Processing of grammatical gender in French as a first and second language:

Evidence from ERPs

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ABSTRACT

The present study examined processing of grammatical gender in second language (L2) French as a function of language background on the one hand (Experiment 1) and, on the other, as a function of overt phonetic properties of agreement (Experiment 2), by examining ERP responses to gender discord in L2 French. In Experiment 1, we compared German and English learners of French when processing post-nominal plural (no gender cues on determiner) attributive adjectives that either agreed in gender with the noun or presented a gender violation, exploring the role of the presence/absence of abstract grammatical gender in the L1 (gendered German, ungendered English). We found grammaticalized responses (P600) by native and L1 English learners, but no response by German L1, a result we attribute to the confounding variable of plurality, which is gender neutralized in German DP concord. In Experiment 2, we examined the role of overt phonetic cues to noun-adjective gender agreement in French, for both native speakers and L2 (Spanish L1) learners, finding that both natives and Spanish L1 learners showed more robust P600 in presence of phonetic cues. These data, in conjunction with those of other ERP studies can best be accounted for by a model that allows for native language influence, that is not, however constrained by age of acquisition, and that must also allow for clear cues in the input to influence acquisition and/or processing.

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Introduction

Semantic gender relies on extra-linguistic properties (e.g., sex, colour, shape, etc.) to categorize nouns into two or more classes and exists universally across the world's languages (Corbett, 1991). While all languages use semantic gender, albeit in different ways, the concomitant presence of a system of grammatical gender varies widely across languages. For instance, English is an example of a language that predominantly relies upon the meaning of an animate noun to determine its gender, and gender is reflected in the pronominal system whereby anaphoric pronouns must agree in gender with their antecedents ("he" and "she" for male and female human antecedents, and "it" for all others). English, as well as a substantial number of the world's languages (Afrikaans, Basque, Chinese, Estonian, Finnish, Japanese, Tamil, etc.), does not have a system of grammatical gender that divides nouns into different classes, compared to many other languages. In contrast, Romance languages (Catalan, French, Italian, Occitan, Portuguese, Romanian, Spanish) as well as many Germanic languages (Dutch, German, Norwegian, Swedish, Yiddish, etc.) have grammatical gender, as evidenced by agreement; the gender of a noun is reflected through the syntactic behaviour and the morphology of other word classes it governs (determiners, adjectives, participles). Native speakers and child learners of gendered languages possess grammatical knowledge of gender assignment and of agreement (concord) rules for that language (Carroll, 1989; Clark, 1985; Muller, 1990; Perez-Pereira, 1991); they implement this knowledge, during processing as revealed by psycholinguistic studies of lexical access (for recent reviews see Bolte & Conine, 2004; Spinelli, Meunier & Seignuric, 2006) and syntactic processing (Barber & Carreiras, 2005; Deutsch & Bentin, 2001; Gunter, Friederici, Schriefers, 2000; Osterhout & Mobley, 1995; among others). Whether late second language learners grammaticalize gender and are able to implement it in processing have been topics of recent research that has provided differing conclusions, particularly with respect to influence of the first language (L1) and to input factors.

The present study examined processing of grammatical gender in second language (L2) French as a function of language background on the one hand and, on the other, as a function of overt phonetic properties of agreement. The first factor, as discussed below, has been widely studied by proponents of two distinct hypotheses. Some scholars advocate the hypothesis that in late L2 acquisition the ability to engage in automatic gender agreement processes is constrained by the abstract grammatical properties of the first-learned language (L1), whereas others argue that L2 acquisition of grammatical gender (and morphosyntax in general), while influenced by the L1, is not restricted by it (see for example Carroll, 1989; Guillemon & Grosjean, 2001; Hawkins, 2001 vs. Bruhn de Garavito & White, 2002; Herschensohn, 2000, 2006, 2007; Hopp, 2007; Schwartz & Sprouse, 1996). Studies of the first type often appeal to the notion of a Critical Period (Lenneberg, 1967; see Herschensohn, 2007, for general discussion) that limits grammatical acquisition of L2 properties related to functional items such as verb morphology or nominal gender to functional features of the native language; studies of the second type attribute difficulties of acquisition to other factors than age, such as processing difficulties (cf. McDonald, 2006).

The second topic of the present study, relating to morphophonlogical cues to agreement in the input, has been examined for French both in natural settings and in psycholinguistic studies (Arteaga, Herschensohn & Gess, 2003; Largy & Fayol, 2001; Frenck-Mestre, Osterhout, McLaughlin & Foucart, 2008). These studies have shown that both native speakers and L2 learners benefit from overt phonetic cues to agreement in French. This has been shown, for example for L2 French learners when first introduced to gender specification of adjectives (Arteaga et al., 2003). Phonetically variable adjectives show a

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pronounced final consonant in feminine [ot] 'high-fem,' contrasting with no consonant in masculine [o] 'high-mas.' Phonetically invariable adjectives are identical in both genders [rapid] 'rapid-m/f.' L2 learners who were taught to focus on these phonetic cues showed more rapid assimilation of L2 morphological rules. The influence of oral cues has also been found, in written French, for verbal agreement (Frenck-Mestre et al., 2008; Largy & Fayol, 2001). French "regular" or "invariable" verb stems have no audible distinction between inflected forms for the singular or between these forms and the third person plural, despite spelling differences. Fewer errors in written language are observed for inflections that are orally realized (Largy & Fayol, 2001; Negro & Chanquoy, 2000), and these overt phonetic cues to inflectional errors produce a larger ERP response than do errors that are only reflected in spelling, in both native French and L2 learners (Frenck-Mestre et al., 2008). Similar results have been found in German and Dutch in production studies, where morphophonlogical ambiguity of case and number marking compared to unambiguous marking elicits errors in subject-verb agreement in native speakers (Hartsuiker, Schriefers, Bock & Kikstra, 2003). Vainikka & Young-Scholten (1998) have suggested that explicit morphosyntactic functional properties expressed in free morphemes act as triggers to acquisition of L2 morphology because "triggers are assumed to be salient in the input data, [and] such salience would further increase the likelihood for the relevant triggers to occur early in the production data" (p. 98).

To examine the above two questions, three groups of adult L2 learners were studied—native Spanish, German and English speakers--and compared to native French speakers with respect to L1/L2 similarities in Experiment 1, and to presence/absence of overt phonetic cues in Experiment 2. The study uses Event Related Potentials (ERPs)—which have hitherto provided evidence of grammaticalized responses in gender processing by native French and L2 French—to determine whether native language predisposition (Foucart, 2008; Foucart & Frenck-Mestre, 2004, 2006, in prep) or phonetic cues (Carrasco & Frenck-Mestre, 2007, 2009, in prep) contribute to the development of grammaticalized gender in L2 French. The choice of these three language groups was driven by their grammatical feature values for gender. Spanish and French, two Romance languages, share the greatest overlap as concerns grammatical gender. Both have two classes--masculine and feminine—and the majority of nouns share the same gender in French and Spanish. The rules of agreement are similar within the determiner phrase where all elements must agree in gender[i] (and number). In addition, both the word order of nouns and adjectives and their agreement rules are highly similar in French and Spanish, for both of which the canonical order of adjectives is post-nominal and for which gender is marked on the adjective independent of its position, number or syntactic role (i.e. for attributive and predicative adjectives). German presents a number of differences with French as concerns grammatical gender. German has three classes for nouns—masculine, feminine and neuter—which in and of itself considerably reduces the overlap of lexical gender across the two languages, whereas the distance of their language familial ties further reduces overlap of gender assignment. As concerns agreement rules, determiners are selected on the basis of gender, number and case, such that they do not unambiguously indicate gender (any more so than case or number). In German, adjectives must agree in gender with the noun however not when plural as no gender distinctions remain in modern German in the plural of determiners, adjectives and pronouns, and not when outside the determiner phrase (i.e. for predicative adjectives). German and English also differ from Romance languages in the position of adjectives within the determiner phrase, which are pre- rather than post-nominal. Compared to the other three languages, English is the odd man out, having no systematic division of nouns into grammatical gender classes,

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anaphoric agreement of animate nouns, and only idiosyncratic gender agreement for a handful of nouns that refer to inanimate objects (for example "she" for a vessel).

Based on these similarities and differences and on the literature discussed below, we expected to find different levels of sensitivity to grammatical gender agreement within the determiner phrase for our different groups of L2 learners, compared to native controls. In our first study, we compared German and English learners of French when processing post-nominal attributive adjectives that either agreed in gender with the noun or presented a gender violation. Grammatical gender across French and German was manipulated such that nouns were either masculine or feminine in both languages or had opposite gender (neuter gender in German was not included). Overt phonetic cues to agreement were held constant; all adjectives were variable adjectives that had distinct forms for the feminine and masculine.. This investigation explored the role of the presence/absence of abstract grammatical gender in the L1 (gendered German, ungendered English).

In our second study, we examined the role of overt phonetic cues to noun-adjective gender agreement in French, for both native speakers and L2 (Spanish L1) learners. Language similarity was not at stake as all nouns shared the same grammatical gender across the two languages under consideration (Spanish L1, French L2). Overt phonetic cues to agreement were manipulated by the type of adjective, which was either variable (presence of final consonant in feminine form: [$\varpi EP\tau/\varpi EP$]) 'green-f/m'or invariable adjectives (no distinction in coda for invariable adjectives: [$\beta\lambda 2$] 'blue-f/m')with, however, distinct orthographic forms for the two forms in all cases ("$vert_{masc}/verte_{fem}$" "$bleu_{masc}/bleue_{fem}$").

The results of the first study allowed us to shed new light on the impact of the L1 on grammatical gender processing while the second provided information about the weight of one salient aspect of input, the oral realization of gender cues on online processing, independent of L1 influence. In both of our experiments, we used event related potentials (ERPs) to investigate processing.

Event Related Potentials (ERPs) record real-time electrical activity in the brain through scalp-attached electrodes that reveal neural responses to linguistic and other stimuli. ERPs provide not only a millisecond precise record of processing but also allow one to delineate between different types of linguistic analysis due to the differential sensitivity of ERP components to these processes (cf. Friederici, Hahne & Mecklinger, 1996; Osterhout, McLaughlin, Kim & Inoue, 2004; Osterhout, McLaughlin, Pitaken, Frenck-Mestre & Molinaro, 2006). Recent studies of L2 processing have suggested, moreover, that distinct stages of grammatical acquisition can be indexed via ERP components (Osterhout et al., 2004, 2006). Of particular interest for the present purposes is a typical ERP response in native speakers elicited by morphosyntactic anomalies (e.g. mistaken morphology, wrong word order) compared to well-formed structures, namely a positive deflection in the waveform that occurs 500-700 milliseconds after the stimulus, known as the P600 (Osterhout & Holcomb, 1992). This component, as discussed below, has been observed in conjunction with various manipulations of gender concord within sentence contexts, both for native processing and in adult L2 learners, and is to date the most reliable ERP index of the processing of gender concord.

The role of age of acquisition and native language properties on L2 Gender Processing: Behavioral and electrophysiological evidence

Numerous linguistic studies (Andersen, 1984; Ayoun, 2007; Bruhn de Garavito & White, 2002; Carroll, 1989; Delisle, 1985; Franceschina, 2001, 2005; Gess & Herschensohn, 2001; Hawkins, 1998, cited in Hawkins, 2001; Hawkins & Franceschina, 2004; Myles, 1995;

White, Valenzuela, Kozlowska-Macregor & Leung, 2004) and a handful of psycholinguistic experiments (Holmes & Dejean de la Batie, 1999; Guillelmon & Grosjean, 2001; Oliphant, 1998; Sabourin & Haverkort, 2003; Sabourin, Stowe & de Haan, 2006; Sabourin & Stowe, 2008; Tockowitz & MacWhinney, 2005), have examined how L2 learners represent and process grammatical gender. The majority of these studies have provided evidence that gender is represented differently in native and L2 speakers although this is qualified by various factors, reviewed in succession below.

How does age of acquisition affect grammatical gender processing in L2 learners? Grosjean and colleagues (Grosjean, Dommergues, Cornu, Guillelmon & Besson, 1994; Guillelmon & Grosjean, 2001) addressed this question by means of a gating task, in which the duration of auditory stimuli is gradually incremented until the listener can correctly identify the stimulus. In a first, monolingual, study it was found that French speakers needed less acoustic information to correctly identify French nouns when these nouns were preceded by determiners that provided gender information than when preceded by gender-neutral determiners. The authors argued from their results that gender is used to accelerate lexical access by reducing the lexical search to only those candidates that are compatible in gender with the prime. It should be noted, however, that the question of exactly when gender information influences lexical processing remains open to debate (for recent discussions see Bolte & Connine, 2004; Colé, Pynte & Andriamamongy, 2003; Spinelli, Meunier, & Seigneuric, 2006). In a bilingual replication, Guillelmon and Grosjean (2001) reported the same gender-priming result for early English L1 French L2 bilinguals (having been exposed to French before age 6) whereas adult L2 French (English L1) learners showed no sensitivity to gender cues. Guillelmon and Grosjean appealed to the critical period hypothesis to explain their pattern of results, in line with various observational studies showing lack of native-like attainment of grammatical gender in late L2 learners whose native language lacks grammatical gender (Andersen, 1984; Carroll, 1989; Delisle, 1985; Franceschina, 2001; Hawkins, 1998, cited in Hawkins 2001). Couched in different theoretical models, Carroll (1989) and Hawkins (Hawkins, 1998; Hawkins, 2001; Hawkins & Chan, 1997; Hawkins & Franceschina, 2004) have argued that unless triggered early on (in childhood), the functional feature of gender will not be available to the second language learner and furthermore, that only those late L2 learners with gender concord in their native language will go beyond a probabilistic selection of gender from surface features based on noun phonology and/or an associative rule[ii]. Hawkins (1998, 2001) points to L2 use of default gender in determiners as proof of the inability of adult learners whose L1 lacks the feature to gain grammaticalized gender in the L2; rather they memorize gender lexically, listing "exceptions" to defaults. These authors assume a syntactic deficit in underlying competence in late second language learners as concerns grammatical gender, which is at the root of the inflectional errors observed in their productions. Such a hypothesis is not endorsed, however, by all (cf. Bruhn de Garavito & White, 2002; Hopp, 2007; Schwartz & Sprouse, 1996; White, 1989; White et al., 2004). White and colleagues (Bruhn de Garavito & White, 2002; White et al., 2004) have argued on the basis of their data from native French and English speakers acquiring Spanish, that the acquisition of gender concord (and abstract gender features) by late L2 learners is independent of the presence of this feature in their native language and of the age of acquisition. They report similar patterns of performance for both groups as concerns gender attribution and conclude that existing functional features in the native language are not the key to acquisition, or rather that the absence of a feature will not impede acquisition. They attribute errors to learners' resorting to default values rather than to a lack of

representation of abstract gender features, and point out that the same errors can in fact be observed in native speakers.

Whether abstract properties of grammatical gender need be present in the native language in order for late learners to fully acquire grammatical gender and gender concord in a second language is in fact at the heart of all studies on L2 gender acquisition. Relatively few, however, have directly compared learner groups with different linguistic backgrounds on the same task. One such study was that conducted by White et al. (2004), cited above, comparing the acquisition of gender concord in Spanish (by means of an offline task) by adult learners whose L1 either had gender (French) or did not (English). The results of that study, showing acquisition of gender concord in the second language independent of the presence of this feature in the native language, contrast with those reported by Sabourin, Stowe and de Haan (2006) who compared the performance of native German, English and Romance (Spanish, Italian or French) speakers on two off-line tasks that examined gender attribution and gender concord respectively. Effects of the native language, present in both tasks, were however, considerably more marked in the grammaticality task, which tapped into the acquisition of agreement[iii]. Both the German and the Romance groups showed acquisition of concord and did not reliably differ from each other, whereas the English group was basically at chance level[iv]. Sabourin et al. (2006) concluded that the transfer of surface features, possible in the German group but not the Romance or English group, enhances the acquisition of gender knowledge and gender concord (see also Sabourin & Stowe, 2008). It should be noted, however, that the Romance group did not differ from the German group as concerns concord and both groups showed the same pattern of performance on gender attribution despite the German group being at a definite advantage. As such, the presence of surface level features does not seem to be as crucial as deep level features, which distinguish native English speakers from the German and Romance group.

In sum, the studies to date leave open the question of the role of the properties of the learners' native language in their capacity to acquire the syntactic reflex of gender agreement. We ourselves examined this question in light of recent electrophysiological data, obtained for L2 French learners whose native language either had grammatical gender (German) or did not (English). Neither of these two languages is closely related to French in the Romance family, and hence they serve to test the absence vs. presence of the abstract feature of grammatical gender without "surface" similarity.

Several studies have used ERPs to examine the on-line processing of gender concord in native speakers, thus providing us with a general baseline for comparison for L2 processing. The general finding of ERP studies on gender agreement in sentence contexts is that a gender mismatch between a controller and target elicits a prominent P600 effect in native speakers, which has sometimes been found in conjunction with an earlier, anterior negativity, often referred to as the LAN (Friederici et al., 1996). This has been shown in various languages, including Hebrew (Deutsch & Bentin, 2001), German (Gunter, Friederici, & Schriefers, 2000), Dutch (Hagoort & Brown, 1999), French (Carrasco & Frenck-Mestre, 2007; Foucart & Frenck-Mestre, 2006) and Spanish (Barber & Carreiras, 2005). This result has been found for gender mismatch within the determiner phrase, whether between the determiner and noun (Gunter et al., 2000; Hagoort & Brown, 1999) or noun and adjective (Barber & Carreiras, 2005; Foucart & Frenck-Mestre, 2006), as well as for subject-predicate agreement (Deutsch & Bentin, 2001) and anaphors and their antecedents although the latter is quite outside the scope of the present paper (Osterhout & Mobley, 1995; Streb, Henninghausen, & Rösler, 2004; Streb, Rösler, & Henninghausen, 1999). The general consensus from these studies is that the processing of gender agreement during sentence

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comprehension is driven primarily by syntactic as opposed to conceptual and/or semantic aspects of agreement. Note, nonetheless, that some researchers have suggested a weak interaction between these two levels in highly inflected languages such as Hebrew (Deutsch & Bentin, 2001; see also Schiller, Münte, Horemans, & Jansma, 2003).

Three published studies to date have used ERPs to investigate the processing of gender agreement in L2 learners. Sabourin and Haverkort (2003) examined German learners of Dutch while Sabourin and Stowe (2008) compared Romance and German learners of Dutch[v]. Tockowitz and MacWhinney (2005), for their part, examined American-English learners of Spanish. In the first study, Sabourin and Haverkort (2003) reported that in sentential context gender concord errors between Dutch indefinite determiners and adjectives (eg; *een kleine$_{com}$/*klein$_{neu}$ tafel$_{com}$* : "a small table") elicited a P600-like effect in the group of native speakers, but not in the group of L2 Dutch (L1 German) learners where basically no effect of gender concord was found. It is noteworthy that these agreement errors also posed far greater problems for the L2 Dutch (L1 German) learners off-line, in a grammaticality judgement task. When agreement involved the definite determiner and noun (e.g. Het$_{neu}$/*De$_{com}$ kleine kind$_{com}$: The small child), Sabourin and Haverkoort (2003) report a P600 effect for the same L2 Dutch (L1 German) participants, although the effect was delayed as compared to native Dutch speakers. Sabourin & Stowe (2008) compared the German L1 participant data to Romance L1 learners of L2 Dutch, for the definite determiner condition (e.g. Het$_{neu}$/*De$_{com}$ kleine kind$_{com}$: The small child) and found an uncharted frontal negativity in the group of Romance learners[vi]. The authors concluded that the presence of grammatical gender does not suffice for L2 learners to engage in automatic processing of gender agreement in their second language, but that overlapping lexical gender is in fact necessary. It is important to note, however, that more than gender agreement is at stake in both of these studies. Indeed, the first study compared overt marking of agreement on the definite determiner (where gender was neutralized on the pronominal adjective) to abstract gender for indefinite determiners where gender is only marked on the adjective (to illustrate, compare *Het kleine kind en de kleine tafel* "the small child and the small table" to *Een klein kind en een kleine tafel* "a small child and a small table"). As such, agreement rules for different elements within the DP as a function of the type of determiner was at play. Interestingly, even though the same rules apply in Dutch and German (*Das kleine Kind und der kleine Tisch* "the small child and the small table" vs. *Ein kleines Kind und ein kleiner Tisch* "a small child and a small table"), when processing their L2 Dutch, German L1 readers were not able to process agreement for structures involving indefinite determiners quickly enough to produce online effects. In the second study, agreement rules were again at stake but this time differed as a function of the L1. For German participants, agreement rules within the DP were the same in their L2, whereas for Romance speakers this was not the case for which not only the determiner but adjective as well must agree in gender with the noun (e.g. *la petite table* vs. *le petit enfant*: "the small table" vs. "the small child"). Differences in performance between the German for the Romance group may also have been attributable to cross-linguistic differences in agreement rules[vii].

Tockowitz & MacWhinney (2005) found that English native speakers were sensitive to gender concord errors (between the determiner and noun) in visually presented Spanish sentences, as evidenced by a P600 response to ill-formed cases. In line with the "competition model", these authors suggested that features that are absent from the native language (in the present case grammatical gender for native English speakers) should in fact be acquired faster than those that are in conflict (or "competition") with second language parameters, such as the case of nominal number concord in English vs. Spanish. As concerns sensitivity

to gender agreement in the L2, the difference between the pattern of results reported by Sabourin and colleagues versus Tockowitz and MacWhinney may be related to the consistency of gender marking on the determiner in Spanish as compared to Dutch. In Spanish, masculine and feminine forms of the determiner are distinct, both in the singular and plural ("el/la", "los/las"). Such is not the case in Dutch, for which "de" marks both the singular and plural for common nouns and the plural for both common and neuter, although for neuter there is a distinction between the singular "het" and plural "de." This many-to-one mapping in Dutch may have played a role in the difficulty of online detection of gender concord errors. Furthermore, Dutch gender—in addition to being morphologically opaque— is late learned by native speakers and problematic for L2 learners, even early ones (Blom, Polisenska & Unsworth, 2008). Nonetheless, the results of Sabourin's studies show a seemingly greater effect of the L1 on L2 processing than does that by Tockowitz and MacWhinney. However, the proficiency levels of the subjects in the Tokowitz and Sabourin studies were not comparable: in the former instructed beginners at university, in the latter three-year residents of the Netherlands whose proficiency was not independently tested.

Our own study using ERPs to index processing of gender agreement in native and L2 French (Foucart, 2008, Foucart & Frenck-Mestre, 2004, 2006, in prep) revealed a pattern of results that shows an influence of the learners' L1 on processing but which was rather unexpected, and furthermore which poses a challenge for models that assume a critical period for (L2) gender acquisition. In our first experiment, reported below, we examined gender agreement for post nominal attributive adjectives. Participants were either native French or L2 French learners whose L1 was either a gender language, German, or an ungendered language, English. The L2 learners were enrolled in a study-abroad program (Erasmus) in a French university; they had all studied French at school (mean 8 years for both groups) and had passed the required exam (DELF) to attend courses in a French university, thus assuring a standard level of proficiency. They were also asked to self-rate their level of French on a Likert scale for different aspects of language comprehension and production; German participants estimated their level of L2 competence slightly higher (written comprehension, 4.8; oral comprehension, 4.8; written production, 3.8; oral production, 4.2) than English speakers (written comprehension, 4.3; oral comprehension, 4.3; written production, 3.6; oral production, 3.6). Following completion of the main experiment, knowledge of the gender of the critical nouns included in the materials was tested in all participants in an offline test which consisted of circling the correct gender marked article. Results were roughly similar for English (errors: 7.3%, SD: 5) and German speakers (errors: 4.2%, SD: 4; t (26) = 1.56, p < 1). The two L2 groups were thus comparable as concerns years of instruction in French, knowledge of lexical gender and proficiency level. Their results of the ERP study, however, revealed different capacities for online processing of gender agreement.

The experimental materials of the ERP study were visually presented single clause sentences of the type illustrated in Table 1. Agreement was manipulated on the adjective alone, which either agreed in gender with the preceding noun or violated gender concord. No gender cue was provided by the determiner, which was plural (and hence gender neutral) in all cases. Gender of the noun was manipulated such that half were feminine and half masculine in French, and for each, half shared the same gender and half had opposite gender in German (no French nouns that had neuter gender in German were selected). Overt phonetic cues to agreement were held constant; all adjectives were variable adjectives that had distinct forms for the feminine and masculine.

Condition	Examples
Same gender across French and German	
Masculine	
Well-formed	Les fromages$_{M, PL}$ ronds$_{M,PL}$ sont dans le réfrigérateur
Ill-formed	Les fromages$_{M, PL}$ rondes*$_{F, PL}$ sont dans le réfrigérateur
	The round (shaped) cheeses are in the fridge.
Feminine	
Well-formed	Les cendres $_{F, PL}$ froides $_{F, PL}$ sont dans la cheminée.
Ill-formed	Les cendres $_{F, PL}$ froids* $_{M, PL}$ sont dans la cheminée.
	The cold ashes are in the chimney
Opposite gender across French and German	
Masculine	
Well-formed	Les repas $_{M, PL}$ froids $_{M, PL}$ sont à prendre à midi.
Ill-formed	Les repas $_{M, PL}$ froides* $_{F, PL}$ sont à prendre à midi.
	Cold meals should be eaten at lunch time.
Feminine	
Well-formed	Les clefs $_{F, PL}$ rondes $_{F, PL}$ sont sur la table.
Ill-formed	Les clefs $_{F, PL}$ ronds* $_{M, PL}$ sont sur la table.
	The round keys are on the table.

Table 1. Examples of experimental materials presented in experiment 1.

Results for the native French participants revealed a prominent, widespread P600 effect (see figure 1) in response to gender agreement errors, in line with the results of previous monolingual ERP studies of gender concord in German, Spanish and Dutch (Barber & Carreiras, 2005; Gunter et al., 2000; Hagoort & Brown, 1999).
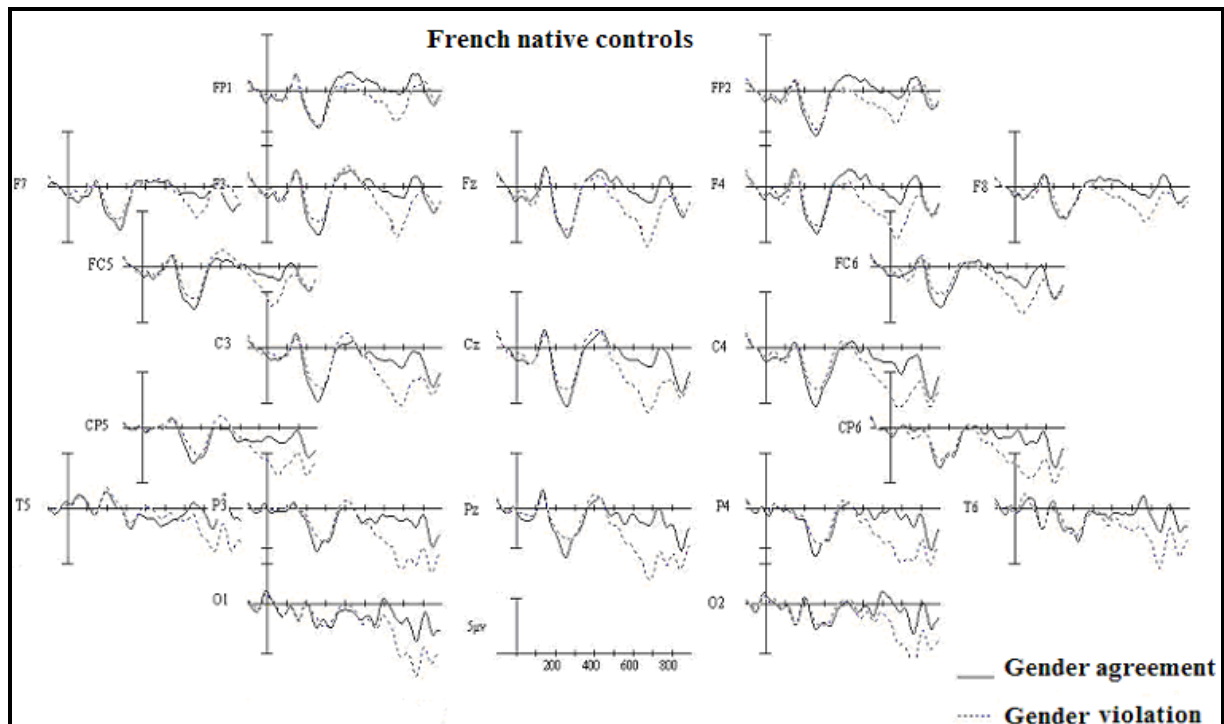
Figure 1. P600 effect elicited by gender agreement violations between the noun and post-posed attributive adjective in native French speakers.

For the L1 English participants, gender violations also provoked a P600 effect although the effect differed from that observed for native French in its scalp distribution and amplitude, being more frontal than in native speakers and overall smaller (see figure 2). The P600 effect for these L2 learners was not, however, delayed in comparison to native French. Somewhat unexpectedly, the results for the L1 German participants showed no reliable ERP response to gender violations (see figure 3). Moreover, this was equally true for nouns that shared lexical gender across French and German and for nouns that had opposite gender in the two languages.
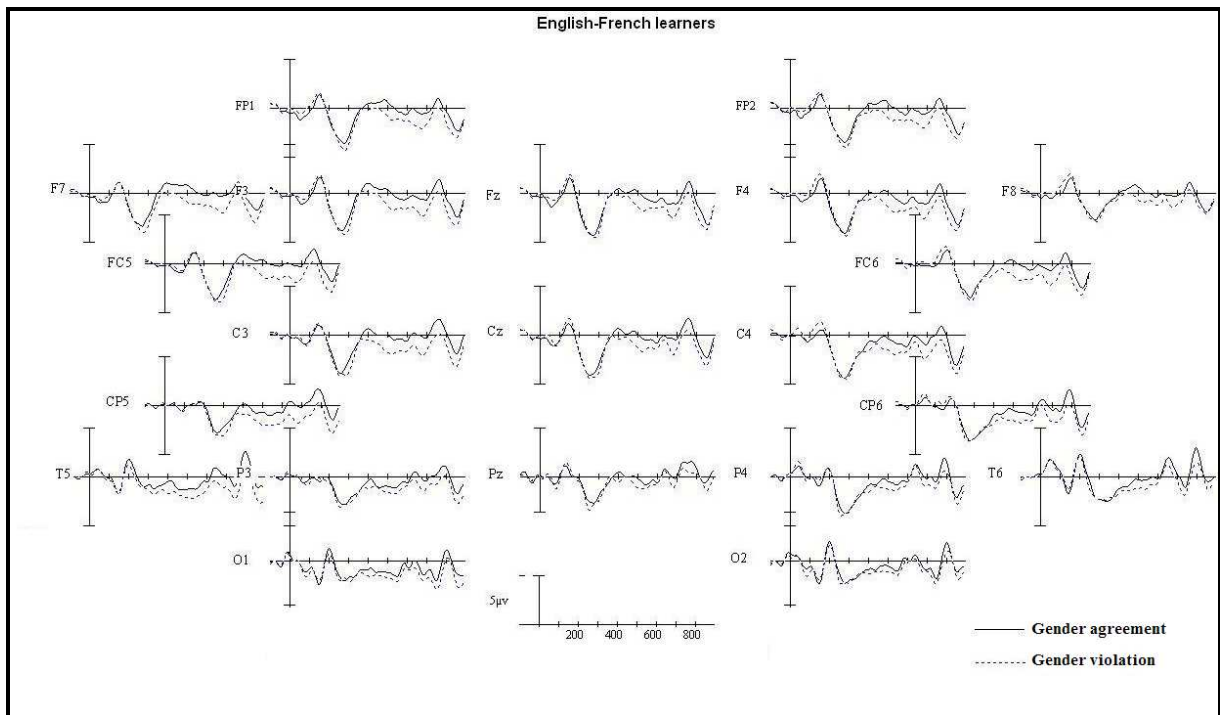
Figure 2. P600 effect elicited by gender agreement violations between the noun and post-posed attributive adjective in L2 French (English L1) learners.
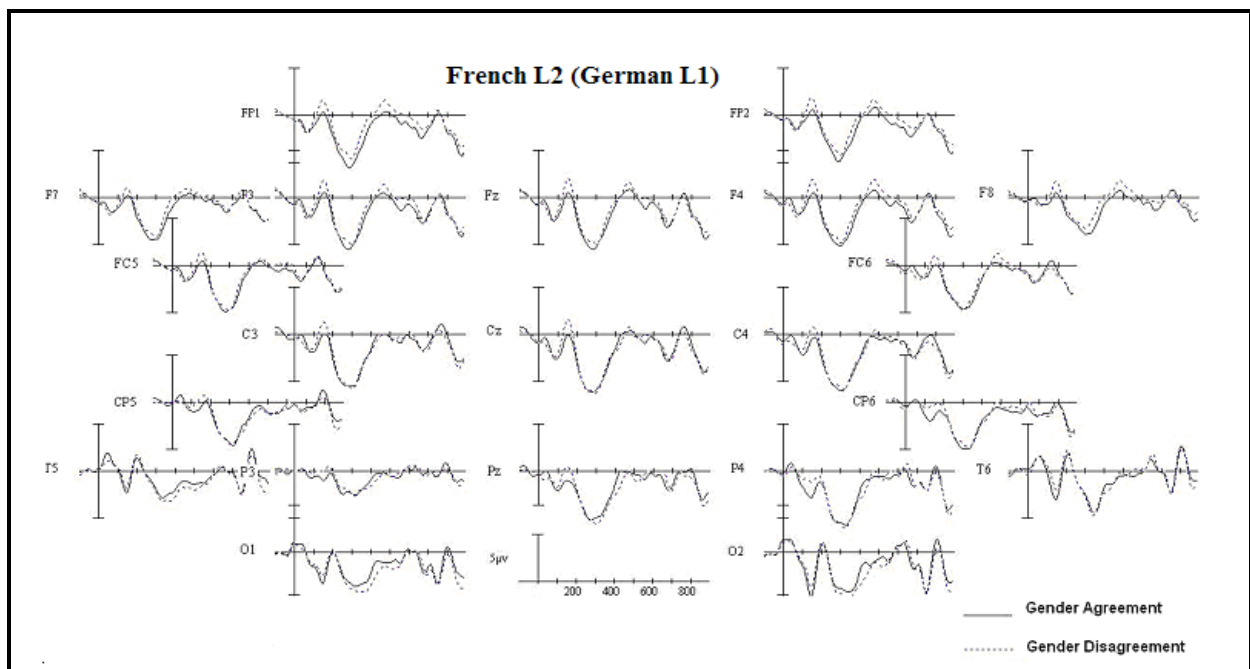

Figure 3. P600 effect elicited by gender agreement violations between the noun and post-posed attributive adjective in L2 French (German L1) learners.

Discussion

The pattern of results we obtained (Foucart, 2008, Foucart & Frenck-Mestre, in prep) showing on-line sensitivity to grammatical gender agreement in L2 French for English native speakers but not for German native speakers is to say the least, intriguing. As concerns the L1 English group, our data clearly challenge models which assume a syntactic deficit in underlying competence in late second language learners of ungendered languages as concerns grammatical gender. For the L1 German group, while the absence of a response to gender concord violations was not expected it can be accounted for by several hypotheses. The first explanation is that our German learners were still in the stage of applying agreement rules from their L1, in which gender is neutralized in the plural (e.g., *die $_{PL}$ kleinen $_{PL}$ Tische$_{M\ PL}$, die kleinen Türen$_{F\ PL}$, die kleinen Autos$_{Neu\ PL}$*; the small tables, doors, cars). In our desire to restrict overt gender cues to the adjective in our French materials, we indeed inadvertently placed our German L1 participants at a disadvantage given the cross-linguistic differences for plural agreement. While it is necessary to examine this hypothesis for the same structure in the singular in French, evidence that it may be valid is provided by another ERP study in which German learners showed a P600 effect similar to native French speakers for gender agreement violations between a definite article and a singular noun in French (Foucart, 2008, Foucart & Frenck-Mestre, in press). Two alternative explanations are that surface structure may have played a role, whereby the post-nominal position of adjectives caused difficulties given the absence of this word order in the L1, and perhaps the postnominal adjective word order was interpreted as similar to the predicative position of adjectives in German, where there is no adjective concord. Another consideration is that adjective-noun agreement in general may pose greater difficulties as suggested by several studies showing that adjective-noun agreement is less accurate and later acquired than determiner-noun agreement in L2 (Bartning, 2000; Bruhn de Garavito & White, 2002; Dewaele & Veronique, 2001; Grandfeldt, 2000). In line with the latter of these hypotheses, Sabourin and Haverkort (2003) indeed failed to find reliable ERP responses to gender agreement violations involving adjectives[viii] for L1 German learners of Dutch, whereas Sabourin and Stowe (2008) report a significant P600 response for the same participants for determiner-noun gender agreement. Nonetheless, neither of these latter hypotheses can account for the entire pattern of data, as one would expect both factors to affect our English L1 participants whereas they apparently did not.

We will return to these studies and the possible influence of L1 following our discussion of another factor that has received comparatively less attention in the L2 literature on gender acquisition, such being the role of morphology and of overt phonetic cues.

Input cues to gender agreement

Over and above the possible influence of native language parameters on the L2 acquisition and processing of gender concord, which has indeed been a major focus of SLA research (for reviews see Carroll, 1999; Herschensohn, 2007), it is of interest to examine factors within the L2 that may play a role. One of these, examined below, relates to the overt phonetic cues to agreement which are available in spoken input and which can become active during silent reading (for a review, see Harm & Seidenberg, 2004). In our second study, we looked at how these cues may affect sensitivity to gender concord when processing post-nominal adjectives in written form. We have indeed recently demonstrated that overt phonetic cues can play a role in verbal agreement both for native French and L2 French

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learners even during silent reading (Frenck-Mestre et al., 2008). We expected to find the same for nominal agreement as concerns gender concord.

In spoken French, adjectives can be divided into three classes with respect to gender marking, 1) those which are invariable, having the same phonetic representation, that is no distinction in coda for the masculine and feminine form (e.g. *rare, bleue/bleu, clair/claire espagnole/espagnol, marron/marron*); 2) those which have a suppletive alternation, that is which are morphologically related but which cannot be predicted by a phonological rule (e.g. *nouvelle/nouvel/nouveau*, and somewhat irregular cases such as *destructrice/destructeur, travailleuse/travailleur*); and 3) those which vary according to a productive morphological rule, having a final consonant in the feminine versus no final consonant in the masculine (e.g. *verte/vert, française/français, petite/petit*). Herschensohn (1993) has in fact argued that spoken French verbs fall into the same three classes with respect to stem alternation of present tense, and therefore that the same rules govern alternation of adjectives and verbs. Because spoken French has substantially evolved over the centuries, its orthographic representation includes more segments than the oral equivalent, such as final consonants whose pronunciation was lost in the 14th Century. In written French, the canonical alternation in orthography between the feminine and masculine for adjectives is the addition of a final –e, which in and of itself is not phonetically realized. For invariable adjectives, differences in orthography, when they exist (most often with the pronounced liquid consonants [r] and [l]), are silent (e.g. *claire/clair* [κλEP],*actuelle/actuel* [ακτΨEλ]); in addition a broad class of adjectives are invariable both phonetically and orthographically (e.g. rouge). Note, however, that the orthographic difference in variable adjectives systematically translates into a phonetically different form for feminine vs. masculine (final consonant vs. zero consonant: e.g. *petite/petit* [π≅τιτ]/[π≅τι], *fausse/faux* [φoσ]/[φo]). For variable adjectives, thus, alternation in gender is marked both in the orthography and phonology, thus providing two unambiguous cues, whereas for invariable adjectives only orthographic cues to gender alternation are available and they map onto a single phonetic representation.

How might these representational differences translate into processing differences? First, we can note that in formal L2 French instruction, emphasis on orthographic differences is less efficient than focus on phonological form in teaching beginning learners to grasp gender alternations for variable adjectives (Arteaga et al., 2003). This data is in line with suggestions by Herschensohn (1993) that providing learners with a systematic classification of inflection based on spoken language is more efficient because more parsimonious than the classifications that arise based on written language. For example, although the feminine and masculine of the variable adjectives "white", "long", and "happy" have orthographic alternations that are both varied (*blanche/blanc, longue/long, heureuse/heureux*) and deviate from the canonical alternation –e (*petite/petit*) they in fact all follow the same morphological rule stipulating that feminine forms have a final consonant whereas masculine forms have the same stem without the consonant. It is therefore easier to retain this distinction than orthographically based ones. We would like to forward, further, that alternations which are grounded only in orthography should lead to less stable representations and poorer performance than those that have distinct phonetic representations, in line with previous work (Frenck-Mestre et al., 2008; Largy & Fayol, 2001; Negro & Chanquoy, 2000).

Consider two psycholinguistic studies of gender processing in L1 French (Colé & Segui, 1994; Jakubowicz & Faussart, 1998). In both studies, a primed lexical decision task was used and a gender congruency effect was found, due to the identification of nouns being accelerated by the presence of a gender-congruent prime compared to a gender mismatch (e.g. mon_{masc} $chat_{masc}$/*ma_{fem} $chat_{masc}$, "my cat"). Of interest here, is a further manipulation in both

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studies, related to the element that preceded the noun. In Colé and Segui (1994), primes and target words were presented visually and "word class" of the prime was manipulated such that it was either a "closed class" word (*ma/mon, la/le, cette/ce, quelle/quel*) or an "open class" word, namely an invariable adjective (*jolie/joli* "pretty"). For the "closed class", thus, the majority of primes (all but the exclamatory *quelle/quel*) had overt phonetic cues to gender, whereas the open-class invariable adjectives marked gender only orthographically. Although this was not the manipulation intended, the presence vs. absence of overt phonetic cues was indeed confounded with word class. In the last experiment, in which only gender violations were examined and in which word length and printed frequency of the "open" and "closed" class primes was equated, results showed a gender-congruency effect *only* for the primes that had overt phonetic cues to gender, whether reaction times or error rates were considered. Briefly visually presented invariable adjectives that conflicted in gender with the target noun did not impact performance. At first blush, a somewhat different result was obtained using auditory presentation of primes and targets by Jakubowicz and Faussart (1998). In this study, the manipulations of interest were, in the first experiment, whether the target noun ($chat_{masc}$) was preceded by a determiner (*mon/*ma*) or by a determiner and invariable adjective (*mon pauvre/*ma pauvre,* "my poor") and, in the second experiment, whether the adjective prime was invariable (*mon pauvre/*ma pauvre*) or variable (*mon gentil/*ma gentille* "my nice"). Interestingly, Jakubowicz and Faussart report in their first experiment that the gender-congruency effect was in fact larger following determiner + invariable adjective primes than determiner primes, and in their second that equal disruption was caused by gender violations for determiner + invariable and determiner + variable adjectives. According to the authors, "*once the feature-marked determiner is accessed, the detection of mismatching agreement features by the syntactic processor proceeds in the same way regardless of whether the feature value of the determiner is confirmed covertly or overtly by the following adjective*." (Jakubowicz & Faussart, 1998, 615). This result is interesting and indeed in line with work suggesting that the determiner plays a crucial role in setting agreement features for the entire noun phrase. For example, representational accounts subscribing to Minimalism describe the nominal domain as the Determiner Phrase, in which the core noun (which carries the interpretable features of number and gender) shares its features with the other projections of the DP (such as adjectives, quantifiers, determiners), and is in turn affected by the determiner's syntactic properties in a given language. In French nouns raise above the canonical attributive adjectives, whereas in English they don't *maison blanche / white house*, and in French concord must obtain throughout the DP whereas it's non existent in English (cf. Hawkins, 2001, 248 ff.). However, scrutiny of the data reveals that the effects are not as water-tight as the authors might wish. In the second experiment, notably, the difference between the disruption caused by variable and invariable adjectives was large enough to provoke a strong statistical trend for an interaction (p<.06) and the numerical effect was in fact 50% larger for variable than invariable adjectives. As such, the data from this experiment with spoken materials are in line with those reported for written stimuli, showing that the overt phonetic realisation of gender cues provide a more reliable cue to agreement.

This conclusion is further supported by ERP data obtained in our laboratory, for French controls and L2 (Spanish L1) learners (Carrasco & Frenck-Mestre, 2007, in prep). The L2 learners were enrolled in a French university; they had all studied French at school (many had also attended a French lycée in their home country) and had passed the required exam (DELF) to attend courses in a French university, thus assuring a standard level of proficiency. On average, they had resided in France for 24 months and all used French at least as often as their L1 in daily life. In this experiment, we examined processing of nominal

gender agreement between the noun and post-nominal adjective. We manipulated overt phonetic cues to agreement via the use of variable and invariable adjectives (presence of final consonant in feminine form in variable adjectives as opposed to no distinction in coda for invariable adjectives). No suppletive alternations were included. Variable and invariable adjectives were equated for length and frequency, and all materials were pre-tested to ensure semantic acceptability. Masculine and feminine nouns were used equally in the two adjective conditions and nouns were chosen on the basis of shared gender in French and Spanish (e.g. *table*$_{fem}$ and *mesa*$_{fem}$). As such, knowledge of the correct gender was not at stake. All materials were presented visually. Examples of the type of sentences created are given Table 2, below.

Condition	Examples
Variable adjective	
Feminine	Jean aime la $_{F, S}$ musique $_{F, S}$ <u>française</u> $_{F, S}$ /*<u>français</u> $_{M, S}$ et le vin rouge.
Masculine	Jérôme regarde un $_{M, S}$ bâteau $_{M, S}$ <u>vert</u> $_{M, S}$/*<u>verte</u> $_{F, S}$ sur l'eau.
Invariable adjective	
Feminine	Jean aime la $_{F, S}$ musique $_{F, S}$ <u>espagnole</u> $_{F, S}$ /*<u>espagnol</u> $_{M, S}$ et le vin rouge.
Masculine	Jérôme regarde un $_{M, S}$ bâteau $_{M, S}$ <u>bleu</u> $_{M, S}$/*<u>bleue</u> $_{F, S}$ sur l'eau.

Table 2. Examples of experimental materials created for experiment 2.

The results for native French controls show, in like fashion to the results we obtained in our first study (Foucart, 2008; Foucart & Frenck-Mestre, 2006, in prep) and in line with previous monolingual ERP results on noun-adjective gender agreement (Barber & Carreiras, 2005) a robust P600 effect to gender violations. Of greater interest, however, was the statistically robust interaction we found between gender violation and type of adjective. Gender violations elicited a P600 effect both when involving variable and invariable adjectives; however, the effect was statistically larger for the former, as can be seen in Figures 4 and 5. As such, our predictions are confirmed in native processing of French, whereby overt phonetic cues to agreement produce a reliably stronger effect than silent cues marked only orthographically.
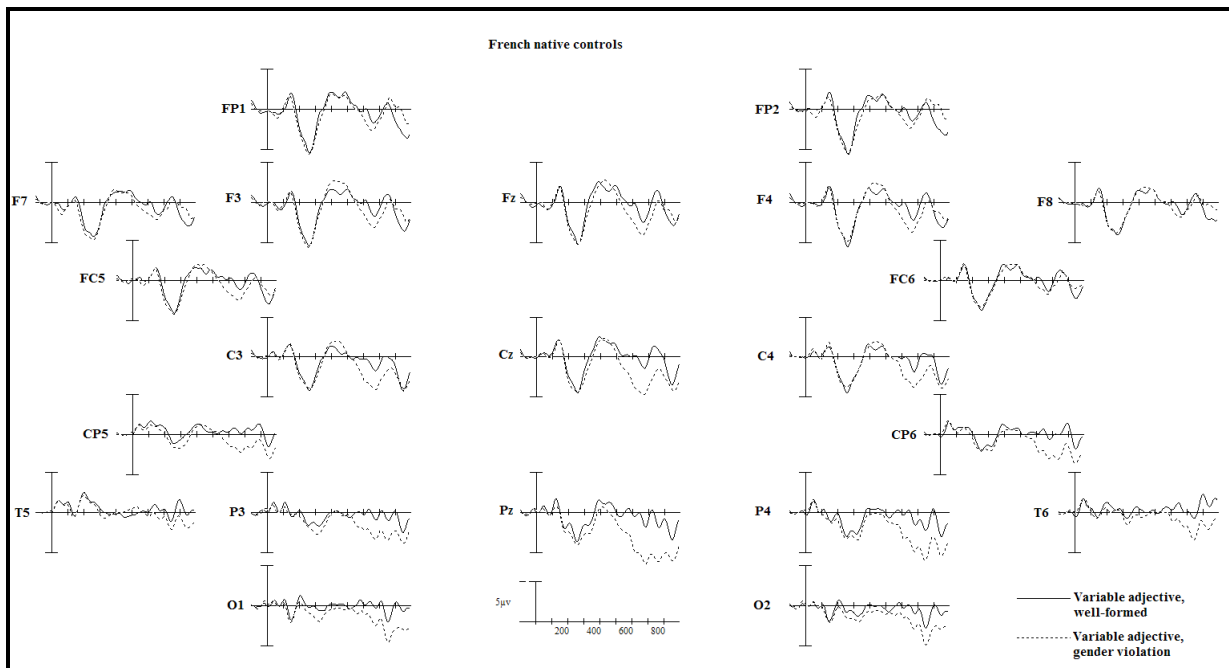
Figure 4. P600 effect elicited by gender agreement violations between the noun and post-posed variable adjective (verte /vert) in native French controls.
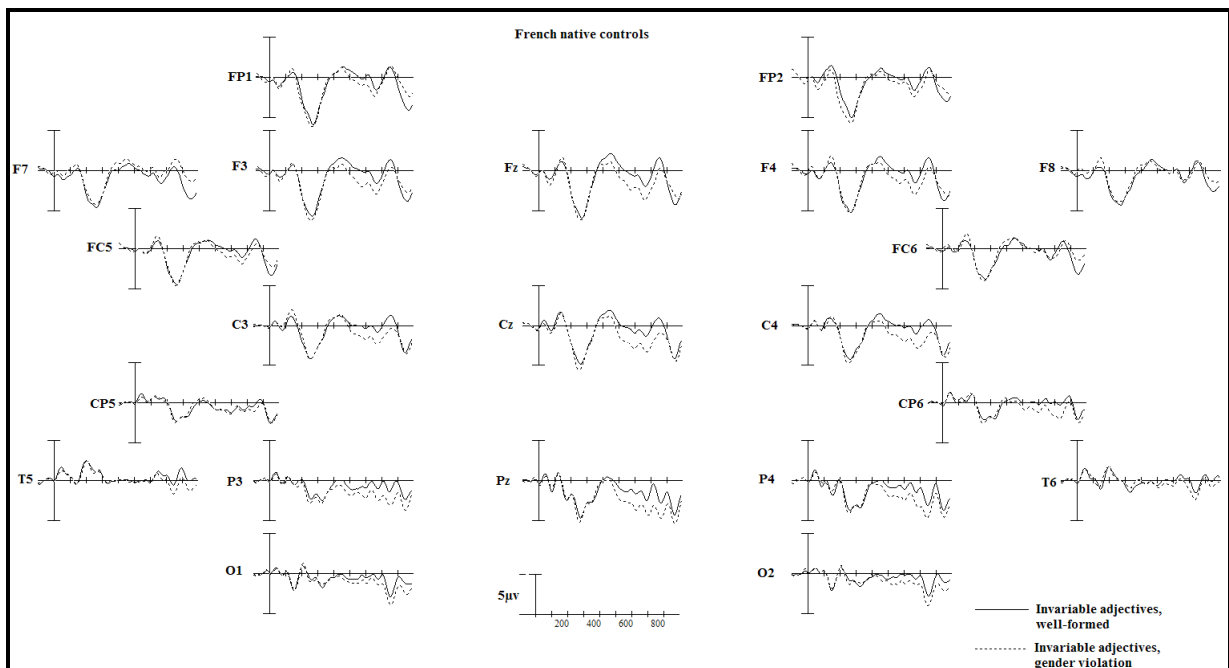

Figure 5. P600 effect elicited by gender agreement violations between the noun and post-posed invariable adjective (bleue/bleu) in native French controls.

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For the L2 French (L1 Spanish) participants, the same general pattern of ERP results was obtained. Gender agreement violations elicited a robust P600 effect, and the size of the P600 was statistically larger for violations when marked on variable than invariable adjectives. These effects can be seen in Figures 6 and 7. In comparison to the native French,

the P600 effect obtained in the L2 group was slightly delayed in onset, and was again more frontally distributed across the scalp than for native speakers. The effect of type of adjective we obtained did not vary as a function of participant group, however.
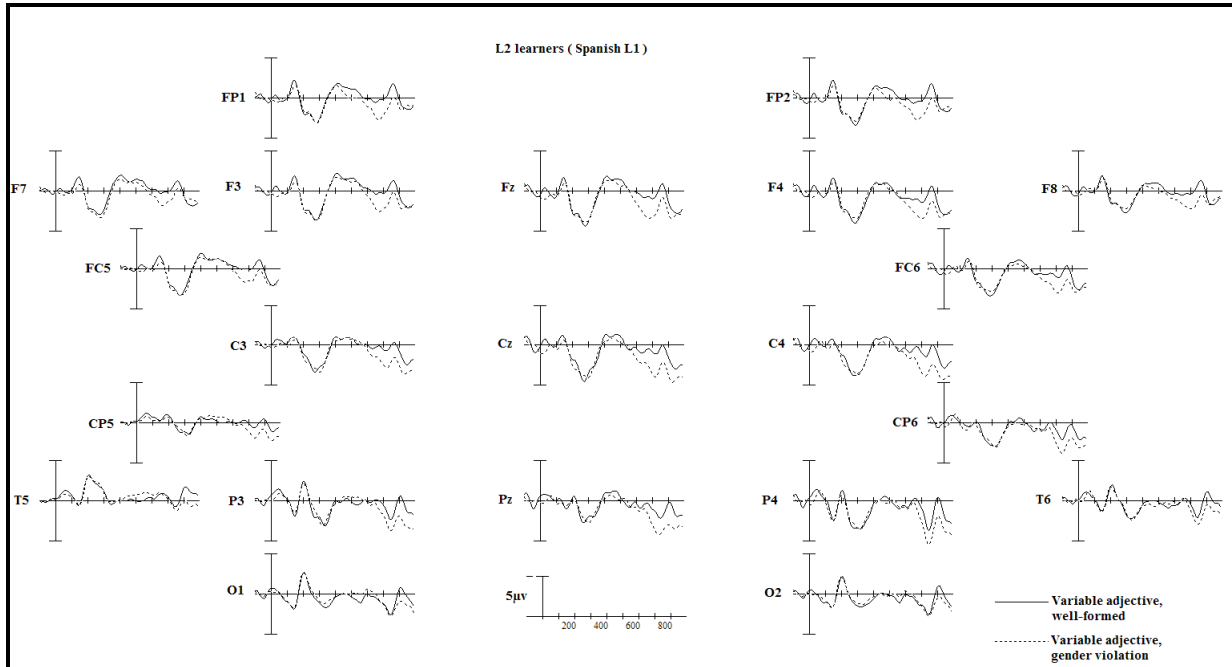

Figure 6. P600 effect elicited by gender agreement violations between the noun and post-posed variable adjective (verte /vert) for French L2 (Spanish L1) learners.
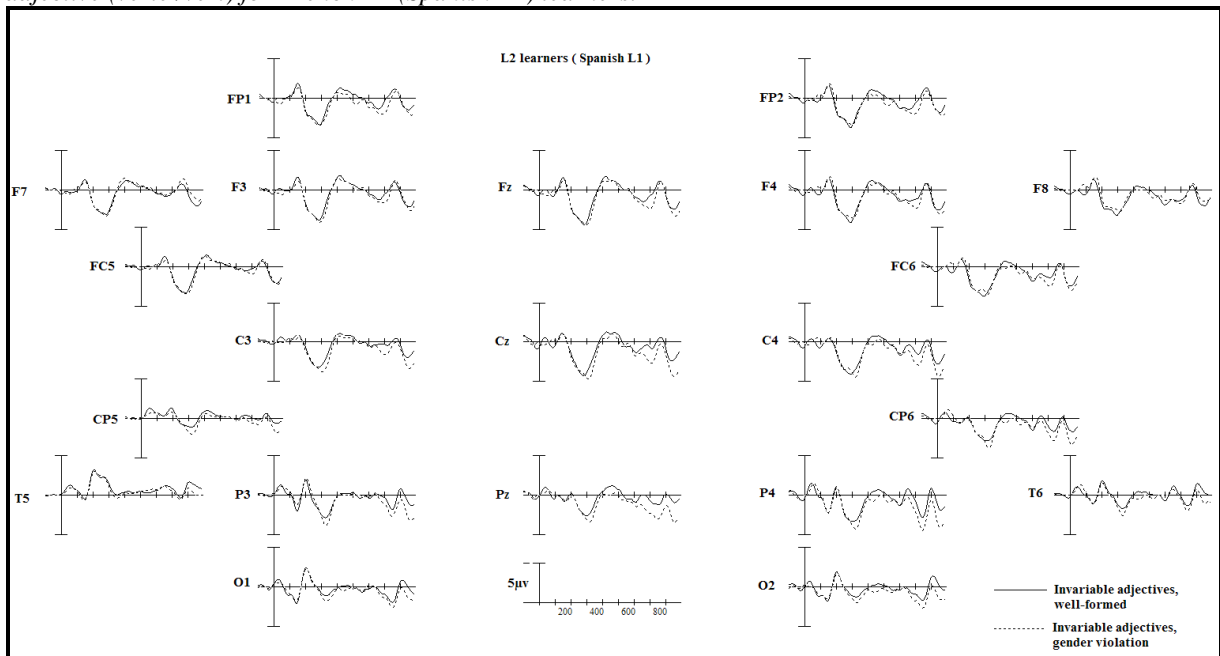

Figure 7. P600 effect elicited by gender agreement violations between the noun and post-posed invariable adjective (bleue /bleu) for French L2 (Spanish L1) learners.

Given that the two participant groups did not differ as concerns the main effect of interest, we pooled the ERP data and plotted them as difference waves (ill-formed sentences – well formed sentences) in Figure 8, to better visualize the difference in the size of the P600

effect as a function of type of adjective. As can be clearly seen, gender concord violations were associated with a larger P600 effect when elicited by variable than invariable adjectives.
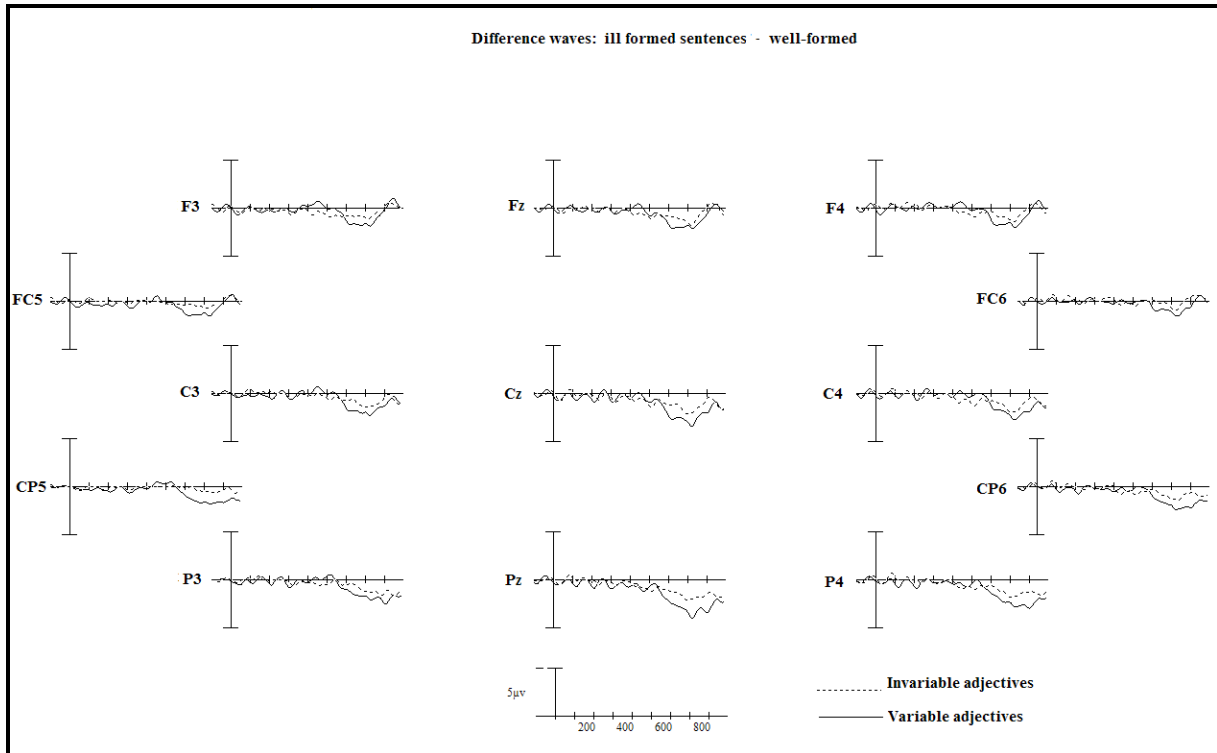

Figure 8. Difference waves for gender violations (gender violation – well formed) as a function of the type of adjective: variable (verte / vert) vs. invariable (bleue /bleu).

Discussion

The results from our second study provide strong evidence that overt phonetic cues to gender agreement enhance processing. Participants showed a larger P600 response when confronted with gender concord errors that have overt phonetic cues than for the same errors that are only represented in the orthography. Note that what exactly the P600 indexes is a continuing subject of debate (Coulson, King & Kutas, 1998; Friederici, Hahne, & Mecklinger, 1996; Kim & Osterhout, 2005; Osterhout & Hagoort, 1999), such that the effects we found may be linked to re-analysis processes as opposed to the initial detection of mismatching agreement features by the syntactic processor. Nevertheless, the effects obtained in the L2 learner group did not differ from those we obtained for native speakers, such that whether the P600 effect we found reflects early or late processes is applicable to both groups.

Herschensohn (1993, 104) has argued that the oral variability of most French adjectives (and present tense singular/plural stems of verbs) can be succinctly captured by a Final Consonant Alternation rule: feminine adjectives have a final consonant whereas masculine ones have the same stem without the consonant. From a representational standpoint, the native speaker or L2 learner may develop this morphological rule as a means of facilitating adjectival or verbal agreement. This idea has indeed been empirically tested:

Arteaga et al. (2003) conducted a study of Anglophone beginning French learners, who were pedagogically presented variable adjectives in two distinct methodologies, one focusing on orthography (add –e to feminine) and one focusing on phonetic cues (feminine consonant indicated in contrast to masculine zero consonant in coda position). The group primed with the phonetic cue training outperformed the orthographic group on a posttest, indicating that training learners to pay attention to phonetic cues—attuning them to the same cues that native speakers note—contributes to a more rapid assimilation of L2 morphological rules. The results obtained in our second ERP study confirm the salience of phonetic cues in variable adjective agreement both for native speakers and L2 learners (in this case with L1 Spanish, which has a robust phonetic distinction between masculine and feminine). Furthermore, the clear benefit of phonetic cues to the acquisition of morphological rules supports the idea of Vainikka & Young Scholten (1998) that signals in the input can act as triggers to the development of L2 morpho-syntactic features and processes. It indeed appears that the L2 learners in our study (as the French natives) were more sensitive to clearly indicated variable phonetic gender (even when an orthographic cue was available) than invariable gender in adjectives.

General Discussion

The present review of recent studies on the acquisition and processing of grammatical gender within a late acquired L2 attests to a rather complex pattern. It is our contention that the model which can best account for the entire set of data is one that allows for native language influence, that is not, however, constrained by age of acquisition, and that must also allow for clear cues in the input to influence acquisition and/or processing.

Tockowitz and MacWhinney (2005) forwarded the argument based on their ERP data and within the framework of the competition model that processing will be impeded when the features and/or grammatical rules of the L1 and L2 are in conflict (or competition) as opposed to when no competition can arise. Our own ERP results, reported in our first study (Foucart, 2008; Foucart & Frenck-Mestre, 2006, in prep), can be accommodated by such an account. When processing gender concord in L2 French, L1 German learners were less sensitive than L1 Anglophone learners to errors in noun-adjective agreement. This was true, however, when the DP was plural. In French, pluralizing the DP neutralizes gender marking on the determiner (being *les* for both genders) but does not affect obligatory gender concord for the adjective (blanches$_{fem\ pl}$ / blancs$_{mas\ pl}$), whereas in German plural marking neutralizes gender for both determiners and adjectives. This cross-linguistic conflict apparently impacted our L2 French (L1 German) participants' capacity to resolve gender concord errors online. We hypothesize that the driving factor was the plural marker, based on other data showing sensitivity to gender concord in the DP for L2 French L1 German participants for the singular (Foucart, 2008; Foucart & Frenck-Mestre, in prep). Caution is nonetheless warranted as this latter effect was found for determiner-noun agreement and many studies have found that det-N gender agreement is acquired earlier than noun-adjective agreement (for a recent review see Ayoun, 2007). However, the data from our L1 Anglophone participants suggests that such is not the reason for the L1 German participants' absence of sensitivity to gender concord in L2 French. Indeed, the Anglophone participants showed online sensitivity to the same gender concord errors for noun-adjective agreement in L2 French. This can be accounted for by assuming that no competition, as concerns either gender attribution or grammatical rules of concord, can arise given the absence of the gender feature in English. Indeed, our ERP results for the Anglophone group are in line with those reported by Tockowitz & MacWhinney (2005),

showing online sensitivity to gender agreement errors for L1 Anglophone learners of Spanish as revealed by a P600 effect to gender concord errors in like manner to the effects we report.

In relation to a recent series of publications on gender agreement processing in L2 Dutch by Sabourin and colleagues (Sabourin, & Haverkort, 2003; Sabourin & Stowe, 2008; Sabourin, Stowe & de Haan; 2006), their conclusions in relation to L2 learners from an ungendered language (English) are not supported by ERP data, reported here, and, moreover, it is possible that factors other than compatibility of lexical gender may be at the heart of some of the difficulties Sabourin et al. (2006) reported for L2 learners, whether from an ungendered or gendered language (German and Romance). Concerning the first point, Sabourin and colleagues forward the idea that acquiring gender concord, as opposed to simply learning to correctly assign gender to nouns, may prove "impossible to acquire" for L2 learners from ungendered languages. Our ERP data reported in the first study (Foucart, 2008; Foucart & Frenck-Mestre, 2006, in prep) clearly discredit this hypothesis, as do other recent ERP data (Tockowitz & MacWhinney, 2005). In both ERP studies, sensitivity to gender concord within the DP was found for Anglophone learners of French (for N-Adj) or Spanish (for det-N). In relation to the second point, it is possible that what was at stake in the offline agreement experiment reported by Sabourin et al. (2006) was the L2 capacity to process structurally complex sentences based on grammatical cues. All of the L2 groups showed significantly worse performance on the agreement task, involving the assignment of grammatical roles in embedded relative clauses, than on the gender attribution task, involving isolated nouns. Moreover, performance on the "gender agreement" task varied for all L2 groups as a function of the lexical frequency of items, being better for high than medium frequency nouns. In other words, lexical frequency interacted with grammatical competence for complex structures. Clahsen and Felser (2006) have argued based on just such data that L2 learners may use "shallow structure" for sentences for which full parsing would yield complex hierarchical structures; that is, L2 learners would opt for lexical-semantic cues rather than rely on syntactic cues to interpretation. This is not assumed for simpler structures or for feature matching on adjacent or locally related words, for which performance is assumed to increase with L2 proficiency. As such, processing of gender concord in more complex structures may prove difficult unless lexical/semantic cues are available, whereas it could be expected to be attainable for elements within the DP. This is indeed the general pattern across the various psycholinguistic studies of L2 gender processing reported here, where gender agreement within the DP is attested both online and offline (Carrasco & Frenck-Mestre, 2007, in prep; Foucart, 2008; Foucart & Frenck-Mestre, 2006, in prep; Sabourin et al., 2006; Sabourin & Haverkort, 2003; Sabourin & Stowe, 2008; Tockowitz & MacWhinney, 2005) but proves more difficult in complex structures (Sabourin et al., 2006). Note, nonetheless, that whether it is necessary to invoke different types of syntactic processing for late L2 learners and native speakers is a current topic and lively debate, (for various viewpoints, see Clahsen & Felser, 2006 Dekydtspotter, Schwartz & Sprouse, 2006; Frenck-Mestre, 2002, 2005a, 2005b, 2006; Felser & Roberts, 2007; Love, Mass & Swinney, 2003). Indeed even for native speakers it has been suggested that a full parse is neither always necessary nor engaged upon (Ferreira, Ferraro & Bailey, 2002; Ferreira & Patson, 2007). The debate of shallow vs. deep analysis does not lend itself to testing by our data, which involve adjacent agreeing constituents, not complex phrase structures such as relative clause disambiguation. The contrast, in results from Experiment 1, between German L1 (no reliable P600, despite L1 gender) and English L1 (P600 despite no L1 gender) indicates that presence / absence of L1 grammatical gender is not definitive in grammaticalization of L2 gender (as per representational deficit ideas). The similarity (greater amplitude of P600 for phonetic cues), in

results of Experiment 2, between native French and L2 learners (L1 Spanish) shows that learners make comparable use of morphophonological cues as Clahsen & Felser suggest.

In addition to the effects on gender agreement processing related to the properties of the L1, we reported results showing an influence of input factors that may trigger the development of L2 morpho-syntactic features and processes (Vainikka & Young Scholten, 1998). Both native French and L2 (Spanish L1) learners showed greater online sensitivity to gender concord errors that had overt phonetic cues (e.g. verte/vert vs. bleue/bleu). These ERP results for adjectival agreement, showing larger effects for violations that have overt phonetic cues, bear a strong resemblance to those we reported for native French speakers and L2 (German L1) learners when processing verbal person errors, whereby errors that had overt phonetic cues produced a larger and more reliable P600 effect than errors that were only represented in the orthography (Frenck-Mestre et al., 2008). The current data thus extend previous online results showing an influence of these input cues on immediate processing of agreement. Indeed, behavioral studies involving native speakers of both French (Largy & Fayol, 2001; Negro & Chanquoy, 2000) and Dutch (Frisson & Sandra, 2002; Sandra, Frisson, & Daems, 1999) have shown that fewer inflectional errors in written language (for both verbal and nominal agreement) are observed for phonologically realized morphemes than for silent morphemes, both during development (Frisson & Sandra, 2002; Negro & Chanquoy, 2000) and in skilled adults (Largy & Fayol, 2001; Sandra et al., 1999, but see Brysbaert, Grondelaers & Ratinckx, 2000). Althouth we did not manipulate variable/invariable verb stems (cf Frenck-Mestre et al., 2008), our results indicating the importance of phonetic cues to variable/invariable adjective processing by native and L2 French subjects, appear to corroborate the findings for verbs, whereby phonetic reinforcement (a secondary morphological cue to gender) is a significant factor in response to orthographic morphology (singular/plural verbs, masculine/feminine adjectives).

Our results are mostly compatible with the full-transfer, full-access account forwarded by Schwartz and Sprouse (1996), but pose difficulties for the representational deficit /failed functional feature account forwarded by Hawkins and collaborators (Hawkins & Chan, 1997; Hawkins & Francescina, 2001). In favour of FTFA, we see the most native-like performance for L2 French learners in a gendered native language for which rules of adjectival gender concord are the same, i.e. the L1 Spanish group. We also can interpret L1 English (no gender, no agreement) responses as indicating access to universal features of grammatical gender and grammaticalization of concord rules: the Anglophone participants show online sensitivity to agreement, even for noun-adjective and even when the determiner was not overly marked for gender (due to being plural). However, FTFA is challenged by the German L1 subjects' absence of response to gender violations, despite the existence of gender in German. We have interpreted the absence of response in this group to inappropriate transfer, or misapplication, of plural concord from the L1. As for FFFH, grammatical gender features should not be accessible to late learners from ungendered languages, yet the L1 Anglophones show immediate sensitivity to gender concord errors on the adjective, even when no cue provided by the determiner. Even if not yet L1-like (much smaller in amplitude), the effect is statistically robust hence representative of the group.

Finally, a word is needed in relation to what the ERP data reported in the present review actually reveal. In general, the ERP signature found for L2 learners processing grammatical gender differed from that found for native speakers, whether in amplitude, scalp distribution or both. In the two studies that examined gender concord in the L2 by L1 Anglophones (Tockowitz and MacWhinney, 2005, Foucart, 2008; Foucart & Frenck-Mestre, in prep) a P600 effect was found to concord errors, however in the one the effect was greatly

reduced in comparison to native (L1 French) speakers and in the other, while no direct L1 control group was available for comparison, the P600 effect was indeed quite small. In the ERP study that examined the role of overt phonetic cues to noun-adjective gender agreement (Carrasco & Frenck-Mestre, 2007, 2009, in prep), the P600 effect found in association with concord errors was of similar magnitude in native and L2 French, but was slightly delayed and more anterior in the L2 group, despite there being complete overlap as concerns grammatical gender and gender attribution in the L1 and L2. In similar fashion, for determiner-noun gender agreement slightly delayed and or more anterior P600 effects have been found for L2 learners compared to native speakers (Foucart, 2008; Sabourin & Stowe, 2008). These patterns fit well with existing ERP data in the literature, which often report delayed L2 effects (see Frenck-Mestre, 2005b, Mueller, 2005; Rodriguez-Fornells et al., 2007). This kind of delay has most often been attributed to a relative slowness of L2 processing in comparison to native capacities and we ascribe to this viewpoint. It is notable that in all of the ERP studies on L2 grammatical gender reported here, the predominant marker of sensitivity to violations of gender concord was the P600 (Carrasco & Frenck-Mestre, 2007; Foucart & Frenck-Mestre, 2004, 2006; Foucart, 2008; Sabourin & Haverkort, 2003; Sabourin & Stowe, 2008; Tockowitz & MacWhinney, 2005). Moreover, the same was true of the native control groups reported in these studies. As such, differences between native and L2 groups were attested in the onset and distribution of the P600, not in terms of the absence of particular ERP components in relation to native controls. Whether the P600 reflects early or late processes is still a matter of debate in the monolingual literature and beyond the scope of the present paper (see Krott, Baayen & Hagoort, 2006 for a discussion of earlier ERP effects); what is important for the present purposes is that it was the only ERP response found in the present series of studies on grammatical gender. Although previous ERP studies have argued that native and L2 processing can be distinguished based on the presence vs. absence of early electrophysiological responses to grammatical transgressions (for a recent discussion see Hahne, Mueller & Clahsen, 2006, but also Osterhout et al., 2004) the present review of gender concord processing presents no evidence of such a differential pattern. Last, it is important to underline that ERP components elicited during morphosyntactic processing are indicative of rapid integration of information. A lack of an ERP effect, such as the P600, in response to a grammatical violation cannot be taken as evidence that the L2 learner was completely insensitive to and/or unable to process the agreement rule in question but, rather, that she did not respond to such in a homogenous automatized manner when under time constraints.

To conclude, we have presented evidence that the native language may influence the acquisition and processing of grammatical features in a late-acquired language, while showing that it is clearly not the case that acquisition is limited to those features present in the L1 nor by the age of the learner. In addition, we have shown that salient phonetic cues can enhance the online processing of agreement and arguably the grammaticalization of these rules. Further work is warranted to investigate how these two variables may interact in L2 acquisition and processing.

References

Andersen, R. (1984). What's gender good for anyway? In R. Andersen (Ed.), *Second languages: A cross-linguistic perspective,* pp. 77-100. Rowley, MA: Newbury House.

Arteaga, D., Herschensohn, J., & Gess, R. (2003). Focusing on phonology to teach morphological form in French. *Modern Language Journal*, 87, 58–70.

Ayoun, D. (2007). The second language acquisition of grammatical gender and agreement". In Dalila Ayoun (ed.), *French Applied Linguistics*, pp. 130–170. John Benjamins.

Barber, H. & Carreiras, M. (2005). Grammatical gender and number agreement in Spanish: an ERP comparison. *Journal of Cognitive Neuroscience*, 17 (1), 137-153.

Bartning, I. (2000) Gender agreement in L2 French: Pre-advanced vs. advanced learners. *Studia linguistica*, 54(2): 225-238.

Bolte, J., & Connine, C. (2004). Grammatical gender in spoken word recognition in German. *Perception & Psychophysics*, 66 (6), 1018-1032

Blom, E., Polisenska, D., & Unsworth, S. 2008. The acquisition of grammatical gender in Dutch. Second Language Research 24: 259-265.

Bruhn de Garavito, J. & White, L. (2002). 'L2 acquisition of Spanish DPs: the status of grammatical features.' In Ana Teresa Pérez-Leroux and Juana M. Liceras (eds.), *The Acquisition of Spanish Morphosyntax: The L1/L2 Connection,* pp. 151-176. Doradrecht: Kluwer.

Brysbaert, M., Grondelaers, S., & Ratinckx, E. (2000). Sentence reading: Do we make use of orthographic cues in homophones? Acta Psychologica, 105, 31-56.

Carrasco, C., & Frenck-Mestre, C. (2007). The impact of morphological and phonological markers on processing morphosyntax in French L2. Event-Related Potentials Evidence Rovereto Workshop on "Bilingual Sentence Processing: Functional and Neural Perspectives", Rovereto, Italy, 20-23 Sept

Carrasco, C. & Frenck-Mestre, C. (2009). Phonology helps in processing grammatical gender: ERP evidence from L1 and L2 French. 22cd Annual CUNY Conference on Human Sentence Processing, Davis, USA, 26-28 march

Carroll, S. (1999). Input and SLA: Adults' Sensitivity to Different Sorts of Cues to French Gender. *Language Learning*, 49, 37-92.

Carroll, S. (1989). Second Language Acquisition and the Computational Paradigm. *Language Learning*, 39, 535-594.

Clahsen, H., & Felser, C. (2006). How native-like is non-native language processing? *Trends in Cognitive Sciences 10*: 564-570.

Clark, E. V. (1985). Acquisition of Romance, with special reference to French. In D. I. Slobin (Ed.), *The crosslinguistic study of language acquisition:* Vol. I. The data (pp. 687–782). Hillsdale, NJ: Erlbaum.

Colé, P., Pynte, J., & Andriamamonjy P. (2003). Effect of grammatical gender on visual word recognition: Evidence from lexical decision and eye movement experiments. Perception & Psychophysics, 65 (3), 407-419.

Colé, P. & Segui J. (1994). Grammatical incongruency and vocabulary types. *Memory & Cognition*, 22, 387-394.

Corbett, G. (1991). *Gender*. Cambridge. Cambridge University Press.

Coulson, S., King, J. W., & Kutas, M. (1998). ERPs and domain specificity, beating a straw horse. Language and Cognitive Processes, 13(6), 653–672.

Dekydtspotter, L., Schwartz, B.D., & Sprouse, R.A. (2006). Proceedings of the 8th Generative Approaches to Second Language Acquisition Conference (GASLA 2006), ed. Mary Grantham O'Brien, Christine Shea, and John Archibald, 33-40. Somerville, MA: Cascadilla Proceedings Project.

Delisle, H.H. (1985). The acquisition of gender by American students of German. *The Modern Language Journal*, 69, 55-63.

Deutsch, A., & Bentin, S. (2001). Syntactic and semantic factors in processing gender agreement in Hebrew: Evidence from ERPs and eye movements. *Journal of Memory and Language,* 45, 200-224

DeWaele, J.M., &Véronique, D. (2001). Gender assignment and gender agreement in advanced French interlanguage: a cross-sectional study. *Bilingualism: Language and Cognition*, 4, 275-97.

Felser, C. and Roberts, L. (2007) Processing *wh*-dependencies in a second language: A cross-modal priming study. *Second Language Research,* 23, 9-36.

Ferreira, F, Ferraro, V., & Bailey, K.G.D. (2002). Good-enough representations in language comprehension. *Current Directions in Psychological Science*, *11*, 11-15.

Ferreira, F., & Patson, N. (2007). The good enough approach to language comprehension. *Language and Linguistics Compass*, *1*, pp 71-83.

Fodor (1959). The origin of grammatical gender. *Lingua*, 8, 1-41 & 186-241.

Foucart, A. (2008). Grammatical gender processing in French as a first and second language. *Unpublished doctoral dissertation*, Université de Provence & University of Edinburgh.

Foucart, A., & Frenck-Mestre, C. (2006). Processing of adjectives in French as first and second language: Evidence from ERPs. CUNY, New York, USA, 23-25 March.

Foucart, A., & Frenck-Mestre, C. (2004). Processing of grammatical gender in French as first and second language: Evidence from ERPs. Architecture and Mechanisms of Language Processing, Aix-en-Provence, France, 16-18 September, p. 127.

Franceschina, F. (2001). Morphological or syntactic deficits in near-native speakers? An assessment of some current proposals. *Second Language Research*, 17 (3), 213-247

Franceschina, F. (2005). *Fossilized second language grammars : The acquisition of grammatical gender*. Amsterdam: J. Benjamins.

Frenck-Mestre, C., Osterhout, L., McLaughlin, J. & Foucart, A. (2008). The effect of phonological realization of inflectional morphology on verbal agreement in French; Evidence from ERPs. *Acta Psychologica*. 128, 528-536.

Frenck-Mestre, C. (2006). Shallow processing? Commentary on Clahsen and Felser. *Applied Psycholinguistics*, 27, 64-65.

Frenck-Mestre, C. (2005a). Eye-movement recording as a tool for studying syntactic processing in a second language: A review of methodologies and experimental findings. *Second Language Research*, 21, 175-198.

Frenck-Mestre, C. (2005b). Ambiguities and anomalies: What can eye-movements and event-related potentials reveal about second language sentence processing? In J.Kroll and A. de Groot (Eds.) *Handbook of Bilingualism*. Elsevier. Amsterdam, pp. 268-284.

Frenck-Mestre, C. (2002). An on-line look at sentence processing in a second language. In R. Herrida and J. Altarriba (Eds.) *Bilingual Sentence Processing*. Elsevier, Amsterdam, pp. 217-236.

Friederici, A.,D., Hahne, A., & Mecklinger, A. (1996). Temporal Structure of Syntactic Parsing : Early and Late Event-Related. Brain Potential Effects Elicited by Syntactic Anomalies. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 22 (5), 1-31.

Frisson, S., & Sandra, D. (2002). Homophonic forms of regularly inflected verbs have their own orthographic representations: A developmental perspective on spelling errors. *Brain and Language*, 81, 545–554.

Gess, R., & Herschensohn, J. (2001). Shifting the DP parameter: a study of anglophone French L2ers. In J. Camps and C. Wiltshire (eds.) *Romance syntax, semantics, and L2 acquisition*. pp. 105-119, Philadelphia/Amsterdam: John Benjamins.

Granfeldt, J. (2005). The development of gender attribution and gender concord in French: A comparison of bilingual first and second language learners. In J.M. Dewaele (Ed.) *Focus on French as a Foreign Language*. Clevedon, U.K.: Multilingual Matters.

Grosjean, F., Dommergues, J.Y., Cornu, E., Guillemon, D., & Besson, C. (1994). The gender-marking effect in spoken word recognition. *Psychophysics*, 590-598.

Guillelmon, D., & Grosjean, F. (2001). The gender marking effect in spoken word recognition: The case of bilingual. *Memory & Cognition*, 29 (3), 503-511.

Gunter, T.C., Friederici, A.D., & Schriefers, H.J. (2000). Syntactic gender and semantic expectancy: ERPs reveal early autonomy and late interaction. *Journal of Cognitive Neuroscience*, 12 (4), 556-568.

Hagoort, P., & Brown, C.M. (1999). Gender electrified: ERP evidence on the syntactic nature of gender processing. *Journal of Psycholinguistic Research*, 28 (6), 715-728.

Hahne, A., Mueller, J., & Clahsen, H. (2006). Morphological processing in a second language: Behavioral and event-related potential evidence for storage and decomposition. *Journal of Cognitive Neuroscience 18*: 121-134.

Harm, M. W., & Seidenberg, M. S. (2004). Computing the Meanings of Words in Reading: Cooperative Division of Labor Between Visual and Phonological Processes. *Psychological Review, 111*, 662-720.

Hartsuiker, R. J., Schriefers, H. J., Bock, J. K., & Kikstra, G. (2003). Morphophonological influences on the construction of subject-verb agreement. *Memory & Cognition*, 31, 1316-1326

Hawkins, R. (2001). *Second language syntax*. Oxford: Blackwell.

Hawkins, R. (2001). The Theoretical Significance of Universal Grammar in Second Language Acquisition. *Second Language Research* 17, 4:345-67.

Hawkins, R. (1998). *Explaining the Difficulty of French Gender Attribution for Speakers of English.* Paper presented at the EUROSLA conference, Paris.

Hawkins, R. & Chan, C. (1997). The partial availability of Universal Grammar in second language acquisition: the 'failed functional features hypothesis'. *Second Language Research*, 13 (3), 187-226.

Hawkins, R. & Franceschina, F. (2004). 'Explaining the acquisition and non-acquisition of determiner-noun gender concord in French and Spanish' in Prevost, P. & J. Paradis (eds) *The acquisition of French in different contexts. Focus on functional categories*. pp. 175-207, Philadelphia/Amsterdam: John Benjamins.

Herschensohn, J. (2007). *Language development and age*. Cambridge: Cambridge UP.

Herschensohn, J. (2006). Français langue seconde: from functional categories to functionalist variation. *Second Language Research,* 22, 95–113

Herschensohn, J. (2000). The second time around: Minimalism and L2 acquisition. Philadelphia/Amsterdam: John Benjamins.

Herschensohn, J. (1993). Applying linguistics to teach morphology: Verb and adjective inflection in French. *International Review of Applied Linguistics*, 30, 97-112.

Holmes, V.M. & Dejean De La Battie, B. (1999). Assignment of grammatical gender by native speakers and foreign learners of French. *Applied Psycholinguistics*, 20, 479-506.

Hopp, H. (2007). Ultimate attainment at the interfaces in second language acquisition: grammar and processing. *Unpublished Doctoral Thesis*, University of Groningen.

Jakubowicz, C. & Faussart, C. (1998). Gender Agreement in the Processing of Spoken French. *Journal of Psycholinguistic Research*, 27 (6), 597-617.

Largy, P., & Fayol, M. (2001). Oral cues improve subject–verb agreement in written French. *International Journal of Psychology*, 36, 121–131.

Love, T., Maas, E. & Swinney, D. (2003) The influence of language exposure on lexical and syntactic language processing. *Experimental Psychology* 50, 204-216.

Lenneberg, E. 1967. *The biological foundations of language*. New York: Wiley.

McDonald, J.L. 2006. Beyond the critical period: Processing-based explanations for poor grammaticality judgment performance by late second language learners. *Journal of Memory and Language* 55: 381-401.

Mueller, J. L. (2005). Electrophysiological correlates of second language processing. Second Language Research, 21, 152–174.

Muller, N. (1990). Gender and number agreement within DP. In J.M. Meisel (Ed.), *Bilingual first language acquisition: French and German grammar development,* pp. 53-88. Amsterdam: Benjamins.

Myles, F. (1995). Interaction between linguistic theory and language processing in SLA. *Second Language Research*, 11(3), 235-266.

Negro, I., & Chanquoy, L. (2000). Subject–verb agreement with present and imperfect tenses: A developmental study from 2nd to 7th grade. *European Journal of Psychology of Education*, 15, 113–134.

Oliphant, K. (1998). Acquisition of Grammatical Gender in Italian as a Foreign Language. *Canadian Modern Language Review*, 54 (2), 239-262.

Osterhout, L., & Hagoort, P. (1999). A superficial resemblance does not necessarily mean you are part of the family: Counter-arguments to Coulson, King, and Kutas (1998) in the P600/SPS-P300 debate. *Language and Cognitive Processes*, 14, 1–14.

Osterhout, L., & Holcomb, P. J. (1992). Event-related brain potentials by syntactic anomaly. *Journal of Memory and Language*, 31, 785–806.

Osterhout, L., McLaughlin, J., Kim, A., & K. Inoue (2004). Sentences in the brain: Event-related potentials as real-time reflections of sentence comprehension and language learning. In M. Carreiras & C. Clifton, Jr. (eds.), *The on-line study of sentence comprehension: Eyetracking, ERP, and beyond*. Psychology Press.

Osterhout, L., McLaughlin, J., Pitkanen, I., Frenck-Mestre, C., & Molinaro, N. (2006). Novice learners, longitudinal designs, and event-related potentials: A paradigm for exploring the neurocognition of second-language processing. *Language Learning*. 56, 199-230.

Osterhout, L. & Mobley, L. A. (1995). Event-Related Brain Potentials Elicited by Failure to Agree. *Journal of Memory and Language*, 42, 739-773

Perez-Pereira, M. (1991). The acquisition of gender: What Spanish children tell us. *Journal of Child Language*, 18, 571-590.

Sabourin, L., & Haverkort, M. (2003). Neural substrates of representation and processing of second language. In Hout, Roeland van, Aafke Hulk, Folkert Kuiken and Richard J. Towell (eds.) *The lexicon–syntax interface in second language acquisition*, pp.175–195.

Sabourin, L., & Stowe, L A. (2008) Second language processing: When are L1 and L2 processed similarly. *Second Language Research*. 24(3), 397-430.

Sabourin, L., Stowe, L.A., & de Haan, G.J. (2006). Transfer effects in learning a second language grammatical gender system. *Second Language Research*, 22, 1-29.

Sandra, D., Frisson, S., & Daems, F. (1999). Why simple verb forms can be so difficult to spell: The influence of homophone frequency and distance in Dutch. *Brain and Language*, 68, 277–283.

Schwartz, B.D., & Sprouse, R.A.(1994). Word order and Nominative Case in nonnative language acquisition: A longitudinal study of (L1 Turkish) German Interlanguage. In T. Hoekstra & B.D. Schwartz, eds., *Language Acquisition Studies in Generative Grammar*. pp. 317-68. Amsterdam: John Benjamins.

Schwartz, B.D. & Sprouse, R. (1996). L2 cognitive states and the full transfer/ full access model. *Second Language Research* 12, 40–72.

Schiller, N.O., Münte, T.F., Horemans, I., & Jansma, B.M. (2003). The influence of semantic and phonological factors on syntactic decisions: An event-related brain potential study. *Psychophysiology*, 869-877.

Spinelli, E., Meunier, F., & Seigneuric, A. (2006). "Does gender information influence early phases of spoken word recognition?" *The Mental Lexicon*, 1, 277-297.

Streb, J., Rösler, F., & Henninghausen, E. (1999). Event-Related Responses to Pronoun and Proper Name Anaphors in Parallel and Nonparallel Discourse Structures. *Brain and Language*, 70, 273–286.

Streb, J., Henninghausen, E., & Rosler, F. (2004). Different Anaphoric Expressions are Investigated by Event-Related Brain Potentials. *Journal of Psycholinguistic Research*, 33, 175-201.

Taft, M., & Meunier, F. (1998). Lexical Representation of Gender: A Quasiregular Domain. *Journal of Psycholinguistic Research*, 27 (1), 23-45.

Tockowitz, N., & MacWhinney, B. (2005). Implicit and explicit measures of sensitivity to violations in second language grammar: An event related potential investigation. *Studies in Second Language Acquisition*, 2, 173–204.

Tucker, G.R., Lambert, W.E., & Rigault, A. (1977). *The French speaker's skill with grammatical gender: An example of rule-governed behavior*. The Hague: Mouton.

Van Berkum, J.J.A., Hagoort, P., & Brown, C.M. (1999). Semantic integration in sentences and discourse: Evidence from the N400. *Journal of Cognitive Neuroscience*, 11(6), 657-671.

Vainikka, A., & Young-Scholten, M. (1998). Morphosyntactic triggers in adult SLA. In M-L. Beck (ed.) *Morphology and its interfaces in second language knowledge*, pp. 89-113. Amsterdam: J. Benjamins.

Weber-Fox, C. M., & Neville, H. J. (1996). Maturational constraints on functional specializations for language processing: ERP and behavioral evidence in bilingual speakers. *Journal of Cognitive Neuroscience,* 8, 231-256.

White, L. (1989). *Universal grammar and second language acquisition*. Amsterdam: John Benjamins.

White, L. (2002). Gender and number in L2 Spanish: more evidence against failed features. Presented at the Second Language Research Forum (SLRF), Toronto, Oct. 2002.

White, L., Valenzuela, E., Kozlowska-Macregor, M. & Leung, Y.I. (2004). Gender and number agreement in non-native Spanish. *Applied Psycholinguistics*, 25, 105-133.

END NOTES

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[i] In French, singular definite determiners are not specified for gender when the noun has an initial vowel due to the process of elision. Moreover, differences in gender agreement arise between French and Spanish when the plural is considered, for which Spanish specifies gender in the definite determiner but French does not.

[ii] It can be noted that in connectionist models, this is assumed to be the process by which all learners, native or L2, acquire grammatical gender (Mirkovic et al., 2005).

[iii] It is important to note that selection of the relative pronoun in Dutch is controlled by both the number and gender of the head noun; as such, the construction tested by Sabourin et al. may not be the best to test for acquisition of gender concord as it confounds the two features.

[iv] Note, however, that none of the groups were at ceiling level on the grammatical agreement task and, moreover, for lower frequency nouns all L2 groups demonstrated better performance for common gender, which selects for the relative pronoun "die" than for neuter gender, which selects for the relative pronoun "dat". This pattern may be explained in part by the differential frequency of the two relative pronouns; "die" will occur on average more often than "dat", first, because two-thirds of the Dutch lexicon falls into the category of common gender, and second, because "die" is also selected for all plural heads, independent of gender (hence correct selection of the relative pronoun tests for acquisition of both number and gender concord). As such, all of the L2 groups may have initially adopted a default "die" selection for relative pronouns, this strategy having not been abandoned by the native English speakers.

[v] The results for the group of German learners of Dutch was also reported in an earlier study, by Sabourin and Haverkort (2003), in which processing of gender for relative pronouns was also examined.

[vi] While the authors advanced various hypotheses to account for the reported negativity they found in the Romance speakers and native Dutch speakers, it is undoubtedly wise to exercise caution before making any strong claims as this effect was both very limited in distribution and hitherto undocumented. Further work is necessary to elucidate the nature of this effect.

[vii] Last, it should be noted that the German and Romance L1 groups differed in size, there being only 8 L1 Romance L2 Dutch learners as opposed to 14 L1 German participants. Given the large amount of variability in grammatical competence that is known to exist in adult L2 populations and the sensitivity of ERPs to this

variability, it is difficult to make any strong conclusions based on such comparisons.Moreover, while the Romance group did show ERP effects for verbal agreement, they were also more accurate on offline measures for verbal than nominal agreement.

[viii] It should be noted that agreement was in fact examined between the indefinite determiner and adjective.