Assessment of linguistic abilities in Italian children with Specific Language Impairment

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ABSTRACT

This study aims to describe in detail the linguistic skills of a large group of SLI participants. Particular attention is paid to the analysis of age-related effects on their linguistic performance and to whether a linguistic assessment of a narrative task can capture language impairments that might not be adequately pointed out by standardized neuropsychological tests assessing linguistic functions. The narratives produced by 62 children diagnosed with SLI with mixed expressive–receptive disorders were compared to those provided by a group of 195 children with Typical Language Development matched for chronological age and level of formal education. Furthermore, an age-related groups' performance analysis has been performed in order to determine possible correlations between patients' ages and types of language impairment. The SLI participants produced an amount of words comparable to that produced by the control group, albeit in a simpler fashion, as their narratives were teeming with omissions and/or substitutions of bound and free morphemes. These data suggest that the domains of morphosyntax and syntax were particularly impaired.

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1. Introduction

Specific Language Impairment (SLI) is a developmental disorder with unknown aetiology. It is characterized by language delay in children with otherwise normal physical, intellectual and cognitive development (Bishop, 1997; Cipriani & Chilosi, 1995; Leonard, 1998). Children diagnosed with SLI do not usually present any additional hearing problems, frank neurological deficits, or severe emotional disorders. However, recent investigations suggest that subtle auditory deficits reducible to temporal processing capacity may be present in at least some SLI children (Bishop & Mcarthur, 2005; Joanisse & Seidenberg, 1998; Segers & Verhoeven, 2005). Furthermore, several studies showed that SLI is linked to abnormalities in the brain structures involved in procedural memory, such as Broca's area, the basal ganglia, SMA and the cerebellum (Gauger, Lombardino, & Leonard, 1997; Jernigan, Hesselink, Sowell, & Tallal, 1991; Oki, Takahashi, Miyamoto, & Tachibana, 1999; Tallal, Jernigan, & Trauner, 1994; Ullman, 2004; Vargha-Khadem et al., 1998).

As far as linguistic skills are concerned, SLI is not a homogenous condition (Laws & Bishop, 2003). Indeed, children with Specific Language Impairment may present with a wide range of different disturbances in language processing, depending on the linguistic level (phonetic, phonological, morphological, syntactic, semantic, or even pragmatic) or the modality of language use (linguistic comprehension vs. production) that can be selectively compromised. One approach to dealing with this heterogeneity involved the identification of clinical subtypes of SLI (Bishop, 1997, 2004; Conti-Ramsden & Botting, 1999; Nation, 2005; Rapin & Allen, 1987). For example, the 10th Edition of the International Classification of Diseases (ICD-10) distinguishes the following amongst 4 different subgroups of Specific Language Impairment: (1) specific speech articulation disorder (ICD-10 code: F80.0), characterized by selective deficits in articulatory development; (2) expressive language disorder (ICD-10 code: F80.1), in which the child's ability to use expressive spoken language falls below the normal range, whereas language comprehension is within normal limits; (3) receptive language disorder (ICD-10 code: F80.2), characterized by comprehension deficits usually associated to a production impairment; (4) acquired aphasia with epilepsy (ICD-10 code: F80.3), in which the child loses both receptive and expressive language skills and the onset of the disorder is accompanied by paroxysmal abnormalities on the EEG. Such classification, however, is far from being universally accepted. Indeed, it would be more appropriate to distinguish between more linguistically oriented subgroups (Bishop, 2004). For instance, Conti-Ramsden and Botting (1999) suggest distinguishing

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between children with lexical-syntactic deficits, children showing verbal dyspraxia, children with phonologic programming deficit syndrome, children with phonological-syntactic deficit syndrome, and children with semantic—pragmatic deficits. Furthermore, Van der Lely and colleagues (Van der Lely, 1994, 1997a, 1997b, 2005; Van der Lely, Rosen, & McClell, 1998) proposed to identify a distinct subgroup of SLI children, termed Grammatical SLI (G-SLI), characterized by a "persisting deficit in syntax and morphology at 9 years and older" (Van der Lely, 2005, p. 57). This is a relatively rare form of SLI with an estimated prevalence of 10–20% within the population of G-SLI children older than 9 years (Van der Lely & Stollwerck, 1996).

With regard to the general aspects of linguistic production, problems in the codification of phonetic and phonological features of language processing (Bortolini, 1995; Stella, 2001) have been called upon to explain both the delayed production of the first words observed in many SLI children (Leonard, 1998) and the reduced amplitude of their mental lexicon (Rescorla & Schwartz, 1990). Nonetheless, morphology and syntax are usually more affected than vocabulary (Aram, Ekelman, & Nation, 1984; Tomblin & Zhang, 1999). Furthermore, their morphosyntactic profile varies quite dramatically depending on their native language. Compared to children with typical language development, SLI children produce shorter utterances (Paul & Smith, 1993; Redmond, 2004) and fewer sentences per narrative (Liles, 1985). Furthermore, their utterances are characterized by reduced grammatical accuracy (Fey, Catts, Proctor-Williams, Tomblin, & Zhang, 2004; Gillam & Johnston, 1992; Norbury & Bishop, 2003) and omission of those lexical elements (both content and function words) that are obligatorily requested by lexical and functional heads governing phrase and sentence generation (Chilosi & Cipriani, 1991). Indeed, the use of function words in the speech of Italian SLI patients is severely limited because of frequent omissions (Cipriani et al., 1991; Sabbadini, Volterra, Leonard, & Campagnoli, 1987) and/or substitutions (Leonard, McGregor, & Allen, 1992). Similar impairments are also evident in the use of verb inflection (e.g. Cipriani, Chilosi, Bottari, & Pfanner, 1993).

The purpose of the present study was two-fold. The primary goal was to describe in detail the linguistic skills of a large group of SLI participants and to control for potential age-related effects on their linguistic performance. The second goal was to determine whether a linguistic assessment of a narrative task could capture language impairments that might not be adequately pointed out by standardized neuropsychological tests assessing linguistic functions. Indeed, in story description tasks speakers tend to be more fluid communicators and make use of several linguistic skills in a communicatively oriented interaction (Marini, Caltagirone, Pasqualetti, & Carlomagno, 2007; Marini, Lorusso, et al., 2007). As a consequence, it was hypothesized that the analysis of the linguistic performance on a narrative task may allow to control for the interaction between several processing levels (e.g. between verb processing, argument structure generation, sentence production) and that such a detailed analysis of lexical, morphosyntactic and syntactic skills can highlight aspects of impaired processing in the SLI participants which may not be evident on a traditional linguistic analysis.

2. Methods

2.1. Subjects

257 Italian-speaking participants, matched for chronological age, education and socio-economic status (SES), were included in the study (Table 1). They formed an experimental group and a control group. The experimental group consisted of 62 children diagnosed with SLI with mixed expressive and receptive disorder (ICD-10 diagnosis: F80.2) aged between 5 and 11 years old (mean 7 years and 6 months; S.D. 1.6). The patients' linguistic assessment was performed on data collected by one

Table 1
Means (and standard deviations) of the two groups' chronological age and level of education

	TLD	SLI
Chronological age	7.5 (1.7)	7.6 (1.6)
Education	2.5 (1.7)	1.6 (1.6)

of the authors (F.F.) during standard linguistic evaluation at the IRCSS "E. Medea", Ass.ne "La Nostra Famiglia" in San Vito al Tagliamento during the years 1999–2001. All parents gave their consent to data processing.

The control group was formed by 195 participants with Typical Language Development (TLD). The control participants, aged between 5 and 11 years old (mean 7 years and 5 months; S.D. 1.7), had been randomly selected from mainstream schools for a previous research (Tavano, De Fabritiis, & Fabbro, 2005). They performed in the normal range on the block-design subtest of the WISC-R and in the tasks included in the "Test of Morphosyntactic Development" (TSM: Fabbro & Galli, 2001) which assesses their linguistic abilities in sentence comprehension, morphological transformations and word and pseudo-word repetition. The control participants showed average school performance in language and reading. In a preliminary interview, their teachers confirmed that they showed normal cognitive and learning development. Moreover, according to school records and parents' reports, none of them had a known history of psychiatric or neurological illness, learning disabilities, or hearing or visual loss. This group was included in order to compare the narratives produced by the group of SLI participants with those uttered by typically developing children, because no normative data are available for the picture description task (see the Section 2.2.3).

In order to control for age-related differences in the SLI participants' performance in the formal linguistic evaluation, the two groups were divided into 6 age-related subgroups. The first subgroup included 35 normally developing children and 9 SLI participants aged from 5 to 6 years of age. The second subgroup was formed by 27 normally developing participants and 9 SLI patients ranging from 6 to 7 years old. The third subgroup consisted of 35 controls and 14 SLI participants aged from 7 to 8 years of age. The fourth subgroup included 35 normally developing children and 11 SLI patients ranging from 8 to 9 years old. The fifth subgroup was formed by 28 controls and 9 patients with SLI ranging from 9 to 10 years of age. The sixth subgroup was made up of 35 normally developing children and 10 SLI participants ranging from 10 to 11 years of age.

2.2. Procedures

2.2.1. Intellectual assessment

The general (verbal and performance) intelligence of SLI participants was assessed by administering age-appropriate Wechsler Intelligence Scales: the WISC-R (Wechsler, 1993) for children older than 6 years and the WPPSI (Wechsler, 1996) for younger children.

2.2.2. Formal language assessment

The SLI participants' general linguistic abilities were analyzed by administering the "Batteria della valutazione del linguaggio in bambini dai 4 ai 12 anni" ("Battery for linguistic assessment of children from 4 to 12 years", Fabbro, 1999), the Italian adaptation of the "Batterie d'évaluation du langage oral de l'enfant aphasique" (ELOLA) (De Agostini et al., 1998). This battery provides an overview of the children's language functions across a variety of modalities to indicate the level of severity of the impairment and a profile of the group. This test battery examines phonological, lexical and syntactic skills in all modalities (i.e. comprehension, production and repetition).

With regard to comprehension, the participants' verbal auditory discrimination abilities were assessed administering a phonemic identity judgement task (S–D: Same–Different Judgement task). The subject is asked to say if a couple of heard words, either identical or constituting a "minimal pair", include the "same" or "different" words. Semantic comprehension was assessed by administering the Italian version of the British Picture Vocabulary Scale (BPVS: De Agostini et al., 1998), which requires matching each of 25 words read by the examiner with one out of four pictures (the target and three semantic distracters). Morphosyntactic comprehension was assessed with the "Test of Grammatical Comprehension for Children" (TCGB: Test di Comprensione Grammaticale nei Bambini, Chilosi & Cipriani, 1995) where the participants are required to match each of 76 sentences of increasing complexity with one out of four pictures. Syntactic comprehension was assessed with the Italian version of the Token Test (De Agostini et al., 1998).

The subjects' production was assessed in a Naming task (NT) requiring subjects to name 36 object pictures and five pictures representing actions (De Agostini et al., 1998) and a Test of Semantic Fluency (SF) where subjects are prompted to name, in 90 s, as many words as possible belonging to two semantic categories: animals and house objects. The largest number of correct words produced in 60 consecutive seconds is recorded as a test score.

Repetition abilities were assessed by administering a Sentence Repetition (SR) task requiring the subjects to repeat a list of sentences of increasing length and com-