



Language development in rural and urban Russian-speaking children with and without developmental language disorder



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ABSTRACT

Using a newly developed Assessment of the Development of Russian Language (ORRIA), we investigated differences in language development between rural vs. urban Russian-speaking children ($n = 100$ with a mean age of 6.75) subdivided into groups with and without developmental language disorders. Using classical test theory and item response theory approaches, we found that while ORRIA displayed overall satisfactory psychometric properties, several of its items showed differential item functioning favoring rural children, and several others favoring urban children. After the removal of these items, rural children significantly underperformed on ORRIA compared to urban children. The urbanization factor did not significantly interact with language group. We discuss the latter finding in the context of the multiple additive risk factors for language development and emphasize the need for future studies of the mechanisms that underlie these influences and the implications of these findings for our understanding of the etiological architecture of children's language development.

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1. Introduction

Language development is an efficient and rapid process that, in terms of key milestones, occurs in a relatively uniform fashion for the majority of children. Yet, there exists a substantial variation in children's language development in both typical and atypical developmental contexts (e.g., in the context of developmental language disorders, DLD¹). In the past two decades, the field's understanding of the importance of both the quantity and quality of linguistic input and, in general, of environmental and social and socio-economic contexts for children's

language development has replaced the early debate between those who suggested that variation in language input parameters and developmental contexts is irrelevant for language development beyond the presence of “normal” input and those who opposed this idea (Snow, 2014). Gaining a better understanding of both typical and atypical language development thus requires examining it in understudied settings and populations that naturally vary with respect to these factors, such as children reared in rural vs. urban environments and children with DLD.

Characteristics of children's linguistic input and their levels of language development are linked to family socio-economic status (SES) and poverty, as well as their correlates, e.g., parental education and income, access to resources, and quality of child care (Hirsh-Pasek et al., 2015; Hoff, 2003; Roulstone, Law, Rush, & Peters, 2011; Vernon-Feagans & Bratsch-Hines, 2013; Zambrana, Ystrom, & Pons, 2012). For example, the amount of “parentese” speech in one-to-one contexts predicted children's concurrent speech and future lexical development at 24 months (Ramírez-Esparza, García-Sierra, & Kuhl, 2014). Huttenlocher, Vasilyeva, Cymerman, and Levine (2002) also found that 47–59-month-olds' syntactic abilities were linked to the characteristics of paternal and teachers' linguistic input, suggesting

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¹ Although the term most commonly used in the literature to refer to a developmental (rather than acquired) disorder of language development in the absence of obvious explanatory factors is specific language impairment (SLI), we will use the DLD label when referring to this condition with an understanding that it is similar to the categories of expressive and mixed expressive–receptive language disorders in the DSM-IV-TR (American Psychiatric Association, 2001) and the category of language disorder in the DSM-V (American Psychiatric Association, 2013).

that these effects extend beyond lexical knowledge. More recently, Demir, Rowe, Heller, Goldin-Meadow, and Levine (2015) showed that SES predicted both children's language and such input parameter as parental decontextualized talk at 30 months, which in turn predicted children's language across multiple domains in kindergarten. However, most of the research on the effects of SES-related characteristics on children's language development and the characteristics of their linguistic environments has been conducted with typically developing (TD) children in disadvantaged urban communities, while both typical and atypical language development in rural settings have received very little attention.

Rural settings are characterized by geographic isolation, low SES, poverty, and limited access to resources and services (e.g., Brossart et al., 2013). These factors likely exert their effects on children's cognitive and language development via multiple distal and proximal mediational pathways that range from metabolic and neuroendocrine imbalances to lack of medical/educational services to cognitive understimulation related to low-quality parenting practices. For example, limited dietary availability of certain nutrients during pregnancy has been associated with children's poorer language development in rural communities in Bangladesh (Skröder et al., *in press*). Limited access to medical resources has been associated with delayed diagnosis of hearing problems in rural Appalachian children in Kentucky, characterized by an increased prevalence of congenital hearing loss (Bush et al., 2014). Delayed identification of congenital hearing problems has, in turn, been associated with poorer language development (Yoshinaga-Itano, Sedey, Coulter, & Mehl, 1998; Kasai, Fukushima, Omori, Sugaya, & Ojima, 2012; for a review, see Pimperton & Kennedy, 2012). Atypical maternal work schedules in African-American families living in rural households were associated with children's lower expressive language outcomes, mediated by maternal engagement and negative work-family spillover (Odom, Vernon-Feagans, & Crouter, 2013). Finally, household disorganization and instability in low-income rural families have been linked to children's poorer expressive and receptive language outcomes (Vernon-Feagans et al., 2012).

The nature of the effects of rural settings on children's language development remains unclear, both in terms of its mechanism(s) and its implications for atypical language development, especially in the light of the recent reports of unusually high rates of delayed language development among the most disadvantaged groups of young children (Law, McBean, & Rush, 2011; Letts, Edwards, Sinka, Schaefer, & Gibbons, 2013), considerably lower SES levels among children diagnosed with DLD (Elbro, Dalby, & Maarbjerg, 2011), and reports of SES-related delays in language development being detectable as early as 18 months of age (Fernald, Marchman, & Weisleder, 2013).

Children with DLD present an important window into the nature of the variation in children's language development. DLD is a highly familial and heritable neurodevelopmental disorder (Stromswold, 1998; Tomblin, 1989), and it is now widely accepted that it has prominent genetic and neurobiological components. Little is known about the precise characteristics of these components and the mechanisms of their action, despite several intriguing molecular genetic (e.g., Eicher et al., 2013; Nudel et al., 2014) and neuroimaging (e.g., Soriano-Mas et al., 2009; Whalley et al., 2011) findings published in recent years. Perhaps surprisingly, environmental influences on language development in children with DLD have rarely been investigated. Yet, studies that employ multiple populations for the purpose of describing and partitioning inter-individual variation in language development are critical for advancing our understanding of the etiology of DLD and the complex interactions between different sources of variation in typical language development.

The study had two goals. First, given the dearth of research on child language development in Russian (both typical and atypical) and the current absence of published standardized instruments for the assessment of Russian language development (Lebedeva, 2014; Rakhlin et al., 2013) available to clinicians, educators, and researchers, we first

aimed at using the sample data to obtain preliminary psychometric data on a new assessment of Russian language development (ORRIA). Correspondingly, we conducted a set of psychometric analyses aimed at 1) providing evidence for the reliability of the indicators of Russian language development obtained using the ORRIA assessment, and 2) evaluating ORRIA's items for the presence of content bias (also called differential item functioning or DIF), which could locally favor urban children and therefore distort the pattern of results of group comparisons.

The second goal of the study was to examine the roles of urbanization (rural vs. urban children), language group (TD children vs. children with DLD), and the interaction between these factors in children's language development. We expected children with DLD to significantly underperform compared to TD children, and rural children to underperform relative to urban children.² We explicitly examined the interaction between these two factors, envisioning three possible outcome scenarios. Under the multiplicative risk factors scenario, we expected to find a significant interaction between urbanization and language status, manifesting in a disproportionately large decrease in language performance in TD vs. DLD children in the rural setting compared to urban setting. Alternatively, under the additive risk factors scenario, we expected children from rural settings to show overall lower language development levels compared to urban children, and both groups of children with DLD to show similar decreases in language performance compared to their rural and rural TD peers, with no interactions between urbanization and language group. Finally, under the overlapping restricted variability scenario, we speculated that if the amount of "free" variation in children's language performance is limited (and in the case of clinically significant language problems is already accounted for by as yet unspecified DLD-specific factors), we would also see a significant interaction between language group and urbanization, resulting in a smaller TD vs. DLD performance gap in the rural setting compared to urban setting.

2. Materials and methods

2.1. Participants

A total of one hundred children in the age range from 4.17 to 8.75 years ($M = 6.75$, $SD = .27$; 56 boys and 44 girls) participated in the study. Participants were sampled from two different locales (rural and urban; see below), for a total of four groups ($n = 25$ each), following a 2 (rural vs. urban) \times 2 (TD vs. DLD) design.

2.1.1. Urban typically developing children and children with developmental disorders of language

TD children ($n = 25$) in the urban group were recruited through local kindergartens and primary schools in a large metropolis located in the Central Federal District of the Russian Federation. All children were nominated by teachers as having no apparent problems with speech, language, and literacy.

Urban children with DLD ($n = 25$) were recruited from speech- and language services groups at the metropolis's centers for psychological, medical, and social services. Although speech sound disorder (SSD), SLI, and DLD are not used as diagnostic categories in Russia, a set of

² Recent studies also suggest that there is a significant discrepancy between rural and urban poverty in the so-called "transition countries" in general and Russia in particular (Macours & Swinnen, 2008), with an almost two-fold increase in poverty rates among rural areas compared to urban areas. In its current wording, the current hypothesis that urban children will outperform rural children relies on the assumption of significant differences between the urban and rural settings in Russia on a variety of environmental variables favoring the urban settings with respect to the resources and stimulation they provide. We would like to recognize that this places emphasis on the between-group comparisons rather than the examination of, for example, factors specific to urban poverty. Note, however, that in Russia poverty is largely a rural phenomenon (Gerry, Nivorozhkin, & Rigg, 2008), and, thus, it is specifically urban vs. rural comparisons that are likely to be sensitive with respect to detecting environmental influences on child language development.

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