

Title: Uninflected Structure in Genetic Dysphasic Speech: Evidence From French

Running Head: Uninflected Structure

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## **Abstract**

We present the results of 20 French subjects with FLI (FLI) on a linguistic battery task, with an emphasis on verb production. The results show strong qualitative differences between the verb production of FLI subjects and that of controls. Language-specific factors do not seem to determine the production of verbs in French FLI individuals. Rather, verb frequency and the inflectional status (uninflected vs. inflected) of the form seem to be determining factors in correct/incorrect production of a verb in a sentence context. The phonetic structure of French inflection provides additional arguments against the hypothesis of a processing deficit in FLI subjects. French tense morphemes are stressed and salient, and should therefore be produced without problems, according to the processing hypothesis. We found evidence contrary to this postulate. We therefore submit that the morphological deficit hypothesis is supported by the French data.

## **Ungebeugte Struktur bei der familiär bedingten Sprachbeeinträchtigung (FLI): Beweismaterial aus dem Französischen**

Wir stellen die Resultate einer linguistischen Testbatterie (Schwerpunkt: Verbproduktion) auf der Basis von 20 französischsprachigen, familiär bedingt sprachbeeinträchtigten (FLI) Testpersonen vor. Die Resultate zeigen starke qualitative Unterschiede zwischen Verbproduktionen von FLI-Patienten und Verbproduktionen der Kontrollgruppe. Es scheinen jedoch nicht sprachspezifische Faktoren für die beeinträchtigte Verbproduktion von französischen Dysphasikern verantwortlich zu sein. Vielmehr scheinen die zwei Faktoren Verbfrequenz und Beugungsstatus (gebeugt/ungebeugt) determinierende Faktoren für richtige/falsche Verbproduktion im Satzkontext zu sein. Die phonetische Struktur von Verbbeugungen im Französischen liefert zusätzliche Argumente gegen die Hypothese, dass FLI-Patienten unter einem Verarbeitungsdefizit leiden. Französische Tempusmorpheme sind betont und fallen auf, sie sollten folglich nach der Hypothese problemlos produziert werden. Unsere Resultate sprechen gegen diese Hypothese. Folglich schlagen wir vor, dass die morphologische Defizithypothese von französischen Daten unterstützt wird.

## **Structure non fléchi chez les dysphasique: données du français**

Nous présentons ici les résultats de 20 sujets dysphasiques francophones sur une batterie de tests linguistiques, avec une emphase sur la flexion verbale. Les résultats démontrent qu'il y a d'importantes différences qualitatives entre les populations de dysphasiques et de témoins dans la production de verbes. Des facteurs linguistiques spécifiques à la langue ne semblent pas déterminer la production de verbes chez les dysphasiques francophones. La fréquence de verbe et le statut flexionnel (fléchi vs. non fléchi) de la forme sont par contre des facteurs déterminants de la production correcte/erronée du verbe dans une phrase. La structure phonétique de la flexion en français nous nous fournit pas d'indices supplémentaires en faveur de l'hypothèse d'un déficit de traitement chez le sujet dysphasique. Les flexions temporelles sont accentuées et saillantes en français, et devraient être produites sans problème, selon l'hypothèse du déficit de traitement. Nos résultats militent contre ce postulat. Par contre, l'hypothèse du déficit morphologique est appuyée par les données présentées ici.

## Introduction

A number of studies of Familial language impairment (FLI) have been documented in the linguistic, psycho-linguistic and speech pathology literature [1–6]. Many of these studies first concentrated on English speakers with FLI, but as it became apparent that certain aspects of language were more impaired than others, cross-linguistic investigations of the disorder were initiated, in order to highlight the language-specific effects that could be found. Research on the linguistic aspects of FLI has now been undertaken in languages as diverse as Japanese, Hebrew, German, Greek, Italian, Inuktitut, English and French [see, among others, ref. 7–13; Dalalakis J: Unpublished doct. diss., McGill University, 1996]. Others have presented cross-linguistic analyses of the linguistic aspects of FLI [14–18]. Our research on the production of novel and real verbs in French hopes to add to this corpus by providing additional data and an analysis of the specific nature of FLI as it manifests itself in French speakers.

Subjects with FLI have a particular linguistic deficit concurrent with the absence of articulatory, psychological, neurological, or cognitive deficits that could be construed as being causally linked to this disorder. Linguists studying this syndrome have pointed out that, at the very least, people with FLI have problems with the inflectional morphology of their native tongue [for an overview of this literature, see ref. 5, 7, 9].

A number of proposals have been put forward to explain the underlying reasons for the linguistic deficit found in subjects with FLI. One school of thought proposes that FLI results from a general cognitive deficit as shown by low performance IQ and general cognitive problems [6]. This language impairment is said to be manifested in a general processing deficit which affects the intake of information, especially when presented at rapid rates. In light of the finding that there are significant differences in the neuro-anatomical structure of subjects with FLI compared to that of controls [20], and in light of previous neuro-imaging research pointing toward anomalous foetal development of the brain in families with a history of FLI [21–24], it is not surprising that a cognitive deficit has been postulated as the cause of this language impairment. However, these claims have not yet been substantiated by strong evidence of a causal link between low IQ and FLI (or vice-versa).

A second group proposes that FLI results primarily from a processing problem (e.g. a processing deficits, an auditory deficits, etc.) while language functions are essentially intact. Curtis and Tallal [25] and Tallal et al. [26] maintain that FLI is the result of a deficit in high-level processing across modalities (e.g. reading, hearing, etc.). This processing deficit would affect the comprehension of rapidly presented stimuli as well as that of complex and non-canonical syntactic structures. Leonard [3] and Leonard et al. [10] propose an account of FLI as being a perceptual processing deficit. This explanation rests strongly on the notion of salience. The salience of a particular morpheme (its phonetic/syllabic structure, its articulatory features, its stress, etc.) will affect its comprehension and/or realization by the FLI subject. Fletcher [27] and Vargha-Khadem et al. [28] suggest that dysphasic subjects have an articulatory deficit that inhibits their grammar but only indirectly: the underlying grammar is presumed to be well-formed, although certain phonological conditions (such as word-final consonant clusters) will induce articulatory problems and the output will appear impaired. However, this theory does not explain linguistic deficits in FLI speakers who do not present praxic problems.

A third group of researchers postulates a specific language deficit (e.g. a rule building deficit [17]; a grammatical agreement deficit [7], or a morpho-syntactic agreement deficit [19]). Linguistic accounts of FLI all suggest the existence of a morphological deficit. Where these accounts differ is on the characterization of the deficit. Proposals range from very specific (where

only a subcomponent of morphology is affected) to more general (where most or all of the morphological component of the grammar is affected).

Clahsen and Hansen [29] propose that only the agreement relationship between categories is impaired in FLI subjects while their grammar is relatively intact. Clahsen [9] found that German children with FLI had difficulty acquiring the inflectional paradigm for verbs and tended to use the infinitive form (-*n*). However, these children were found to inflect participles appropriately and their regularization patterns were similar to those of children without FLI [30]. These results were taken to indicate that children with FLI had a specific impairment with agreement relations and not a general impairment with inflectional morphology. These authors posit that word order should not pose any difficulty for children with FLI unless it is dependant on an agreement relation. Furthermore, if a child with FLI is taught the agreement paradigm, s/he will be able to acquire the correct word order.

In contrast to Clahsen and Hansen [29] Gopnik et al. [17] propose that all implicit morphological rules are affected in FLI. This results from the inability of individuals with FLI to build implicit morphological rules. Reports from various cross-linguistic studies on FLI support this conclusion. FLI subjects cannot abstract a root from a complex (affixed or compound) form in Greek [Dalalakis J: Unpublished doct. diss., McGill University, 1996]. FLI subjects do not treat inflected and uninflected forms differently on times lexical decision tasks (contrary to controls) and are not sensitive to morphological relatedness in priming tasks, thus showing a lack of sensitivity to sub-lexical features [31]. These observations are taken to indicate that FLI subjects lack word-internal morphology. In English, the lack of implicit morphological rules shows up in past tense and plural formation: i.e. FLI subjects have difficulty providing plural and past tense forms for real and novel stimuli. Paradis and Gopnik [32] and Gopnik et al. [17] posit that FLI subjects use compensatory strategies (e.g. they produce explicit or analogous past-like forms, substitute or avoid complex forms and memorize complex forms as whole chunks) to produce seemingly appropriate outputs. However, often, these forms do not obey the morphological rules which automatically come into play when implicit rules are used [13].

This paper investigates the general behaviour of 20 French FLI subjects with respect to their responses to a battery of tests adapted from Paradis [33]. We will see that people with FLI have a specific linguistic deficit with strong repercussions on productive morphological processes that control subjects master at a young age. This article will review the results from the French Battery Test of the FLI Project at McGill University, with particular emphasis on the Verb Tense Task (where subjects were asked to produce inflected or stem forms for novel and real verb inputs). This task will be used in this paper to illustrate the behaviour of French FLI speakers in comparison with control subjects. The paper is organized as follows: In section 1, we will present an overview of the French Battery Test. In section 2 we will discuss verb production by FLI subjects, in comparison with the control group. In section 3 we will go in to a finer analysis of the factors that influence the production of verbs in FLI subjects. Finally, in section 4 we will discuss the implications of our results for theories of what underlies FLI.

### *Recruitment and Screening*

A total of 120 French- and English-speaking children clinically diagnosed with language impairment (the probands) and their families were recruited from various institutions (children's hospitals, schools and a dysphasia association). Medical records (speech/language pathology, audiological, psychological and neural assessments) were obtained for all probands and impaired members. The proband had to have: (a) a confirmed diagnosis of language impairment by a speech/language pathologist, (b) normal hearing (25dB), (c) performance IQ of 70 and over, (d)

no presence of frank neurological signs, (e) no evidence of autism or schizophrenia (DSM-III criteria). Twenty-four families qualified for our study.

The French Battery Test (described in the next section) was administered to 84 French-speaking subjects between the ages of 4 and 54 years: 54 were male, and 30 female. Eight were external non-family controls who were taken from a pool in the general population and showed no history of language impairment. They will be used as our controls throughout this article. Among the probands and family members tested on the linguistic battery, we found 20 (between 9 and 46 years of age, 4 of whom were female)<sup>1</sup> to be clearly impaired in their language abilities. Some participants were deemed possibly impaired ('questionable') for reasons such as low results on some but not all tasks, borderline results (between 75% and 85% correct; control speakers always scored above 85%), and atypical reactions to tasks such as extreme nervousness and refusal to answer questions when novel words were used. A breakdown of the participants is provided in table 1.

**Table 1.** Participants

FLI (n = 20)				Control (n = 8)			
code	age at test years; months	sex	score, %	code	age at test years; months	sex	score, %
AI003I	12;7	M	65.4	UA001N	28;8	M	95.6
AI004I	9;10	M	40.6	UB001N	26;11	F	93.3
AR003I	11;11	M	82.2	UH001N	14;4	M	98.3
CA001I	46;0	M	84.2	UI001N	14;10	M	98.3
CA002I	39;1	F	84.1	UJ001N	49	F	98.3
CA003I	21;6	M	75.4	UR001N	34;4	F	100
CA004I	15;11	M	71.5	UR002N	10;11	F	100
CG005I	12;9	M	66.7	UT001N	45;10	M	100
CG006I	12;9	M	57.7				
CT001I	43;2	M	78.9				
CT004I	10;1	M	38.5				
CT005I	10;1	F	67.9				
CX004I	10;6	M	43.7				
DP002I	40;8	F	72.2				
DP004I	9;5	M	56.3				
DS004I	11;7	M	52.2				
EA007I	11;10	M	67.2				
FE003I	10;11	F	72.8				
FX003I	9;0	M	49.6				
SB001I	21;8	M	64.3				

We refer to the participants using codes to protect their identities. Codes include the family code, ranking in the said family, status (I = DLI, N = control) and age.

<sup>1</sup> Children younger than 9 years old were not included in the analysis because control children were not able to perform correctly on the battery before this age. After 9 years of age control participants perform at ceiling levels (see e.g. participant UR2 in table 1).

In this paper, we will analyze the results for impaired ( $n = 20$ ) versus external-control subjects ( $n = 8$ ). We have decided to do so for the following methodological reasons. For one, our external controls have had no family or personal histories of language deficit and so we have reason to believe that they are truly linguistically unimpaired. Within families, this is not as clear. If dysphasia is genetically determined, as has been claimed [34], then the question of gene penetrance is an issue. In other words, how do we know that a person who manages to get a good score on the task has absolutely no language problems? Lexical decision tasks that have been taken by English subjects in the Familial Language Impairment Project have revealed subtle impairments amongst family members of diagnosed subjects [Gopnik M: personal commun.]. In addition, we have not divided the participants in to age groups, for the following reasons. First we have not found a clear correlation between age and performance in both FLI and control subjects who participated in the study. For example, at 11 years old, AR003I has a score of 82.2%, which is similar to that of 46-year-old CA001I, who has a score of 84.2%. A closer analysis of results in table 1 suggests that older FLI subjects perform better on the French Battery Test. However, this tendency may not be characteristic of language development per se; it could rather be the result of more extended use of compensatory strategies [see ref. 32 on this issue].

In the next section, we will give a description of the French Battery Test and discuss some of its aspects, in light of the patterns found in the FLI participants' responses. This section will provide us with a characterization of French FLI speech and will serve as a general background for the subsequent analysis of FLI verb production in French.

**Table 2.** Overview of the French Battery Test

Task	Focus	Stimuli
Spontaneous Speech	speech production	questions, general conversation
Story Description	tense continuity, anaphora	comic strip type story board
Pointing	auditory comprehension (phonetic & semantic), singular/plural distinction	images of objects and questions (16 questions)
Grammaticality Judgment	recognition and correction of ungrammatical sentences	30 sentences (half ungrammatical)
Derivational Morphology	derivation of new words	sentences with one word missing (12 sentences, all real words)
Verb Tense	affixation of new words, past and present	sentences with one word missing (24 sentences, half novel verbs)
Story Repetition	memory	short story
Story Comprehension	memory and comprehension	short story and questions (5)
Syntactic Comprehension	phrase structure	images of actions and sentences (25)

## 1. The French Battery Test

In 1994-1995 the French Battery Test for a preliminary dysphasia diagnostic was used as a general analytical tool to provide us with an idea of the linguistic abilities found in FLI. The battery was adapted for Japanese, Greek, English and French subjects in order for our results to be comparable across languages.

The French version of the test was administered orally by a native French speaker, and the participant's responses were written down by an assistant and recorded on tape. The test contains

a spontaneous speech section (free and guided) and a set of elicitation tasks aimed at tapping into metalinguistic knowledge (grammaticality judgment), implicit linguistic knowledge (mental representations and/or knowledge of rules), and explicit knowledge of linguistic processes (e.g. “when in the past add *-ε/ʹ*”). All the elicitation tasks were preceded by examples, which were given by the tester, and trial runs during which the subject was not scored. An overview of the French Battery Test is presented in table 2.

In the following subsections we will present a brief description of each of the tasks and provide some examples of the results obtained from both impaired and unimpaired speakers. Before we discuss the tasks individually, we give in table 3 an overview of the results for each of these tasks, comparing FLI and control participants. As the number of individuals with FLI and control groups was not equal, we performed an F test for variance in order to determine whether the variance found in results for the two groups was equal. Significant p values (less than 0.05) on this test indicate unequal variance; we assume equal variance for non-significant p values (more than 0.05). Following this we performed an (unpaired) two-sample t test assuming equal/unequal variance in order to determine whether the results differed significantly between the two groups.

**Table 3.** Overview of results for FLI and control participants

Task	FLI (n = 20)		Control (n = 8)		F test	t test
	average,%	SD	average, %	SD		
Pointing	96	1.27	100	0	>0.05	>0.05
Grammaticality Judgment	78.6	9.29	98.3	0.06	<0.10	<0.10
Derivational Morphology	59.6	16.06	100	0	<0.10	<0.10
Verb Tense	48.1	17.96	93.8	1.14	<0.10	<0.10
Story Comprehension	77.9	4.8	75	3.1	>0.05	>0.05
Syntactic Comprehension	90.6	9.92	100	0	<0.10	<0.10

### *1.1. Spontaneous Speech and Story Telling*

In the undirected spontaneous speech section, we asked the subjects questions about favourite activities, school, vacations, work and other general topics. Apart from creating a relaxed atmosphere, the main goal of this task was to see if speech was generally fluent. A story description task followed, during which we asked the subject to describe a story represented in a series of six pictures. This task was directed, but the subject nevertheless spontaneously described actions happening on the story board.

### *1.2. Pointing Task*

We verified comprehension of number, marked on the noun phrase determiner, with a word-picture matching task, in which we asked the subject to point to the picture representing a word we had just said (either singular or plural). The visual stimuli contained two phonetic and two semantic foils in the singular and plural for each question, in addition to a singular and plural representation of the target. Six pictures were presented for each question, as illustrated in (1).

(1) Stimuli: Montrez-moi le banc [lə bɑ̃].

‘Show me the bench’

Plural foil: les bancs [lɛ bɑ̃].

‘the benches’  
Phonetic foils: le paon [lɛ pɑ̃], les paons [lɛ pɑ̃].  
‘the peacock’ ‘the peacocks’  
Semantic foils: la table [la tab(1)], les tables [lɛ tab(1)].  
‘the table’ ‘the tables’

The foils enabled us to ensure that preliminary auditory and semantic processing were intact, thus reducing the possible range of explanations for impaired performance. As subjects with FLI have not been found to have such problems, we did not anticipate substitutions to take place during the Pointing Task. Indeed, all subjects, impaired and unimpaired, did well on this task; as expected, there was no significant difference between FLI and control groups (table 3).

### *1.3. Grammaticality Judgment*

The Grammaticality Judgment Task required the subject to decide if a sentence was a ‘correct’ sentence in French and, in the case of an incorrect sentence, to correct it. Half the sentences in this task were ungrammatical; the other half were grammatical and were used as control sentences for the ungrammatical ones. This task has a double objective. The grammaticality judgment taps into metalinguistic (explicit) knowledge. However, to correct the sentence, the subjects must use their linguistic (explicit and implicit) knowledge. Therefore this task taps into the different levels of linguistic structure such as semantics (argument structure), morphology (lexical structure) and syntax (agreement). The types of errors found in these sentences were noun phrase structure errors (lack of determiner, wrong determiner, etc.), syntactic errors including tense and agreement (infinitive verb in a tensed sentence, plural subject with singular verb and vice versa, etc.) and violations of the  $\theta$ -criterion (e.g. lack of direct object with an obligatorily transitive verb).

Cross-linguistic evidence has shown that people with FLI generally accept grammatical and ungrammatical sentences [16]. All subjects were expected to do well on the grammatical sentences whether they had FLI or not. Controls did overwhelmingly well on this task with an average of 98.3% correct responses overall. The FLI subjects did not do as well as controls on this task (78.6%), making most of their errors in sentences with ungrammatical verb phrases (especially in singular-plural agreement of the subject with the verb) and ungrammatical  $\theta$ -roles. Ungrammatical noun phrases (e.g. lacking determiners) were generally corrected appropriately. As reported in table 3, the difference in scores between controls and FLI subjects is significant.

We expected that the grammatical sentences would be less problematic for the FLI subjects since they are presumably checking the input for conceptual appropriateness, which is non-linguistic. We also expected FLI subjects to have difficulties with ungrammatical sentences, especially in cases where agreement and tense violations require use of the morphosyntactic rules of the language. Finally, we did not expect the FLI subjects to do badly with argument structure violations, as the semantic component has generally been found to be intact in these speakers [16]. Our hypotheses were confirmed. On the one hand, grammatical sentences did not show significant response differences between the two groups. On the other hand, if we consider only ungrammatical sentences, the average score on this task goes down to 60.71% in FLI speakers vs. 97.32 % for controls. This difference is significant (F test:  $p < 0.01$ , t test:  $p < 0.01$ ).

As anticipated, FLI subjects had difficulty recognizing ungrammatical sentences and subsequently correcting them. Sometimes the subjects corrected the wrong element in the sentence. These responses were counted as incorrect. We see an example in (2) where a missing



preposition is not provided and where the participant unnecessarily changes the verb form. (Response provided by participants are in bold type.)

- (3) \*Le garçon sourit la fille Corrected to  
\***Le garçon a souri la fille.**  
'The boy smile-PRES. the girl.'  
'The boy AUX smile-PP. the girl.' DP002I (38)

There are two sentences in (3) that FE003 accepted as grammatical. We can see from these examples that agreement and tense constitute a problem for FLI speakers.

- (3) \*La rose fleurissent [flœʁis] dans la jardin.  
Incorrect Agr input  
'The rose flowerPRES.PL. in the garden.'  
FE003I (11)  
\*L'an passé, Joseph habite [abit] à la campagne.  
Incorrect Tns input  
'Last year, Joseph live-Ø in the countryside.'  
FE003I (11)

#### 1.4. Derivational Morphology

During the Derivational Morphology Task we asked the subjects to produce a derived word based on one we had provided in context. An example is given in (4).

- (4) Mes amis font de la magie. Ce sont des \_\_\_\_\_ magiciens.  
'My friends do magic. They are \_\_\_\_\_ magicians.'

This task involves production of derived words. It allows us to investigate whether or not the subjects can derive new words from stem forms. Controls have an average result of 100% on this task. The subjects with FLI, however, had difficulty. The difference in scores between the two groups is again significant, as we can see in table 3. Subjects with FLI produced a number of substitutions, some of which were pragmatically appropriate and others not, as illustrated in (5).

- (5) Sois poli quand tu parles au monsieur. Parle-lui \_\_\_\_\_ \*correctement (should be poliment)  
'Be polite when you speak to the man. Speak to him \*correctly/politely'. CA003I (20)  
Cet endroit n'est vraiment pas agréable. Il est \_\_\_\_\_ \*déprimé (should be désagréable)  
'This place is really not agreeable. It is \*depressed/disagreeable.' SB001I (21)

Two of the 20 impaired subjects had perfect scores on this task, while they did poorly on the Verb Tense Task. The fact that FLI speakers can do well on the derivational morphology task may be due to the representation of complex words in their lexicons. Complex words might be listed as simple forms in the lexicon and stored in semantically and/or morphologically related groups as proposed by Kehayia [31, 35]. Goad and Rebellati [13, 36] have argued that, for the case of inflection, the 'inflected' word could also be a compound-type construction in the lexicon of the impaired speaker, rather than a derivationally complex form. Thus the FLI subject cannot derive a word starting with a stem form and applying a rule, does not relate a stem and a derived

form as being part of a family of interrelated forms in the language, nor does s/he store them as such in the lexicon.

### *1.5. Verb Tense*

In the Verb Tense Task, subjects were required to produce real or novel verbs in the past or present tense, as exemplified in (6).

- (6) Le bébé a pleuré [plœʁe] toute la nuit. Encore maintenant il \_\_\_\_ pleure [plœʁ].  
'The baby AUX cryPART all night. Even now it \_\_\_\_ cry-Ø.'

This task investigates both direct lexical retrieval and use of inflectional rules with real word stimuli. It also has the advantage of looking at use of inflectional rules with novel words. Subjects could make use of both implicit or explicit strategies in order to produce an output; in controls as well as in FLI subjects, real words could be accessed whole and produced as such. Controls are assumed to have the additional option of using a productive morphological rule to produce an output. Novel verbs were assumed to be dealt with differently by the two groups; controls would use implicit rules of morphology while FLI subjects would use explicit rules to produce an output. Subjects with FLI did extremely poorly on this task while controls did not have any difficulty during this task. Again the difference in results is significant, as seen in table 3. Section 2 is devoted to a more detailed discussion of this task.

### *1.6. Story Repetition and Story Comprehension*

The main goal of the Story Repetition Task was to ensure that the FLI subjects' attention span was normal. We asked the subjects to repeat a short, four-sentence story that we read to them, so that they were forced to pay close attention to what was being said. This was a preparatory task for the following task. During the Story Comprehension Task we asked the subjects to answer five questions about a second short story, demonstrating use of short-term memory and reasoning. The subjects, FLI and control, showed similar results in this task. This shows that short-term memory in subjects with FLI is at least comparable to that of controls.

### *1.7. Syntactic Comprehension*

The Syntactic Comprehension Task is a sentence-picture matching task. We used it to test for comprehension of passive versus active sentences and for comprehension of pronouns (masculine/feminine, singular/plural, subject/object). We asked the subjects to point to one picture among six which corresponded to a sentence read to them by the tester. The five foils included reverse passive or active voices, cleft passives, singular in place of plural as well as feminine in place of masculine subjects and objects. Two sample sentences are given in (7).

- (7) La fille est poussée par le garçon.  
'The girl is pushed by the boy.'  
Il le tient.  
'He it-MASC hold-Ø.'

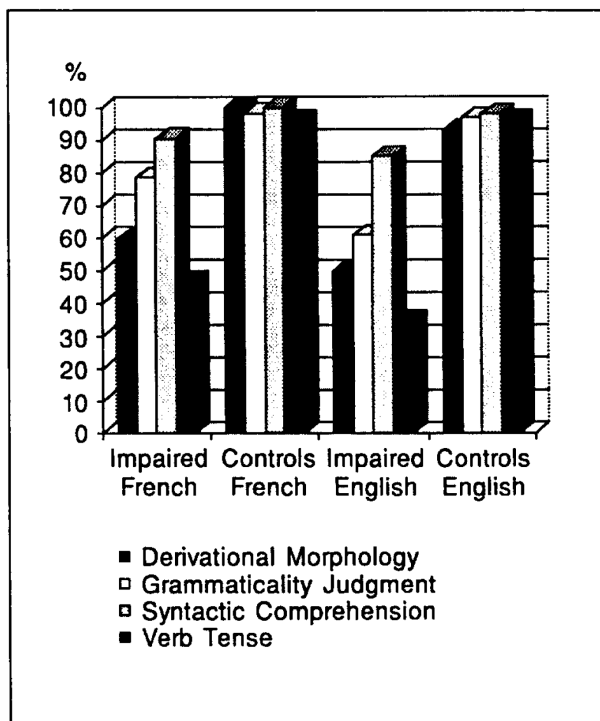
Control subjects did well on this task with an average score of 100%. However, we found that even though subjects with FLI generally did well on canonical SVO sentences, they had much more difficulties with the interpretation of cleft and passive constructions (see 8). As we can see in table 3, when all sentences are analyzed together, the difference between controls and FLI

speakers is significant. However, when canonical (SVO) and non-canonical (OVS) sentences are analyzed separately, the pattern of errors becomes much clearer. Controls and FLI participants generally have the same judgments on SVO sentences (the difference between the two groups is not statistically significant). In the case of OVS sentences, although controls performed perfectly, FLI speakers had more problems in pointing to the appropriate image (87.8%, F test  $p < 0.02$ ; t test  $p < 0.05$ ).

- (8) La fille est poussée par le garçon.      Passive  
 ‘The girl is pushed by the boy.’  
 C’est la fille que le garçon pousse.      Cleft  
 ‘It is the girl whom the boy pushes.’

The difference of behaviour between control and FLI speakers suggests that the latter have more difficulties analyzing sentences that are structurally marked, whereas unmarked structures seem to be adequately processed by their grammar. However, more research must be done before we can speculate as to what aspect of these sentences is causing lower levels of correct responses: word order, passive morphology, both, or some other syntactic problem.

The overall patterns of linguistic deficit in the French battery were similar to those observed in the English Battery Test, as illustrated in figure 1. This shows again that, regardless of the language spoken and regardless of the typological differences between languages, the behaviour observed in French FLI subjects leads to the same characterization of the deficit. Even if comprehension seems to be globally intact, all tasks necessitating analysis of marked structures or use of implicit rules highlight the linguistic deficit of FLI subjects. Similar patterns were found for Japanese and Greek speakers with FLI [17].



**Fig. 1.** Tasks used for FLI diagnostic (English and French Battery Tests)

## 2. Verb Morphology: Production by FLI subjects

In the Verb Tense Task, we asked the subjects to produce verb forms for the 3rd person singular in present and past contexts, with both real and novel verbs. While FLI subjects were able to produce various types of responses, they were generally not able to give a correct response to the prompting of the tester. An example is presented in (9).

- (11) Il n'a pas plu [ply] le mois dernier. Mais depuis deux jours, il \_\_\_\_\_ \*lu [ly]/pleut [plø]  
 'It did not rain last month. But for the last two days, it \*readPP.' FE003I (11:11)

In the following subsection we outline the type of responses that were given by FLI subjects and controls during this task, with emphasis on the factors that affect the FLI subject's performance. We will highlight the inability of the FLI subjects to productively inflect infrequent and novel verbs. We will also show that FLI subjects have a preference for uninflected verb forms and that, when they do produce 'inflected' verbs, they do not produce them in appropriate contexts. (We will see that these 'inflected' forms are probably not produced through the inflectional process that is used by control speakers.) These first two observations support the hypothesis that the component of the grammar responsible for productive affixation on verbs is inaccessible or non-existent in FLI speakers. This last observation supports the hypothesis that the grammar of FLI speakers lacks features as they produce 'inflected' forms in illegal contexts.

### 2.1. Responses

Possible responses to this task include any variation of the inflection pattern of a real or novel verb that does not go counter to the context of the sentence and to the phonetic form of the word. For example, the *passé composé* could be used instead of the *imparfait* in a past tense context. FLI subjects produced a number of responses that were impossible according to the grammatical, semantic or phonetic context (or a combination of these), although they generally did put a verb in the unfilled position. (Rarely used strategies include the production of a noun or an adjective instead of a verb.)

A comparison between the response types provided by the impaired versus the non-impaired population shows that the subjects with FLI had enormous difficulties in accomplishing this task, as we can see in table 4.

**Table 4.** Verb Tense Task response comparison

	Target	Possible	Impossible
Controls	65.54%	28.25%	6.21%
FLI	31.72%	16.38%	51.9%

Note that the number of target responses for the FLI subjects is not negligible (31.72%). Several factors might account for this fact. First, this might be partly due to the high frequency of some verbs. Second, all of the stimuli were in the 3rd person singular, which is non-overtly inflected in French; this form, when used in the *indicatif présent*, does not show a phonological inflectional marker and is considered to be the 'default' form in French [see e.g. ref. 34 on the phonological aspects of French inflection]. Finally, French often has homophonic forms for different tenses of the same verb (e.g. manger [mãze] 'eat, infinitive', mangez [mãze] 'eat, 2nd

person plural’, mangé [māʒe] ‘eat, past participle’); this allows for production of correct forms without necessarily implying knowledge of the verbal paradigm. The fact that subjects with FLI have such a high number of impossible responses (51.9%) even in a language like French – where verbal morphology is quite simple – suggests that their rules for inflection are impaired or inaccessible.

## 2.2. Licit Verb Production Strategies

Since verb production for a given individual cannot be explained or illustrated by the simple statement of numbers, in this section we will make a more in-depth analysis of the various licit strategies that were found during the task. These strategies can lead to either correct or incorrect responses. Therefore a case-by-case analysis is necessary in order to detect what the patterns of verb production are for both FLI and control speakers. As we shall see, controls and FLI subjects use several strategies or means in order to provide outputs. Most strategies were used by all of the subjects to produce responses for real and novel verbs, while some were used only by FLI subjects.

One could produce a stem form when an inflected verb was given as input: A number of forms had to be eliminated from the sample in these cases. Some novel responses sounded like real French words *verrit* [vɛʁi] → *verre* [vɛʁ] ‘glass’, *ferrit* [fɛʁi] → *ferre* [fɛʁ] ‘steel; horse shoe; to shoe (a horse)’, *cromit* [kʁomi] → *chrome* [kʁom] ‘chrome’. (Throughout this paper, all novel forms are phonetically transcribed only). These forms were given in the past tense and the target response would normally keep the final vowel in the present tense, because they resemble *-ir* verbs. However, many subjects (including controls) produced the stem without the final vowel. Thus, we eliminated these responses from the corpus. We see examples of stem production in (10a). One could also inflect the verb with a temporal suffix or with an auxiliary (or both), as seen in (10b). Another strategy would be to repeat the stem given by the tester, as seen in (10c). Finally, some subjects echoed the full inflected form of the verb, as seen in (10d).

### (13) Examples of Licit Verb Strategies (leading to either correct or incorrect responses)

#### a) Production of a stem

Le bébé a pleuré [plœʁe] toute la nuit. Encore maintenant il \_\_\_ pleure [plœʁ].  
 ‘The baby AUX cryPART all night. Still now he cry-Ø.’ CT004I (10)

#### b) Production of an ‘inflected’ form

Elle rapit tous les soirs. Hier soir, elle \_\_\_ a rapié.  
 ‘She [ʁapi]-Ø every evening. Yesterday evening she AUX [a ʁapje]PART. UJ001C (49)

#### c) Repetition of a stem

Marc bousse chaque jour un peu plus. Le mois dernier, il \_\_\_ \*bousse/boussait.  
 ‘Marc [bòs] each day a little bit more. Last month, he \*[bus]/[buse].’ CA004I (16)

#### d) Repetition of an inflected form

Avant, Patrick n’aimait pas beaucoup le poisson. Mais maintenant, il \_\_\_ \*aimait/aime.  
 ‘Before, Patrick did not like fish. But now he \*[ɛmɛ]/[ɛm].’ CX004I (9)

The general pattern we found for controls was generation of correct responses. Speakers with FLI produced a high number of incorrect forms even while using the same response types as controls.

## 2.3. Illicit Verb Production Strategies

The response types discussed in this subsection always resulted in an impossible answer, whether phonetically, semantically or grammatically (relative to the tense of the phrase). These strategies were much more prevalent among the FLI subjects.

One type of response was to substitute a real verb for a real or novel form, sometimes with appropriate tense marking and sometimes not, as in (11).

(11) Substitution

Marie n'a pas ferri ces derniers jours. Alors maintenant, elle \_\_\_ \*l'a fait/ferrit [fɛʁi].  
Marie has not [fɛʁi] these last few days. So now, she did it \*[la fɛ]/[fɛʁi]. AI003I (12)

The second illicit strategy, here designated as echoing, stands for all cases where a subject repeated a form produced in a previous question at any time during the task. This is illustrated in (12). In (12a) we have a form used in a previous sentence relative to the target sentence in (12b). This type of response was never used by controls.

(12) Echoing

a) Previous question (asked before the sentence in which the echoed form is produced)

Elle se salit toujours au football. L'année dernière aussi, elle \_\_\_ se salissait.  
She SELF dirty-Ø always at football. Last year also she \_\_\_ SELF dirty-PAST.

b) Echoed form

Marc bousse chaque jour un peu plus. Le mois dernier, il \_\_\_ \*s'est toujours sali/boussait.  
'Mark [bus]-Ø every day a bit more. Last month he \_\_\_ SELF AUX always dirty-Ø/  
[buse]. DP002I (38)

Note that, except for novel substitutions, most of the illicit responses given reveal that the speaker with FLI knows that we are asking for a verb to be produced. This indicates that the speaker does know something about what a verb is and where it should be found in the syntax of French. This is consistent with Dalalakis [38], who found that Greek FLI speakers produced forms that were of the appropriate lexical category, and with Ullman and Gopnik [39], who proposed that the responses given by FLI speakers were conceptually appropriate, even if they were not the target response.<sup>2</sup> What the FLI subjects do not seem to know is how to go beyond the simple verb and use its morphological paradigm productively.

Finally, cases of no response or refusal to answer occurred in 1.47% of all the responses for the FLI subjects. This never happened in controls.

### 3. Verb Tense Task: Detailed Results

Table 5 shows the total number of responses for all of our subjects, across each category of response. As discussed above, the first four verb production strategies can result in correct or incorrect forms, but the next three production strategies always produce incorrect results relative to the task.

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<sup>2</sup> Alternatively, this observation is also compatible with the fact that subjects with developmental language impairment know what a canonical sentence must look like. Since all the targets for the Verb Tense Task were canonical SVO sentences (preceded by a temporal phrase marker), they had no difficulties in selecting the right target grammatical category. This interpretation allows for the subjects' use of pragmatic and semantic cues to complete the sentence.

**Table 5.** Productions strategies by group: overall results

	Verb	FLI	Controls
Legal strategies	Production of a new (non-inflected) stem	91 (19%)	70 (40%)
	Production of an ‘inflected’ form	126 (26%)	75 (42%)
	Repetition of a (non-inflected) stem	88 (19%)	19 (10.5%)
	Repetition of an ‘inflected’ form	26 (5%)	1 (0.5%)
Illegal strategies	Substitution	72 (15%)	2 (1%)
	Echoing	19 (4%)	–
	No response	7 (2%)	–
	Other	47 (10%)	10 (6%)
Total		476 (100%)	177 (100%)

The term ‘non-inflected stem’ means a verbal form that does not show overt inflection. For example, the verb *pleure* in *je pleure* [plœʁ] ‘I cry’ does not show overt suffixal realization for tense or number.

An ‘inflected’ form is a verb (possible or not in French) that seems to have overt inflection, i.e. an overt tense and/or person marker. For example, the novel form *il foyait* [fwajɛ] shows the *imparfait* marker /-ɛ/.

As mentioned above, unimpaired speakers are assumed to use implicit as well as explicit rules to produce results, while impaired speakers are assumed use explicit rules (or compensatory strategies) throughout the task. The major strategy used by control speakers when producing a verb form is to either inflect the verb or abstract the stem. This accounts for 82% of all their verb production. Repetition of the stem comes in third place. We can also see in table 5 that the FLI speakers produce a non-inflected stem less often than controls. They repeat the stem or inflected verb, or produce an echoed form more often than controls. Use of all ‘illegal’ strategies is higher for FLI subjects as compared to control speakers. Echoing or refusing to answer strongly point towards an impaired status because controls never show this type of response. Thus, this list of verb production strategies, outlining types of responses given during a verb production task, could constitute a preliminary diagnostic device for identifying speakers with FLI.

### 3.1. Interpretation of Results

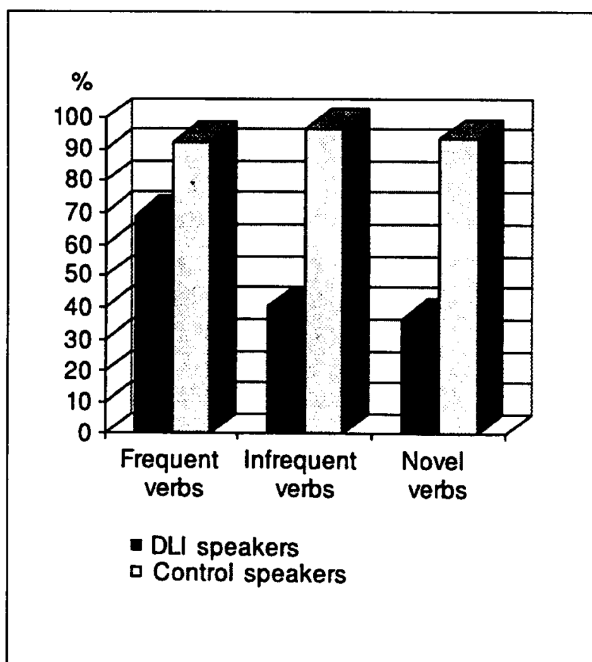
Table 6 shows an analysis of the results according to input. We will see that the frequency of the verb has an effect on its appropriate production. FLI subjects are uncomfortable with novel verbs and have difficulty producing responses with them. They therefore react to novel verbs in different ways than they do for frequent verbs and use a higher number of illegal strategies to produce a response with a novel verb.

A significant factor in verb production in the FLI population was the type of verb (novel/infrequent/frequent) used in the response ( $p = 0.027$ ). Although we specifically asked the speakers to use the same verb we gave them in the input, many types of substitution were used, as we have already seen in the previous section. In the stimuli provided, half the tokens were novel (zero frequency) verbs, four were less frequent real verbs (*pleuvoir*, *se réveiller*, *terminer*, *se salir* which we will call infrequent) and the remaining were frequent real verbs (*pleurer*, *comprendre*,

*travailler, aimer, perdre, finir, faire, avoir*) [relative frequencies were based on ref. 40]. The overall pattern we see for the control group reflects the nature of the input. In terms of correctness of response, the patterns for the impaired group are strongly related to the input, especially with novel and infrequent verbs. The impaired population is uncomfortable with these verbs, and is at a loss as to what to do with them. Figure 2 illustrates that FLI speakers have much more difficulty with infrequent and novel verbs than with frequent verbs whereas control subjects do not seem to be directly affected by the relative frequency of the verbs (a ceiling effect is observed in the case of control speakers). This pattern is comparable with the observations made in Gopnik et al. [18] for Greek and Japanese.

**Table 6.** Type of response according to input

Input	Control speakers				FLI speakers			
	novel	infrequent	frequent	total	novel	infrequent	frequent	total
New (non-inflected) stem	32 (39%)	14 (47%)	24 (37%)	70 (40%)	33 (14%)	16 (21%)	42 (26%)	91 (19%)
New 'inflected' form	31 (38%)	8 (27%)	36 (56%)	75 (42%)	35 (15%)	16 (21%)	75 (46%)	126 (26%)
Repetition of (non-inflected) stem	12 (15%)	7 (23%)	–	19 (10.5%)	56 (24%)	13 (16%)	19 (12%)	88 (19%)
Repetition of 'inflected' form	1 (1%)	–	–	1 (0.5%)	14 (6%)	1 (1%)	11 (7%)	26 (5%)
Echo	–	–	–	–	7 (3%)	6 (8%)	6 (4%)	19 (4%)
Substitution	–	–	2 (3%)	2 (1%)	52 (21%)	17 (22%)	3 (2%)	72 (15%)
No response	–	–	–	–	3 (1%)	2 (3%)	2 (1%)	7 (2%)
Other	6 (7%)	1 (3%)	3 (4%)	10 (6%)	38 (16%)	6 (8%)	3 (2%)	47 (10%)
Total	82	30	65	177	238	77	161	476



**Fig. 2.** Correctness of response relative to input.



Control speakers produce more new stems overall than subjects with FLI during this task. Stem production is used on average 40% of the time by controls. This shows that this group of speakers can productively remove the inflectional morpheme from the stem even with a novel input.

(13) Stem Production for Inflected Inputs

Jean a toujours aimé mudir. Même en ce moment, il \_\_\_ mudit.

‘Jean has always liked [mydɪʁ]. Even at this moment, he [mydi]’

UA001C (28)

FLI speakers show a different pattern. They produce new stems proportionally less often with novel verbs than with infrequent or frequent verbs. Most of the stem production is found in the frequent verbs group, accounting for 46% (24/70) of all stem production in the FLI speakers. This pattern is probably due to the fact that an impaired speaker knows the stem (and other forms) of a frequent verb’s paradigm, and can match the stem to the inflected form of the verb. This would be much more difficult with a novel form or a low-frequency verb where the paradigm is less likely to be memorized. It is not surprising, in the case of frequent verbs, to find higher levels of correct responses when producing a root form. These presumably have been memorized.

When faced with a novel or infrequent verb, FLI speakers produce a seemingly inflected form only rarely. On the other hand, frequent verbs result in the highest level of use of ‘inflected’ forms: 46% of all frequent verbs appear with inflectional suffixes. The use of inflection is thus correlated with verb frequency in FLI subjects. An example of a seemingly inflected verb is presented in (14). As we can see, the tentative inflection results in a wrong tense marking.

(14) ‘Inflected’ Form

Il n’a pas plu le mois dernier. Mais depuis deux jours, il \_\_\_ \*pleuvra/pleut

It NEG AUX not rain-PP the last month. But since two days, it \_\_\_ \*rain-FUT/rain-Ø.

CA003I (20)

Therefore even though FLI speakers know that they should add some inflectional marker on the verb during this task, they not always suffix the right tense marker to the verb. This again suggests that features like *tense* are not available resources to the FLI speaker’s grammar.

Repetition of all types (stem, inflected form, echoing) is the preferred strategy for FLI speakers. The stem repetition strategy is exemplified in (15).

(15) Repetition of a Stem

Elle se perd souvent en ville. Il y a trois jours, elle \_\_\_ \*perd encore/se perdait.

‘She SELF lose-Ø often in town. Three days ago, she \*lose-Ø again/SELF lose-PST’

AI004I (9)

As opposed to FLI speakers, control speakers tend not to repeat stems as a general strategy. They use this strategy only 15% of the time when faced with a novel verb, and use of stem repetition is generally low (11% overall). Moreover, repetition of the stem seems to be subject to an inverse-frequency effect in FLI speech. When faced with a novel verb, the FLI subjects repeat the stem more often than in the case of frequent verbs. Repetition of novel stems accounts for 64% (56/88) of all the cases of repetition. Speakers with FLI do not readily produce an inflected

form when presented with the stem form of a novel verb. This supports the hypothesis that there is no automatic application of rules for tense in this population; the component responsible for inflection is impaired or inaccessible in FLI speakers' grammar.

### 3.2 Inflection Patterns

As we have seen, the types of responses given by speakers with FLI support the hypothesis that the morphological component responsible for the implicit formation of rules for past tense (and perhaps other tenses) is not accessible or is impaired. However, the FLI speakers do produce some inflected forms that they apparently have not heard before. So the question is: How can they do this if they do not have the implicit rules required to produce these forms? We have seen that controls are able to productively apply inflectional rules for the past tense and the past participle. This is their preferred type of response (42% of all responses). Impaired subjects produced new forms with tense marking only 27% of the time. In addition, these forms were not always adequate relative to the context of the sentence. We see in table 7 that when producing a seemingly inflected form, only 50% (232/461) of their responses were correct. Nevertheless, when we look at the breakdown of the forms produced, some details which make this number seem inflated are worth mentioning.

**Table 7.** Tense form and correct usage by control and FLI speakers

Input	Control speakers					FLI speakers				
	imparfait	passé composé	other	present (uninflected)	total	imparfait	passé composé	other	present (uninflected)	total
Correct	44 (92%)	38 (95%)	2 (67%)	82 (95%)	166 (94%)	51 (46%)	43 (49%)	11 (35%)	127 (55%)	232 (50%)
Incorrect	4 (8%)	2 (5%)	1 (33%)	4 (5%)	11 (6%)	60 (54%)	45 (51%)	20 (65%)	104 (45%)	229 (50%)
Total	48	40	3	86	177	111	88	31	231	461

First, we find suppletive forms in these responses. For example, 18 of the 20 FLI respondents correctly 'inflected' the auxiliary verb *avoir* 'to have' in the present tense (16). (One did not finish the verb production task and so did not have the chance to answer this question.)

(23) Hier il a eu mal aux dents. Aujourd'hui encore, il \_\_\_ a mal.  
 'Yesterday he AUX havePART pain in his teeth. Still today he have-Ø pain.'

We would not expect children or adults with FLI (as well as controls) to have difficulty inflecting *avoir*, because it is most probably lexically stored as such.

Production of the stem/present form of the verb was also used by FLI subjects during this task, although less often than for control speakers. Close to 55% of their responses were correct; this is the highest level of performance amongst 'inflection' types, but it is still much lower than that achieved by control speakers (95%). In addition, most of the subjects who did produce new stem forms for the verb did so for the verbs *aimer* and *pleurer*. Both verbs are of high frequency and their paradigms are arguably memorized by FLI speakers. It is not surprising to see that the uninflected form of the verb yields the highest level of correct responses. Recall that stem forms

were commonly found with frequent verbs, the FLI subjects should presumably have no trouble in producing the memorized forms.

In some cases where the stem was repeated from the input we can see that the subject with FLI is not sensitive to the obligatory nature of the temporal morpheme in past tense contexts in French, as exemplified in (17).

(17) Stem / Present Repetition

Mon père travaille [tʁavaj] trop. Hier soir il \_\_\_\_ \*travaille trop/travaillait [tʁavajɛ].  
'My father work-Ø too much. Yesterday he work-Ø too much.' FG003I (8)

When 'inflectin' the verb, the choice of a particular verb tense was a significant factor ( $p = 0.034$ ) in distinguishing the control and FLI groups. Although the raw numbers only show slight differences in choice of verbal form (*imparfait* vs. *passé composé* vs. stem/présent forms), we find that FLI subjects produced monomorphemic forms more often than controls. FLI subjects also occasionally repeated infinitive forms, as shown in (18). This shows that they are not sensitive to the morphology on these verbs, nor are they sensitive to the particular distribution of this morpheme.

(18) Jean a toujours aimé mudir. En ce moment il \_\_\_\_ \*mudir/mudit [mydi].

'John AUX always lovePART [mydɪʁ]. At the moment he [mydɪʁ].' CG006I (12)

Il se roit tous les jours. Encore hier il se \_\_\_\_ \*se rejoindre/se royait [ʁwajɛ].

'He SELF [ʁwa]-Ø every day. Again yesterday he SELF \_\_\_\_ SELF reunite-INF' FX003I (9)

The *imparfait* is produced by adding *-ait* [ɛ] to the stem of the verb. This is arguably a common type of verb inflection used in past tense contexts in the normal population, in formal elicitation situations. This form is taught in school and could be learned by children with FLI during their verb drills with speech pathologists. Probably all the subjects we have tested have some amount of metalinguistic knowledge about *imparfait*. This explicit 'rule' might be parallel to the 'add an *-s*' explicit plurals produced by impaired subjects during the extended Wug Test [36] or to the 'when in the past add *-ed*' strategy observed during the testing of past tense knowledge [41]. FLI subjects might therefore be using a route different from the implicit one that controls use to produce regularly inflected forms. There is another common past tense form in French, the *passé composé*. This tense form involves the use of an auxiliary and a past participle (*-é* for *-er* verbs, *-i* for *-ir* verbs, and usually *-i* or *-u* for irregular verbs). In oral French, the *passé composé* is the most commonly used in past tense situations. The FLI population uses this tense less often during the Verb Tense Task compared to controls (28% and 43% respectively). We do not know if this is due to the presence of the auxiliary in one of the tenses or just due to a task effect, where the formality of the situation encourages the speaker to use forms learned in school or in therapy.

### 3.3 Summary: FLI Speakers' Verb Production

The discussion of FLI speaker's errors has demonstrated that there is a *qualitative* difference within the FLI population. FLI subjects do not regularly produce correct responses when providing stem forms, when repeating the stem, when providing seemingly inflected verbs, or even when repeating an inflected input, all of which are legal verb-production strategies. For

example, they produce past tense or infinitive verbs in present tense contexts,<sup>3</sup> uninflected forms (present) in past tense contexts, and they echo the stimulus presented by the tester even if the context of the sentence clearly denotes a temporal change. The subjects with FLI seem to know that we want them to give us a ‘modified’ verb, but they are really not sure about the best way of achieving this result. Also, some speakers prefer one strategy to another and stick to it throughout the task. Other subjects use various strategies during the task, trying them out haphazardly and showing no knowledge of a productive morphological rule. All of these results (qualitative intra-subject differences, incorrect responses while using seemingly legal strategies, repetition of the stimulus, etc.) point towards a characterization of FLI grammar as lacking morphological features, either to produce or to check outputs.

#### 4. Conclusion

In this paper, we have analyzed the general linguistic behaviour of 20 French FLI subjects. We found that FLI subjects have a specific linguistic deficit with strong repercussions on productive morphological processes normally mastered at a young age in a normally developing child. Throughout this article we have reviewed the results on the French Battery Test, with particular emphasis on the Verb Tense Task (where subjects were asked to produce inflected or stem forms for novel and real verb inputs). The Verb Tense Task was used to illustrate the behaviour of French FLI speakers in comparison with control subjects. We have found that French FLI subjects are linguistically comparable to FLI subjects who speak languages other than French. This lends additional support to a cross-linguistic characterization of the deficit [14–18]. Other factors such as frequency of the target verb and target tense (i.e. present versus past, or unmarked versus marked) have proven to be determinant in the successful output of verbs by the FLI subjects. These promote an analysis where verb forms would be memorized one by one and in ‘whole chunks’ (i.e. without internal morphological structure) [35]. This type of storage, without access to morphological rules of inflection (and possibly derivation), would be sensitive to form frequency. Novel words, having frequencies of zero, would be hard to process by FLI subjects, as we have found. This is not to say that people with FLI would never be able to respond to infrequent or novel input. We would expect subjects with FLI to make use of their metalinguistic knowledge (explicit rules that they have learned and memorized) [32] to produce a certain number of correct forms, but still significantly less than controls.

We have discussed certain properties of French which enable us to directly address some theoretical issues that have arisen in the literature. We will review them here and highlight some of their implications. First, tense problems (on the Grammaticality Judgment and the Verb Tense Tasks) and difficulties deriving new words has been found. These findings seem to invalidate Leonard et al.’s [10] hypothesis of impaired processing, in particular their definition of salience.

- (a) French is a stress final language; the final syllable is always stressed.
- (b) The tense morphemes (and other inflections, e.g. irregular plural, person marking) in French are of the form CV# or V# and are suffixed onto the stem.
- (c) Since stress is final, when a tense morpheme is suffixed to a verb, stress always falls on the said morpheme.

Using Leonard et al.’s [10] concept of salience, we see that these three facts about French verbal morphology result in optimal conditions for salience of the tense morpheme. We would

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<sup>3</sup> Many subjects with DLI used the *passé composé* in the present. This is legal occasionally, for example when the present can be interpreted as a recent past context.

therefore expect French subjects with FLI to produce inflected forms with relative ease and with a high level of correct forms during Verb Tense Task such as the one discussed in this paper. We have seen that this is not the case, and that the number of correct responses given by FLI subjects is quite low. The results we found were comparable to the ones that had been found in English verb inflection tasks [41] (fig. 2). The results obtained with the French Battery Test reveal clearly that saliency cannot be considered as the only determining factor explaining language deficit in FLI. Contrary to French, English inflectional morphology does not have the ‘attributes’ necessary for high saliency. In English, verbal inflections are of the form C# or [ə]C# and are not stressed. Leonard et al. [10] argue that these facts underlie the difficulties English FLI speakers have in producing inflected forms. French FLI subjects, however, do just as poorly in French as the English FLI subjects do in English. The notion of saliency can therefore no longer be considered as a tenable global explanation for the deficits observed in both languages.

Second, recognition of the plural (on the Pointing Task) and listening comprehension is normal in FLI subjects. It thus seems apparent that the processing hypothesis can hardly account for all the problems found in the subjects. Third, the cognitive deficit hypothesis is too vague as to what particular aspects of language should be affected and which should be spared in the subjects. Moreover, this hypothesis does not explain the high level of correct responses on the pointing and the listening comprehension tasks.

Finally, the results obtained from the French corpus provide additional support for the morphological deficit hypothesis, by showing that the ability to produce correct verbal forms in context is related to the frequency (an important factor in the lexicalization process) of the form and to the target tense (the 3rd person singular form being by far the one selected the most often). The results do not demonstrate any effect attributable to the structure of French morphemes. The French FLI subjects exhibited a lack of implicit and automatic rule application for inflection and generally produced uninflected forms. Moreover, our results show that FLI subjects are insensitive to the properties of inflectional morphemes on verbs. They have difficulty both abstracting the stem from the inflected form and productively and automatically suffixing the stem to create a polymorphemic form. The errors we documented in this paper illustrate a marked morphological deficit in French FLI speech.

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