The acquisition of a verbal paradigm:

Verb Morphology in French L1 children

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Abstract:

How do previously learned cells in a morphological paradigm influence the acquisition of new cells? This study examines the *passé simple* verbal morphology production of 486 French L1 children in grades 4 to 6 as measured by a gap-filling task. The objective was to study the acquisition of a verbal form belonging to a complex paradigm exhibiting paradigmatic sub-regularities, and to assess the extent to which learners took into account previously learned forms in their acquisition. An overall correct response rate of only 24% attests to the fact that participants were in the early stages of acquisition of this literary verb form. Success and error patterns reveal that learners are sensitive to the regularity of plural formation across the various verb classes. In addition, learners are sensitive to sub-regularities existing between paradigm cells. No unique paradigm cell can be identified as the source for the morphological forms produced by the learners. On the contrary, various types of phonological factors influence learners' productions: homonymies between paradigm cells, number of syllables in the root, and the phonological structure of the morphological ending.

Keywords:

Morphology, L1 acquisition, first language acquisition, French morphology, verb morphology, French passé simple, morphological paradigm.

1 Introduction

In the study of morphological acquisition, the structure of the full paradigm being acquired and learner knowledge thereof are rarely taken into account. How do previously learned cells in a morphological paradigm influence the acquisition of new cells? The present paper addresses this question by looking at how French speaking children acquire the *passé simple,* a tense encountered after the essentials of the French verbal paradigm have already been mastered.

The tense targeted in this study, the *passé simple*, is acquired relatively late, after children have reached the age of five. This past tense is used essentially in written narratives (and in oral renditions thereof), which explains its late acquisition. It is widely believed that the *passé simple* is virtually obsolete in French and that it is only learned in school through formal instruction. However, primary school children are exposed to this tense through story books and use it spontaneously in story writing. For example, in a corpus of oral and written stories produced by primary school children of Montreal (Canada) (Godard, 1991), the *passé simple* is used by over a quarter of the children (4/15) in Grade 2, and by two-thirds of the children (10/15) in each of Grades 3, 4 and 5. Since the first mention of the *passé simple* is in sixth grade in the curriculum of the province of Quebec where the present study was carried out, and since formal instruction on this tense is generally delayed until secondary school, the verbs in the passé simple observed in the productions of primary school children attest to the fact that children develop an implicit knowledge of this verb form prior to receiving formal instruction on it. Therefore, a study of the *passé simple* forms produced by upper primary school children allows us to assess implicit acquisition of the tense. The *passé simple* is rare enough to ensure that overlearning does not occur. This means that a study of children's written production provides a good developmental view of the acquisition of verbal

morphology in the absence of the ceiling effects that frequently occur in the case of more commonly used tenses. Moreover, it allows for an assessment of the extent to which learners notice regularities in a paradigm and use them to produce a form not committed to memory. In particular, the fact that this verb form is learned later than the current forms of the paradigm provides a measure of the ability of learners to take into account prior morphological knowledge in learning a new verbal category.

The description of the research proper is presented in section 4, after a short review of the main theoretical concepts relevant to the study, and a description of the *passé simple* within the French morphological paradigm.

2 Theoretical concepts

Previous research on morphological acquisition has identified the following factors as influencing the acquisition of a flexional paradigm:

1. **Token frequency**: A frequent item has a stronger memory trace than a rare item. In network models of lexical memory, all items should be sensitive to token frequency (e.g. Rumelhart & McClelland,1986; Plunkett & Marchman, 1993; McClelland, J.; Patterson, K. 2002a, Bybee, 1985, 1995a,b, 1999); in dual mechanism models, rare regular forms would be computed and should not be sensitive to token frequency. (e.g. Pinker, 1999; Ullmann, 2001a, b; Pinker & Ullman, 2002)
2. **Type frequency**: An ending found on a large class of words is easier to acquire than an ending found on a small class of items, and is generalised more easily (e.g. Bybee, 1985, 1995a,b, 1999).
3. **Regularity**: Regular endings tend to be mastered earlier than irregular endings and are often erroneously applied to roots requiring an irregular ending. A regular-irregular dichotomy is predicted by dual mechanism models of morphological processing,

where rules are applied whenever a form is not found in memory. Lexical network models account for the regular/irregular distinction by frequency effects.

4. **Phonological similarity and subgeneralizations**: The phonological similarity of a form to other forms of the language is a strong predictor of speakers' behaviour (e.g. Plunkett & Marchman, 1993; McClelland & Patterson, 2002b). Irregular lexical items may often be grouped in families of phonologically similar forms **(**McClelland & Patterson, 2002b). Bybee's (1985, 1995a,b, 1999) network model distinguishes between *source-oriented* schemata, which relate an input form to an output form much like traditional morphological rules do (e.g. English past tense verbs end in *-ed*), and *product-oriented* schemata, which link sets of output forms – such as the schema in *-ought* for the past tense of English verbs like *think, bring, seek*, where the set of input verbs does not allow for a unifying phonological description. Albright (2002, 2009, Albright & Hayes,2003) proposes representing these subgeneralisations by means of stochastic morphological rules (see also Yang, 2002; Keuleers, 2008).
5. **Distribution of regular and irregular forms in a word class**: In a study of the production of the Italian participle by children, it was found that the first conjugation, which is productive and completely regular, does not give rise to errors in the production of the past participle in *–ato*. The second conjugation, which contains a minority of verbs with a regular ending in *–uto*, gives rise to small rate of regularization to *–uto* (12.5%) and many irregularizations. The third conjugation, which contains a majority of verbs with a regular ending in *–ito*, gives rise to an 84.4% rate of regularization of irregulars to the *–ito* pattern (Colombo, Laudanna, De Martino and Brivio, 2004). Thus, the structure of a paradigm determines how it is acquired (see also Orsolini et al., 1998; and Dabrowska, 2004, 2005 on Polish.)

The general trend that emerges from the literature is that models of morphological processing must take into account the fact that paradigm structure plays a role in the encoding and processing of inflectional forms. Logically, as paradigm structures change from language to language, the subgeneralizations to be arrived at during acquisition should change as well.

3 The French *passé simple*

A French verb conjugation comprises a array of 39 simple forms in current use, where most cells of the array represent a (tense-mood-aspect)+(person-number) combination. There are three non finite forms (infinitive, participle, gerund) and six simple finite conjugations (present, imparfait, future, passé simple, conditional, subjunctive). Table 1 illustrates the paradigm for one verb of the third conjugation, a paradigm characterized as much by stem allomorphy as by ending variations.

Table 1 - Third conjugation – the verb *venir* 'come'

Person-number	Indicative Present	Indicative Imparfait	Indicative Future	Indicative Passé simple	Conditional	Subjunctive Present
1-sg	[vjẽ]	[vən.ɛ]	[vjẽd.rɛ]	[v.ẽ]	[vjẽd.rɛ]	[vjɛn]
2-sg	[vjẽ]	[vən.ɛ]	[vjẽd.ra]	[v.ẽ]	[vjẽd.rɛ]	[vjɛn]
3-sg	[vjẽ]	[vən.ɛ]	[vjẽd.ra]	[v.ẽ]	[vjẽd.rɛ]	[vjɛn]
1-pl	[vən.ɔ̃]	[vən.jɔ̃]	[vjẽd.rɔ̃]	[v.ẽm]	[vjẽd.rjɔ̃]	[vən.jɔ̃]
2-pl	[vən.e]	[vən.je]	[vjẽd.re]	[v.ẽt]	[vjẽd.rje]	[vən.je]
3-pl	[vjɛn]	[vən.ɛ]	[vjẽd.rɔ̃]	[v.ɛ̃r]	[vjẽd.rɛ]	[vjɛn]
Infinitive : [vən.ir]		Past participle : [vən.y]		Present participle : [vən.ã]		

The *passé simple*, henceforth PS, is the perfective past tense used to foreground events in written narratives. In contrast, background situations are represented by means of the imparfait. In current speech, foregrounding is achieved using a complex tense, the *passé composé*. Table 2 summarizes the oral endings for the third person singular and plural forms

of the PS.[1] In the singular, four different vocalic endings are used: /a/, /i/, /y/, and /ɛ̃/. These will be referred to respectively as the *a, i, u*, and *N* (for 'nasal') classes. The *a* class is the regular class, by far the most common, and the class into which neologisms are integrated. The *i* pattern is found on about five hundred verbs. Next comes the seventy-verb *u* pattern and finally twenty-six verbs following the *N* pattern. The *N* pattern comprises all and only the verbs of the morphological families of *venir* (to come) and *tenir* (to hold) (e.g. *revenir* 'to come back'*, devenir* 'to become'*, obtenir* 'to obtain'*, souvenir* 'to remember', etc.). The type frequency of each class was calculated using the Lexique 3.0 database (New et al. 2001)[2], and represents an estimate of the number of verbs in current use.

Table 2 – Endings of the PS in the various conjugation groups

PS Class	3rd singular	3rd plural	Regularity	Type frequency	Traditional conjugation class
1. a	/a/ mangea 'ate'	/ɛr/ mangèrent	regular	4655	1st
2. i	/i/ finit 'ended'	/ir/ finirent	irregular	483	2nd (262) and 3rd (221)
3. u	/y/ but 'drank'	/yr/ burent	irregular	70	3rd
4. N	/ɛ̃/ vint 'came'	/ɛ̃r/ vinrent	irregular	26	3rd

[1] A decision to exclude first and second person forms from the study was made, based on the fact that the *passé simple* is restricted to formal narratives, texts dominated by third person.

[2] This database, accessible at www.lexique.org, was compiled from a combination of literary texts (14,7 million words) and film subtitles (50 million words).

The PS of regular verbs is obtained in the singular by adding the suffix *-a* to the verb stem, which corresponds to the form of the present singular (except for the occasional application of a phonological rule opening /e/ and /ə/ in closed syllables: *lève / leva,* 'raises / raised'). In contrast, the suffixal status of the *i, u* and *N* endings is more debatable. Many verbs of the *i, u*, and *N* classes have stem allomorphy, requiring the learner to select not only the ending but also the proper stem. In patterns like ***mettre***$_{\text{infinitive}}$ > ***mit***$_{\text{PS}}$ ('to put'), ***mouv****oir*$_{\text{infinitive}}$ > ***m****ut*$_{\text{PS}}$ ('to move'), or ***ven****ir*$_{\text{infinitive}}$ > ***v****int*$_{\text{PS}}$ ('to come'), ***v****oir*$_{\text{infinitive}}$ > ***v****it*$_{\text{PS}}$ ('to see'), the verb stem is reduced to a single consonant in the PS and the lexeme is determined jointly by the consonantal root and by the vocalic ending. In light of these cases it could be argued that a word-and-paradigm theory, in which morphologically complex forms are considered to be lexical items related to other lexical items in the paradigm, would be more appropriate than a suffixation rule (e.g. Blevins, 2003; Stump, 1998, 2001). Also supporting a word-and-paradigm approach are the homophonies (syncretisms) within the paradigms (described below), and the fact that in all verbs of the *second conjugation* the final /i/ of the PS, e.g. *finit* ('finished') is part of the long stem of the verb, e.g. ***finiss****ent*.

In the plural, the final -r is concatenative and suffixal to the form of the singular with the irregular patterns in *i, u* and *N* (see Table 2). In regular verbs, the addition of /r/ to the singular involves a vowel change (third person singular /a/ > third person plural /ɛr/), but plural suffix /ɛr/ as a whole is concatenative and suffixal to the stem (ex. *donnèrent* from *donn-(er)*). Hence, the rule adding /r/ to a singular to make a plural is limited to verbs with an irregular ending, but at the same time /r/ is common to the plural of all conjugations, giving rise to a product-oriented schema.

The regular endings (/a/, /ɛr/) do not have homophones elsewhere in the conjugation. However, for a subset of verbs belonging to the *i* and *u* classes, the singular of the PS is homophonous with the form of the participle. In addition, in all verbs of the *second*

conjugation, the PS is homophonous with the present singular. Another frequent syncretism is the homophony between the plural of the PS and the infinitive in /ir/. Syncretisms may be viewed as rules relating one cell of the paradigm with another cell. If a learner notices a syncretism in a verbal paradigm, he can use the form of a known cell to produce a form for a distinct cell. Importantly, these rules are probabilistic. As shown in Table 3, 91% (342/376) of the verbs having a participle ending in -i are homophonous with the singular of the PS in *i*. In contrast, only 43% (68/159) of the verbs having a participle in -u form a PS in *u* in the singular. In addition, 82% of the verbs ending orally in /ir/ in the infinitive have a PS in /ir/ in the plural.

Table 3 - PS endings compared to participle and infinitive endings (irregular verbs only). Syncretisms indicated in grey.

	PS endings				
	i	**i (≠)[1]**	**u**	**N**	**Totals**
Participle endings					
-i	342[2]	33	-	-	376
-u	65	-	68	26	159
other	41	-	2	-	43
none	1[3]	-	-	-	1
Totals	*449*	*33*	*70*	*26*	*578*
Infinitive endings[4]					
-ir	327[2]	33	14	26	400
-Vr	9	-	36	-	45
-Cr	113	-	20	-	133
Totals	*449*	*33*	*70*	*26*	*578*

[1] Verbs for which the *PS* in *i* is phonetically distinct from the participle in -i, e.g. $écrit_{participle} \neq écrivit_{PS}$ (written, wrote). With the infinitive, the same verbs have a different stem in the PS and in the infinitive.
[2] Includes all 262 verbs of the second conjugation.
[3] *Renaître* ('to come back to life').
[4] Infinitive endings: Vr = vowel distinct from /i/ + /r/; Cr = consonant +/r/.

Although the regular endings of the *first conjugation* in *-er* are predictable on the basis of the infinitive, irregular verb endings are not. The /i/-/ir/ pattern is drawn from both the *second conjugation* and a subset of verbs of the *third conjugation*. The verbs patterning in *u*

and *N* all belong to the *third conjugation* and include verbs ending in /ir/ in the infinitive (e.g. all *N* verbs end in /ir/ in the infinitive).

To sum up, a number of factors distinguish the various endings of PS morphology: regularity, frequency, morphological relatedness, and paradigmatic syncretisms. The present study considers the role of these factors in accounting for the accuracy and error rates observed in the course of a forced production task completed by L1 learners of French.

4 Methodology

4.1 PARTICIPANTS

A total of 486 children from grades 4 to 6 (aged 8 years 10 months to 13 years 7 months), were tested in four schools in the Greater Montreal area (Canada). In total, 139 children were in grade 4, 169 in grade 5, and 178 in grade 6. The children all used French as their principal language of communication at home and were enrolled in the French L1 school system.

4.2 MATERIAL AND PROCEDURE

A narrative text was constructed with 60 verbs in the PS from which the ending was removed (see Appendix 1). All verbs were in the third person, about half of them in the singular and half in the plural. There were 22 *a* verbs, 21 *i* verbs, 12 *u* verbs, and 5 *N* verbs; this distribution roughly preserves the respective type frequency of the different patterns, while including a sufficient number of low frequency types to allow for the drawing conclusions concerning the children's knowledge of these forms. The part of the verb that was provided to the children was the stem. In a few cases, only the first letter was given in order to conceal the inflectional vowel (e.g. for the form *mit* of the verb *mettre*).

The text was distributed in class. The children were asked to read the story and complete the verbs. The task was not timed.

4.3 DATA ANALYSIS

Overall task results were compiled by grade level and verb pattern. Each pattern was further divided into singular and plural occurrences. Answers were counted as correct if they provided an accurate phonological representation of the target form irrespective of spelling.

Once analysis began, a number of problems had to be addressed, some anticipated and some not. The vowel of one plural form in /yr/, *taire - turent*, was inadvertently included and the item had to be eliminated. Also eliminated was the second occurrence of *faire* in the third person plural; no other verb was repeated in the same person and number. A less predictable problem arose when it was noticed that participants made almost exclusive of the *imparfait* instead of the PS for three blanks (*jouer, inventer, craindre)*. A choice was made to eliminate these blanks. Finally, although the expectation was that participants would elect to use past tense verbal morphology to complete the gapped verbs, many children used present tense morphology in many blanks. In total, 22% of the responses were in the present, a percentage similar to the 24% correct answers in the PS. When present tense morphology was homophonous with PS morphology, it became impossible to determine if the answer was correct by design or by chance. For this reason, the decision was made to remove four ambiguous blanks from the analysis (*adoucir, interdire, murir, rougir)*; these are all of the *i* class and were all singular. This left 50 verbs: 20 in *a*, 15 singulars and 5 plurals, 14 in *i*, 3 singulars (all from the third conjugation) and 11 plurals (from both the second and third conjugations), 11 in *u*, 6 singulars and 5 plurals, et 5 verbs in *N*, 3 singulars and 2 plurals.

5 Results

5.1 GENERAL OVERVIEW OF THE RESULTS BY SUBJECT

The global success rate of 24% shows that the children have not yet mastered the PS by the end of primary school. The mean number of correct answers per child as a function of

grade level is illustrated in Figure 1. There is a significant improvement with grade level ($F(1,484) = 16.25$, $p<.001$); however, the R-squared value of 0.02 shows that the proportion of variance with grade level is small. There is very little difference between grade levels when children in the first quartile are compared, probably due to a floor effect. The increase in the mean is essentially due to the improvement of average and high performing children over time. Pairwise comparisons using the Wilcoxon rank sum test indicate that Grade 4 (mean 0.38, s.d. 0.16) is significantly different from Grade 5 (mean 0.46, s.d. 0.20) ($W=9639$, $p=.007$) and from Grade 6 (mean =0.47, s.d. 0.23) ($W=9956.5$, $p=.003$); however, there is no significant difference between Grades 5 and 6 ($W=14730$, $p=.74$).

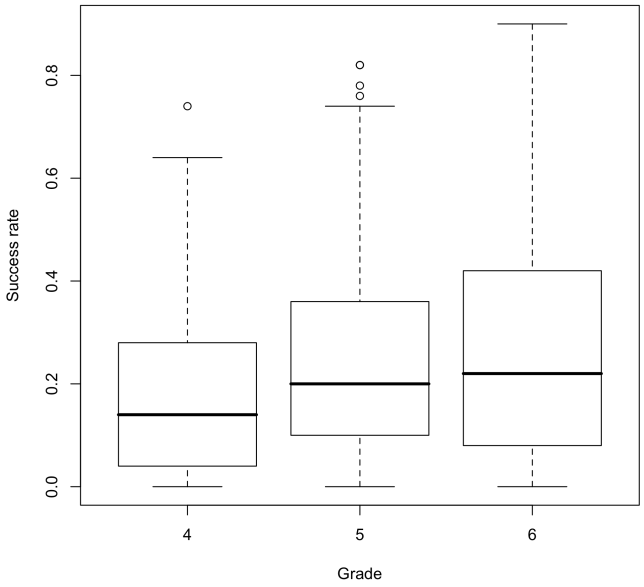


Figure 1 - Success rate by Grade level

With a 24% success rate, we know that the tense is far from being mastered. This gives us an opportunity to study the forms produced by the children at this relatively early stage of acquisition. Given the minimal impact of grade level, this factor will not be

considered in the analyses to come, which concentrate on the linguistic properties of the verb forms produced.

5.2 ANALYSIS BY ITEM - ATTEMPTS AT PRODUCING A PS

Table 4 shows that close to 44% of the verb forms produced by participants had an ending typical of the PS. Regular a class verb forms were assigned a PS ending close to 43% of the time. Both i and u class verbs were more frequently assigned PS endings (respectively 51% and 45%). The verb class yielding the least number of attempts at producing a PS is the N class (25%).

Table 4 - Percentage of responses with a PS ending

	Verb class ending			
	a (reg.)	**i**	**u**	**N**
Total number of verbs elicited	9720	6804	5346	2430
Verbs with a PS ending	42.6% (4139)	51% (3467)	45.1% (2413)	25.1% (609)

Given the nature of the test, the rate of production of a PS ending per verb was influenced by textual factors like the position of the verb in the text, the nature of the preceding word or the existence of orthographic competitors to verbs for which few letters were given. Such factors are difficult to measure, and they might have had a non-uniform effect on each verb class. Therefore, it was felt that an analysis of variance by verb class would not be valid.

5.3 ANALYSIS OF THE PS FORMS

Let us now turn to the central aspect of our research, the analysis of the verb forms obtained. For this analysis only the verb forms with an ending typical of the PS were retained. The verbs conjugated with a correct vocalic ending will be examined first (section 5.3.1), then the verbs with an ending typical of an erroneous verb class (section 5.3.2). See Appendix 3 for the detailed results per verb.

5.3.1 Endings of the correct verbal paradigm

Table 5 presents the total number of PS forms ending in a vowel typical of the class to which the verb belongs, eventually followed by /r/. When the children produce a form with a PS ending, the ending is appropriate for the verb 86% of the time with regular verbs, 80% of the time with *i* verbs, 70% of the time with *u* verbs and only 41% of the time with *N* verbs. Thus the verb inflection is more often appropriate than not, except for the *N* class; this, combined with the fact that the *N* class gives rise to only 25% of responses with a PS ending, indicates that this class is far from being mastered by the children.

Table 5 - Endings of the correct paradigm

	Verb class ending			
	a (reg.)	**i**	**u**	**N**
Correct forms of the PS (including agreement errors)	3540 85.5%	2225 64.2%	1676 69.5%	251 41.2%
Correct answers (excluding agreement errors)	2961 71.5%	1440 41.5%	1221 50.6%	215 35.3%
Correct ending, but incorrect stem **Singular ending** **Plural ending**	 26 9	 403 150	 3 0	 0 1
Total correct paradigm	3575 86.37%	2778 80.13%	1679 69.58%	252 41.38%
Total number of forms with a PS ending	4139	3467	2413	609

The differences between lines 1 and 2 of Table 5 indicate that children produce a high number of agreement errors. Singular verbs (71.3%) have a higher correct agreement rate than plural verbs (35.3%) and for all verb classes children were prone to producing singular forms when the verb was expected to be in the plural more often than they produced plural forms when the verb had a singular subject (see Table 6). This suggests that children learn the singular before they learn the plural.

Table 6 – Percentage of Number errors by verb class

Verb Class	Expected verb number	
	Singular verbs with plural ending	Plural verbs with singular ending
a	0.05 (157/3034)	0.38 (16/164)
i	0.08 (67/887)	0.28 (718/2580)
u	0.03 (40/1422)	0.42 (415/991)
N	0.04 (20/445)	0.10 (16/164)

Stem form errors (line 3 of Table 5) are rare among regular verbs; they are produced mainly with *essuyer* 'to wipe', where the semi-vowel /j/ is omitted (*essua* instead of *essuya,* 20/26; *essuèrent* instead of *essuyèrent*, 9/9). There are also few incorrect stems among the *u* and *N* verbs. The figures are much higher for *i* verbs. In the singular, nine erroneous stem forms in /i/ cannot be attributed to production of a present tense or participle form. The large majority of the errors come from two verbs of the third conjugation requiring a long stem where the children produced a short stem form in /i/ homophonous with the present singular and with the participle: *conduit* instead of *conduisit* 'led' (222 tokens), *écrit* instead of *écrivit* 'wrote' (172 tokens). The strategy of using the present/participle as a PS may be taken as reflecting sensitivity to the syncretism with these cells for the majority of *i* verbs, but the possibility that these forms reflect a tense error rather than an attempt at PS morphology cannot be discarded. However, the children produced plural forms in /ir/ based on the same short stem and homophonous with the infinitive (*conduire(nt)* instead of *conduisirent* 'led-pl.', 44 tokens; *écrire(nt)* instead of *écrivirent* 'wrote-pl.', 102 tokens), a fact that suggests that a certain proportion of the short stem forms in /i/ are meant as forms of the PS. The use of the infinitive for verbs having an infinitive in /ir/ again reflects sensitivity to the syncretism observed with the majority of *i* verbs. Four other plural forms are true overgeneralizations of the -ir pattern, not homophonous with the infinitive (**prenir*, **réjouisirent*, **réfléchissuirent*, **partirir).* The forms ending orally in /ir/ are often spelled with mute plural agreement morphology, indicating that they are inflected forms.

To sum up, when a child produces the expected ending, he rarely makes a verb stem error, except with those *i* verbs where the PS has a root distinct from that of the infinitive or the present/participle. In that case, there are 16% verb stem errors where children tend to use a form homophonous with the present/participle or with the infinitive.

Table 7 shows that there is no linear relation between type frequency and percentage of correct responses for each verb class. The odd class here is the *u* class, that has a higher success rate than *i*, with only a fraction of the verbs of this class.

Table 7 – Comparison of type frequency and correct responses

	a (regular)	i	u	N
Type frequency	4655	483	70	26
- percent of verbs	89.7	9.3	1.3	0.5
Success rate	71.5	41.5	50.6	35.3

In addition, no correlation was found between verb success rate and estimated lemma frequency per million words. However, there is a strong positive correlation between the surface frequency of the precise PS form called for and the success rate for this form (r=0.45, p=.001). The correlation is significant for all verb classes except the *a* class, where, if an outlier is removed, a significant correlation results (*a* class w/o outlier: r=.47, p=.041; *i* class: r=.70, p=.005; *u* class: r=.63 p=.037; *N* class: r=.93, p=.021).

5.4 GENERALIZATIONS ACROSS PARADIGMS

Table 8 displays the number of verbs produced with an ending typical of a PS class distinct from the one to which the verb belongs. In each cell, the total number of forms is given first; in parentheses figure more conservative numbers (to be explained below).

Table 8 – Generalizations to incorrect paradigms (more conservative figures between parentheses)

Verb class →	a (reg.)	i	u	N	Totals
Choice of ending ↓					
***a* ending (regularization)**					
/a/	-	147	271	110	530
/ɛr/	-	131	70	66	269
/ar/		2			
***i* ending**					
/i/	261 (39)	-	279 (57)	36 (17)	576 (113)
/ir/	24	-	113	34	171
***u* ending**					
/y/	245 (3)	165 (149)	-	99	509 (256)
/yr/	33	237 (227)	-	12	282 (271)
***N* ending**					
/ɛ̃/	1	6 (2)	1 (0)	-	8 (3)
/ɛ̃r/	0	1	0	-	1
Number of erroneous endings	564 (100)	689 (659)	734 (511)	357 (338)	2346 (1614)
Total number of PS endings	4139	3467	2413	609	10628
Percentage of generalization to other classes	13.6 (2.42)	19.87 (19.0)	30.42 (21.18)	58.62 (55.50)	22.07 (15.19)

For irregular verbs of the *i, u* and *N* classes, 45% of the errors are regularizations, including 530 forms in /a/, 269 in /ɛr/ or /ar/, for a total of 799 (the /ar/ ending is a extension of the plural rule: the child adds /r/ to a singular in *-a* to produce a plural). At the opposite end of the spectrum, the *N* ending is rarely if ever applied to verbs of another class. This result is hardly surprising given the children's low success rate with verbs of this class. On the other hand, the number of verbs attributed an *i* or *u* ending typical of a non-regular paradigm is quite high (1538 tokens in total, i.e. 66% of all incorrect endings).

***A* Class (first column of Table 8).** Given the regularity of the *a* class, participants might have been expected to systematically apply /a/ in the singular and /ɛr/ in the plural to all of the verbs. However, the children produced 285 verb forms with an *i* ending and 278 verb forms with an *u* ending. The 24 forms in /ir/ observed with regular verbs are clear overgeneralizations (e.g. **essuirent* 'wiped', **crirent* 'yelled'). They appear on verbs whose root ends in /i/ in the present singular (*essuie* 'wipes', *crie* 'yells'), and show that children

consider as plausible a plural form in /ir/ for such verbs. In the singular, there are 39 clear overgeneralizations to /i/ for regular verbs (this number figures in parentheses in the table). The other forms distribute as follows. The singular forms in *essuie* (42) and *crie* (180) are homophonous with the present singular and are likely to stem from two distinct sources. The large number of verbs in the present in the corpus suggests that a good proportion of the occurrences of *essuie* and *crie* are simply verbs in the present singular.[3] But because forms in /ir/ were observed with the same verbs, one has to assume that some of the forms in /i/ reflect knowledge by the children of the possibility of syncretism between a present in /i/ and a PS in /i/. Thus, it is likely that the exact number of generalizations to *i* with the regular verbs is larger than the more conservative number in parentheses. This is all the more probable since the singular is better known than the plural and often substituted for it, as seen above.

Among the *u* endings observed on regular verbs, there are 3 clear cases of overgeneralization to the /y/ paradigm in the singular. Among the other singular verbs, 175 are confined to two forms homophonous with the present singular (*continue* 'continue', 135; *diminue* 'diminish', 40). Treating a present form in /y/ as a potential PS reflects a product-oriented schema because no verb having a *u* ending in the PS shows syncretism with the present singular. However, the large number of occurrences is likely to include a good proportion of present forms. Another 67 extensions of the *u* ending to a regular verb occurred when the children produced **essue* or **essut* 'wiped', which corresponds to the form provided in the text to which many participants added a mute letter like 'e' or 't'. This might reflect a product-oriented schema, where children considered a form in /y/ as a possible PS, but it could also be a low-level error of simply adding a mute verbal ending to the stimulus. In the plural, however, 33 forms in /yr/ with the same verbs (**essurent* 'wiped', **continurent*

[3] The form *cri* is also homophonous with the noun *cri* 'yell'.

'continued', **diminurent* 'diminished') are undeniable indications that the children used the root vowel as a source for constructing the PS, by adding /r/ to a root in /y/. Therefore it can be assumed that the number of forms in /y/ homophonous with the present includes a certain percentage of forms actually meant to be in the PS.

As far as regular verbs go then, generalization to an irregular paradigm rarely occurs. When irregularization does occur, it is largely limited to cases in which the verb root ends in /i/ or /y/, where the final vowel of the stem seems to induce the use of a product-oriented schema in /i(r)/ or /y(r)/.

***I* Class (second column).** For *i* verbs, irregularization involves providing the /y/ or /yr/ ending typical of *u* verbs, an error found 402 times. This error is observed mainly with the verbs *voir* 'see', *vaincre* 'defeat', *enfuir* 'flee' and *faire* 'do'. In the case of *voir*, there are 60 occurrences of *vu(t)*, homophonous with the past participle *vu*, and 17 occurrences of **vurent*. The strategy of using the participle form for *voir* appears to indicate analogical reasoning at work, and use of a syncretism observed in the paradigm for other verbs. The erroneous plural form **vurent* is formed by adding a /r/ sound to a singular in /y/ (plus silent letters encoding the plural), a strategy indicating the observation of the regularity of the plural suffix /r/ in PS formation. Similarly, in the case of *vaincre*, there are 38 forms of *vaincu*, again a form homophonous with the participle, and 181 forms of **vaincurent*. The verb *enfuir* yields 46 cases of **enfu(ent)*, and 25 cases of **enfurent.* Here the forms are not homophonous with the participle, which is *enfui*, but the fact that the prompt *enfu-* ends in -u was apparently sufficient for the children to trigger a past participle in /y/-/yr/; moreover the verb ending, sounds like the PS of the verb *être* 'to be' (*fut, furent*).

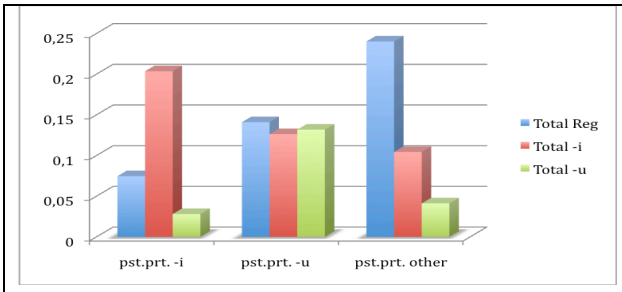
The verb *faire* yields forms in *fut* (16) and in *furent* (10) (vs 68 forms in /i/ or /ir/). *Fut/furent* is the PS of the verb *être*; the error might reflect verb confusion, but we observed *fut* as a PS of *faire* in spontaneous texts written by primary school children. Removing the

verb *faire* from the total in Table 6, still yields 149 generalizations in /y/ and 227 generalizations in /yr/ for *i* verbs. Indeed, for the plural of *i* verbs, there are more forms in /yr/ typical of the *u* pattern than there are regularized forms in /ɛr/. Considering that type frequency has been hypothesized as accounting for the frequency of generalization of a morphological pattern, the high rate of generalization to the *u* pattern is unexpected, as there are over 4600 regular verbs, but only 70 *u* verbs.

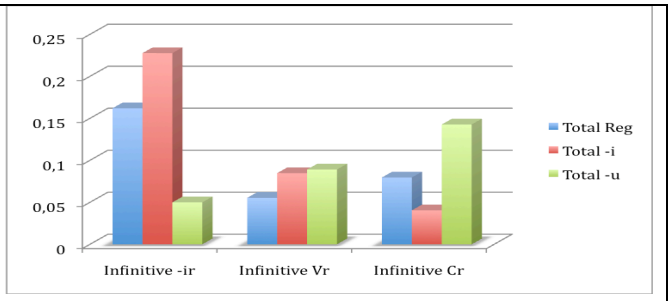
***U* Class (third column).** Verbs in *u* give rise to 57 clear cases of generalizations to the *i* pattern in the singular. Among the other cases, the form *cri* for the verb *croire* 'believe' (expected form *crut*) may reflect the use of the verb *crier* 'yell' in the present (88 tokens). The form *fit* instead of *fut* for the verb *être* (50 tokens—compared to 238 tokens of *fut*) might be a result of confusion with the PS of the verb *faire*, but here again, *fit* instead of *fut* was found in spontaneous written productions. The form *lit* of the verb *lire* (84 tokens) is homophonous with the present. In the plural, the forms **lirent* (67 tokens) and **courirent* (15 tokens) are homophonous with the infinitive and reflect use of the dominant syncretism; the other forms (e.g. **buvirent* instead of *burent*) —3 tokens— are creative analogies.

***N* Class (fourth column).** For all verbs of the *N* class, the infinitive is in /ir/ and the participle in /y/. This class gives rise to analogical extensions to all the other classes. In the case of *venir* 'to come', the form in /i/ (*vit*) is homophonous with the PS of *voir* 'to see' and could be a verb choice error, but again the same error was observed in spontaneous written texts. All the other *i* forms are analogical creations. The participants more often produced a form in /ir/ than a form in /i/ when a plural was required (21 forms in /ir/ vs 2 forms in /i/ for plural verbs); conversely they produced more /i/ forms when the singular was required (34 forms in /i/ vs 13 forms in /ir/ for singular verbs). The erroneous forms in /y/ constitute, after the regular form in /a/, the second most frequent choice. It is likely that the /y/ ending here is favoured by virtue of its homophony with the participle.

To summarize, a large number of the irregularization errors made by the children reflect analogical reasoning within the paradigm, and, in particular, use of the probability of a syncretism between the present, participle or infinitive and a form of the PS. In order to obtain a more precise idea of the importance of syncretisms in the children's answers, the distribution of the regular, *i*, and *u* endings for the PS was calculated as a function of the infinitive and participle endings. The results are illustrated in Figure 3.



Participle endings



Infinitive endings

Figure 2 – Percentage of regular, /i/ and /u/ PS endings produced (Y axis) as a function of verbs' participle (left) and infinitive (right) ending

The left hand graph of Figure 3 shows that when the participle is in -i, learners tend to use an *i* ending for the PS, while the *u* ending is more frequent when the participle ends in -u. This pattern of response suggests that the existence of syncretisms with a participle in -i or -u increases the probability of a learner producing a PS in *i* or *u*. For participles ending neither in *i* nor in *u*, children tend to use the regular ending; however, the choice of the regular ending is mainly due to the production of the singular form *mour(r)a* for the verb *mourir*, a form homonymous with the future. When only plural forms are considered, the children prefer the *u* ending for these verbs (50% of *u* endings, compared to 25% choice of the regular ending),

even though the distribution in Table 3 would suggest a potential preference for the *i* ending. Thus, simple probability of occurrence is not predictive of learners' behaviour.

The graph on the right hand side of Figure 3 shows that with verbs having an infinitive in /ir/, children prefer a PS with an *i* ending, a behaviour coherent with the syncretism existing in most /ir/ verbs. Simple frequency of a PS ending with an infinitive ending in the absence of syncretism, however, is of no help to the children. The children hesitate between *i* and *u* for infinitives ending in a vowel distinct from /i/ followed by /r/, and prefer the *u* ending for infinitives ending in a consonant followed by /r/; neither pattern is predicted by the distribution of forms in Table 3.

5.4.1 Importance of type and token frequencies in generalization errors

Table 9 compares the type frequency of each verb class with the percentage of generalizations to each class. For the percentage of overgeneralizations, the more conservative numbers in parentheses in Table 8 were used. This underestimates the generalizations to the *i* and *u* endings. Even so, there are proportionally *fewer* regularizations to the *a* class than the proportion of verbs belonging to the regular class, but far *more* generalizations to the *u* ending than would be expected given the low type frequency of this class. Hence, type frequency does not account for the distribution of errors.

Table 9 – Comparison of type frequency and proportion of generalization

	a (regular)	i	u	N
Type frequency (% out of total number of verbs)	4655 (89.7)	483 (9.3)	70 (1.3)	26 (0.5)
Generalization to the class -number of tokens (% out of 1614 generalizations)	799 (49.5)	284 (17.6)	527 (32.7)	4 (0.2)

Overall the *u* ending is better known, and more overextended than what its type frequency would predict, even in cases where the distribution of the verbs would favour an *i* ending. One factor comes to mind to explain the children's knowledge of the *u* ending: token frequency. Are the *u* verbs more frequent than the verbs of the other verb classes?

In order to calculate the mean token frequencies of the various verb classes, it was not possible to use the surface frequency of the PS, because of the homonymy between the PS and the present for the majority of the *i* verbs. In the Lexique database, the surface frequency of *finit* for example subsumes that of the present and of the PS. To overcome this difficulty, we calculated the mean lemma frequency for each verb class, assuming that the frequency of use of a verb in the PS is proportional to its lemma frequency. This may not be the case because the perfective aspect of the PS makes it more compatible with eventive verbs than with stative verbs. However, pending an analysis of the distribution of the PS in texts, the lemma frequency provides a rough approximation of the relative token frequencies of the verbs of the various classes. The *u* verbs include the auxiliaries *avoir* (*eut)* and *être (fut)*, whose high frequency and irregularity should make them morphological islands (Bybee 1999). For this reason, these two verbs were removed before the mean token frequency for the four verb classes was calculated. The modal verbs (*pouvoir, devoir, vouloir, falloir*), which also belong to the *u* class, were retained. As shown in Table 10, the mean lemma frequency of the *u* class is quite high, a fact that might explain why the class ending is well known and overextended to other verbs. Note, however, that the *N* class also has a very high frequency and yet was not mastered by the children despite its high phonological coherence. Therefore, if lemma frequency is representative of PS frequency, simple frequency of occurrence fails to explain the difference in success rates between the *u* class and the *N* class.

Table 10 - Mean token frequency of the various verb classes

	a (reg)	i	u	N
Mean lemma frequency per million	16.8	85.5	399.4	206.1

To sum up, neither type nor token frequency straightforwardly accounts for the data, which probably result from a complex interaction between these factors, as well as others like syncretisms or implicit phonological paradigm membership cues. The next section discusses one implicit cue for paradigm membership that seems to have influenced ending choice: the syllabic structure of the root.

5.4.2 Syllabic structure

No significant correlation was found between number of letters provided and success rates, either globally or by verb class but there is a significant positive correlation (r=50.9, p=.002) between the number of letters given in the prompt and the number of regularizations of irregular verbs.[4] A closer look at the data reveals that verbs for which only one or two letters were provided gave rise to fewer regularizations than the other verbs. This suggests that the phonological form of the root was operative in the choice of ending by the children. A number of frequent irregular verbs, particularly of the third conjugation, have stem allomorphs of one or two consonants (*e.g.* ***p**rit, **v**ut, **t**int*). However, there are no regular verbs with a subsyllabic root. In other words, the children had never observed a PS of the form [C(C)+a], but had often observed a PS of the form [C(C)+ i/ y/ ɛ̃]. This could account for the correlation observed: children refrain from producing a regularized verb of type [C(C)a]. If

[4] This correlation is calculated after eliminating the results for *mourut* because of the large number of *moura* responses, a form (quasi) homophonous with a future form of the conjugation, *mourra*. With *moura* included, the correlation remains significant.

this is correct, it shows that surface phonological constraints are operative in children's productions.

5.5 ROOT SELECTION

Regular verbs have only one stem, but the verbs of the other classes generally have more than one stem. When a child wants to add the regular ending to a verb of a different class, he needs to decide which stem will be used for the addition of the suffix. Table 11 shows that it is not the stem of the infinitive or of the third singular person of the present that is used. Instead, three times out of four the child uses the stem of the *imparfait*. (E.g. *buv-a* — expected form *but* — is based on the same root as *buv-ait*, and not on the present *boit* or on the infinitive *boire*).

Table 11 – Stem selection – percent of choice of the Imparfait

Grade	Root chosen	
	Imparfait	Other
4 (N= 211)	74.41	25.59
5 (N= 352)	76.42	23.58
6 (N= 377)	78.25	21.75

This is all the more interesting because there is no indication within the paradigm of regular verbs that the stem for the *imparfait* should be selected for the addition of the PS ending. Stem choice must result from an analogical process within the irregular forms with multiple stems. The fact that the *imparfait* is a past tense like the PS is perhaps not irrelevant in stem selection, but phonology is more probably the main factor here. The *imparfait* is the only tense constructed by the addition of a vocalic ending, /ɛ/ to a stem. Because the PS in /a/ or /ɛr/ requires the addition of a vowel initial ending, the root for the *imparfait* is an

appropriate choice. This observation highlights once again the importance of phonological factors in morphological processing, a conclusion repeatedly stressed by previous authors (e.g. Albright, 2002; Bybee 1985; McClelland & Patterson, 2002b; Plunkett & Marchman, 1993).

6 General discussion

The present research examined how a native learner can exploit his previous knowledge of a verbal paradigm to learn a new verb category, namely the PS. The data show that learners of French use the regular ending proportionally more often than the other endings. However, verbs are not overwhelmingly regularized, and there are a substantial number of generalizations to irregular classes. Extension of regular endings to verbs of other conjugations accounts for 45% of the generalization errors. This percentage is lower than what would be expected if these endings functioned as a default. In addition, surface frequency is correlated with success rates even for regular verbs (once the outlier is removed), which suggests retrieval from memory rather than the application of a rule. If participants rely on memory retrieval even for regular verbs, there is a high probability that they are using lexical schemata to come up with a plausible form of the PS for verbs not yet committed to memory. In support of this hypothesis is the fact that the regular ending clearly competes with irregular endings in the participants' responses.

In the case of regular verbs, regularity exerts an incontestable influence. The children have learned that the most common way to form the PS is by adding the suffix /a/ or /ɛʁ/ to a regular stem. The PS forms produced for this class of verbs are generally correct, except when their stem ends with an /i/ or an /y/. In that case, there is a certain tendency to produce a pattern in *i* or *u* typical of the use of a product-oriented schema. Some children seem to consider a stem ending in /i/ or /y/ as an acceptable PS form. In that case, the phonological form of the stem is more important than the application of the regular rule, and more

preeminent than the verb class to which the verb belongs (a verb ending in –er in the infinitive). This illustrates the importance of phonological form in morphological processing.

As for the *i, u* and *N* patterns, a number of factors seem to have influenced their treatment by children. The use of the *i* ending is in competition with that of the *u* ending, despite the low type frequency of the latter. This shows that type frequency is not the only or even the main factor guiding ending choice. The high token frequency of the *u* class is a potential factor favouring the *u* ending; however, the fact that the *N* class is poorly known despite a high token frequency suggests that something else is going on. It was suggested that the influence of syncretisms is a relevant factor. The *u* ending is favoured with verbs having a participle in *u* compared to verbs having a participle in *i.*

Looked at from this perspective, the poor success rate and lack of generalization of the *N* ending probably results from factors other than low type frequency alone. Because the class is extremely coherent, comprising only and all the verbs of the families of *venir* and *tenir*, and because some of these verbs are frequent (*venir* 'come'*, devenir* 'become'*, revenir* 'come back'*, souvenir* 'remember'*, tenir* 'hold'*, retenir* 'hold back, remember', *obtenir* 'obtain'…) some signs of acquisition would logically be expected across this class (whose type and mean token frequency are in the same range as the *u* class). It can be hypothesized that the low success rate of the *N* ending stems from the fact that this ending is exclusive to the PS and is not derivable from another cell in the paradigm. If this is correct, the differences in success rates and generalization rates observed between the *N* class and the *u* class would result from the absence of syncretism in the *N* class, contrary to the *u* class. This might indicate that children find it harder to learn a completely new form than to learn that one form is to be found in a distinct cell of the paradigm (which we might view as a type of addressing mechanism).

The irregular forms in /yr/ and some forms in /ir/ distinct from the infinitive reflect a type of rule-governed behaviour: « to form the plural of the PS, add /r/ to the singular form ». This rule does not work for the regular paradigm (where the plural is in /ɛr/ and not in /ar/), but it is systematic for the irregular paradigms, and it is clear that the children have learned it. Whether they encode it as a procedural rule or as a lexical schema is unclear. The fact that infinitives in /ir/ are accepted as forms of the PS suggests schema application rather than rule application.

It is worth noting here that the analogical creations made by the children differ in a crucial way from what is observed with the English past tense. In the case of English, the child learns the relation between a stem and a past form. If there are multiple rules, the source of the rule is always the verb stem, which happens to be an independent form. Albright (2002, 2008) proposes generalizing this to other languages, suggesting that all forms in a paradigm are based on a unique base form. The data discussed here suggest that this is not a tenable position. The source for the construction of the French simple past is not one particular cell in the paradigm. For some verbs, the present form is used; for others, the infinitive or the participle. Moreover, the stem used as a basis for the addition of the regular PS ending is generally that of the *imparfait*, and not that of the present, the infinitive, or the participle.

CONCLUSION

This study of the acquisition of the French PS shows that, even though the children tested have yet to develop extensive knowledge of this verb form, they have already learned and encoded many low-level regularities. When they cannot find a memorized version of the PS of a verb, they do not use the regular ending by default. The regular ending is often used, but it is in strong competition with other endings, reflecting various types of creative analogy, some based on source-oriented schemata (add /r/ to the singular), others based on product-

oriented schemata (a PS may end in /y/), still others based on the observation of the existence of homophonous paradigm cells (an infinitive in /ir/ may be used as the plural of a PS).

Two crucial points emerge from the present study. Firstly phonological factors play an important role in the participants' production: the phonological form of the stem, the syllabic structure of the stem, and the choice of stem given the vocalic nature of the ending all explain some aspects of the children's creative analogies. Secondly, learners take into account a variety of paradigm cells in order to compute the PS: the present, participle, and infinitive are used to compute the ending, and the imparfait is used to determine the stem. Therefore learners are sensitive not only to phonological factors, but also to paradigmatic structure. Studies of the acquisition of complex paradigms of various types are required in order to better understand how learners are sensitive to the relations existing between paradigm cells when encoding or computing a form belonging to a complex paradigm.

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Appendix 1 – The test.

Lis le texte suivant et complète les verbes. Assure-toi de bien faire l'accord avec le sujet.

Il y a très longtemps il y avait un enfant, Mio, qui avait envie de vivre des aventures avec ses amis. Pendant tout l'été ils jou____ au chevalier et invent____ des histoires de châteaux et de princesses. Lorsque l'automne arriv____ et que le blé mûr____ dans les champs, ils part____ sur la route de la montagne. Ils cheminaient depuis quelques heures dans le bois et commençaient à avoir soif lorsque tout à coup ils aperç____ une source au loin. Ils cour____ jusqu'à la source et b____ l'eau fraîche. Puis, levant les yeux, ils v____ qu'un message était écrit sur le rocher d'où coulait la source. Ils l____ : «Qui me boit …» et le reste était effacé. Soudain le rocher boug____ et un être étrange appar____. Celui-ci rassur____ les enfants et leur expliqu____ que l'eau qu'ils avaient bue était magique et qu'elle leur donnerait des pouvoirs surprenants. Cela pl____ à Mio qui demand____ comment ils pouvaient utiliser ces pouvoirs. L'être étrange les condui____ à l'entrée d'une grotte où se trouvait un monstre qui terrorisait toute la région et il leur di____ qu'avec les pouvoirs conférés par l'eau, ils pouvaient tuer le monstre et délivrer les gens de ce fléau. Les enfants se réjoui____ de connaître une aventure mais ils n'étaient pas rassurés. Seraient-ils capables de combattre le monstre? Ils se tu____, réfléch____, et décid____ d'un plan d'attaque. Voici ce qu'ils f____. Mio pr____ un bâton et en touch____ le sol. Un énorme trou se cré____ dans le chemin. Puis, tous les enfants sauf Mio se t____ à l'entrée de la grotte et cri____ pour attirer le monstre à l'extérieur. Ils attend____. Lorsque le monstre s'approch____, les enfants s'enfu____, mais pas trop vite pour s'assurer que le monstre les suivait. Quand le monstre f____ à l'extérieur, Mio pouss____ un cri et, grâce à ses pouvoirs magiques, un rocher v____ bloquer l'entrée de la grotte. Il interd____ ainsi la retraite au monstre. Les autres enfants ralent____ leur course lorsqu'ils arrivèrent au trou du chemin, ils f____ un bond magique qui les transport____ de l'autre côté. Le monstre qui les poursuivait continu____ sur sa lancée et tomb____ dans le trou. À ce moment, les enfants d____ une formule et il se m____ à tomber de l'eau magique sur le monstre. L'eau roug____ et grésill____ au contact du monstre. Les rugissements du monstre diminu____, puis s'arrêt____. Mio cr____ qu'ils l'avaient tué. En fait, il ne mour____ pas mais son caractère s'adouc____ et il se transform____ en chaton. C'est ainsi que les enfants vainqu____ le monstre; ils en conn____ une grande fierté. Mais que faire

maintenant? Mio craign____ que le chaton ne meure dans son trou, et il obt____ l'aide de ses amis pour le sortir de là. Il le secour____, l'essu____ et il dev____ son ami. Les enfants se souv____ du message écrit sur la source. Ils y retourn____ et écri____ «…vaincra ».

Appendix 2 – Detailed results for verbs having a PS ending

VClass	Num	Verb	Correct response	Incorrect responses (by ending produced)										Total
				a[1]	er	ar	i	ir	u	ur	N	Nr	AgrError	
a	plural	arreter	76				1						142	219
		crier	81				180	9					54	324
		decider	117					2					89	208
		diminuer	52	1			2		40	9			64	168
		retourner	103				1	6	1	2			73	186
	Sum p		429	**1**			**184**	**17**	**41**	**11**			**422**	**1105**
	singular	approcher	229				3						4	236
		arriver	155				2						6	163
		bouger	198	2			6	1	1				8	216
		continuer	123				2		135	3			5	268
		creer	188	2									12	202
		demander	155				1	1					3	160
		essuyer	93	20	9		42	2	67	18			21	272
		expliquer	206							1			10	217
		gresiller	67				11	1					3	82
		pousser	249										1	250
		rassurer	175						1				5	181
		tomber	231				5						15	251
		toucher	96	1			1	2			1		3	104
		transformer	226				4						8	238
		transporter	141										53	194
	Sum s		2532	**25**	**9**		**77**	**7**	**204**	**22**	**1**		**157**	**3034**
Sum a			2961	**26**	**9**		**261**	**24**	**245**	**33**	**1**		**579**	**4139**
i	plural	attendre	73	4	23				2	2			32	136
		dire	135	2	4		1		2	2			66	212
		ecrire	4	25	17		172	102				1	6	327
		enfuir	160	7	8		2		46	25			126	374
		faire	50	3	2		1		16	10			18	100
		partir	73	2	15			1			1		29	121
		ralentir	110	6	14								92	222
		reflechir	113	16	3			1					149	282
		rejouir	101	10	9	1	3	1			3		159	287
		vaincre	19	18	25	1			38	181			7	289
		voir	115		2				60	17	2		34	230
	Sum p		953	**93**	**122**	**2**	**179**	**105**	**164**	**237**	**6**	**1**	**718**	**2580**
	singular	conduire	84	29	8		222	44					16	403
		mettre	226	6	1								50	283
		prendre	177	19			2	1	1				1	201
	Sum s		487	**54**	**9**		**224**	**45**	**1**				**67**	**887**
Sum i			1440	**147**	**131**	**2**	**403**	**150**	**165**	**237**	**6**	**1**	**785**	**3467**
u	plural	apercevoir	89	4	4		1						141	239
		boire	59	14	19			3					102	197
		connaitre	50	5	9			2					53	119
		courir	73	14	19		1	15					59	181
		lire	35	1	8		84	67					60	255

	Sum p		306	**38**	**59**		**86**	**87**					**415**	**991**
	singular	apparaitre	230	13			8		2				1	254
		croire	91	4			88				1		1	185
		etre	238	2			50	1					11	302
		mourir	71	142	3		10	4					1	231
		plaire	185	12			4	1					4	206
		secourir	100	60	8		33	20	1				22	244
	Sum s		915	**233**	**11**		**193**	**26**	**3**		**1**		**40**	**1422**
Sum u			1221	**271**	**70**		**279**	**113**	**3**		**1**		**455**	**2413**
N	plural	souvenir	18	17	35		2	9	10	3			12	106
		tenir	5	5	19			12	7	6			4	58
	Sum p		23	**22**	**54**		**2**	**21**	**17**	**9**			**16**	**164**
	singular	devenir	88	29	9		4	4	17	2		1	18	172
		obtenir	18	48	1		11	6	44	1				129
		venir	86	11	2		19	3	21				2	144
	Sum s		192	**88**	**12**		**34**	**13**	**82**	**3**		**1**	**20**	**445**
Sum N			215	**110**	**66**		**36**	**34**	**99**	**12**		**1**	**36**	**609**
Total			5837	**554**	**276**	**2**	**979**	**321**	**512**	**282**	**8**	**2**	**1855**	**10628**

[1] The columns in grey correspond to the production of an ending appropriate for the verb class, most of the errors in these columns are verb stem errors.

> The concerns expressed in my comments aside, I really like this article. I think a couple of the dots could be more strongly connected in the text (ex. the different cases in which phonology is a factor; the connection between token (lemma) frequency and textual/contextual factors ... not evoked but could be tied in ... in that some verbs just aren't found in the PS very often and some contexts were iffy for PS use).