. One possibility is that vocabulary development follows a more uniform developmental trajectory across languages and cultures than the acquisition of specific and quite diverse grammar systems. The second possibility is that instruments measuring grammatical development across languages differ in the degree of suitability and reliability. The findings we see here with the Bulgarian toddlers' sample may be a product of both. It is possible that the instrument in its current form is not sensitive enough to capture subtle changes in the trajectories of learning the relatively complicated morpho-syntax of Bulgarian, for example, modifier–noun and subject–predicate agreement in gender and number. Future work will show whether it is possible to find better ways to measure grammatical development, especially with the accumulation of large-scale data, which are currently lacking for Bulgarian with the exception of the sample described here.

At the same time as we established the general trends for toddlers' communicative development between the ages of 20 and 30 months in Bulgarian-speaking children, we also found considerable individual variation as attested in previous studies (e.g., Bates, Dale, & Thal, 1995). In fact, we had to exclude four children from the analysis on the basis of their poor vocabulary scores. While some of the variability may be due to differences in caregivers' approach to the task of providing information on their children's level of development, this is not sufficient to explain the very real differences in level of attainment across children at this age.

As with previous studies on the topic, we found significant correlations between two strands of communicative development – the acquisition of grammar and vocabulary growth (Bates & Goodman, 1997; Bleses et al., 2008; Caselli, Casadio, & Bates, 1999; Devescovi, Caselli, Marchione, Pasqualetti, Reilly, & Bates, 2005; Fenson et al., 1994). Interestingly enough, we found a significant correlation between vocabulary size and a number of different grammatical development measures, specifically designed to address the characteristics of the Bulgarian language and the challenges it poses to children learning to communicate in it, including two measures of complexity, MLU, and the use of inflectional morphology on nouns and verbs. One other measure was not found to be associated with developmental change in our sample – whether children were reported as having started to combine words. This is possibly due to the limited age brackets of the sample and ceiling effects as only 16 children in the sample were reported by parents not to have started combining words.

Apart from age, two main demographic factors were examined in terms of their influence on children's communicative development, i.e., gender and maternal education. Both have been shown to affect language developmental trajectories in early childhood. Despite previous findings from numerous studies, gender was found to have little influence in this sample. This was particularly valid in the analysis of grammatical development where on three out of four measures (two complexity measures and MLU), gender made no significant contribution. The one exception was parent estimates of the regularity of use of inflectional morphology by their children. However, at this age and stage of language development of Bulgarian-speaking toddlers it is difficult to say whether use of inflections is based on an underlying understanding of grammatical categories and regularities vs. rote learning. We need a more refined tool in order to make finer distinctions. Generally, however, we can conclude that our boys and girls did not differ significantly in their acquisition of grammar. At the same time, gender did make a significant albeit modest contribution to the assessment of vocabulary development in line with previous studies. Overall, the conclusion here leads towards finding no major differences between the girls and boys in terms of communicative development as reported by their mothers. This finding is in line with some recent studies of other non-English languages, for example, Eriksson and Berglund (1999). Gender differences can be viewed in terms of biogenetic and sociocultural factors, and in this case, the addition of data from Bulgarian provides another look at possible cultural influences on language development against the backdrop of numerous studies of the major European languages.

Finally, maternal education was found to be an important predictor of both lexical and grammatical development of toddlers. This finding deserves future investigation given the somewhat biased sample distribution with respect to education levels of caregivers.

In sum, we have found the Bulgarian adaptation of the MacArthur–Bates CDI-2 Words and Sentences to be a useful tool in the assessment and research on language development of Bulgarian-speaking toddlers. Further efforts in data collection, instrument improvement, and development of short forms will help us throw more light on communicative development in a language and cultural environment that have been under-studied so far. Cross-linguistic comparisons will allow for conclusions to be made on the generalizability of findings and to seek explanations of differences that relate to the major developmental task of becoming communicative in one's community.

Funding

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