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Lexical conflict resolution in children with specific language impairment

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ABSTRACT

The aim of our study is to examine the effect of conflict on naming latencies in children with specific language impairment (SLI) and typically developing (TD) children and to explore whether deficits in conflict resolution contribute to lexical problems in SLI. In light of previous results showing difficulties with inhibitory functions in SLI, we expected higher semantic conflict effect in the SLI than in the TD group. To investigate this question 13 children with SLI and 13 age- and gender-matched TD children performed a picture naming task in which the level of conflict was manipulated and naming latencies were measured. Children took longer to name pictures in high conflict conditions than in low conflict conditions. This effect was equally present in the SLI and TD groups. Our results suggest that word production is more effortful for children when conflict resolution is required but children with SLI manage competing lexical representations as efficiently as TD children. This result contradicts studies, which found difficulties with inhibitory functions and is in line with findings of intact inhibitory abilities in children with SLI. Further studies should rule out the possibility that in SLI lower level of conflict resulting from weaker lexical representations masks impairments in inhibition, and investigate the effect of linguistic conflict in other areas.

1. Introduction

1.1. Lexical impairments in specific language impairment

Children with specific language impairment (SLI) show linguistic deficits that are not accounted for by obvious impairments in other cognitive domains. Usually morphosyntactic and syntactic problems are emphasized (e.g.: Bishop, 1997; Leonard, 1998/2014) but lexical impairments are reported as well. Several studies show that first words appear later in children with SLI than in typically developing children (TD) and their vocabulary size lags behind age-based expectations at older ages too (Bishop, 1997; Watkins, Kelly, Harbers, & Hollis, 1995; Trauner, Wulfeck, Tallal, & Hesselink, 1995). SLI can also appear later without early vocabulary deficits, and early vocabulary problems do not always lead to language impairment later (Henrichs et al., 2011; Poll & Miller, 2013; Rescorla, 2011; see Ellis Weismer, 2007 and Leonard, 1998/2014 for a review).

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Children with SLI are less efficient than TD peers in experimental word learning tasks as well (e.g. Rice, Buhr, & Nemeth, 1990; Rice, Buhr, & Oetting, 1992; Rice, Oetting, Marquis, Bode, & Pae, 1994). Word retrieval seems problematic in picture naming tasks: they make more errors than TD children even when they know the word (Kail & Leonard, 1986; McGregor & Leonard, 1995), and they have longer naming latencies (Anderson, 1965; Ceci, 1983; Kail & Leonard, 1986; Katz, Curtiss, & Tallal, 1992; Lahey & Edwards, 1996; Leonard, Nippold, Kail, & Hale, 1983; Miller et al., 2001; Wiig, Semel, & Nystrom, 1982; Windsor & Hwang, 1999a). Difficulties with lexical processing also appear: children with SLI show more errors (Crosbie, Howard, & Dodd, 2004) and longer reaction times in lexical decision (Edwards & Lahey, 1996; Windsor & Hwang, 1999b) and in word monitoring tasks (Montgomery & Leonard, 1998; Montgomery, Scudder, & Moore, 1990; Stark & Montgomery, 1995). Taken together, these findings show that the acquisition, production and processing of words are slower and more error-prone in SLI than in typical development (see also Leonard & Deevy, 2004).

1.2. Accounts of lexical impairments in SLI

As the above review suggests, lexical deficits are present in various forms in the language of children with SLI, and there is no agreement in the literature on the potential causes of these impairments. A possible explanation is that lexical problems are caused by differences in the features of lexical representations. Several studies argue that in language impairment, less information is available about lexical items and the items are not as well-organized as they are in the mental lexicons of typically developing children (Kail & Leonard, 1986; Lahey & Edwards, 1999; McGregor, Newman, Reilly, & Capone, 2002; Sheng & McGregor, 2010). McMurray, Samelson, Lee and Tomblin (2010) attributes language impairments to faster lexical decay after word retrieval in these populations.

Others relate lexical problems to non-linguistic impairments: several earlier studies suggest that a generally slower processing contributes to lexical impairments as well (Kail, 1994; Leonard et al., 2007; Miller et al., 2001; Windsor & Hwang, 1999c). Lahey and Edwards (1996) argue that children name pictures more slowly because their non-linguistic response processes are impaired. Non-linguistic problems are suggested to contribute to the processing of ambiguous words by Norbury (2005), who proposes that less effective suppression mechanisms can contribute to weaker performance of children with SLI and she also emphasizes deficits of memory and attention skills as likely factors at play. Mainela-Arnold, Evans and Coady (2008) and Mainela-Arnold, Evans and Coady (2010) argue, based on findings from a gating task, that top-down attentional processes are impaired in children with SLI. In a gating task participants are presented with increasingly longer chunks of words starting from their beginning, and they are asked to guess the word after each trial. Children with SLI showed similar performance as TD children with one difference: they produced competing alternatives even after they found the appropriate word. According to the authors, this pattern is the result of weaker representations that are more vulnerable to lexical competition or, alternatively, it is caused by the deficit of top-down competition-resolving processes, or by a combination of the two (Mainela-Arnold et al., 2008).

Mainela-Arnold et al., (2010) also showed that performance of children with SLI lags behind TD children both in a word definition task and in a delayed word repetition task, with positive correlations between the two performance measures. They propose that because of reduced attentional capacity – reflected by impaired performance on the delayed repetition task – children with SLI have weak phonological representations which have a negative effect on semantic representations as well. Impairments of higher order top-down processes in word retrieval can also be linked to a new line of research in the psycholinguistic literature that emphasizes the role of cognitive control functions in linguistic processes, which we review below.

1.3. Competition and the role of cognitive control in word retrieval

According to recent studies, cognitive control, i.e. the ability to orchestrate our actions and thoughts with our internal goals (Miller & Cohen, 2001) is necessary for language use in many areas including syntactic ambiguity resolution (January, Trueswell, & Thompson-Schill, 2009; Novick, Trueswell, & Thompson-Schill, 2005; Novick, Trueswell, & Thomspon-Schill, 2010), lexical ambiguity resolution (Bedny, Hulbert, & Thompson-Schill, 2007), the assessment of common ground (i.e. the set of shared beliefs by the interlocutors; Brown-Schmidt, 2009), and, most importantly from the point of view of our research question, in word production as well (Kan & Thompson-Schill, 2004; Schnur, Schwartz, Brecher, & Hodson, 2006; Schnur et al., 2009). When a word is retrieved several other words are activated and for successful production of the target word, the activation level of its lexical representation has to be higher than that of the competing words. When the difference between the activation level of the target word and the other words is not big enough, word retrieval difficulties may appear.

The blocked cyclic naming paradigm is a widely used paradigm to investigate word production under competition (e.g. Belke, Meyer, & Damian, 2005; Damian, Vigliocco, & Levelt, 2001; Kroll & Stewart, 1994; Schnur et al., 2006, 2009). In this task participants are asked to name pictures in the context of other pictures either from the same category (homogeneous block, e.g. *pear, apple, melon . . .*) or from different categories (mixed block, e.g., *pear, chair, blouse . . .*). Sets of items are repeated in succession multiple times in various orders. For example, six fruits are presented after each other and then they are repeated several times in different orders. A robust finding is that adults name pictures in the homogeneous blocks significantly slower than pictures in the mixed blocks. This effect is usually not present in the first cycle (or first homogeneous cycles are named even faster than first mixed cycles), in the second cycle there is a large drop in reaction times