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Regularity, sub-regularity and irregularity in French acquisition

Abstract

We review our studies and others on French acquisition of morphosyntax that refer to regular and irregular rules. Data on French past participle and adjective production and elicitation reveal that children distinguish regular, irregular and sub-regular rules. Children are sensitive to distinctions between verb conjugation classes even when they occur infrequently in the corpus. We propose that for morphological processes to become regular rules during language acquisition, they must show productivity and morphophonological consistency.

1. Psycholinguistic models of language processing and language acquisition

The question of regularity and irregularity in morphology is an issue often addressed models of language acquisition, as regular morphological paradigms benefit from a privileged status in acquisition. Linguists and other cognitive scientists have proposed a number of models to account for systematized behaviour in language acquisition and the acquisition of irregular and sub-regular rules. Most models fall into one of two camps: single- or dual-route.

According to the East-Coast linguistic school, children are endowed with a language acquisition device (LAD) that enables them to use language acquisition rules. The LAD is innate and pre-wired (Chomsky 1986). According this approach, all morphologically complex forms are processed via linguistic rules, or “operations over variables” (Marcus 2003: 34), whether or not they are regular. Other single-route approaches in the psycholinguistic tradition also propose single mechanisms for language acquisition, based on general pattern-based probabilistic cognitive processes. Linguistic “rules” are thought to be by-products of emergent properties of the system (Marchman & Bates 1994), and pattern frequency (i.e., rule frequency) is an important mediating factor for

schemata acquisition (Bybee 1995). However, other researchers propose that at least two cognitive mechanisms come into play: children learn language using both general cognitive mechanisms for item-based learning and morphologically-based word construction and analysis to develop linguistic rules (Bartke et al. 1995; Clahsen 1996; Clahsen & Rothweiler 1993; Clahsen et al. 2002; Marcus et al. 1995; Pinker 1999).

1.1. Arguments in favour of dual-route models

The proposed arguments for the dual route include differences in productivity, differential transparency effects, different overregularization rates for different conjugation classes, and sensitivity to internal word structure.

Productivity is a linguistic feature that can be used to measure the automaticity of a linguistic process. If an inflectional process is productive, it can be applied to all possible forms in the language. On the other hand, if it is found only for certain word classes (in French, irregular vs. regular verbs), it is considered less productive or unproductive. Indications of productivity are the integration of loanwords (*chatter* ‘to (web-)chat’), neologisms (*tchorer* ‘to steal’), the creation of derived forms such as denominals (*fumer* ‘to smoke’) and onomatopoeia (*ronronner* ‘to purr’). These four examples show that the first French verb conjugation (-er verbs) is productive, unlike the third class, which shows no productivity. Moreover, these examples support the notion that the first conjugation is the default (see the section below on French verbs).

It has also been shown that children acquire the more morphologically transparent inflections more efficiently. Thus, they master regular better than irregular forms in English (Berko 1958), Spanish (Clahsen et al. 2002) and French (Royle 2007). However, children often produce irregular verbs with erroneous stems. For example, in German, a child might produce **gewinn* for *gewonnen* ‘won’ or **gebind* for *gebunden* ‘bound’ (Clahsen & Rothweiler 1993).

Another indication that children acquire productive linguistic rules is overregularization. Only productive rules are overregularized. In English, children show overregularization of irregular verbs (approx. 4% of the irregulars in a corpus of 11,521 utterances) and 8.5% of noun plurals (range 0–22%) (e.g., *foots* for ‘feet’) (Marcus et al. 1992). Overregularizations are also found in German-speaking children for verbs where the regular -t participle is used instead of the -en participle (**gebt* for *gegeben* ‘given’, **gefalt* for *gefallen* ‘fallen’ **weggereitet* for *wegeritten* ‘ridden away’) (Clahsen & Rothweiler 1993), and in noun plurals where -s plurals are used in neology (*lumlum-s* ‘balloons’, *puppa-s* ‘dolls’, *aua-s* ‘booboos’) and -n and -s plurals in overregularization (**mann-s* for *Männer* ‘men’, **loper-s* for *Pullover* ‘sweaters’, **mutter-s* for *Mütter* ‘mothers’, **pferden* for *Pferde* ‘horses’ and **auten* for *Autos* ‘cars’) (Clahsen et al. 1992). Overregularization is also observed in Spanish children at the early acquisition stages (ages 1;7–4;7). This process tends to respect the verb conjugation group. That is,

the child uses a regular pattern within the verb's conjugation class (**sabo* for *sé* 'I know', or **pusí* for *puse* 'I put-past') (Clahsen et al. 2002). In French, children typically overregularize into the first conjugation at ages as young as 3;0 (Grégoire 1937; Guillaume 1927[1973]; Hiriartborde 1973; Royle 2007), as illustrated in (1):

- (1) *Je l'ai *batté* [bat-e]/*battu* [bat^sy]
 I 3SCL-AUX beat-PP
 'I beat him' = 'I won' (personal data 4;6)¹

Furthermore, children are sensitive to the morphological structure of words, which influences how they process them in terms of inflection patterns. For example, verb forms that are homophonous to irregulars, or derived from them, can be integrated into regular patterns. When producing past tense forms of denominal verbs that are homophonous to irregular verbs (such as 'flie' in the sense of 'to cover a board with flies'), pre-school and school-aged children tend to use regular verb patterns (*flied*) more than irregular ones (*flew*), while at the same time preferring irregular forms for the non-derived meaning (for further details, see Kim et al. 1994). These authors present similar data for pluralization in compounds with exocentric (e.g., proper nouns based on irregulars, or Bahuvrihi compounds, *Batman*, *snaggletooth*) and endocentric (e.g., *fat man*, *shark tooth*) nouns. Children tend to use irregular plurals with endocentric compounds, whereas exocentric compounds allow both types of plurals (regular and irregular).

1.2. Arguments in favour of single-route pattern-based models

A number of researchers have proposed that these distinctions between different conjugation or pluralization patterns in acquisition do not result from morphological sensitivity or processing. For instance, the regular-irregular distinctions observed have been attributed to a number of linguistic and psychological properties of language. One appeals to type frequency in the corpus (and therefore input to the child) and the other appeals to patterns found in regular and other verb inflection patterns.

Some researchers propose that the regularity effects (especially better mastery of some patterns) stem from the type frequency of these patterns. For example, regular verbs would be mastered better than irregular verbs simply due to the higher type frequency in the corpus (thereby pushing the pattern to the forefront) (Bybee 1995). This accounts well for English data, as the regular pattern is predominant in any corpus. Connectionist models have been developed that can implement this frequency effect through a learning algorithm in which rule-based learning does not appear to be required to produce the appropriate outputs (Rummelhart & McClelland 1986).

¹ All personal data were obtained from the first author's son, a French-dominant bilingual.

However, not all regular patterns are the most frequent in a given corpus (see e.g., Clahsen et al. 1992 and Marcus et al. 1995, for a discussion on German plurals). Moreover, as we discuss below, some less frequent verb conjugations in the input or output can nevertheless be productive, according to the above-mentioned criteria. Cognitive scientists who believe that morphological structure is unnecessary for word and structure acquisition do not see this as a problem. In fact, connectionist models can apparently implement even low (type) frequency patterns with “hidden” layers, and “sensitivity” to phonological sub-regularities in the pattern (Seidenberg 1997), as found in *sing-sang-sung* (termed *gang effects*, Bybee & Moder 1983).

Therefore, it remains an open question whether children’s language acquisition models need to refer to morphological sensitivity to account for learning patterns, especially regarding sensitivity to regular verb patterns and overregularization. We present a review of recent data on French language acquisition in the aim of making a relevant contribution to this debate. We first present studies on verb inflection and then introduce data on adjective acquisition in French-speaking children.

2. Studies on French verb acquisition

Hiriartborde (1973) established that French children as young as 3;6 can productively produce the *passé composé* (a compound tense used to denote perfective aspect) on regular high- and low-frequency verbs in experimental settings. Her study of 13 children aged 3;5 to 3;7 showed that they could produce real and novel regular *passé composé* forms, but only if their spontaneous speech corpus contained at least four regular types. Nicoladis et al. (2007) studied the acquisition of past tense morphology by English-French bilingual and French- or English-speaking monolingual children to determine the role of input frequency in the differentiation between regular and irregular verbs. They hypothesized that the acquisition of verb inflection patterns is determined by both corpus type and token frequency. That is, children must hear not only many different verbs (types), they must also hear them many times (tokens) in order to master past tense morphology. In addition, given that bilingual children are exposed to fewer tokens in each language, and because frequency is crucial for acquisition, these authors explored the possibility that bilingual children would produce verbs less accurately than monolingual children. We focus here on the French (monolingual and bilingual) data only.

In order to verify the importance of frequency in verb acquisition, Nicoladis et al. (2007) first looked at the number of verb types and tokens in child-directed adult oral input and child book corpora. They found that the majority of types (62.5%) and half the tokens (50.5%) that French-speaking children heard were regular (first conjugation) verbs. Their conclusion is that regular verb types and tokens occur frequently in French,

whereas irregular types and tokens occur infrequently. Therefore, the first conjugation would be well mastered and overregularized.

In spontaneous speech, monolingual and bilingual children produced more regular than irregular verb tokens. The same pattern was found for types. Moreover, there was no effect of language group: both bilingual and monolingual groups produced a similar number of tokens and types. However, effects of both language group and verb type as well as their interaction were observed on accuracy. Whereas monolingual French children inflected regular and irregular verbs equally well in spontaneous speech (90%), bilingual French children inflected regular verbs (95%) verbs more accurately than irregular verbs (60%).

Error types and rates for irregular verbs were as follows: monolingual children produced present or stem forms (60% of errors) and no overregularizations. This last finding was contrary to expectation. Bilingual French children produced overregularizations (10%) and present/stem forms (50%). However, note that *-ir* sub-regular verbs (verbs that are not the default conjugation but are nevertheless formed by a regular rule) were classified as irregulars, and moreover, that regularizations into this pattern were classified as “irregularizations”), although these error types were rare (see examples in 2a/b):

- (2a) *a mour-i* for *est mort*
 AUX die-PP
 ‘died’
- (2b) *a re-ouvr-i* for *a re-ouvert*
 AUX re-open-PP
 ‘re-opened’

Nicoladis et al. (2007) conclude that the difference between monolingual and bilingual children is due to less frequent exposure to French for bilinguals than monolinguals. Accordingly, at early stages in development, children are very sensitive to token frequency. Because bilingual children hear fewer irregular verb tokens than monolinguals do, they produce them less accurately. In addition, because regular verbs show higher token frequency, bilingual children initially learn more regular than irregular verbs. In a following phase, children will become sensitive to phonological regularities within families (e.g., verbs ending in *-frir* or *-vrir* tend to form their past participle with *-ert* [ɛʁ] *offrir/offert* ‘to offer’, *ouvrir/ouvert* ‘to open’). According to Nicoladis et al. (2007), these French verb types, unlike English irregulars, tend to be morphologically stable. Therefore the formation of the past tense is relatively predictable. This could explain why very few overregularizations were produced in French. That is, children do not usually have difficulty mapping the appropriate verb ending with a stem according to its morphological family. Only at a later phase do children become sensitive to type frequency (that is to specific patterns of conjugation). In sum, these authors argue that their data support single-route models. In other words, children acquire the past tense by analogy, and children use regular and irregular verbs differently based on their repre-

sentational strength. In particular, the quasi absence of overregularizations in monolinguals is not explained: if children overregularize an irregular form when their memory fails, they would frequently apply the rule for regular verbs, as they do in other languages. We feel that this last conclusion is too hasty, as sub-regular verbs were sometimes regularized into the second conjugation pattern (*-ir* pattern, see 2a/b above). In addition, the true type and token frequencies of different verb groups are unclear. We take up this issue below.

Furthermore, it is known that spontaneous speech data can overestimate linguistic abilities (e.g., productivity) in children (De Villiers 1992, Royle & Thordardottir 2008). For instance, in some cases no errors or overregularizations are observed in the corpus. It is therefore important to verify language production in more controlled settings. We present below two elicitation experiments that addresses this issue. But first we begin by addressing the issue of subregularity in French and romance languages.

3. The issue of subregularity

Much of the debate on processing has centered on the regular-irregular distinction, as played out by English verbs. However, not all languages have this strong dichotomy. Some languages, like French, have irregular stems that combine with regular suffixes. In English, however, most irregulars are usually portmanteau morphs that blur the distinction between stem and affix. More important for the present paper is the issue of verb conjugation class. In many languages, the regular-irregular distinction is not so straightforward in terms of frequency, productivity, default, or the overregularization processes involved. We focus here on romance languages, but similar issues arise in German, for example (Clahsen & Rothweiler 1993).

Spanish

Spanish has three verb conjugation classes, identified by a thematic vowel in the infinitive. The first conjugation (*-ar* verbs) is the most productive and regular, and the most frequent in terms of types (87%) in the corpus (Clahsen et al. 2002). This conjugation integrates loanwords (*esquiar* ‘to ski’), neologisms (*tuitear* ‘to tweet’), deadjectival and denominal forms (*endulzar* ‘to sweeten’, *encajar* ‘to box’), and onomatopoeia (*tintinear* ‘to tingle’). The second and third conjugations (*-er* and *-ir* verbs) account for 6% and 7% of corpus types, respectively. The second conjugation contains both regular and irregular verbs, and the third contains mostly irregular verbs. However, some deadjectivals fall into the third conjugation. Whereas most irregularities in Spanish verbs appear in stem changes, some also affect inflexional suffixes. Irregular suffixes tend to combine with irregular stems, while regular suffixes combine with both regular and irregular stems. Spanish verbs therefore distinguish between regular and irregular verbal forms for both stem formation and inflexional suffixation.

Clahsen et al. (2002) showed in a spontaneous speech study in Spanish-speaking children (aged 1;7–4;7) that most verb errors are cases of overregularization of irregular stems or inflections. Moreover, overregularization occurs mostly within a given verb conjugation class, and not necessarily into the most frequent (and default) pattern. In stem regularization, there is no class mixing: children tend to maintain the correct form for each verb class. As for suffixation, there are few cases where the first conjugation suffix occurs instead of the second or third conjugation suffix, and so on.

Clahsen et al. (2002) also found very low overregularization rates. The average mean is only 10%, while it is higher in the past than the present tense. Clahsen and collaborators claim that overregularization does not depend on type frequency in children's vocabulary because at the time when overregularization begins (around age 2), children produce similar type frequencies for both regular and irregular verbs. Only at a later age do regular forms outnumber irregulars (around age 2;2). Therefore, if child-corpus type frequency influences overregularization, it would be expected to occur only after 2;2 years of age.

Italian

Similar to Spanish, Italian has three verb conjugation classes. According to Say & Clahsen (2002) (see also Orsolini et al. 1998), the first conjugation (containing verbs with the *-a-* thematic vowel) is the most frequent in terms of type (with 73%) and is also the default pattern. This conjugation integrates loanwords (*scioccare* 'to shock'), neologisms (*tifare* 'to be a supporter/fan of'), deadjectival and denominal forms (*falsare* 'to falsify', *silenziare* 'to silence'), and onomatopoeia (*spruzzare* 'to splash'). The second (with *-e-* vowel, mostly irregular) and third conjugations (with *-i-* vowel, mostly regular) account for only 17% and 10% of types, respectively. However, some deadjectivals fall into the third group: *arrichire* 'to enrich' (from *rico* 'rich') *ingiallire* 'to turn yellow' (from *giallo* 'yellow'). Moreover, spontaneous production shows that overregularization occurs mostly within a given verb conjugation group, and not necessarily into the most frequent (and default) pattern, as seen in **cadè* rather than **cadò* for *cadde* 'fell'.

Therefore, Spanish and Italian verbs groups include three types of verbs (regular, sub-regular and irregular), which appear to be treated differently in terms of productivity versus acquisition. Children do not systematically overregularize into the most productive conjugation pattern, and are thus sensitive to class membership, while neologisms overwhelmingly occur within the productive conjugation (with some notable exceptions, see discussion by Albright 2002, below).

French

Being a romance language, French also has three conjugation groups. Traditional grammars estimate that the first conjugation (*-er* verbs in the infinitive) contains approximately 4,000 verbs (or 85% of types), whereas the second (regular *-ir*) and third

(irregular *-ir* and other endings) both contain about 7.5% of types (Bescherelle 2006: 133, Grévisse & Goose 1980: 235). A review of Guillaume's (1927[1973]) seminal child language corpus shows that the first conjugation accounts for 76% of types, but only 36.2% of tokens. The second conjugation (no distinction is made between regular and irregular verbs) comprises 10.6% of tokens and 6% of types, and the third conjugation accounts for 17.9% of types but 57.6% of tokens. In French, there is a strong polarity between type and token frequency, where the first conjugation dominates types, the third is more frequent in the token count, and the second is low in both type and token frequency. We already know that the first conjugation is productive and considered the default in French, and that children overwhelmingly regularize into the first conjugation. However, French children have also shown regularization patterns into the second conjugation (Guillaume, 1927[1973]; Hiriartborde 1973 [see 3a]; Royle 2007), which has the *-i* thematic vowel (also see examples in 2a–b).

- (3a) *On les a *pardi* [paʁdi]/*perdu* [pɛʁdʁy]
 we them AUX lose-PP
 'we lost them'
- (3b) *Il a *répondi* [ʁepɔ̃dʁi]/*répondu* [ʁepɔ̃dʁy]
 he AUX answer-PP
 'he answered' (personal data 5;10)²
- (3c) *Il a *survi* [syʁvi]/*survécu* [syʁveky]
 he AUX survive-PP
 'he survived' (personal data 10;3)³

In addition, some neologisms (*atterrir* 'to land on earth', *alunir* 'to land on the moon') and deadjectival verbs (*verdir* 'to (cause to) become green', *mincir* 'to become thin') fall into the second conjugation in French. The question remains: do French-speaking children distinguish regular and irregular verbs, and can they productively inflect using the first conjugation group?

4. Verb elicitation study of frequency and regularity (*-er* vs. irregular verbs)

Royle (2007) studied emerging verb inflection abilities in seven girls and eight boys from Montreal at early stages of linguistic development (2;11–4;6, mean 44.3 months, SD 6). In order to control for verb use, she developed an elicitation experiment using four groups of eight verbs. In the initial stage, 16 early acquired verbs were used: eight regular *-er* verbs (e.g. *laver* 'to wash') and eight irregular verbs (*-ir* and others) (e.g.

² See footnote 1.

³ See footnote 1.

ouvrir ‘to open’). A second set of stimuli involved less frequent verbs: eight regular (e.g. *brider* ‘to bridle’) and eight irregular (e.g. *fendre* ‘to split’). On frequent verbs, she observed a main effect of regularity on response patterns, such that children produced regular verbs (78.13%, SD 14.56) better than irregular forms (40.63%, SD 12.94). Although an age effect (better mastery levels in older children) was observed, regularization patterns remained similar (quite low) across ages. Moreover, the children regularized into both the first and second conjugations (see 4a/b).

- (4a) *Elle* *a* **tené* [tœn-e]/*tenu* [tœny] *l’auto*
 she AUX hold-PP the-car
 ‘she held the car.’
- (4b) *Elle* *a* **ouvri* [uvʁ-i]/*ouvert* [uvʁ] *la boîte*
 she AUX open-PP the box
 ‘she opened the box.’

A similar pattern was observed when pooling frequent and less frequent verbs in a subgroup of eight children 38 to 54 months old (mean 47.4 months, SD 5) who participated in this second half of the experiment (most of the younger children had difficulty responding to the first set of frequent stimuli). Regular verbs (53.9%, SD 23.3) were produced better than irregular verbs (21.9%, SD 10.88), and overregularizations were again observed. In addition, a frequency effect indicated that frequent verbs (78.1%, SD 14.6) were produced better than infrequent ones (29.7%, SD 32). Only one child produced an appropriate irregular infrequent form, and no age effect was observed on response patterns for the eight children. Interestingly, regularizations into the second conjugation were not observed for less frequent irregular verbs, where only the first conjugation was used (see examples in 5a/b).

- (5a) *Elle* *a* **tordé* [tɔʁd-e]/*tordu* [tɔʁd²y] *la serviette*
 she AUX wring.PP the towel
 ‘she wrung the towel’
- (5b) *Elle* *a* **moudré* [mudʁ-e]/*moulu* [muly]
 she AUX grind.PP
 ‘she ground’

These data show that, on the one hand, children are aware that certain verbs fall outside the default *-é* pattern, and they inflect them using the *-i* past participle suffix. However, the default *-é* pattern remains predominant. We also note that when the child is exposed to a low-frequency form, no *-u* irregularizations are observed. As these low-frequency forms are presumably not yet stored in the lexicon and possibly not yet classified by conjugation group, children appear to automatically process them using the default rule. This suggests that *-i* neologisms are not based on gang effects, because they are sensitive to frequency (i.e., an existing representation of the verb).

5. Verb elicitation and lexical decision on different verb suffixes

Kresh (2008) studied past participle processing in French five-year-olds ($n=28$), second graders ($n=48$) and adults ($n=41$) using lexical decision and elicitation tasks. In her master's research paper, she focused on forms with *-é*, *-i* and *-u* participle forms and other irregulars. Her overall findings show that second⁴ and first conjugation verbs patterned similarly, whereas third conjugation *-u* verbs and other irregulars patterned differently from the first two. Reaction times were faster and error rates lower for first and second conjugation verbs in lexical decision tasks. Irregular and *-u* verbs showed strong frequency effects (i.e., significantly longer reaction times and higher error rates on lower-frequency than high-frequency forms). In verb production, a more complex story emerges. In an elicitation paradigm similar to Royle's (2007), adults showed almost no errors in production, whereas children showed different patterns depending on age. The youngest children mastered first and second conjugation verbs better than irregular verbs. However, they also showed frequency effects, in that low-frequency forms were not well produced, especially when they fell outside the first conjugation pattern. By the second grade, both first and second conjugation higher-frequency verbs were well produced (see Table 1), as were lower-frequency verbs from the first group. Most other types were either poorly produced or showed strong variability in production, as evidenced by large standard deviations (note that the verb groups were not balanced in terms of number of experimental items).

Reported error patterns are also informative. Children tended to replace the target form with *-e*, *-i*, irregular forms or other responses, to varying extents. Kindergarten children preferred 'other' responses (substitutions, infinitival forms or other tenses) (55% of errors), followed by *-e* overregularizations (23%), *-i* overregularizations (14%) and finally irregularizations (8%). Older children preferred *-e* overregularizations (48%), 'other' errors (23%) and equal numbers of *-i* forms and irregularizations⁵ (16% and 13% respectively). No participant produced *-u* irregularizations. It is interesting to note that children did produce many *-i* as well as *-é* suffixes. For example, *recouvri* for *recouvert* 'covered', *souffri* for *souffert* 'suffered', *secouri* for *secouru* 'saved', *tordi* for *tordu* 'twisted/wrung' and *mouvri* for *moulu* 'ground'. The two last examples are with verbs having no *-i* vowel in the stem. Children also overregularized into the first conjugation, sometimes when the verb belonged to a second conjugation pattern. This was the preferred pattern overall. The children 'irregularized' only verbs that belonged to the *-u* groups (but see Footnote 5).

⁴ Note, however, that she groups all second conjugation verbs together irrespective of regularity.

⁵ Note that some irregularizations are ambiguous in nature. For example, *moud* for *moulu* 'ground' is homophonous to *mou* 'soft,' and is also a present stem form of the verb, so it would fall into the 'other' category, whereas *parraît* [paʁɛ] for *paru* 'seemed' and *recouvre* for *recouvert* 'covered' are also both present stem forms, so it is unclear how they are 'irregularized.'

Kresh (2008) argues that these data are better interpreted by a single-system model (as in Bybee 1995), because dual-route models would not predict that *-i* patterns behave like *-é* ones. That is, according to Kresh, dual systems posit that there is only one default (*-é* in French), whereas the remaining patterns would be modulated (or used productively) based on their frequency in the corpus.

	Kindergarten	Second grade
	% (SD)	% (SD)
1st conjugation <i>-é</i>		
<i>Medium frequency</i>	86 (36)	98 (14)
<i>Low frequency</i>	61 (50)	98 (14)
2nd conjugation <i>-i</i>		
<i>Medium frequency</i>	71 (46)	96 (20)
<i>Low frequency</i>	36 (49)	65 (48)
3rd conjugation <i>-u</i>		
<i>Medium frequency</i>	25 (44)	48 (51)
<i>Low frequency</i>	4 (19)	27 (45)
3rd conjugation other		
<i>Medium frequency</i>	4 (19)	13 (33)
<i>Low frequency</i>	36 (49)	69 (47)

Table 1: French verb conjugation patterns on an elicitation task in percentage of target responses (adapted from Kresh 2008)

5.1. Can we explain these data with a single-system model?

According to single-system models, the high type frequency of the default regular (here *-é*) verb conjugation patterns promotes regularization of this pattern. This explanation does not account for sub-regularizations into the second conjugation, as it has low type frequency in French, according to the sources cited. Furthermore, we would expect to observe at least a similar number of *-u* as *-i* irregularizations, if type frequency is important because many past participle forms and high frequency irregular verbs have *-u* final vowels. In fact, no irregularizations of this type were observed.

5.2. Back to the corpus

The question remains: have we accurately determined the relative frequencies of French verbs? Royle (2007) bases her estimates on an analysis of a corpus nearly one hundred

years old, and Nicoladis et al. (2007) use books written for children as well as adult (child-directed) corpora to estimate type and token frequencies. We therefore decided to verify the spontaneous speech corpus of current child speakers of Quebec French in order to evaluate type and token frequencies for different verb groups. We analyzed the spontaneous speech corpus of 12 children aged 36–45 months who had participated in a previous experiment on the acquisition of French agreement (Royle 2005–2008). Each child produced 200 utterances in a free play session using a standard set of toys. Recordings were transcribed by trained research assistants, and each transcription was verified by a second transcriber. The transcriptions were then coded for morphosyntactic structure and re-verified by a second person. All disagreements were settled by consensus. Each transcription was checked for all verb uses (excluding auxiliaries, i.e., *avoir*, *être* and *aller*, used in compound tenses). A first analysis evaluated type and token frequencies for each conjugation group and type and token frequencies for regular and irregular forms within these conjugations. All forms (infinitives, past participles and inflected forms) were tallied. Table 2 presents the average use of each conjugation group in terms of types and tokens, in number and percentage. Table 3 presents the total use of different verb types and tokens calculated across the 12 children.

The data show that French-speaking children in Quebec produce more tokens of irregular third-conjugation verbs than of other conjugation groups. However, the most common verb types fall into the first conjugation, and most of these are regular (irregulars are *aller* ‘to go’ and *s’en aller* ‘to leave.REFL’). The second conjugation, regular or irregular, is not strongly represented, either in types or tokens. In fact, regular second conjugation verbs are quite rare. These data essentially replicate the findings from Guillaume (1927), although he does not distinguish regular and irregular verbs in the first two groups.

	Types		Tokens	
	Nb (SD)	%	Nb (SD)	%
1st conjugation <i>-er</i>	19.25 (4.55)	52.5	68.58 (19.87)	35.55
<i>regular</i>	17.83 (4.34)	48.64	41.08 (10.23)	22.0
<i>irregular</i>	1.42 (0.67)	3.86	27.5 (15.01)	14.73
2nd conjugation <i>-ir</i>	4.58 (2.54)	12.5	11.67 (6.64)	6.05
<i>regular</i>	0.58 (0.67)	1.59	1.08 (1.51)	0.58
<i>irregular</i>	4 (2.59)	10.91	10.58 (7.38)	5.67
3rd conjugation	12.83 (4.24)	35	113.42 (25.13)	58.79

Table 2: French verbs, average types and tokens (12 children, aged 36–45) in Royle’s corpus

	Types		Tokens	
	Nb	%	Nb	%
1st conjugation <i>-er</i>	104	65.82	828	35.75
<i>regular</i>	102	64.56	513	22.15
<i>irregular</i>	2	1.27	315	13.6
2nd conjugation <i>-ir</i>	19	12.03	148	6.39
<i>regular</i>	4	2.53	18	0.78
<i>irregular</i>	15	9.49	130	5.61
3rd conjugation	35	22.15	1340	57.86

Table 3: French verbs, total types and tokens in Royle's corpus

We also looked at the suffixes used in the *passé composé* forms in the corpus, as this inflected form was studied by Nicoladis et al. (2007) and Royle (2007). All instances were categorized by conjugation group and regularity, as presented in Table 4. Only one overregularization was observed, and it was into the second conjugation (*il a ouvert* for *il a ouvert* 'he opened'). We also performed a grouping by past participle form (*-é*, *-i*, *-u*, other) and by regularity, as shown in Table 5.

	Types		Tokens	
	Nb	%	Nb	%
1st conjugation <i>-er</i>	29	63.04	60	48.39
<i>regular</i>	28	60.87	58	46.77
<i>irregular</i>	1	2.17	2	1.61
2nd conjugation <i>-ir</i>	8	17.39	36	29.03
<i>regular</i>	3	6.52	10	8.06
<i>irregular</i>	5	10.87	26	20.97
3rd conjugation	9	19.57	28	22.58
Total	46	100	124	100

Table 4: Total French *passé composé* types and tokens grouped by conjugation and regularity

We found that the dominant pattern for past participles, in terms of both type and token, was the first conjugation regular *-é* (the irregular *allé* 'went' also follows the regular pattern for the past participle), with the second conjugation having slightly more tokens than the third conjugation. Table 4 shows that although these forms are irregular, they most often have an *-i* vowel. So even though second conjugation verbs do not dominate the corpus in general, they are well represented in past participle forms (although they have never been measured at over 30%). Other forms such as *-u* forms (*j'ai bu* 'I drank') and idiosyncratic forms (*il est mort* 'he/it is dead') account for the remainder of the data. These findings are similar to those of Nicoladis et al. (2007), in that regular patterns dominate in types and tokens. However, our data also show the impor-

tance of the second conjugation pattern (assumed by Nicoladis et al. to be irregular, but which we contend is regular), while highlighting that the relative frequency of *-u* past participles does not appear to influence their overregularization by these children. However, only one instance of overregularization is observed in the entire corpus. Our corpus analysis has given us a deeper understanding of verb pattern frequencies. Nevertheless, it is also clear that spontaneous speech data are not very useful in exploring regularization in French.

	Types		Tokens	
	N b	%	Nb	%
Past participle in <i>-é</i>	29	63.04	60	48.39
<i>regular</i>	28	60.87	58	46.77
<i>irregular</i>	1	2.17	2	1.61
Past participle in <i>-i</i>	8	17.39	34	27.42
<i>regular (2nd)</i>	3	6.53	10	8.06
<i>irregular (2nd, 3rd)</i>	5	10.87	24	19.35
Past participle in <i>-u</i>	4	8.70	6	4.84
Other past participle form	5	10.87	24	19.35
Total:	46	100	124	100

Table 5: Total French *passé composé* types and tokens grouped by inflected form and regularity

5.3. How do we explain sub-regularizations into the *-ir* conjugation?

As mentioned above, children learning Spanish and Italian tend to respect morphological conjugation groupings. It is possible that the shared formal properties of conjugation patterns (for example, thematic vowels) are subsume the sub-regularizations observed. We now apply this analysis to French and evaluate its power to explain our elicitation and spontaneous speech data.

Could the shape of a given verb stem give the child a hint as to its past participle form? For example, the thematic vowel *-i* in the stem could point to a past participle ending in *-i*. This would account for the sub-regularization, where a verb such as *lire* ‘to read’ maintains an *-i* vowel throughout the verbal paradigm, except for the past participle (3c, 6a). However, this does not account for the sub-regularization of *boire* (6c–e), *perdre* (3a), or *répondre* (3b), as they have no form with this thematic vowel in their paradigm. In order to account for these cases, we must posit that the child is doing one of two things: either abstracting the stem from the infinitive form and wrongly using it in the past participle (3a, 6a–b), or adding a sub-regular [i] suffix to a stem to form the

past participle (4b, 6b–c, 3a–b). In both cases, we must assume that the child is using some kind of morphemic analysis.

- (6a) *Lit* [li] *lisez* [lize] *lire* [liʁ]
 read.3s read-2p read.INF
Elle *a* **li* [li]/*lu* [ly]
 she AUX read-PP
 ‘she read’
- (6b) *Ouvre* [uvʁ] *ouvrez* [uvʁe] *ouvrir* [uvʁiʁ]
 open.3s open-2p open.INF
Elle *a* **ouvri* [uvʁ-i]/*ouvert* [uvʁe]
 she AUX open-PP
 ‘she opened’
- (6c) *Boit* [bwa] *buvez* [byve] *boire* [bwaʁ]
 read.3ps read-2pp read.INF
Il *a* **boizi* [bwaz-i]/*bu* [by]
 he AUX bwaz-PP⁶
 ‘he drank’
- (6d) *Tord* [tɔʁ] *tordez* [tɔʁde] *tordre* [tɔʁd(ʁ)]
 wring.3s wring-2p wring.INF
Elle *a* **tordi* [tɔʁdi]/*tordu* [tɔʁdy] ‘wrung’
 she AUX wrung-PP
 ‘she wrung’ [Kresh 2008]
- (6e) *Moud* [mu] moulez [mule] moudre [mud(ʁ)]
 grind.3s grind-2p grind.INF
Elle *a* **mouvri* [muvʁi] / *moulu* [muly] ‘ground’
 she AUX mouvr-PP⁷
 ‘she ground’ [Kresh 2008]

It is also possible that simply the presence of an *-ir* infinitive form is sufficient to categorize a verb into the regular second conjugation. As we saw above in Tables 4 and 5, most *-ir* verbs in the child corpus also have *-i* past participles. However, to support this, we would have to show that the infinitive has a special status in the development of conjugation paradigms, in particular for the development of the past participle, and that children are sensitive to this status. Moreover, this still does not account for the over-regularization of irregular second conjugation verbs into the first conjugation, or of irregular verbs that have no *i*-vowels in any of their forms into the second conjugation. It would therefore be difficult to account for these patterns based on formal properties of the verbs in terms of gang effects.

⁶ Note that /bwaz/ is not a possible stem.

⁷ Note that /muvʁ/ is not a possible stem.

6. Can languages have regular defaults with no morphology?

Another question that arises in the study of language acquisition is what happens when the morphological structure is so irregular, arbitrary and idiosyncratic that the only ‘regular’ forms in the language have no apparent morpheme? A case in point is French adjectives.

French adjectives in a noun phrase⁸ must agree with a head noun in gender. However, only variable adjectives have feminine and masculine forms. These variable adjectives have word-final consonants on feminine forms, and occasionally there are other associated phonological changes from the masculine (the default) to the feminine form. These adjectives have sometimes been described as having ‘floating’ or ‘latent’ consonants, involving a C-deletion rule from the feminine to the masculine form (see Paradis & El Fenne 1995). However, it has been argued that there is actually no rule for the formation of the feminine (or back-formation to the masculine), and that the default rule for adjectives involves *no change* between the feminine and masculine forms (Royle & Valois 2010; see also Nelson 2005). In particular, consonant deletion appears to apply arbitrarily across forms (for example *brune* becomes *brun*, but *jaune* does not become *jaun*), and the final consonant on the feminine cannot generally be adduced based on the masculine form. No overregularizations are observed in children or adults (e.g., *étanche* → **étanc* ‘(air/water)-tight’ as in *blanche* → *blanc* ‘white’). No neologisms, denominals or borrowings (e.g., *hot*, *laïc* ‘secular’) are integrated into the variable group (Herschensohn 1993). Furthermore, in experimental settings, French speakers do not insert or delete final consonants on nonce words, but instead preserve the presented forms 89% of the time (Fink 1985).

6.1. Study of the acquisition of variable and invariable French adjectives

Royle and Valois (2010) studied the acquisition of adjectives using an elicitation experiment and spontaneous speech data. Thirty-two French-speaking children aged 3;0 to 4;11 (mean age 47 months, SD = 6.8) participated in the experiment. The experimenters elicited early-acquired size and colour adjectives, with size and colour variable and invariable adjectives. A gender effect was observed on the production of size adjectives: masculine forms were better produced than feminine forms (94% vs. 81%). Despite strong mastery of the elicited structure, children typically made gender errors on feminine noun phrases (3% of responses) (7a). On colour adjectives, both gender and adjective type (variable vs. invariable) mediated responses, and an interaction between these factors was found, as illustrated in Figure 1. Children typically made more errors on

⁸ Although predicative adjectives in the verb phrase also show similar properties, we restrict our discussion here to the acquisition of adjectives in the noun phrase.

feminine forms of variable adjectives, again making gender errors (12.4% of errors) (7b).

- (7a) *la* **gros* *maison*
 the.F big.M house
 ‘the big house’
- (7b) *la* *grenouille* **vert*
 the.F frog green.M
 ‘the green frog’

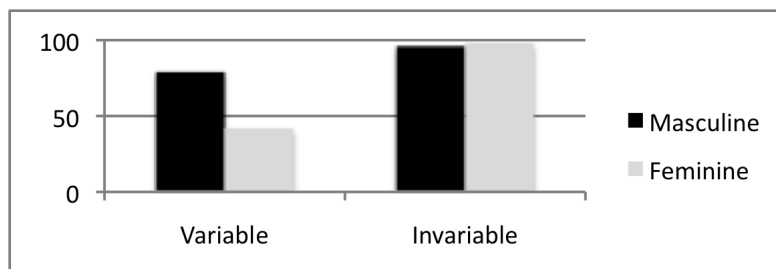


Figure 1: Interaction of adjective type and gender effect on target responses for noun phrases with colour adjectives

Even more intriguing were the cases of a few children who, although they could recognize masculine forms for some colour adjectives in a comprehension task, were unable to recognize their feminine counterparts. One child (N89, aged 3;0) could not recognize the feminine *brune* ‘brown,’ even though he spontaneously produced and understood the masculine *brun*. A second child (N29, aged 3;4) showed a similar pattern for the feminine form *verte* ‘green.’

Verification of the spontaneous speech corpus of all the children shows that difficulties with variable feminine forms cannot be attributed to their absence from the corpus. The children produced more variable than invariable adjectives overall (353 vs. 247) and produced many feminine forms of both types (151 vs. 114). No ‘irregularizations’ into the variable pattern were observed. It therefore appears that, in French acquisition, invariable adjectives are mastered better than variable forms, even though variable forms are well represented in the corpus.

Note that Spanish-speaking children do not appear to have as much difficulty producing inflected variable adjectives as their French-speaking counterparts. This is most probably due to the highly regular nature of gender marking on variable adjectives in Spanish (Royle et al. accepted).

7. How do French children do it?

The data on French verbs indicate that French children are sensitive to morphological regularity, as they can overextend the first and second group conjugation patterns to irregular forms. However the data on French verbs and adjectives also suggest that a minimal amount of consistency is needed for this behaviour to occur, even when the pattern is common in the corpus (types or tokens). In particular, in Royle's and other studies, *-u* past participle overregularizations were not observed, whereas *-i* past participles overregularizations were found in spontaneous speech and in elicitation, although less frequently than *-é* overregularizations. Moreover, the *-i* overregularization pattern appears to be linked to the presence of a lexical representation of the verb (i.e., it has not been observed with novel or low frequency forms). French *-u* past participles and variable adjectives do not appear to have high morphological regularity, and therefore do not promote the development of rule-like behaviour in children. Thus, even when a pattern is only relatively frequent in the corpus, if it occurs fairly consistently, children can pick up on it (as with the second conjugation). On the other hand, if the pattern is not morphophonologically consistent (as is the case for final consonants in feminine variable adjectives, or for *-u* past participles), children do not appear to develop any rules for these forms, regardless of the frequency of occurrence in the corpus. We must therefore integrate these features into language acquisition models.

8. Morphological acquisition models

8.1. Morphological regularity

A number of dual-route models have been outlined above, all of which make a principled distinction between regular and irregular forms. Some also account for default and sub-regular patterns (Clahsen et al. 1992, Marcus et al. 1995). However, these are not operationalized in the model to account for the distinction between regular and sub-regular rules. In particular, it is unclear how to account for the fact that novel verbs are systematically inflected using the first conjugation, whereas known irregulars are sometimes inflected using the first or second conjugation. In addition, how can the 'no change' default in adjectives be accounted for? Recently, Albright (2002) proposed an Islands of reliability model to explain Italian verb inflection and judgement patterns in adults. His model accounts for differing patterns of morphological productivity and acceptability ratings by comparing the reliability of given rules in a specific phonological environment. He states that high reliability is related to a large number of "morphologically consistent words that can be described by a common structural de-

scription, regardless of how general or specific that description is.” (Albright 2002: 689). According to Albright, this model could also account for the fact that some preferred patterns bearing semantic information (e.g., deadjectival verbs in Italian) are not necessarily formed within the default conjugation. This model could resolve the issue of second conjugation regularizations in French, as the metric could verify consistency between each verb and a possible past participle form. The question remains: what should this metric be based on (the root or a stem, and if a stem, which one)?

Bertram et al. (2000a) proposed a model of morphological processing in adults that operationalizes the effects of semantic transparency (i.e., changes caused by morphological processes), productivity and homonymy in Dutch and Finnish processing. They observed that adults are sensitive to morphological semantics and will use productive (semantic) patterns to parse words. The notion of semantic transparency is formalized as a graded scale used to distinguish inflection from derivation. Person and number marking are situated at one end of the scale and are meaning invariant, while lexical category change is meaning-changing and at the other end of the scale. In between the two extremes, we find morphological processes that add meaning (plural, diminutive and comparative). This model presents parsing as a decision tree (see Figure 2 below). First, is the process productive? If not, the word will not be parsed. If it is productive, the person can move on to the next decision. Is the process homophonous (i.e., is there suffix ambiguity)? If so, the word is not parsed. If not, the next decision arrives: is the process meaning-invariant (semantically transparent)? If so, a word can be optionally parsed. A study of word processing by Bertram et al. (2000b) in Finnish third- and sixth-grade children shows that they also use morphological structure to parse words when giving definitions. Children are better at reading morphologically derived than monomorphemic words of equal length and frequency, provided that the derivational morpheme is productive (e.g., *laula-ja* ‘singer’).

Adapting the model to our data, we can specify how a French-speaking child would acquire and use verbal and adjectival morphology. When faced with a verb, the first decision the child must make is to establish whether or not it is regular (note that the child does not have to worry about productivity, because all verbs are inflected in most situations, barring defective paradigms). If the verb is known and is irregular, the relevant irregular forms are activated in the lexicon and produced accordingly. If the verb is not known to be irregular (i.e., no irregular form is lexicalized), the child must move to the next node in the decision tree. The child must then decide which (of the first and second) conjugations to use. If the verb is known, the child chooses the appropriate inflectional paradigm. However, if the verb is less well known, some other aspects of its structure might come into play in this decision. If the verb has very low frequency or is unknown to the child, the default (first conjugation) is preferred. The presence of a thematic *-i* vowel in the stem when the meaning of the verb is known could point to the second conjugation (although we have seen that this is not categorical, and that irregular

verbs without this vowel can also be integrated into this pattern, or alternatively, that verbs with the *-i* thematic vowel can be conjugated using the first conjugation pattern).

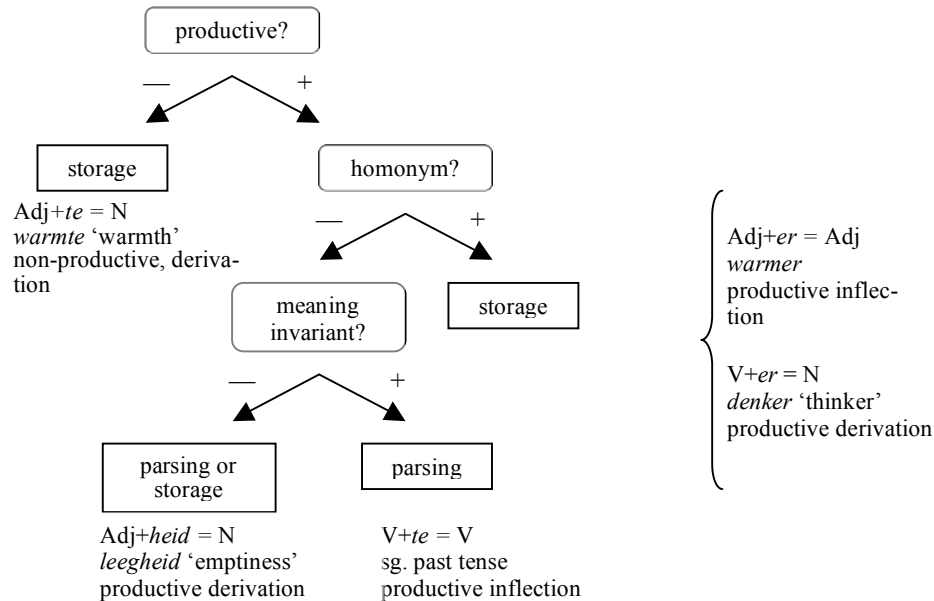


Figure 2: Decision tree for parsing and storage, adapted from Bertram et al. (2000a)

Our data show that children are sensitive to productivity and prefer the default when they have few clues to a verb's meaning. The fact that children sometimes overregularize into the first or second conjugation suggests that they are changing the verb conjugation class. However, another interpretation is plausible. As in Spanish, French inflexional features determine which rule (e.g., plural, present or past) is to be applied. Furthermore, inflexional conjugation may also depend on conjugation class. So the verb conjugation class determines the specific inflexional suffix to be used. Therefore, children not only need to learn which inflexional rule (e.g., past participle) to apply to all conjugations, they also need to know which specific rule to apply according to the conjugation class (e.g., *-é*, *-i*, *-u* or other). So children learn the past participle rule very early, but for some verbs, they do not appear to know which conjugation-specific rule to apply (Clahsen et al. 2002). According to Clahsen et al., the fact that children apply the inappropriate inflection even while maintaining the appropriate thematic vowel points to difficulties in rule selection rather than change of class.

With respect to Albright's (2002) model, it is difficult to integrate these data as presented, as he would predict stronger consistency between verb form and conjugation

pattern than what was observed, especially for second and third conjugation verbs. In particular, it is unclear why third conjugation verbs are alternatively regularized into the first and second conjugation, with few seemingly consistent patterns, especially when many of the stems do not have the thematic *-i* vowel but are still integrated into the second conjugation. Alternatively, the pattern with *-u* (*boire – bu, voir – vu, battre – battu*) could be a potential Island of reliability that is not exploited by children (and almost never by adults, except in literary jokes).

Regarding rule status, it is apparent from the data on adjectives (as well as the absence of *-u* overregularizations) that the strong presence of a specific pattern in the corpus does not automatically trigger rule-like status in child language. Our intuition is that this lack of rule status is linked to the non-productivity of the pattern in the language. Because no new verbs are integrated into the third conjugation pattern and no new adjectives are variable, children do not consider these patterns to be candidates for morphological rules. Again, further studies should explore this area. However, these could simply converge in providing negative evidence in support of this view (see also Fink 1985, who found that novel adjectives are usually treated as invariable by native speakers).

Interestingly, none of the previously published elicitation experiments focused on a three-way distinction between verb groups (both Royle 2007⁹ and Nicoladis et al. 2007 focus on the difference between regular and irregular verbs, and Hiriartborde 1973 only on frequent and infrequent regulars). Kresh (2008) studied processing differences for different past participle forms and revealed interesting overregularization patterns (note that she believes that *-i* verbs are irregular). Her data also support the notion that the *-i* pattern is less stable than the *-e* pattern, while still being productive, as the *-i* pattern becomes strong only in older children and usually with frequent verbs first. However, her verbs are not grouped based on conjugation group but on suffix type, thus confounding regularity and conjugation group in *-i* suffixed forms. It would therefore be worthwhile to continue exploring this distinction in elicitation tasks. Further research on issues of morphophonological reliability in French inflection patterns could enrich this discussion.

In conclusion, we have shown that child learners of French are sensitive to morphological rules for inflection, provided that these rules are productive. Rule frequency of does not need to be high in terms of either types or tokens, as we have seen for the second conjugation paradigm. Inversely, it is not high representativeness in the corpus that makes the rules salient or productive, as we have seen for C/Ø alternations on adjectival forms, nor does phonological consistency appear to predict rule reliability, as we have seen for third conjugation verbs with *-u* endings. Instead, children appear to be able to pick up on morphological productivity and to capitalize on it to establish the presence

⁹ Although she discusses overregularization into the second conjugation, Royle (2007) did not initially design her experiment to study this issue.

of inflectional paradigms in French. However, as mentioned above, more research is needed to fully support this interpretation.

Abbreviations

2P	second person plural	INF	infinitive
3S	third person singular	M	masculine
3SCL	third person singular object clitic	PP	past participle
AUX	auxiliary verb	REFL	reflexive
F	feminine		

References

- Albright, Adam (2002): Islands of reliability for regular morphology: evidence from Italian, in: *Language* 78, 684–709.
- Bartke, Susane; Marcus, Gary, & Clahsen, Harald (1995): Acquiring German noun plurals, in: *Proceedings of the BUCLD* 19(1), 60–69.
- Berko, Jean (1958): The child's learning of English morphology, in: *Word* 14, 150–177.
- Bertram, Raymond; Schreuder, Robert & Baayen, R. Harald (2000a): The balance of storage and computation in morphological processing: the role of word formation type, affixal homonymy and productivity, in: *Journal of Experimental Psychology: Learning, Memory, and Cognition* 26(2), 489–511.
- Bertram, Raymond; Laine, Matti & Virkkala, Minna Maria (2000b): The role of derivational morphology in vocabulary acquisition: Get by with a little help from my morpheme friends, in: *Scandinavian Journal of Psychology* 41(4), 287–296.
- Bescherelle, Louis Nicholas (2006): *Le Nouveau Bescherelle 1. l'Art de conjuguer; dictionnaire de 12 000 verbes*. Montréal: Éditions Hurtubise HMH.
- Bybee, Joan L. (1995): Regular morphology and the lexicon, in: *Language and Cognitive Processes* 10(5), 425–455.
- Bybee, Joan L. & Moder, Carol Lynn (1983): Morphological classes as natural categories, in: *Language* 59, 251–270.
- Chomsky, Noam (1986): *Knowledge of language: its nature, origin and use*. New York: Praeger.
- Clahsen, Harald (1996): The representation of participles in the German mental lexicon: evidence for the dual-mechanism model, in: Booij, Geert & Van Marle, Jap (eds.), *Yearbook of morphology*. Dordrecht: Kluwer, 73–95.
- Clahsen, Harald; Aveledo, Fraibet & Roca, Iggy (2002): The development of regular and irregular verb inflection in Spanish child language, in: *Journal of Child Language* 29, 591–622.
- Clahsen, Harald & Rothweiler, Monika (1993): Inflectional rules in children's grammars: evidence from German participles, in: Booij, Geert & Van Marle, Jap (eds.), *Yearbook of morphology 1992*. Dordrecht: Kluwer, 1–34.

- Clahsen, Harald; Rothweiler, Monika; Woest, Andreas & Marcus, Gary F. (1992): Regular inflection in the acquisition of German noun plurals, in: *Cognition* 45, 225–255.
- Fink, Robert (1985): French adjective morphophonemic patterns: their generalization and representation, in: *Linguistics* 23, 567–596.
- Grégoire, Antoine (1937): *L'apprentissage du langage*. Paris: Droz.
- Grévisse, Maurice & Goose, André (1980): *Nouvelle grammaire française* (2nd Ed.). Paris/Gembloux: Duculot.
- Guillaume, Paul (1927[1973]): Le développement des éléments formels dans le langage de l'enfant, in: *Journal de Psychologie* 24, 203–229.
- Herschensohn, Julia (1993): Applying linguistics to teach morphology: verb and adjective inflection in French, in: *International Review of Applied Linguistics in Language Teaching* 31(2), 97–113.
- Hiriartborde, Annie (1973): Sur la généralisation de quelques marques grammaticales dans le langage d'enfants de 3 ans 1/2, in: *Études de Linguistique Appliquée* 9, 101–124.
- Kim, John J.; Marcus, Gary F.; Pinker, Steven; Hollander, Michelle & Coppola, Maria (1994): Sensitivity of children's inflection to grammatical structure, in: *Journal of Child Language* 21, 173–209.
- Kresh, Sarah (2008): L'acquisition et le traitement de la morphologie du participe passé en français. M.A. Thesis. UQÀM.
- Marchman, Virginia A. & Bates, Elisabeth (1994): Continuity in lexical and morphological development: a test of the critical mass hypothesis, in: *Journal of Child Language* 21, 339–366.
- Marcus, Gary F. (1995): Children's overregularization of English plurals: a quantitative analysis, in: *Journal of Child Language* 22, 447–459.
- Marcus, Gary F. (2003): *The algebraic mind*. Cambridge, MA: MIT Press.
- Marcus, Gary F. (1996): Why do children say "brokek"? in: *Current Directions in Psychological Science* 5(3), 81–85.
- Marcus, Gary F.; Brinkmann, Ursula; Clahsen, Harald; Wiese, Richard & Pinker, Steven (1995): German inflection: the exception that proves the rule, in: *Cognitive Psychology* 29, 189–256.
- Marcus, Gary F.; Pinker, Steven; Ullman, Michael; Hollander, Michelle; Rosen, T. John & Xu, Fei (1992): Overregularization in language acquisition, in: *Monographs of the Society for Research in Child Development* 57 (4, serial No. 228), 126.
- Nelson, Don (2005): French gender assignment revisited, in: *Word* 56(1), 19–38.
- Nicoladis, Elena; Palmer, Andrea & Marentete, Paula (2007): The role of type and token frequency in using past tense morphemes correctly, in: *Developmental Science* 10(2), 237–254.
- Orsolini, Margherita; Fanari, Rachele & Bowles Hugo (1998): Acquiring regular and irregular inflection in a language with verb classes, in: *Language and Cognitive Processes* 13(4), 425–464.
- Paradis, Carole & El Fenne, Fatimazhora (1995): French verbal inflection revisited: constraints, repairs and floating consonants, in: *Lingua* 19, 169–204.
- Pinker, Steven (1999): *Words and rules: the ingredients of language*. New York, NY: Basic Books.
- Royle, Phaedra (2005–2008): *Outils morphosyntaxiques pour le dépistage de la dysphasie chez les jeunes francophones* [Morphosyntactic tools for SLI detection in young French speakers]. FQRSC Establishment Grant for New Researchers. 2006-NP-104790.
- Royle, Phaedra (2007): Variable effects of morphology and frequency on inflection patterns of French preschoolers, in: *The Mental Lexicon Journal* 2(1), 103–125.

- Royle, Phaedra & Thordardottir, Elin (2008): Elicitation of the perfect past in French pre-schoolers with and without SLI, in: *Applied Psycholinguistics* 29, 341–365.
- Royle, Phaedra & Valois, Daniel (2010): Acquisition of adjectives in Quebec French as revealed by elicitation data, in: *Journal of French Language Studies*.
- Royle, Phaedra; Mariana Vial & Daniel Valois. (accepted): The acquisition of concord in French and Spanish determiner phrases, two elicitation experiments, in: *Revista de la Asociación Española de Lingüística Aplicada*.
- Rumelhart, David E. & McClelland, James L. (1986): On learning the past tenses of English verbs, in: McClelland, James L.; Rumelhart, David E. & the PDP Research Group (eds.), *Parallel distributed processing: Explorations in the microstructure of cognition, vol. 2: Psychological and biological models*. Cambridge, MA: Bradford Books/MIT Press, 216–271.
- Say, Tessa, & Clahsen, Harald (2002): Words, rules and stems in the Italian mental lexicon, in: Nootboom, Sieb; Weerman, Fred & Wijnen, Frank (eds.), *Storage and computation in the language faculty*. Dordrecht: Kluwer, 93–129.
- Seidenberg, Mark S. (1997): Language acquisition and use: Learning and applying probabilistic constraints, in: *Science* 275, 1599–1604.
- Thordardottir, Elin (2005): Early lexical and syntactic development in Quebec French and English: Implications for cross-linguistic and bilingual assessment, in: *International Journal of Language and Communication Disorders* 40(3), 243–278.
- De Villiers, Jill (1992): On the acquisition of functional categories: A general commentary, in: Meisel, Jürgen M. (ed.), *The acquisition of verb placement*. Netherlands: Kluwer Academics, 423–443.