

The French noun phrase in preschool children with SLI: morphosyntactic and error analyses*

PHAEDRA ROYLE

*School of Speech Language Pathology and Audiology, University of Montreal
and Centre for Research on Brain, Language, and Music, Montreal*

AND

ISABELLE STINE

School of Speech Language Pathology and Audiology, University of Montreal

(Received 17 June 2011 – Revised 15 December 2011 – Accepted 16 July 2012 –

First published online 14 September 2012)

ABSTRACT

We studied spontaneous speech noun-phrase production in eight French-speaking children with SLI (aged 5;0 to 5;11) and controls matched on age (4;10 to 5;11) or MLU (aged 3;2 to 4;1). Results showed that children with SLI prefer simple DP structures to complex ones while producing more substitution and omission errors than controls. The three groups also showed distinct error patterns. Children with SLI appeared to have difficulty with phonological processes involved in liaison, elision, and contraction, whereas control children tended to make more lexical errors. These data support models of reduced morphosyntactic and syntactic abilities in this population, and suggest that morphophonological processes should also be integrated into descriptive models of SLI.

[*] This research was funded by an FQRSC Grant to P. Royle (2006-NP-104790, 2005-2008) and a COPSE summer scholarship to I. Stine (IRSC, 2008). We thank the families and children that volunteered, Margaret McKyes for her editing, and two anonymous reviewers and the action editor for their comments on previous versions of this article. The first author thanks Marie-Do and Meïr for hosting her in Vientiane during the writing of this article. Address for correspondence: Phaedra Royle, Université de Montréal, Faculté de médecine, École d'orthophonie et d'audiologie, C.P. 6128, Succursale Centre-Ville, Montréal (Québec), H3C 3J7. tel: 514-343-6111, 0925; fax: 514-343-2115; e-mail: phaedra.royle@umontreal.ca

INTRODUCTION

Specific language impairment (SLI) is a language learning disability that occurs without any obvious cause such as hearing impairment, mental retardation, autism, or other neurological or cognitive disorders (Leonard, 1998). In Quebec, it is usually identified when a child presents lower than normal expressive or receptive language abilities in the presence of preserved cognitive functions in other domains, with persistent linguistic difficulties over time (the diagnosis is *dysphasie*; OOAQ, 2004). The diagnostic criteria for SLI are stricter than those used in the USA (Elin Thordardottir & Namazi, 2007). We translate the OOAQ (2004) definition of *dysphasie* as: “a primary linguistic deficit in the expressive or expressive-receptive spheres with variable deficits in more than one linguistic domain: phonology, morphology, syntax, semantics, or pragmatics [...] heterogeneity in manifestations across individuals, and within individuals, [...] persistence and variability over time, in addition to the probability that little development will be seen without intervention.” The child must also be over four years of age, have been followed regularly over several meetings, and have been evaluated using differential diagnostics. Slow evolution and persistence of the delay or difficulties are part of the diagnosis. No time period is specified, but in clinical settings a minimum of six months is typical. Presently, there is no clear linguistic marker for the early identification of SLI in French.

SLI can be difficult to identify in pre-school-aged children for a number of reasons. In French and other languages, one problem is that late talkers, who will eventually resolve their developmental delay, are often hard to distinguish from children who truly have a persistent linguistic impairment (Bates & Goodman, 1997; Paul, 1991; Thal, Tobias & Morrison, 1991; see also Desmarais, 2007, Demarais, Sylvestre, Meyer, Bairati & Rouleau, 2008, and Ellis & Thal, 2008, for systematic literature reviews on late talkers, mainly learning English). In addition, studies of French language development in pre-school children (Elin Thordardottir & Namazi, 2007; Le Normand, Leonard & McGregor, 1993; Royle & Elin Thordardottir, 2008) reveal few differences between normal and impaired language development on spontaneous-speech measures that have previously been useful in distinguishing children with SLI from normally developing children in other languages, such as English, Spanish, or Swedish (Leonard, Salameh & Hansson, 2001; Restrepo, 1998; Rice & Wexler, 1996).

A study of global morphosyntactic development in the spontaneous speech production of French-speaking children aged 3;2 to 4;6 found almost no differences between children with language impairment and age-matched controls (Elin Thordardottir & Namazi, 2007). The impaired children’s morphosyntactic productivity was similar to that of younger children matched on mean length of utterance in words (MLUw), and error rates were negligible (lower than 1%) in all groups, indicating that error

pattern analysis is not useful for establishing language impairment or identifying atypical linguistic behaviour in these children. A previous study of French children aged 4;0 to 6;0 found similar strengths in determiner use (Le Normand *et al.*, 1993). These data contrast with those from studies of children speaking other languages. Pre-school-aged English-speaking children with SLI aged 4;4 to 5;8 show marked difficulties inflecting verbs, omitting the past tense *-ed* and third person present morpheme *-s* in spontaneous speech (Rice & Wexler, 1996). Spanish-speaking American children aged 5;0 to 7;1 show difficulties with determiners in the noun phrase, making gender substitutions (e.g. producing **la agua* for *el agua* 'det.m/f water' 'the water'), or omitting them (Restrepo & Gutierrez-Clellen, 2001). Swedish-speaking children aged 4;3 to 5;7 show difficulties with genitive *-s* and plural *-er* marking on nouns (all errors were omissions), determiner omissions, and gender substitutions with determiners and adjectives (neuter for uter gender or vice versa) in the noun phrase (Leonard *et al.*, 2001). Finally, a subgroup of Italian-speaking children aged 4;2 to 10;7 show high levels of determiner omission in obligatory contexts (Bottari, Cipriani, Chilosi & Pfanner, 2001). Note that children were included in this last study only if they had specific difficulties with determiners.

Although school-aged and adolescent French-speaking children with SLI do show differences from their unimpaired peers, especially in elicited production, in domains such as accusative clitic production (Grüter, 2005; Jakubowicz, Nash, Rigaut & Gérard, 1998; Paradis & Crago, 2004; Paradis, Crago & Genesee, 2005/2006), verb inflection (Jakubowicz & Nash, 2001; Rose & Royle, 1999), and subject-verb agreement (Franck *et al.*, 2004), the elicitation of verbal and clitic forms is quite difficult in young children and poses interpretation problems, as target production levels are low (see, e.g., Royle & Elin Thordardottir, 2008). Thus, although Royle and Elin Thordardottir's study reveals differences between groups with and without SLI in elicited verb production, floor effects on the task make the data difficult to interpret. In fact, the younger control children (aged 3;2-4;6) participating in the task might also have been too young to be tested on verb production (Royle, 2007). In the current study, we considered young children's use of noun phrases, which, being acquired early, were expected to provide rich data for our understanding of language acquisition and language impairment.

The noun phrase, also called the determiner phrase (DP), contains determiners and nouns, and can also contain adjective phrases, prepositional phrases, and adjunct structures. Noun phrases are produced in French children's initial utterances (Bassano, 2000; Pannemann, 2007). They quickly become syntactically complex, first containing determiners and even adjectives (with noun-drop). More complex structures (involving a determiner, a noun, and an adjective) emerge between ages 2;0 and 2;1

(Demuth & Tremblay, 2008; Valois & Royle, 2009; Valois, Royle, Bourdua-Roy & Sutton, 2009). Mastery of gender agreement on the determiner is very high throughout (85–100%), whereas variable adjective production can take longer, with gender errors often occurring as late as age five years (Roulet-Amiot & Jakubowicz, 2006; Royle & Valois, 2010). Although children with SLI typically show relative strengths in the nominal over the verbal domain (Clahsen, 1989; Conti-Ramsden & Windfuhr, 2002; Le Normand *et al.*, 1993; Jakubowicz *et al.*, 1998; Rice, Wexler & Cleave, 1995; van der Lely & Stollwerck, 1997), studies of nominal acquisition have shown difficulties in number and gender agreement on determiners and adjectives in Spanish (Restrepo & Gutierrez-Clellen, 2001), case marking in English DPs (Ramos, 2000a), number marking on English nouns (Conti-Ramsden & Windfuhr, 2002; Goad, 1998), and the interpretation and production of definiteness in English (*a/the red car*) (Ramos, 2000a; 2000b). Italian-, Spanish-, and Swedish-speaking children with SLI also show difficulties with determiners, omitting them at higher rates than control groups in spontaneous production (Bedore & Leonard, 1998; Bottari *et al.*, 2001; Hansson, Nettelbladt & Leonard, 2003; Leonard *et al.*, 2001; Paradis *et al.*, 2005/2006) and in probed structures (Hansson *et al.*, 2003; Leonard *et al.*, 2001), all the while not using morphological place holders (usually reduced vowels, e.g. [ə] in [ə'po] standing for /lɔʃa'po/ *le chapeau* 'the hat') to indicate functional positions (Bottari *et al.*, 2001), a behaviour typically found in normally developing children.

Royle, Toupin, Bourguignon, Trudeau and Valois (2010) elicited DPs in French-speaking children with and without SLI (8 children with SLI aged 5;0–5;11, and four groups of controls aged 3;6–6;0) and showed that a majority of children with SLI are more likely to make gender errors on adjective agreement compared to age-matched controls, while a minority also made systematic errors on determiners (omissions and substitutions). However, the question remains as to why DP errors do not surface in the spontaneous speech analyses by Le Normand and colleagues (1993), Elin Thordardottir and Namazi (2007), and Royle and colleagues (2010). It could be that the elicitation task imposes such high cognitive constraints that it results in reduced performance compared to a more natural setting, such as that found in spontaneous speech settings. This is unlikely, however, as the children in Royle *et al.*'s study showed close to normal performance on a subset of the elicitation tasks, such as colour naming and size DP production, while having more difficulty with complex structures involving colour adjectives and both colour and size adjectives. Alternatively, the spontaneous speech analyses may not provide enough detail about the DP structures for us to gain a better understanding of how they are acquired. Elin Thordardottir and Namazi's study primarily addressed the production and mastery of morphosyntactic markers (mainly verb marking,

determiners, adjectives, and nominal clitics), and did not analyze the syntactic structures used (i.e. the types of noun or verb phrases) or the morphophonological processes involved in the determiner preposition CONTRACTION, LIAISON and ELISION (see 'Error analysis' and examples therein below). Also, in order to avoid misrepresenting natural language, all adjectives were coded as having gender marking, even though many adjectives in French are invariable (i.e. the feminine and masculine forms are identical). This might have inflated the appearance of gender marking mastery. It is also possible that syntactic and morphosyntactic differences emerge at ages later than those studied by Elin Thordardottir and Namazi. Parisse and Maillart (2007) found differences in 'syntactic' abilities (actually, correct and incorrect use of lexical and function words) in a group of four French-speaking children with SLI with a wider age range (3;0–6;0, using a longitudinal design). A corpus analysis might be more revealing if a closer look were taken at the variety and complexity of syntactic structures produced by the children, or alternatively, if closer attention were paid to the types of syntactic and morphological errors children make in these structures (e.g. Do children produce contracted determiners such as *du* [d^ʁy] 'of-the.m', an obligatorily contracted form of *de le* [dɔlə], or do they produce the uncontracted form?).

It has also been shown that quasi-syntactic measures such as the NUMBER OF THREE-ELEMENT NOUN PHRASES are useful in discriminating between children with and without language impairment (Gavin, Klee & Membrino, 1993), suggesting that syntactic analyses of spontaneous speech data might be helpful in this respect. Furthermore, the mean number of errors in a matrix clause or its subordinate clause has also been found to discriminate between Spanish-speaking children with and without normal language development (Restrepo, 1998). Therefore, a finer-grained analysis of syntactic structures used and error patterns appears to be a useful approach to understanding SLI in French pre-school populations.

In the light of different theories of SLI, we developed a number of hypotheses as to what types of difficulties might emerge in the linguistic behaviour of French-speaking children with SLI. According to the first SURFACE HYPOTHESIS (SH) and a later modification, the MORPHOLOGICAL RICHNESS HYPOTHESIS (MR), proposed by Leonard (1998), a general processing deficit, not specific to grammar, will lead children with SLI to focus on language-specific structures that are salient and most relevant to their mother tongue (e.g. English children will focus more on word order to establish thematic roles, whereas Greek children will use case marking to do the same). Leonard does not provide a clear definition of salience, but he often equates this property to morphological richness: the more morphological structure in a given language, the more the child learner will focus on this property and the better and more quickly they will master it.

Properties such as lexical stress, syllabicity, and sonority are also expected to play a role. Because of the processing deficit in SLI, linguistically less salient structures will be more difficult to master than linguistically more salient ones. French, being a Romance language, has gender agreement in the DP (and elsewhere, e.g. on predicative adjectives, pronouns, and past participle forms). Because gender is a salient grammatical feature, children with SLI should show relative strengths in this domain. However, gender in the DP is most consistently marked on the singular determiner, which is an unstressed clitic (commonly called an article) that is integrated into the foot of the following adjective or noun (Demuth & Tremblay, 2008), thus rendering it less phonetically salient than free-standing lexical items. Data on acquisition show that French children make few errors in determiner choice (Valois & Royle, 2009), and omit them at very young ages only when they cannot be footed, e.g. when the words are bisyllabic (Demuth & Tremblay, 2008) or are part of syntactically complex structures. For example, there are more determiner omissions for *la belle pomme* 'the nice apple' vs. *la banane* 'the banana', even though these two contexts have the same number of syllables (Fréchette & Labelle, 2007). On the other hand, variable adjectives (adjectives with feminine and masculine forms, such as *vert-verte* [vɛʁ-vɛʁt] 'green.m./f.') appear to be more difficult to acquire, probably due to the highly inconsistent nature of their gender marking (Royle & Valois, 2010). According to Leonard's approach, French-speaking children with SLI should therefore master determiners relatively well, but show much more difficulty using variable adjectives: no noticeable differences in the syntactic or morphological complexity of DP structure would be expected between different groups of children.

A second hypothesis, developed by Clahsen (1989), proposed that spec-head (noun-verb) agreement is a specific domain of difficulty in children with SLI. His AGREEMENT-DEFICIT (AD) hypothesis would not predict salient difficulties in the DP domain (i.e. head-head Det-N-Adj agreement). However, a more recent version of the AD hypothesis proposes that children with SLI not only have disproportionate difficulties with spec-head agreement, but also with agreement in head-head relationships (within the DP). Ramos (2000a) and Roeper, Ramos, Seymour and Abdul-Karim (2001) proposed that children with SLI might have different DP structures related to specific AGR (agreement) difficulties in multiple domains of syntax (e.g. errors in genitive case marking in the DP, as in *Me daddy like mustard*, or in nominative case marking, as in *Me don't know*, as well as in prepositional structures: *What beach you going?*). Ramos (2000a) showed that English children with SLI (aged 4;9 to 5;5) can have difficulties understanding and differentiating the meanings of genitive structures such as *that bear's balloons* (interpreted as 'many bears' balloons' rather than 'one bear with many balloons'), predicative structures such as *yellow horse's signs*

(interpreted as ‘yellow horse with yellow signs’ or ‘any horse with yellow signs’ rather than ‘yellow horse with signs’), and genitive structures such as *cat’s mug* (interpreted as ‘cat-shaped mug’ rather than ‘cat owning a mug’) during forced-choice tasks. According to this hypothesis, French children with SLI should show less spontaneous production of complex DPs with structural hierarchies beyond the basic NP, and would also present difficulties involving not only gender marking but also other functional elements such as prepositions and possessive pronouns within the DP.

A third hypothesis as to the nature of difficulties in SLI is the COMPUTATIONAL COMPLEXITY (CC) hypothesis proposed by Jakubowicz and colleagues (see, e.g., Jakubowicz & Nash 2001). This hypothesis specifically predicts difficulties related to the level of syntactic complexity of the output. However the underlying grammar is assumed to be intact. Roulet-Amiot and Jakubowicz (2006) studied adjective and determiner production in the French DP in children with SLI aged six and above. They had previously established that French-speaking children mastered the determiner system at the age of four, and that six-year-olds are sensitive to agreement errors during semantic judgement tasks (but see Royle *et al.*, 2010, for a dissenting opinion on this last point), while adjective agreement mastery occurs around the age of five. According to their study, children with SLI (aged 6;10–12;6) lag behind their peers, but only in the production of appropriate gender on adjectives (only one example is presented in the article, and it contains both determiner and adjective errors, as well as a syntactic ordering error, **Un *neuf passoire* (SLI aged 8;8) ‘a.m new.m colander’ for *une passoire neuve* ‘a.f colander new.f’). In a second study, Roulet (2007) observed determiner omissions and gender errors in picture naming in a similar group of children with SLI compared to controls aged 6;6, who made no errors. It must be noted that extreme variability was found in this task, with three children producing the bulk of the errors and only half of the eighteen children with SLI showing abnormal behaviour in terms of agreement errors and omissions. Roulet-Amiot and Jakubowicz (2006) argued that it is the additional syntactic computational complexity of structures with adjectives that makes them more difficult to produce accurately compared to simpler structures (involving, for example only DET–N pairs). Therefore, according to the CC hypothesis, we would expect children with SLI to produce less complex structures than their unimpaired peers. In addition, for structures with low DP complexity (e.g. structures with no adjectives or complements), they should show similar performance to their unimpaired peers, and for structures with greater complexity, they should show more errors.

In summary, the three hypotheses outlined above make different predictions as to the behaviour we should observe in children with SLI: (1) According to the MR hypothesis (Leonard, 1998), children with SLI

should master DP morphosyntax quite well, similarly to unimpaired French speakers. They should show behaviour typical of younger children, such as gender errors on adjectives. (2) According to the AD hypothesis (Ramos, 2000a; Roeper *et al.*, 2001), children with SLI should show difficulties not only with all types of agreement present in the DP (determiners and adjectives, etc.), but also with other structural dependencies such as those found in genitive structures, prepositional phrases, and so on. (3) According to the CC hypothesis (Jakubowicz & Nash, 2001; Roulet-Amiot & Jakubowicz, 2006), children with SLI should use simpler syntactic structures than their peers in general, and make more errors in DP-internal agreement only when producing more syntactically complex structures.

To test these hypotheses, we performed an in-depth analysis of DP complexity and error patterns in three groups of children: French-speaking children with SLI and two groups of peers, the first age-matched and the second language-matched with the SLI group. We analyzed syntactic structures used by children with SLI and their peers. Two separate analyses were performed. The first focused on DP structures produced by the children in order to test whether syntactic richness is similar or different in these groups. The second examined error types in order to establish whether the different groups present similar linguistic behaviour with respect to syntactic and morphosyntactic rules governing DP structure.

METHOD

Participants

The SLI group consisted of eight monolingual French-speaking children (three girls and five boys) aged between 5;0 and 5;11 ($M=5;7$ years, $SD=0;4$) and having a mean length of utterance in words (MLUw) of 4.4 ($SD=0.97$). These children were recruited through specialized services for children with language impairment (a research hospital and a summer camp), and had been identified by speech language pathologists as having *dysphasie* (SLI). They had all been in clinical therapy for at least nine months, and had been initially assessed at a minimum nine months and up to three years prior to testing. One pair of children (D5 and D6) were twins. Additional selection criteria included residing in the province of Quebec, both parents speaking French, being exposed to French at least 80% of the time at home or in daycare, and having no hearing loss (hearing threshold was set at 20 dB at 500 Hz, and 15 dB at 1000, 2000, and 4000 Hz for both ears). According to parents' reports, the children presented no history of autism, neurological disorder, hearing loss, learning disabilities, or other medical conditions that could be direct causes of their language impairment.

Each child with SLI was matched with two French-speaking normally developing peers on sex, mean parental education, and MLUw or age

THE FRENCH NOUN PHRASE

TABLE 1. *Participant characteristics*

	Age (months)	MLUw	MLUm	Sex	MEM IQ	EVIP	EDUC
<i>SLI group</i>							
D2	65	4.02	5.18	F	109	81	22
D3	70	3.75	4.91	M	96	87	14
D4	60	2.88	3.79	M	90	<1	a
D5	67	4.39	5.79	M	96	75	11
D6	67	5.38	7.17	M	90	30	11
D7	69	4.17	5.50	M	106	11	12
D8	69	4.64	5.10	F	74	14	11
D9	71	6.02	8.06	F	53	15	14
Mean	67.25	4.41	5.69		89.0	45	13.6
SD	3.49	0.97	1.35		18	35	3.95
<i>AGE group</i>							
N55	63	4.70	6.10	F	106	79	15
N50	69	4.25	5.37	M	122	97	14
N42	58	4.59	6.47	M	103	50	14.5
N20	67	4.49	5.92	M	100	99	13.5
N20	67	4.49	5.92	M	100	99	13.5
N101	69	5.27	7.31	M	103	97	14.5
N127	68	3.65	5.57	F	112	64	12
N9	71	4.11	5.77	F	100	66	10.5
Mean	66.25	4.44	6.05		106*	81.4*	13.4
SD	3.3	0.47	0.61		7.72	19.4	1.5
<i>MLU group</i>							
N62	49	4.03	5.03	F	87	58	13.5
N96	45	3.87	4.64	M	106	68	10
N19	38	3.15	4.28	M	84	94	16.5
N41	56	4.28	5.71	M	109	50	13
N115	49	5.61	7.51	M	125	50	15
N80	46	4.21	5.66	M	122	73	12
N92	43	4.21	5.56	F	143	62	15.5
N3	44	6.15	7.77	F	87	30	14
Mean	46.25**	4.43	5.77		109!	60.6!	13.7
SD	5.29	0.96	1.26		21	18.9	2.07

NOTES: a: missing value.

MLUw: mean length of utterance in words; MLUm: mean length of utterance in morphemes.

MEM IQ: Leiter memory subtest.

EVIP: French PPVT receptive vocabulary, centile score.

EDUC: mean parental education.

T-tests between SLI and control groups: ! $p < 0.1$, * $p < 0.05$, ** $p < 0.01$.

(depending on the group) to create a triad for analyses. Individual participant characteristics are presented in Table 1. The MLU-matched group had a mean age of 3;09 ($SD=0.6$) and a MLUw of 4.67 ($SD=0.87$). The AGE-matched group had a mean age of 5;6 ($SD=0.3$) and a MLUw of 4.4 ($SD=0.47$). These children were chosen from a larger sample of over 150 children participating in a project aimed at developing norms for a DP production task (Royle, 2005–2008). Selection criteria for both groups were

the same as for the SLI group, excluding SLI diagnosis. Significant differences were observed between SLI and the AGE-matched group on the LEITER memory screen and the EVIP vocabulary score. As expected, a significant difference in age was observed between the SLI and the MLU-matched group. No significant differences were observed between SLI and control groups on MLU scores (however, these scores did not include morpheme counts). This is not unheard of in studies of SLI in French speakers (Elin Thordardottir *et al.*, 2005; Elin Thordardottir & Namazi, 2007).

Procedure

Participants and their parents were invited to an experimental session lasting approximately one-and-a-half hours and held in a recording lab equipped with an observation post (two-way mirror) at the *Centre de recherche Marie-Enfant* (Montreal, Canada). The procedure was approved by the IRB committee of *Centre de recherche CHU Ste-Justine*. Parents signed a consent form for their child's participation. The children were assessed with a number of linguistic and cognitive tasks: a hearing screening, an assessment of receptive vocabulary in French (EVIP, *Échelle de vocabulaire en images Peabody*; Dunn, Thériault-Whalen & Dunn, 1993), a non-verbal memory IQ task (Leiter Memory Screen; Roid & Miller, 1996), an experimental elicitation of noun phrase structures with adjectives (Royle & Valois, 2010; Royle *et al.*, 2010), and a spontaneous speech recording used to analyze morphosyntactic structures of interest and to establish mean length of utterance in words (MLU_w) and morphemes (MLU_m). Only spontaneous speech data are presented here. Table 1 shows EVIP, IQ, and MLU scores as well as parental education levels for all groups. Audio-video recordings were made of the spontaneous speech samples. Non-directive speech was used by research assistants while individual children played with a standard set of toys (play dough, cooking utensils, dinosaurs). Parents were asked not to interact orally with the children during the procedure. They could observe the procedure through a two-way mirror or sit with the child if he or she was too shy to stay alone with the experimenter.

Because complex DP structures are relatively rare in spontaneous speech, a minimum of 200 utterances were obtained for each child (Valois & Royle, 2009). These were coded using the SALT program (Systemic Analysis of Language Transcripts; Miller and Chapman, 1984–2002) adapted to French (Elin Thordardottir *et al.*, 2005). MLU counts in morphemes and words were based on a sample of the first 100 utterances. Spontaneous speech was transcribed by the same research assistants who administered the tasks. Control participants' transcriptions had already been checked in a four-step process. Each transcription was checked by a second native speaker, then

coded for morphosyntax and checked again. All disagreements were resolved by consensus. When no consensus was obtained, the transcriptions were coded as incomprehensible (<1% of the total). The first author checked for reliability by retranscribing the entire SLI corpus transcribed by the second author. An initial analysis of reliability revealed that both transcribers heard the same words 96.6% of the time. Most divergences occurred when one transcriber heard a word whereas the other did not. We also checked for inter-transcriber morpheme reliability. For all the words that both transcribers heard, we checked whether they had transcribed the same inflectional or root morpheme. Inter-transcriber reliability on this measure was 97.9%. Spontaneous speech corpora were similar in length for all groups, and the first 200 utterances were analyzed for each child.

The corpora were then analyzed to identify all DPs produced. A total of 3049 DPs were included in the analysis. Between 71 and 171 DPs were produced by each child ($M=127$, $SD=29.66$). Each noun was considered along with its determiner and other lexical or syntactic structures, if present within the DP. In addition, the use of prepositions *de* 'of' and *à* 'to' were analyzed when they occurred DP-initially, because they are part of the complex contracted determiners *du* and *de la* 'of the.m/f', *des* 'of the.m/f.pl', *au* and *à la* 'to the.m/f', and *aux* 'to the.m.pl/f.pl'. Moreover, *du* and *de la* are the determiners used for mass nouns (*du pain* 'bread', *de la bière* 'beer'). Paralexemes,¹ a common compound type in French that contains a prepositional structure (e.g. *maison de poupée*, 'doll house', literally 'house of doll'), were counted as one lexical unit in the coding system (see Elin Thordardottir *et al.*, 2005). When a DP contained an unintelligible element or a word used ambiguously, it was excluded from the analysis. On average, 3.21 DPs per child ($SD 2.28$, $Min=0$, $Max=10$) were excluded from the analysis.

Syntactic analysis

All DPs were classified according to syntactic structure type: determiner + noun (DN, (1a)), proper noun (PN, (1b)), determiner + noun + adjective

[1] Paralexemes can be identified using the following linguistic tests: (1) they bear only one word-final lexical stress, rather than two or more; (2) they are inseparable (e.g. *maison de *grosse poupée*, 'house of big doll', in the sense of 'doll house'); (3) they can often be replaced with morphologically simple synonyms (e.g. *pomme de terre*, literally 'apple of earth' = *patate* 'potato'); (4) one cannot change part of the paralexeme for a synonym while preserving meaning (e.g. **MacIntosh de terre* 'MacIntosh of the earth'); (5) co-ordination is impossible within them (**maison de soldat et de poupée* 'soldier and doll house'); and (6) they must be complete in anaphoric structures, contrary to noun phrases with PP complements, where the noun alone can be repeated (e.g. *J'avais un seau de terre et des pommes de terre. J'ai perdu le seau mais pas les *pommes*. 'I had a bucket of earth and some potatoes. I lost the bucket but not the apples').

(DNA, (1c)), determiner + noun + prepositional phrase (DNP, (1d)), noun-drop (NDrop, (1e)), preposition + noun (with or without a determiner, PrepN, (1f)), and Other (1g). We identified the DP's head noun gender (masculine, feminine) and noted additional words or syntactic structures they contained (adjective, adverb, coordinate clause, preposition, quantifier, relative clause, verb) as well as the presence of determiners, noun-drop, grammatically correct omission of the determiner (e.g. *rose* 'pink' as an answer to "What is your favourite colour?"), proper nouns, and other elements that were present. All productions were coded for any errors present (see 'Error analysis' below). The number of occurrences of the different DP types, the number of feminine and masculine DPs, and the number of simple DPs (i.e. DPs containing a noun and a determiner (DN), a proper noun (PN), or a noun introduced by a preposition (PrepN)) versus complex DPs (all other types) were also calculated for each child.

- | | |
|---|------------------------------|
| (1) a. <i>un chien</i>
'a.m dog' | DN (D ₂ , 5;5) |
| b. <i>grandpapa Gilles</i>
'grandpa Gilles' | PN (D ₂ , 5;5) |
| c. <i>un bouchon vert</i>
'a.m plug green.m' | DNA (D ₂ , 5;5) |
| d. <i>les arbres (dans les arbres) dans les branches</i>
'the trees (in the trees) in the branches' | DNP (D ₂ , 5;5) |
| e. <i>la rouge</i>
'the.f red (one)' | NDrop (D ₂ , 5;5) |
| f. <i>d'place</i>
of-room = 'space/room' (mass) | PrepN (D ₂ , 5;5) |
| g. <i>un truc qui fait d'lumière en haut</i>
'a thing to make of light on up' = something to make light up there | Other (D ₂ , 5;5) |

Error analysis

Error types were classified and coded as ungrammatical (UG) – these included structures with more than one syntactic or morphosyntactic error (2a), insertion (IN, (2b)), substitution (S, (2c)), word order (WO, (2d)), gender or number agreement (AGR, (2e–f)), omission (OM, (2g)), and over-regularization (OR, (2h–k)). Over-regularization errors included contraction (2h), liaison (2i), elision (2j), and lexical errors (2k) with irregular plurals or idiosyncratic adjectives.

- | | |
|---|-----------------------------|
| (2) a. <i>des princesses les barbies</i>
'some princesses the Barbies' = the Barbie princesses | UG (D ₀₉ , 5;11) |
| b. <i>de l'ami</i> = l'ami
'of the-friend' = the friend | IN (N ₀₃ , 3;08) |

- c. *des chevaux* = les chevaux S (N55, 5;3)
 ‘some horses’ = ‘the horses’
- d. *méchant un gros requin* = un gros requin méchant WO (D5, 5;7)
 ‘mean.m a.m big.m shark’ = a big mean shark
- e. *la vert* AGR (D2, 5;5)
 ‘the.f green.m (one)’
- f. *les petits choses qui ___ plein de couleur* AGR (D09, 5;11)
 ‘the.pl small.m things that ___ full of colour’
- g. *_ porte* OM (D2, 5;5)
 ‘door’
- h. *à les dinosaures* = aux dinosaures OR Contraction
 ‘of-the dinosaurs’ (N50, 5;9)
- i. *le nenfant* = l’enfant OR Liaison
 ‘the child’ (D3, 6;10)
- j. *des drôles de images* [dœ.imaʒ] = d’images OR Elision
 [dimaʒ] (N55, 5;3)
 ‘some funny (of) images’
- k. *un chevaux* [ʃœvo] = un cheval [[œval] OR Lexeme
 ‘a horses’ = ‘a horse’ (N115, 4;1)

The first three types of OR are linked to highly productive phonological rules of French, and the fourth is lexical. The first, in (2h), illustrates the absence of preposition and determiner contraction (an obligatory process in French). The child produced the full phonological form of the preposition and the determiner (*à les* [a.le]) instead of the standard fused form (*aux* [ɔ]). The second error type is the interpretation of liaison as being part of the word structure (2i). In French liaison, the final consonant in *un* and *des* and other determiners are pronounced only if the following word starts with a vowel (i.e. it has an empty syllable onset and the determiner is syllabified into the phonological word, e.g. *un enfant* [oẽnãfã] ‘a child’ vs. *un papa* [oẽpapa] ‘a father’). In the early stages of acquisition, French-speaking children can mis-analyze vowel-initial words (such as *enfant* in (2i)) as having a consonant onset and produce these liaisons in spontaneous speech (see, e.g., Chevrot & Fayol, 2001, and Wauquier-Gravelines & Braud, 2005, for a description of this behaviour in children aged from 1;4 to 4;0 and elicitation in ages 3;0 to 4;5). Liaison errors are not typical of children older than four (see Chevrot & Fayol, 2001, for experimental support) and peak at around age 3;5 (Wauquier-Gravelines & Braud, 2005). A third type of error was linked to elision (2j), or phonological reduction on a vowel-final determiner when it is followed by a vowel-initial word. Here the child produced the full determiner [dœ.imaʒ] ‘of images’ instead of the elided form [dimaʒ] ‘of-images’. The fourth type of over-regularization (2k) was the substitution of a wrong lexeme for another (usually an irregular singular

or plural form) when the noun had both singular and plural forms. In French, the default and regular rule for plural involves no change between the singular and plural (i.e. *chat* 'cat.s' and *chats* 'cat.pl' are both pronounced [ʃa]). A subgroup of nouns ending in *-al* and *-ail* have *-aux* plurals (see, e.g., (2k), where the child used the irregular plural instead of the singular form of horse). Because the regular rule of French pluralization involves NO MORPHOLOGICAL OR PHONOLOGICAL CHANGE, and children appear to be applying this regularity to irregular forms, we classified these errors as over-regularizations.

When a child made more than one error on a single lexeme, both errors were described, but it was considered as one error only in the statistical analysis when the target involved contraction. This was done to avoid inflating error statistics when tallying forms with contracted prepositions and determiners. For example, although the DP *les choses à bébé* 'the things of baby', for *les choses du bébé* 'the things of-the baby' = 'the baby's things', contains a preposition substitution (*à* 'to' instead of *de* 'of') and a determiner omission (*le* 'the'), only one error (substitution) was tallied, as the target is a contracted form.

RESULTS

Because we used non-parametric statistical analysis, only DP structures accounting for at least 5% of the all DPs from the triads (children with SLI and their two matched control groups) were considered in order to obtain statistically valid comparisons. Due to the large variability in complex structures used, most complex structures did not meet this criterion, and were grouped into the category 'Other'. Frequencies for syntactic structures and error patterns were entered into separate chi-square analyses comparing SLI children and control groups. An alpha of 0.05 was used for all analyses. We first present the data on syntactic structures, followed by the error analysis.

Syntactic structures

When comparing all syntactic structures used, we observed significant differences between SLI and AGE groups ($\chi^2(6, N=2127)=20.81, p<0.01$) as well as MLU groups ($\chi^2(6, N=1969)=17.94, p<0.01$). Although all groups preferred simple DPs (DN, PN, and PrepN structures), other preferences emerged in the comparisons (see Tables 2 and 3 for a breakdown of structures used by the three groups).

As can be seen, the proportions of DP types produced varied according to group. The SLI group produced fewer PrepN, NDrop, DNP, and Other structures but more DN and PN structures than the AGE group. When

TABLE 2. *Frequency of syntactic structures for determiner phrases in SLI and AGE groups*

Syntactic structures	Group		Total
	SLI	AGE	
<i>DN</i>			
Observed	646 (61.7%)	642 (59.4%)	1288
Expected	634	654	
<i>PN</i>			
Observed	90 (8.6%)	57 (5.3%)	147
Expected	72.4	74.6	
<i>DNA</i>			
Observed	123 (11.7%)	126 (11.7%)	249
Expected	122.6	126.4	
<i>PrepN</i>			
Observed	42 (4.0%)	54 (5.0%)	96
Expected	47.3	48.7	
<i>NDrop</i>			
Observed	54 (5.2%)	68 (6.3%)	122
Expected	60.1	61.9	
<i>DNP</i>			
Observed	30 (2.9%)	59 (5.5%)	89
Expected	43.8	45.2	
<i>Other</i>			
Observed	62 (5.9%)	74 (6.9%)	136
Expected	66.9	69.1	
Total	1047	1080	

NOTES: DN: determiner + noun; PN: proper noun; DNA: determiner + noun + adjective; PrepN: preposition + (det) + noun; DNP: determiner + noun + preposition; NDrop: noun-drop.

comparing the SLI and MLU groups, children with SLI again produced more DN and PN structures in addition to more DNA and NDrop structures than MLU controls. However, they produced only slightly fewer PrepN and Other structures than controls. Given the small sample sizes, we compared the SLI and control groups' production of each structure using the Wilcoxon signed rank test with an alpha of 0.05. Only one result showed group differences: SLI children produced more DNA structures ($Mdn = 15.6$, $Range = 7.2$) than MLU controls ($Mdn = 9.75$, $Range = 4.5$) ($z = (8) -2.38$, $p = 0.02$). The difference in proper noun use between SLI and AGE groups also failed to reach significance ($p > 0.1$), and appears to be linked to two children's over-reliance (D5 and D8, with 33 and 29 proper nouns each in their respective corpora) on this specific structure.

Regarding individual results, we noted that most AGE control children produced at least four examples of the analyzed structures. Only two AGE controls produced a single proper noun, while another produced only three

TABLE 3. *Frequency of syntactic structures for determiner phrases in SLI and MLU groups*

Syntactic structures	Group		Total
	SLI	MLU	
<i>DN</i>			
Observed	646 (61.7%)	609 (66.1%)	1255
Expected	667.3	587.7	
<i>PN</i>			
Observed	90 (8.6%)	54 (5.9%)	144
Expected	76.6	67.4	
<i>DNA</i>			
Observed	123 (11.7%)	78 (8.5%)	201
Expected	106.9	94.1	
<i>PrepN</i>			
Observed	42 (4.0%)	57 (6.2%)	99
Expected	52.6	46.4	
<i>NDrop</i>			
Observed	54 (5.2%)	37 (4.0%)	91
Expected	48.4	42.6	
<i>DNP</i>			
Observed	30 (2.9%)	27 (2.9%)	57
Expected	30.3	26.7	
<i>Other</i>			
Observed	62 (5.9%)	60 (6.5%)	122
Expected	64.9	57.1	
Total	1047	922	

NOTES: DN: determiner + noun; PN: proper noun; DNA: determiner + noun + adjective; PrepN: preposition + (det) + noun; DNP: determiner + noun + preposition; NDrop: noun-drop.

PrepN and two children produced fewer than four Other structures. Children with SLI and their MLU controls showed less consistency in their behaviour: a minimum of two (and up to four) children with SLI produced fewer than four instances of every analyzed type, except for DN and DNA noun phrases. MLU controls showed similar behaviour, with a minimum of one (and up to three) children producing fewer than four instances of a given structure, again except for DN and DNA types.

Because we were interested in knowing whether structural complexity was driving these group differences, we grouped all DP types into simple versus complex structures and reran the chi-square analyses. Simplex structures were proper nouns (PN), determiner-noun (DN), and preposition-noun structures (PrepN) involving no extra elements apart from obligatory ones. All other structures involving additional elements such as adjectives, prepositional phrases, relative clauses, and so on were considered to be complex. This was also the case for noun-drop structures

(NDrop), which are assumed to contain an adjective phrase (Valois & Royle, 2009). Results confirmed significant differences between SLI and AGE groups ($\chi^2(1, N=2027)=5.54, p<0.02$), and between SLI and MLU groups ($\chi^2(1, N=1969)=3.86, p=0.05$). Children with SLI produced fewer complex structures (269, or 25.7% of structures) on average than the AGE group (327, or 30.3%), and more of these on average than the MLU group (with 202, or 21.9% of structures).

In sum, our syntactic analyses of DPs revealed subtle differences between control and SLI groups. The main difference was that AGE-matched children produced more complex structures than their peers with SLI. This difference went in the opposite direction when comparing SLI and MLU-matched groups, indicating that it is difficult to distinguish between children with language impairment and normally developing children using these syntactic measures.

A closer look at the complex structures produced by SLI and control groups confirms that the differences between the groups are subtle. DPs with noun-drop (NDrop) were not systematically produced by SLI and MLU groups. DPs with relative clauses were more common in the AGE group, where six children produced between one and ten, with other children (SLI and AGE) producing fewer of these. DPs with adverbs were uncommon overall, and were inconsistently produced by the SLI and MLU groups. Coordinate DPs were used by subsets of the SLI group (D5, D7, D8, and D9) and MLU children (N62, N115, N92, and N3), whereas only two AGE-controls produced any (N55 and N9). Other structures we will call expansions were produced by all groups. Examples are presented in (3). Children with SLI produced 5.9 of these on average ($SD\ 3.0$, range 1–10), whereas the AGE-matched group produced 9.75 ($SD\ 3.0$, range 4–18) and the MLU-matched group 4.63 on average ($SD\ 2.9$, range 0–9). These expansions contained genitive structures, always introduced by the preposition *de* in French (3a), complement phrases introduced by prepositions (3b), DPs introduced by prepositions (3c) (similar in structure to the above-discussed paralexemic compounds), and more rarely, infinitive complements, again within prepositional phrases (3d).

- (3) a. *les monstres de Scooby Doo* N115 (4;1)
 the.pl monsters of Scooby Doo = ‘the Scooby Doo monsters’
 b. *des parties où c’est pas solide* N20 (5;7)
 some parts where it-is not solid = ‘parts that aren’t solid’
 c. *des tours d’éléphant* N9 (5;11)
 some tours of-elephant = ‘elephant rides’
 d. *l’heure d’aller faire la sieste pour moi* N42 (5;10)
 the-time to-go.INF do.INF the nap for me = ‘time for me to go
 have a nap’

TABLE 4. *Frequency of errors for determiner phrases in SLI and AGE groups*

Syntactic structures	Group		Total
	SLI	AGE	
<i>Agreement</i>			
Observed	27 (18%)	14 (24.1%)	41
Expected	29.6	11.4	
<i>Omission</i>			
Observed	75 (50.0%)	15 (25.9%)	90
Expected	64.9	25.1	
<i>Substitution</i>			
Observed	38 (25.3%)	13 (22.4%)	51
Expected	36.8	14.2	
<i>Over-regularization</i>			
Observed	10 (6.7%)	16 (27.6%)	26
Expected	18.1	7.3	
Total	150	58	

Error patterns

Three error types (ungrammatical (UG), insertion (IN), and word order (WO)) had fewer than five instances per group (IN reached six items in the SLI group only) and were excluded from the statistical analysis. The remaining four error types (agreement (AGR), substitution (S), omission (OM), over-regularization (OR)) were included in the analyses. The distribution of the SLI group was significantly different from that of the AGE group ($\chi^2(3, N=208)=21.22, p<0.001$) and the MLU group ($\chi^2(3, N=231)=14.22, p<0.01$) in its error patterns. Error type frequencies for the three groups are presented in Tables 4 and 5.

As presented in Table 4, children with SLI made more OM, S, and AGR errors and fewer OR errors than both control groups. We compared the SLI and control groups' production of each error type using the Wilcoxon signed rank test with an alpha of 0.05. The differences in OM errors between SLI and AGE groups were significant: SLI (Mdn=7, Range=18) vs. the AGE group (Mdn=1.5, Range=4) ($z=(8) -2.41, p<0.02$), and vs. the MLU group (Mdn=3.5, Range=16) ($z=(8) -2.21, p<0.05$). S errors were also significantly more common in the SLI group (Mdn=4.5, Range=7) than in the AGE (Mdn=2, Range=4) ($z=(8) -2.34, p<0.02$) and MLU groups (Mdn=1, Range=3) ($z=(8) -2.32, p=0.02$). The differences in other error patterns did not reach significance.

What appears to distinguish the SLI and control groups is omission and commission (substitution) of obligatory elements. All children with SLI produced at least 3 and up to 21 omissions (average 9.4), whereas AGE-matched controls produced from 0 to 4 of these types (average 1.9),

TABLE 5. *Frequency of errors for determiner phrases in SLI and MLU groups*

Syntactic structures	Group		Total
	SLI	MLU	
<i>Agreement</i>			
Observed	27 (18.0%)	11 (13.6%)	38
Expected	24.7	13.3	
<i>Omission</i>			
Observed	75 (50.0%)	43 (53.1%)	118
Expected	76.6	41.4	
<i>Substitution</i>			
Observed	38 (25.3%)	10 (12.3%)	48
Expected	31.2	16.8	
<i>Over-regularization</i>			
Observed	10 (6.7%)	17 (21.0%)	27
Expected	17.5	9.5	
Total	150	81	

and MLU controls were more variable, producing from 0 to 16 omissions (average 5.4). It is important to note that the most common error in both the MLU and SLI groups was the omission of obligatory elements, but that these errors occurred significantly more often in the SLI group. Substitutions were also a hallmark of the SLI group, which produced 4.8 (range 1–8) of these on average, compared to 1.6 (range 0–4) for the AGE group and 1.3 (range 0–3) for the MLU group. On the other hand, lexemic over-regularization, i.e. using inappropriate lexemes (noun or adjective) with irregular plural or variable masculine forms (e.g. *cheval/chevaux* ‘horse/s’, *animal/animaux* ‘animal/s’, *oeuf* [œf]/*oeufs* [ø] ‘egg/s’, *beau/bel*² ‘handsome.m’) were found in a minority of children (one SLI child, and two each in the AGE and MLU matched groups), but were more frequent in controls.

Finally, it should be noted that children with SLI produced a number of insertions. Because these errors were rare in control groups (2 in each group), they were excluded from the analyses. They included the insertion of an *ou* ‘or’ between the (gender inappropriate) determiner and the noun (4a), insertion of an uncontracted preposition and determiner (genitive structure) between the adjective and the noun (4b), insertion of the 3ps masculine clitic pronoun *i* (the reduced form of *il* ‘he’) in the DP (4c), insertion of a genitive preposition in a nominative structure (4d), and insertion of a singular definite determiner when the context requires either

[2] This form appears before vowel-initial masculine nouns and is homophonous with the feminine *belle*.

a plural indefinite or, more commonly, no determiner (4e; note that this example also contains a common verb over-regularization *sontaient*, which is used in many dialects of Quebec French). These appear to signal insensitivity to syntactic constraints on DP structure.

- | | | | |
|--------|-------------------------------------|--------------------------------------|-----------|
| (4) a. | <i>*du *ou roche</i> | Target: <i>de la roche</i> | D4 (5;0) |
| | of-the.m or rock | of the.f rock = 'some rock' | |
| b. | <i>les méchants *de *les tirex</i> | Target: <i>les méchants tirex</i> | D5 (5;7) |
| | the mean of the.pl T- <i>rexes</i> | the mean T- <i>rexes</i> | |
| c. | <i>sept *i robots</i> | Target: <i>sept robots</i> | D5 (5;7) |
| | seven he robots | seven robots | |
| d. | <i>un *de bébé</i> | Target: <i>un bébé</i> | D6 (5;7) |
| | a of baby | a baby | |
| e. | <i>i sontaient pu jamais *l'ami</i> | Target: <i>ils étaient plus amis</i> | D9 (5;11) |
| | they were NEG ever *the-friend | they were no-more friends | |

DISCUSSION

The data presented here show that children with SLI aged 5;0 to 5;11 presented both subtle and straightforward differences from their peers in DP production abilities. Generally, we can characterize their syntactic profile as somewhere between their age-matched and the younger (MLU-matched) peers. Children with SLI gravitated towards a simpler DP syntax compared to AGE-matched controls. Their linguistic productivity appeared to be more constrained than that of normally developing children, and was in many respects similar to that of MLU-matched peers.

Although there were generally few errors in the corpus, the error analyses further distinguished the three groups. The SLI children stood out in their propensity to omit and to substitute obligatory elements in the DP. Omissions accounted for 50% of their errors (versus 25.9% for the AGE group). However, these were also the most frequent error type in the MLU group, accounting for 53.1% of errors. Substitutions, the second most common error type in the SLI group (25.3%), were rarer in both the AGE and MLU groups, accounting for 12.3% of errors in the MLU group and 22.4% of errors in the AGE group. Insertion errors were found only in the SLI group, pointing to a marker that could be helpful for identifying SLI in young French speakers. However, these error types were also relatively rare, and were observed in only half the children with SLI.

Previous elicitation research suggests that agreement errors are a salient aspect of language difficulties in French SLI (Roulet, 2007; Roulet-Amiot & Jakubowicz, 2006; Royle *et al.*, 2010). This did not turn out to be the case in the spontaneous speech data. Although children with SLI made more agreement errors on average than controls, these differences did not reach

significance. A more encompassing study of all types of agreement in the corpus (e.g. clitics and predicative adjectives) might obtain richer data on agreement, but that was beyond the scope of this study.

Over-regularization patterns also appeared to differ across the three groups. In the children studied here, the absence of contraction and the presence of liaison errors appeared to signal an immature grammar. On the other hand, lexemic over-regularization errors involving the use of default no-change forms appeared to be the domain of normally developing children. In sum, children with SLI might also have difficulties with the automatic application of morphophonological rules at ages when unimpaired children do not normally show this behaviour.

One should bear in mind that this study examined a small sample of children, and that the observed linguistic behaviour may not be generalizable to the entire population of French-speaking children with SLI. One must also take into account that the children in this study were classified as light to severe SLI, and might have shown variable levels of difficulty, in terms of either language production or comprehension. Regarding the diagnostics used to identify children with SLI in Quebec, it is unclear whether these children would have been identified as late talkers rather than having SLI in other circumstances, given the strict criteria for the *dysphasie* diagnosis (see 'Introduction' and 'Participants' above). We remain confident that these children are representative of French children with SLI.

Theories of SLI

The fact that children with SLI tended to produce more syntactically simple DP structures than their peers goes against the MC hypothesis (Leonard, 1998), according to which children with SLI should master DP syntax, even though they might have difficulties with variable adjectives, and unstressed elements in the DP such as determiners. Results support both the AD hypothesis (Roeper *et al.*, 2001) and the CC hypothesis (Roulet-Amiot & Jakubowicz, 2006), because these two approaches predict reduced structures in language production. However, according to Roulet-Amiot and Jakubowicz, children with SLI should show similar performance to their peers (i.e. without errors) when producing syntactically simple DPs. This was not the case, as they produced 52% of their errors on simple structures (usually omissions, substitutions, or, less often, liaison or elision errors and over-regularizations). Omission and substitution errors are also consistent with an agreement deficit, if, following Ramos (2000a) and Roeper *et al.* (2001), we understand agreement as being an integral part of the construction of more complex structures within the DP. In fact, omissions and substitutions were observed largely on agreement-bearing elements such as determiners or contracted determiner-prepositions.

The fact that children with SLI produced over-regularizations was initially surprising, as this behaviour is usually linked to the development of productive linguistic rules in studies of verb acquisition, and is not expected in children with SLI, who have difficulties in this domain (Rice & Wexler, 1996). However, a closer look at the types of OR found showed that they differed in nature from those usually studied in the literature (i.e. applying an overt suffix onto an irregular verb root or stem), and involved misapplication of morphophonological rules (e.g. liaison). Lexemic over-regularization errors were seen only in normally developing children. In sum, children with SLI appear to have difficulties with the automatic application of morphophonological rules, and this problem persists at ages when unimpaired children do not show this behaviour. Because the total numbers of these errors were small, these interpretations need to be supported by further research using specifically targeted data collection methods such as elicitation tasks. However, our error analyses allowed us to pinpoint specific profiles that can emerge in normally developing children and their impaired peers. Such analyses could potentially enable better identification of children with language deficits.

We suggest that future research could focus on French rules of liaison, elision, contraction, and possibly agreement (in its larger sense, as proposed by Ramos, 2000a, and Roeper *et al.*, 2001), using elicitation methods, in order to obtain further evidence on questions that have arisen from our corpus analysis, as well as to develop age-appropriate tools for the identification of SLI in children three to five years old. Previous studies have demonstrated the usefulness of elicitation methods for the study of liaison (Chevrot & Fayol, 2001) in normally developing children aged 3;0 to 4;5, and for the study of adjective and determiner agreement in French children as young as 3;0 with and without SLI (Roulet-Amiot and Jakubowicz, 2006; Roulet, 2007; Royle *et al.*, 2010; Royle & Valois, 2010), as well as complex DP structures in children aged 4;9 to 5;5 (Ramos, 2000a). These methods could readily be extended to the processes observed here.

In conclusion, we have shown that the syntactic and error analyses of DP production in children can lead to a deeper understanding of SLI and its properties in French. French-speaking children with SLI often produce DPs that are syntactically simpler than those of their age-matched peers, with above-normal omission and commission of obligatory, high-frequency, and early acquired elements such as determiners and prepositions. Insertion errors appear to indicate extra insensitivity to syntactic constraints on DP internal structure. Finally, over-regularization errors, although marginal, suggest that children with SLI occasionally omit the application of obligatory morphophonological rules governing preposition–determiner contraction, liaison, and elision, pointing to a weaker mastery of these processes. These data indicate that in order to account for the observed behaviour,

linguistic models of SLI have to be more encompassing than those outlined above, most of which focus on only one or two aspects of the morphosyntax interface. None accounts for the morphophonological processing errors, as observed here, although Roeper *et al.* (2001) propose that a number of different dependencies in the DP can be deficient in SLI. Work by Goad and colleagues (Goad, 1998; Gopnik & Goad, 1997) on the morphophonological processes at play in English SLI previously pointed to morphophonological deficits in this domain in some English-speaking patients with SLI (e.g. allomorphy rules for the plural noun suffix). Parisse and Maillart (2008) have recently suggested that phonological difficulties (mainly involving syllable structure integrity) are characteristic of SLI. They stressed the importance of taking phonological abilities into account, at least to describe the deficit. In view of all these findings, it would be appropriate to return to a more general account of SLI, where multiple aspects of grammar, including morphophonological processes, would be expected to be impaired in this population.

REFERENCES

- Bassano, D. (2000). Early development of nouns and verbs in French: Exploring the interface between lexicon and grammar. *Journal of Child Language* 27, 521–59.
- Bates, E. & Goodman, J. C. (1997). On the inseparability of grammar and the lexicon: Evidence from acquisition, aphasia, and real-time processing. *Language and Cognitive Processes* 12(5/6), 507–584.
- Bedore, L. M. & Leonard, L. B. (1998). Specific language impairment and grammatical morphology: A discriminant function analysis. *Journal of Speech, Language and Hearing Research* 41(5), 1185–92.
- Bottari, P., Cipriani, P., Chilosi, A. M. & Pfanner, L. (2001). The Italian determiner system in normal acquisition, specific language impairment, and childhood aphasia. *Brain and Language* 77, 283–93.
- Chevrot, J.-P. & Fayol, M. (2001). Acquisition of French liaison and related child errors. In M. Almgren, Andoni Barreña, M.-J. Ezeizabarrena, I. Idiazabal & B. MacWhinney (eds), *Research on child language acquisition: Proceedings of the 8th Conference of the International Association for the Study of Child Language*, vol. 2, 761–75. Somerville, MA: Cascadia Press.
- Clahsen, H. (1989). The grammatical characterization of developmental dysphasia. *Linguistics* 27, 897–920.
- Conti-Ramsden, G. & Windfuhr, K. (2002). Productivity with word order and morphology: A comparative look at children with SLI and children with normal language abilities. *International Journal of Language and Communication Disorders* 37(1), 17–30.
- Demuth, K. & Tremblay, A. (2008). Prosodically-conditioned variability in children's production of French determiners. *Journal of Child Language* 35, 99–127.
- Desmarais, C. (2007). Classification du retard de langage à deux ans et analyse des caractéristiques personnelles et sociofamiliales associées et de leur cumul [Classification of later-talkers at age two with an analysis of associated personal and socio-familial characteristics and their combinatory effects]. Unpublished doctoral dissertation, Université Laval, Québec.
- Desmarais, C., Sylvestre, A., Meyer, F., Bairati, I. & Rouleau, N. (2008). Systematic review of the literature on characteristics of late-talking toddlers. *International Journal of Language & Communication Disorders* 43(4), 361–89.

- Dunn, L., Thériault-Whalen, C. & Dunn, L. M. (1993). *Échelle de vocabulaire en images Peabody* [French Peabody picture vocabulary test]. Toronto: Psychan.
- Elin Thordardottir, Gagné, A., Levy, J., Kehayia, E., Lessard, N., Sutton, A. & Trudeau, N. (2005). Systematic language sample analysis in French: Normative data for conversation. Paper presented at the Emergence of Language Acquisition, Lyon, France.
- Elin Thordardottir & Namazi, M. (2007). Specific Language Impairment in French-speaking children: Beyond grammatical morphology. *Journal of Speech, Language and Hearing Research* 50(3), 698–715.
- Ellis, E. M. & Thal, D. J. (2008). Early language delay and risk for language impairment. *Perspectives on Language Learning and Education* 15, 93–100.
- Franck, J., Cronel-Ohayon, S., Chillier, L., Frauenfelder, U. H., Hamann, C., Rizzi, L. & Zesiger, P. (2004). Normal and pathological development of subject–verb agreement in speech production: A study on French children. *Journal of Neurolinguistics* 17(2/3), 147–80.
- Fréchette, R. & Labelle, M. (2007). Influence of prosody on the production of determiners and adjectives in two-year-old children's sentences. Paper presented at the 32nd Annual Boston University Conference on Language Development, Boston University. Available at: <http://www.er.uqam.ca/nobel/r32764/Labelle/Acquisition.html>.
- Gavin, W. T., Klee, T. & Membrino, I. (1993). Differentiating Specific Language Impairment from normal language impairment using grammatical analysis. *Clinical Linguistics and Phonetics* 7, 191–206.
- Goad, H. (1998). Plurals in SLI: Prosodic deficit or morphological deficit? *Language Acquisition* 7(2/4), 247–84.
- Gopnik, M. & Goad, H. (1997). What underlies inflectional error patterns in genetic dysphasia? *Journal of Neurolinguistics* 10, 109–137.
- Grüter, T. (2005). Comprehension and production of French object clitics by child second language learners and children with Specific Language Impairment. *Applied Psycholinguistics* 26(3), 363–91.
- Hansson, K., Nettelbladt, U. & Leonard, L. B. (2003). Indefinite articles and definite forms in Swedish children with Specific Language Impairment. *First Language* 23(3), 348–62.
- Jakubowicz, C. & Nash, L. (2001). Functional categories and syntactic operations in (ab)normal language acquisition. *Brain and Language* 77, 321–39.
- Jakubowicz, C., Nash, L., Rigaut, C. & Gérard, C.-L. (1998). Determiners and clitic pronouns in French-speaking children with SLI. *Language Acquisition* 7(2/4), 113–60.
- Le Normand, M.-T., Leonard, L. B. & McGregor, K. K. (1993). A cross-linguistic study of article use by children with specific language impairment. *European Journal of Disorders of Communication* 28(2), 153–63.
- Leonard, L. B. (1998). *Children with specific language impairment*. Cambridge, MA: MIT Press.
- Leonard, L. B., Salameh, E.-K. & Hansson, K. (2001). Noun phrase morphology in Swedish-speaking children with Specific Language Impairment. *Applied Psycholinguistics* 22, 619–39.
- Miller, J. & Chapman, R. (1984–2002). *Systematic analysis of language transcripts: Software for analyzing English and Spanish language transcripts*. University of Wisconsin Madison: Language analysis Laboratory. Available at: www.saltsoftware.com.
- OOAQ (2004) Troubles primaires du langage: Dysphasie. Guide et outils cliniques, Trouble primaire du langage/Dysphasie [Primary language impairments: *Dysphasie*. Guide and clinical tools, primary language impairment/*dysphasie*]. Unpublished clinical guidelines. Ordre des orthophonistes et audiologistes du Québec.
- Pannemann, M. (2007). DP acquisition as structure unraveling. Unpublished doctoral dissertation, Universiteit van Amsterdam.
- Paradis, J. & Crago, M. (2004). Comparing L2 and SLI grammars in child French. In P. Prévost & J. Paradis (eds), *The acquisition of French in different contexts: Focus on functional categories*, 89–107. Amsterdam: John Benjamins.

- Paradis, J., Crago, M. & Genesee, F. (2005/2006). Domain-general versus domain-specific accounts of Specific Language Impairment: Evidence From bilingual children's acquisition of object pronouns. *Language Acquisition* **13**(1), 33–62.
- Parisse, C. & Maillart, C. (2007). Phonology and syntax in French children with SLI: A longitudinal study. *Clinical Linguistics and Phonetics* **21**(11/12), 945–51.
- Parisse, C. & Maillart, C. (2008). The interplay between phonology and syntax in French-speaking children with specific language impairment. *International Journal of Language and Communication Disorders* **43**(4), 448–72.
- Paul, R. (1991). Profiles of toddlers with slow expressive language development. *Topics in Language Disorders* **11**, 1–13.
- Ramos, E. (2000a). Acquisition of noun phrase structure in children with specific language impairment. Unpublished doctoral dissertation, University of Massachusetts, Amherst. Available at: <http://scholarworks.umass.edu/dissertations/AAI9960783/>.
- Ramos, E. (2000b). Comprehension of definite and indefinite articles in children with SLI. Paper presented at the The 2000 ASHA convention. Available at: www.umass.edu/aae/ramosartic.pdf.
- Restrepo, M. A. (1998). Identifiers of predominantly Spanish-speaking children with language impairment. *Journal of Speech, Language and Hearing Research* **41**, 1398–411.
- Restrepo, M. A. & Gutierrez-Clellen, V. F. (2001). Article use in Spanish-speaking children with SLI. *Journal of Child Language* **28**, 433–52.
- Rice, M. L. & Wexler, K. (1996). Toward tense as a clinical marker of specific language impairment in English-speaking children. *Journal of Speech, Language and Hearing Research* **39**, 1236–57.
- Rice, M. L., Wexler, K. & Cleave, P. (1995). Specific Language Impairment as a period of extended optional infinitive. *Journal of Speech and Hearing Research* **38**, 850–63.
- Roeper, T., Ramos, E., Seymour, H. & Abdul-Karim, L. (2001). Language disorders as a window on Universal Grammar: An abstract theory of agreement for IP, DP, and V-PP. *Brain and Language* **77**, 378–97.
- Roid, G. & Miller, L. (1996). *The Leiter international performance scale-revised*. Dale, IL: Wood Stoelting Co.
- Rose, Y. & Royle, P. (1999). Uninflected structure in familial language impairment: Evidence from French. *Folia Phoniatrica et Logopedica* **51**(1/2), 70–90.
- Roulet, L. (2007). L'accord grammatical de genre dans la dysphasie de développement [Grammatical gender agreement in children with SLI]. *Psychologie française* **52**, 55–70.
- Roulet-Amiot, L. & Jakubowicz, C. (2006). Production and perception of gender agreement in French SLI. *Advances in Speech-Language Pathology* **8**(4), 335–46.
- Royle, P. (2007). Variable effects of morphology and frequency on inflection patterns of French preschoolers. *Mental Lexicon Journal* **2**(1), 103–125.
- Royle, P. & Elin Thordardottir (2008). Elicitation of the perfect past in French pre-schoolers with and without SLI. *Applied Psycholinguistics* **29**(3), 1–22.
- Royle, P., Toupin, J., Bourguignon, N., Trudeau, N. & Valois, D. (2010). Déficit de l'accord dans le syntagme nominal chez les jeunes francophones avec un trouble spécifique du langage [Noun phrase agreement deficit in young French speakers with SLI]. *SPECTRUM* **2**, 1–18.
- Royle, P. & Valois, D. (2010). Acquisition of French adjective concord as revealed by elicitation data. *Journal of French Language Studies* **20**(30), 313–38.
- Thal, D., Tobias, S. & Morrison, D. (1991). Language and gesture in late talkers: A 1-year follow-up. *Journal of Speech and Hearing Research* **34**, 604–612.
- Valois, D. & Royle, P. (2009). Partitivity, atomization, and N-Drop: A longitudinal study of French child language. *Language Acquisition* **16**(2), 82–105.
- Valois, D., Royle, P., Bourdua-Roy, E. & Sutton, A. (2009). Étude transversale de l'ellipse du nom en français et le rôle des données de l'acquisition pour la théorie linguistique [A cross-sectional study of noun-drop in French: The role of acquisition data for linguistic theory]. *Revue canadienne de linguistique / Canadian Journal of Linguistics* **54**(2), 339–66.

- van der Lely, H. K. J. & Stollwerck, L. (1997). Binding Theory and grammatical specific language impairment in children. *Cognition* **62**, 245–90.
- Wauquier-Gravelines, S. & Braud, V. (2005). Proto-déterminant et acquisition de la liaison obligatoire en français [Proto determiner and acquisition of obligatory liaison in French]. *Langages* **2**(158), 53–65.