



Language comprehension in children, adolescents, and adults with Down syndrome



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ABSTRACT

Background: There is conflicting evidence as to whether receptive language abilities of individuals with Down syndrome (DS) continue to improve into adulthood, reach a plateau in late adolescence, or even start to decline.

Aim: The study aims to shed light on the question whether receptive syntactic skills change from childhood/adolescence to adulthood and provides a detailed qualitative analysis of the receptive abilities of adults with DS.

Methods: 58 individuals with DS participated in the study: 31 children/adolescents (aged: 4;6–19;0 years) and 27 adults (aged: 20;8–40;3 years). They completed measures of grammar comprehension, nonverbal cognition, and phonological working memory.

Results: There was no significant correlation between comprehension performance and chronological age in the overall sample. Separate correlational analyses for the subgroups of children/adolescents and adults yielded a significant positive result for the former subgroup but not for the latter. We also found significant positive correlations between grammar comprehension scores and nonverbal mental age as well as measures of phonological working memory. Qualitative analyses showed various limitations in the receptive syntactic abilities of adults with DS. Difficulties increase with sentence length and grammatical complexity, but are also apparent in simple sentences.

Conclusion: The results suggest that syntactic comprehension abilities of individuals with DS continue to improve through childhood and adolescence and that thereafter a plateau is reached and maintained. Language comprehension in adults with DS is impaired for a variety of grammatical structures and receptive performance seems to be related to nonverbal cognitive abilities, phonological working memory, and grammatical complexity.

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1. Introduction

Down syndrome (DS) is the most common neurodevelopmental disorder causing intellectual disability. The prevalence in live births in Europe is approximately 1 in 900 (Loane et al., 2013). Among the main characteristics of DS are impaired language abilities. Despite considerable interindividual variability, the language phenotype has been described as follows: later onset and slower pace of language development, relative strength in vocabulary knowledge (especially receptive), particular difficulties in morphosyntax, better language comprehension than production abilities (Abbeduto, Warren, & Conners, 2007; Martin, Klusek, Estigarribia, & Roberts, 2009). Given the late onset and slower pace in language development,

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a crucial issue is whether language development in DS, in particular the development of grammatical abilities, continues throughout adolescence or whether it stagnates at a certain point.

Some studies have provided evidence for an ongoing development of language skills into adulthood. Schaner-Wolles (1985, 2004) reported findings of a cross-sectional investigation assessing the abilities of German speaking children, adolescents, and adults with DS (age range: 7;3–41;10 years) on tasks of phonology, lexicon, and semantics as well as morphology and syntax. The author stated that “even the adults with DS showed continuing syntactic development” (Schaner-Wolles, 2004, p. 116). The data supporting this claim, however, are not presented in these papers. Likewise, Sanoudaki and Varlokosta (2015) found improvement with age in the comprehension of certain sentence structures with reflexive pronouns in a cross-sectional study with Greek speaking adolescents and adults with DS (ages: 10–34 years).

Another study, in contrast, has found no evidence of progress in language beyond adolescence. Rondal and Comblain (1996, 2002) studied language abilities of French speaking children and adolescents as well as younger and older adults with DS (ages ranging from 6 to 46 years) using tasks on receptive and productive vocabulary, grammar comprehension, and language production (mean length of utterance (MLU)). Based on their data, they suggested that there is no change in language capacities between late adolescence and about 50 years of age.

Moreover, ongoing development might be restricted to language production. Some studies have indicated that syntactic comprehension is likely to reach a plateau in late adolescence or even to decline with age, starting in older adolescents or young adults, whereas acquisition of expressive language capacities seems to continue throughout adolescence and possibly into adulthood (Chapman, Hesketh, & Kistler, 2002; Laws & Gunn, 2004; Thordardottir, Chapman, & Wagner, 2002). Thus, although the aforementioned literature on the language phenotype in DS reports a dissociation between better language comprehension and more impaired language production, the studies by Chapman et al. (2002) and Laws and Gunn (2004) indicate that the window for development in the receptive modality might be more restricted, at least for receptive grammar.

Studies that have focused on language abilities in adults with DS also report heterogeneous findings. Most of the available evidence stems from assessments of adaptive behavior that include the domain of communication or from verbal IQ measures, whereas direct language measures beyond the single word level are rare. Some studies have found declining abilities in both language comprehension and production in adults aged 45 or older (Hawkins, Eklund, James, & Foose, 2003; Roeden & Zitman, 1997). Other studies, in contrast, have observed no change with age in communication skills in subjects ranging from 20 to 69 years (Tsao, Kindelberger, Fréminville, Touraine, & Bussy, 2015) or no differences in verbal IQ scores between individuals younger than 45 years and individuals of 45 years and older (Devenny & Krinsky-McHale, 1998). A number of studies have only found receptive language abilities to decline, starting around the age of 40 years (Carter Young & Kramer, 1991; Cooper & Collacott, 1995; Ghezzi et al., 2014; Rasmussen & Sobsey, 1994), or, according to Couzens, Cuskelly, and Haynes (2011) already around the age of 20 years. In one of the rare investigations that employed direct measures of language abilities, Iacono, Torr, and Wong (2010) studied the relation between language and age in 55 adults with DS (19–58 years). They found significant negative correlations between chronological age and measures of receptive (vocabulary and grammatical structures) and expressive language (MLU). However, only the latter remained when nonverbal cognition and scores on an assessment of dementia were controlled. Thus, the results of this study indicated that language production is affected by aging independent of the onset of dementia or cognitive decline, while declines in language comprehension seem to be associated with symptoms of dementia and/or decreases in nonverbal cognition.

In conclusion, language abilities of individuals with DS may change over time, but the evidence to date is inconclusive as to whether affected individuals still improve in their grammatical abilities in the transition from adolescence to adulthood and whether respectively when a plateau is reached or declines begin. As the review of the available literature has indicated this issue is particularly debated for receptive language skills where some studies have found evidence of ongoing development into adulthood whereas others have reported the building of a plateau in late adolescence and again others have described declines starting as early as the age of about 20 years. A possible explanation for the varying and conflicting evidence is that different aspects of language were assessed and a variety of measures was used. That was particularly the case for adults with DS for whom language abilities have only rarely been investigated by specifically designed tests targeting circumscribed language abilities. To contribute to the available data on receptive language abilities in DS, we decided to focus on one core aspect of language, that is, syntax. The aim of our paper is to shed light on the issue whether receptive syntactic skills change from childhood/adolescence to adulthood and within adulthood. To this end, we will present data on the comprehension abilities of a large group of German speaking individuals with DS ranging in age from 4;6 to 40;3 years. Grammar comprehension was assessed using the TROG-D (Fox, 2011), the German adaption of the TROG (*Test for Reception of Grammar* (Bishop, 1983, 2003)), which is a well-established instrument both for diagnostic and research purposes. The TROG tests a broad array of grammatical structures and allows for a quantitative as well as a qualitative analysis. To the extent of our knowledge, detailed qualitative analyses of the receptive abilities of adults with DS as measured by the TROG do not exist so far. Thus, the current study aims to enlarge the existing database on the comprehension of grammatical structures for this group. We will use correlational analyses to investigate the relationship between language comprehension and chronological age. We will also evaluate the influence of nonverbal cognition and phonological working memory on comprehension abilities. Both have been found to be related to language outcome in DS in earlier studies (e.g. Abbeduto et al., 2003; Chapman, Schwartz, & Bird, 1991). Especially phonological working memory is often discussed as a critical factor which might, at least, be partly responsible for the language deficits in DS. An impairment of phonological working memory is a well-described feature of the cognitive phenotype in DS (Baddeley & Jarrold, 2007; Jarrold, Baddeley, & Hewes, 2000; Laws & Gunn, 2004). It is hypothesized that there is a deficit in the phonological loop component of the working memory system. The

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