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Nouns and predicates comprehension and production in children with Down syndrome

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ABSTRACT

Our study investigated the lexical comprehension and production abilities as well as gestural production taking into account different lexical categories, namely nouns and predicates. Fourteen children with DS (34 months of developmental age) and a comparison group of 14 typically developing children (TD) matched for gender and developmental age were assessed through a test of lexical comprehension and production (PiNG) and the Italian MB-CDI. Children with DS showed a general weakness in lexical comprehension and production that appeared more evident when the lexicon was assessed through a structured test such as the PiNG that requires general cognitive skills that are impaired in children with DS. As for the composition of the lexical repertoire, for both groups of children, nouns are understood and produced in higher percentages compared to predicates. Children with DS produced more representational gestures than TD children in the comprehension tasks and above all with predicates; on the contrary, both groups of children exhibited the same number of gestures on the MB-CDI and during the subtests of PiNG production. Children with DS produced more unimodal gestural answers than the control group. Theoretical implications of these results are discussed.

1. Introduction

Down syndrome (DS) is the most frequent genetic cause of intellectual disability and involves about one child in a thousand live births (Morris & Alberman, 2009). Besides generalized cognitive delay that affects approximately 80% of individuals with DS, the neuropsychological profile of children with DS is characterized by a lack of developmental homogeneity between cognitive and linguistics abilities, with a greater impairment of the latter. In fact, despite rare exceptions (Papagno & Vallar, 2001), many authors have observed that the linguistic abilities of children with DS are poorer than what is expected on the basis of their overall cognitive level. Furthermore, some authors highlighted that language ability in this population is not uniform with morphosyntax more impaired than lexicon (Chapman, 1997; Fabbretti, Pizzuto, Vicari, & Volterra, 1997; Galeote, Soto, Sebastián, Checa, & Sánchez-Palacios, 2013; Martin, Klusek, Estigarribia, & Roberts, 2009; Vicari, Caselli, Gagliardi, Tonucci, & Volterra, 2002). Some researchers also highlighted that children with DS show a preference for nonverbal communication using more gestures with respect to typically developing (TD) children (Chan & Iacono, 2001; Hattier, Matson, Sipes, & Turygin, 2011; Maltese, Rappo, Scifo, & Pepi, 2012). However, the findings on lexical skills and on the use of communicative gestures lead to contrasting results and many questions remain open.

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1.1. Lexical comprehension and production

Different studies on typically developing toddlers have shown that word comprehension is closely linked to the development of non-verbal cognitive skills (Ellis & Thal, 2008); moreover word comprehension emerges before word production and children have a greater repertoire of words comprehended compared with words produced (Bello, Giannantoni, Pettenati, Stefanini, & Caselli, 2012; Caselli, Rinaldi, Stefanini, & Volterra, 2012; Gershkoff-Stowe & Hahn, 2013). Some studies (Caselli, Casadio, & Bates, 1999; Tardif, Shatz, & Naigles, 1997; Waxman, Fu, Arunachalam, Leddon, & Geraghty, 2013) have also shown that the increase in vocabulary size is accompanied by important qualitative changes in both comprehension and production: nouns are acquired before predicates (i.e. verbs and adjectives) and, although they continue to be the most common category of words in children's early vocabulary, when the lexical repertoire increases, the number of predicates progressively increases as well, in terms of both quantity and frequency.

Both relationships between comprehension and production as well as between nouns and predicates are rarely investigated in children with DS. Receptive vocabulary is consistently observed as a relative strength among the various aspects of language function in Down syndrome, although it is often delayed relative to chronological age (CA) (Næss, Halaas Lyster, Hulme, & Melby Leverag, 2011; Roberts, Price, & Malkin, 2007 for a review on this topic). However, contrasting results emerge in studies on children and adolescents with DS in which different types of assessment (direct vs indirect) were used. Previous studies on 3 year old (CA) toddlers with DS, have found that receptive vocabulary levels measured by MacArthur-Bates Communicative Development Inventory (MB-CDI) are less delayed than expressive vocabulary levels (Caselli et al., 1998; Singer Harris, Bellugi, Bates, Jones, & Rossen, 1997). In both these studies mental ages of children was not available. In a more recent study the same questionnaire was used with parents of 186 children with DS (CA ranging from 1 to 6 years). The sample was divided in 7 subgroups according to the different mental ages (MA) (ranging from 8 to 29 months). The results of this study highlighted that in children with DS the size of lexical comprehension vocabulary was greater than TD children matched for MA (Galeote, Sebastián, Checa, Rey, & Soto, 2011). Similar results emerged in the study by Lázaro, Garayzábal, and Moraleda (2013) which shows (although it is not the central point of the paper) that, in older children with DS, receptive vocabulary, directly assessed through the Spanish version of the Peabody Picture Vocabulary test (PPVT) is lower than expected for CA (12.2 years) but higher than expected for MA (6.5 years). In agreement with Chapman (2006), authors suggest that lexical comprehension exceeds non-verbal cognitive levels because of more life experience due to the greater chronological age of children with DS.

On the contrary, some authors have found a weakness in receptive vocabulary both in children (CA: 9 years; MA: 4 years) (Caselli, Monaco, Trasciani, & Vicari, 2008; Price, Roberts, Vandergrift, & Martin, 2007) as well as in adolescents (CA: 14 years; MA: 6 years) (Ypsilanti, Grouios, Alevriadou, & Tsapkini, 2005). A previous longitudinal study on children with DS (CA: 9.9 years) showed an interesting developmental trend: similar levels of vocabulary to TD children matched on mental age only at the first point of observation (MA: 4.3 years) but non at the subsequent time-points: as they grow older, the vocabulary comprehension skills in children with SD are progressively lower compared with ST control groups (Hick, Botting, & Conti-Ramsden, 2005). Overall, these data support that verbal comprehension is coherent with more general cognitive abilities in the early years, becoming progressively poorer with respect to the children's stage of cognitive development, although it remains better than their production capacity.

As for vocabulary production, several studies on children with DS younger than 36 months (MA) have highlighted similarities with TD children matched for MA in expressive vocabulary when the MB-CDI was used (Galeote, Soto, Checa, Gómez, & Lamela, 2008; Galeote et al., 2011; Vicari, Caselli, & Tonucci, 2000). However, considering the spontaneous production of children during a free-play session with their mothers, Zampini and D'Odorico (2011b) reported that children with DS (MA: 30 months) tended to use their acquired words with a lower frequency than the vocabulary-size matched TD children. Analyzing the vocabulary composition, the study showed that nouns are more frequently used than predicates both in children with DS and in TD controls. The proportion of adverbs and function words was significantly lower in children with DS, whereas the percentage of simpler word classes, such as routines and names for people, was higher. The authors suggested that their findings support the hypothesis that once children have reached a specific linguistic stage, they usually tend to persist in it (Zampini & D'Odorico, 2011b). However the results could indicate that children with DS have a different language profile than TD children, rather than a delay (Chapman & Hesketh, 2001; Fowler, 1990; Miller, 1988; Miller, Laddy, & Leavett, 1999).

Different results emerged in studies on Italian children and adolescents with DS where expressive lexical skills were assessed through structured tasks. Using the Boston naming task, Vicari, Bates, et al. (2004) showed lower performance of participants with DS in lexical production with respect to control group matched for MA (5.2 years). More recently, two studies of our group confirmed this finding on younger children with DS (MA 3.10 years). In both studies a preliminary version of the picture naming test – PiNG (Bello et al., 2012) was used. Results confirmed that children with DS produced fewer correct and more incorrect spoken answers with respect to both groups of TD controls matched for chronological and mental age (Stefanini, Caselli, & Volterra, 2007) or for mental and language age (LA) (Stefanini, Recchia, & Caselli, 2008).

These results suggested that not specific asynchrony emerged between cognitive and expressive vocabulary when an indirect instrument of language was used, whereas a weakness in language with respect to non verbal cognition was evident when expressive lexical skills were assessed through direct tasks.