Second Language Research

Processing tense/aspect-agreement violations on-line in the second language: A self-paced reading study with French and German L2 learners of English

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Abstract
In this article, we report the results of a self-paced reading experiment designed to investigate the question of whether or not advanced French and German learners of English as a second language (L2) are sensitive to tense/aspect mismatches between a fronted temporal adverbial and the inflected verb that follows (e.g. *Last week, James has gone swimming every day*) in their on-line comprehension. The L2 learners were equally able to distinguish correctly the past simple from the present perfect as measured by a traditional cloze test production task. They were also both able to assess the mismatch items as less acceptable than the match items in an off-line judgment task. Using a self-paced reading task, we investigated whether they could access this knowledge during real-time processing. Despite performing similarly in the explicit tasks, the two learner groups processed the experimental items differently from each other in real time. On-line, only the French L2 learners were sensitive to the mismatch conditions in both the past simple and the present perfect contexts, whereas the German L2 learners did not show a processing cost at all for either mismatch type. We suggest that the performance differences between the L2 groups can be explained by influences from the learners' first language (L1): namely, only those whose L1 has grammaticized aspect (French) were sensitive to the tense/aspect violations on-line, and thus could be argued to have implicit knowledge of English tense/aspect distinctions.

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I Introduction

In the field of second language (L2) acquisition research, the acquisition of tense and aspect has long been a topic of intensive investigation (for overviews, see for example Bardovi-Harlig, 2000; Slabakova, 2002). This is unsurprising given that temporal expression is fundamental to communication, yet its formal and functional marking varies dramatically from language to language. The acquisition of tense and aspect is therefore a core task for all language learners. From earlier research, in particular data from corpus studies and acceptability judgment tasks, we know much about learners' production of tense/aspect distinctions and of tense/aspect morphology in development both at early and more advanced stages of L2 acquisition, and more recently about how L2 learners interpret target language tense/aspect distinctions in general. However, little is known about the nature of learners' knowledge of the grammatical marking of tense and aspect once it is observed off-line. In other words, it is unclear whether the knowledge that learners display can be applied automatically in real-time comprehension. This is a topic that can be conceptualized in terms of the debate in the field on the nature of 'implicit' versus 'explicit' knowledge (e.g. R. Ellis, 2005), and is an important issue because language acquisition is a complex task that requires both the acquisition of knowledge as well as the ability to put this knowledge to use in real time. Focusing on the latter, in this article we investigate whether French and German L2 learners of English are sensitive to mismatches in agreement between fronted temporal adverbials (e.g. *Initially/Since last week*) and the tense/aspect of immediately following verbs (*ate/has eaten*) as shown in (1), in their on-line comprehension of the target language.

(1)   a.   Initially, the cat ate/*has eaten only fish.
      b.   Since last week, the cat *ate/has eaten only fish.

Both French and German have a compound past (the *passé composé*/the *Perfekt*)[1] which is similar in surface form to the present perfect in English (*have* + past participle). However, both French and German contrast with English in that the English present perfect cannot be used with an adverbial specifying definite past time (e.g. *Yesterday I have danced all night*; cf. 'the present perfect puzzle', Klein, 1992). On the other hand, French and English pattern together and both differently from German in that aspect is grammaticized in the former, but not in the latter language, a difference that may impact L2 processing (Papadopoulou et al., 2008). In the current study, we investigate the potential role of the learners' first language in their ability to put their (explicit) knowledge of English tense and aspect – as measured by traditional off-line production tasks – to use in on-line comprehension.

Before reporting the details of the current experiment and the results, we consider what is meant by implicit and explicit knowledge. We then briefly present an overview on the cross-linguistic expression of tense/aspect, summarize findings on the study of the acquisition of tense/aspect in the L2 with particular reference to first language (L1) influences, and present a brief review of the processing of tense/aspect in real-time comprehension.

1 Implicit and explicit knowledge

The distinction between implicit and explicit knowledge refers to whether or not that knowledge is intuitive and available for automatic processing (implicit), or consciously available through effortful, controlled processing (explicit) (e.g. R. Ellis et al., 2006; Hulstijn, 2005). According to Tokowicz and MacWhinney (2005: 178) types of explicit knowledge include similarities between the L1–L2 pairings, and explicit grammar rules, which can be exploited by L2 learners when making linguistic judgements. As such, experimental tasks such as off-line grammaticality judgment tasks (GJTs) are typically considered conducive to testing and measuring this type of knowledge (e.g. R. Ellis, 2005; Tokowicz and MacWhinney, 2005). On the other hand, as learners cannot consciously tap into their implicit knowledge, on-line tasks such as real-time spontaneous oral production tasks (e.g. R. Ellis, 2005) and event-related potential (ERP) responses in sentence comprehension tasks (e.g. Tokowicz and MacWhinney, 2005) are considered appropriate for measuring implicit knowledge (e.g. R. Ellis, 2005). In this spirit, we test explicit knowledge using an untimed GJT and implicit knowledge using a self-paced reading task in an attempt to give a better understanding of how learners use their knowledge in on-and off-line comprehension.

2 Temporal adverbs and temporal verbal morphology

According to (Klein, 1994)[2] past, present and future tense is established by the temporal relation between the topic time (TT) and the time of the utterance (TU), and this abstract temporal relation may or may not be grammatically marked, for instance by verbal morphology. Klein distinguishes the topic time from the situation time (TSit): both are time spans, but the former relates to the time (past, present, future) for which an assertion is made (e.g. I *had* danced – past time – before TU), and the latter, which is associated with the non-finite part of the utterance, refers to the time span at which the situation occurs. Aspect in this system is established by the relationship between the topic time and the situation time, creating temporal relations such as BEFORE, AFTER, (partly) SIMULTANEOUS (in 'I had danced', the TT is AFTER the time of the situation (TSit) *dance*).

Lexical devices such as temporal adverbs can also mark such temporal relations. Temporal adverbs can specify the internal and the external properties of a time span, and also, as shown in (2) below they can modify either the TT (yesterday) or the TSit (all night), depending on their position in a sentence.

(2)   Yesterday, I slept all night.

Languages differ in how these temporal relations are established, ranging from languages with mandatory marking of tense and aspect, to those with no such marking but a full repertoire of temporal adverbials. For instance, and relevant to the current study, in German, French, and English, tense is mandatorily marked grammatically. For example, (3a–c) below demonstrate the present simple in English, French and German. In terms of preterit meaning in English it is realized by the past simple (3d). French also has a past

simple (3e), but it should be noted that is usually only used in written French or in very formal spoken contexts (Hawkins and Towell, 2001) otherwise the compound past is used for preterit meaning in written and spoken French (3g). German also has past simple tense (3f). However, in many varieties of German, the compound past form (3h) has become either a past simple allomorph or the only past tense form (Comrie, 1976/1998). Similar to French, in dialects where the past simple is used, it is mainly used as a formal, narrative tense.

(3) a. English: Maria sleeps.   present
     b. French: Maria dort.   present
     c. German: Maria schläft.   present
     d. English: Maria slept.   simple past
     e. French: Maria dormit.   simple past
     f. German: Maria schlief.   simple past
     g. French: Maria a dormi.   compound past
     h. German: Maria hat geschlafen.   compound past

Turning now to aspect, it is marked grammatically in English. First, progressive aspect, realized by (*be* + v-*ing*), distinguishes it from habitual/generic (present) and completed (past) interpretations associated with the simple forms (4a). Second, English clearly instantiates the perfect/non-perfect aspectual distinction realized by two distinct surface forms: the present perfect and past simple respectively (4b).

(4) a. English: Maria is/was sleeping.   progressive
                     Maria sleeps/slept.   non-progressive
     b. English: Maria has slept.   perfect
                     Mary slept.   non-perfect

In contrast to the 'finished time' interpretation associated with the past simple, the core meaning of the present perfect is an 'unfinished time' reference, usually denoting a past event with current relevance. It should be noted, however, that although these two meanings are encoded in English, their distributional properties show variation (e.g. Comrie, 1976/1998), with a wider distribution, for example, in British English (BE) compared to North American English (NAE). Thus, 'Did you see it, yet?' is appropriate in North American English but British English generally requires the present perfect 'Have you seen it, yet?'

French also marks aspect, albeit differently to English. First, it encodes imperfectivity realized by the imperfect in contrast to perfectivity realized by past forms (5a).

(5) a. French: Maria dormait. ('Maria was sleeping')   imperfective
                    Maria dormit/a dormi. ('Maria slept')   perfective
     b. French: Maria a dormi. ('Maria has slept')   perfect
                    — ('Maria slept')   non-perfect

Second, although French encodes perfect aspect realized by (aux + V-*en*), as we have seen above, this form also encodes non-perfect meaning, i.e. preterit meaning (5b). In other words, the compound past form encodes both the simple past and present perfect

meaning (Comrie, 1976/1998) expressing both a finished and an unfinished time (Hawkins and Towell, 2001). This leads to the licensing of adverbs that collocate with definite past time reference, which is ungrammatical in English (6).

(6) a. English: * Yesterday Maria has slept.
     b. French: Hier Maria a dormi.

German is 'a language which lacks any overt morphemes to mark aspect' (Schilder, 1997: 28), i.e. it encodes neither the perfective/imperfective distinction nor the progressive/non-progressive distinction grammatically (although lexical marking of such distinctions is of course available). Regarding perfect aspect, as noted above, the compound past in many dialects of German encodes preterit meaning (7a) and having encroached on the semantic space of the preterit, it no longer encodes perfect meaning.[3] Perfect meaning is nevertheless achieved periphrastically with the use of non-definite time adverbials, such as *schon* ('already') or *gerade* ('just') (7b) or perfect meaning is assigned via context.

(7) a. German: Maria hat geschlafen. ('Maria slept')   preterit
     b. German: Maria hat *schon* geschlafen. ('Maria has *already* slept')   perfect

To sum up the cross-linguistic similarities and differences in the area of tense marking in English, French and German, all three languages distinguish [+/−past] for tense. With regards to aspect, English and French, but not German, also encode aspectual features. Despite this similarity between English and French in the grammatical marking of aspect, the two languages in fact differ. English distinguishes between non-progressive and progressive meaning, i.e. it encodes Asp[+/−prog] whereas French marks the perfective/imperfective distinction, i.e. Asp[+/−perfective]. For present perfect meaning, English encodes T[−past] and Asp[+perfect]. Furthermore, preterit and perfect meaning are distinctly realized by two forms underlying the two meanings. French, on the other hand, has one form underlying the two meanings: the compound past encodes T[+past] for preterit meaning and T[−past] and Asp[+perfect] for present perfect meaning. Finally, in many varieties of German, the compound past encodes T[+past] for preterit meaning only.

3 Acquisition of tense/aspect in the L2

The L2 acquisition of tense/aspect has been investigated from both functional and formal perspectives. Researchers working within the functional tradition have been interested in how learners establish temporal relations rather than in their ability to acquire the formal morphological marking of tense/aspect (e.g. Dietrich et al., 1995; Giacalone Ramat, 1992; Klein and Perdue, 1992; Skiba and Dittmar, 1992; Starren, 2001). Furthermore, most of the research has investigated learners at an early stage of development, and very often before tense/aspect is consistently marked morphologically (Kihlstedt, 2002). Functional studies have also tended to rely on learners' production, and there has been less interest in learners' comprehension of tense/aspect morphology. Tapping into learners' understanding is important given that it has been

noted that they may yet have to acquire the underlying semantics of tense/aspect morphology even though they are able to produce morphologically-marked 'target-like' utterances.

Research from a formal perspective has centred on learners' knowledge and use of verbal inflectional morphology (together with other agreement phenomena), in particular in the context of discussions on the presence/absence and development of functional categories and features in learners' underlying grammars. Studies have shown that learners from certain L1 backgrounds have difficulties with using particular target-like forms consistently, even at high levels of L2 proficiency. For example, L1 speakers of Chinese, show persistent optionality in their use of L2 English past simple (e.g. Hawkins and Liszka, 2003; Lardiere, 1998a, 1998b, 2000). Such selective differences help to inform debates on whether Universal Grammar is fully available to older L2 learners (e.g. Lardiere, 1998a, 1998b, 2000; Prévost and White, 2000; Schwartz and Sprouse, 1996; Vainikka and Young-Scholten, 1996a) or whether it is only partially available (e.g. Hawkins and Chan, 1997; Hawkins and Liszka, 2003; Hawkins et al., 2008; Tsimpli, 2003; Tsimpli and Dimitrakopoulou, 2007). In turn, this contributes to the discussion on how much, if any, the L1 influences the acquisition of abstract underlying grammatical properties at the level of parametric variation between the L1 and L2. Hawkins and Liszka (2003), for example, suggest that the persistent optionality shown in Chinese L2 English in using the past simple results from the absence of T[+/−past] in the L1. Furthermore, this representational deficit is permanently fixed for post-childhood learners, contrasting with learners whose L1 specifies T[+/−past], such as German. For these learners, native-like attainment is predicted as any feature associated with a functional category that is instantiated in the L1 is available in the L2.

Turning to the present perfect, Liszka (2004, 2005) tested L1 Chinese, German and Japanese speakers of advanced L2 English on the acquisition of the (British) English present perfect, using a form-interpretation task. The results showed that the German learners produced the present perfect 58% of the time in present perfect contexts, similar to 56% for the Japanese and 47% for the Chinese. However, what is particularly striking in this study is the distribution of non-present perfect forms used in present perfect contexts. The Japanese alternated mainly between past simple use (55%) and present use (38%), with the remaining 7% made up of other forms. There was also an alternation between past simple (54%) and present (46%) shown by the Chinese. However, the Germans showed a strong preference for past simple use (81%), compared with present simple use (14.5%) and the use of other forms (4.5%). Pertinent to this study, Liszka suggests that the results for the German group reflects a representational deficit, i.e. these German speakers lack the feature Asp[+/−perfect] and do not establish current reference time via grammatical means, accounting for the 81% use of past simple.

Irrespective of the theoretical framework one adopts, the results of earlier L2 acquisition (e.g. Liszka, 2005) make predictions for the learner groups in the current study, directly attributable to an L1 influence. The German group may not show a processing cost for the present perfect mismatch items as German does not specify Asp[+/−perfect], but they may show a cost for the past simple mismatches as it specifies T[+/−past]. In contrast, the French group might find it more difficult to process the mismatch

conditions, for both past simple and present perfect, as French specifies both T[+/−past] and Asp[+/−perfect].

Crucially, what has yet to be explored in the area of the acquisition of tense/aspect is whether, once learners are able to display explicit knowledge of the correct tense/aspect morphology, they can also put to use their knowledge of tense/aspect distinctions automatically in real-time comprehension, and whether or not the learners' L1 influences this process. That is, whether they show implicit knowledge of such distinctions and/or whether this is dependent on the presence/absence of such distinctions in their L1. By looking at the sensitivity of German and French L2 learners of English to tense/aspect agreement violations in their on-line processing, we investigate this issue in the current study.

4   Comprehending temporal relations on-line

One way to investigate learners' implicit grammatical knowledge is to use methods that can tap into comprehenders' moment-by-moment processing of sentences, while they are reading the input for comprehension (for an overview of L2 processing, see Roberts, 2012). There has been some (monolingual, mainly in English) research into the real-time comprehension of temporal markers showing that in sentences like (8) the processor interprets the tensed clause (*went/has gone ...*) in the context of the fronted temporal adverb. That is, the fronted adverbial creates its own domain of interpretation, and this has been shown in studies that find that readers disregard earlier context, instead taking the reference time as set by the adverbial in their comprehension of any tensed clause that follows it (Bestgen and Vonk, 1995, 2000; Dickey, 2001; Trueswell and Tanenhaus, 1991, 1992). These findings fit with the view that the fronted temporal adverbial functions as a topic (Chafe, 1984; Partee, 1984; Reinhart, 1983; Virtanen, 1992) and, as such, creates a new discourse segment.[4]

> (8)   a.   Last week, James went/*has gone swimming every day.
>   b.   Since the summer, James has gone/*went swimming every day

Of interest to the current experiment with L2 learners is how the processor handles mismatches between a fronted temporal adverb and a morphological marker of tense/aspect, and there are very few studies that have focused on the consequences of processing temporal or tense/aspect violations on-line. One such (monolingual) study is by Steinhauer and Ullman (2002), who investigated the processing of sentences like (9) below by English native speakers with experimental sentences very similar to those we use in the current study. The readers' processing of correct sentences (9a) was compared to their processing of items with a temporal mismatch between the adverbial and the following verb (9b) while their brain (event-related potential, ERP) responses were measured:

> (9)   a.   Yesterday, I sailed Diane's boat to Boston.
>   b.   * Yesterday, I sail Diane's boat to Boston.

The tense violations, which were interpreted by the authors as morphological violations, elicited a left-anterior negativity (LAN) in the 400–500 ms time window following verb onset, and a positive-going wave form at starting at approximately 600 ms (a so-called P600 effect). Similar results were found in another study, which investigated such temporal violations using electronencephalography (EEG) by Baggio (2008), whose Dutch native speakers read similar sentences to those in Steinhauer and Ullman. The sentences contain. The sentences tense violations (10b) which were caused by the mismatch between the semantics of the fronted temporal adverb *Afgelopen zondag* ('Last Sunday'), in this case referring to past time, and the present tense semantic feature as expressed by the morphological marking on the verb *lakt* ('paints') (10a).

(10) a. Afgelopen zondag lakte Vincent de kozijnen van zijn landhuis.
           Last Sunday Vincent painted the window frames of his country house.
      b. * Afgelopen zondag lakt Vincent de kozijnen van zijn landhuis.
           * Last Sunday Vincent paints the window frames of his country house.

The violations elicited a left anterior negativity between 200 and 400 ms following the onset of the critical verb (*lakt*), which was followed by a P600 at about 700 ms in comparison to conditions where there was no such temporal mismatch (*Afgelopen Zondag – lakte*) (6a). Unlike Steinhauer and Ullman, Baggio interprets these effects as being caused by a semantic rather than a morphosyntactic violation, even though LAN effects are rarely reported for semantic violations. Whether the system perceives the anomaly as semantic or morphological (even if semantic in origin), these findings show that at least native speakers are sensitive to such temporal mismatches in on-line sentence comprehension.

II   The current study

In the current study we investigate the knowledge of the English past simple and present perfect by advanced French and German L2 learners; specifically, we ask whether the learners are able to access and apply this knowledge in the on-line processing of English sentences with tense–aspect violations. The underlying assumption is that if the learners have fully acquired the semantics underlying the morphological marking of tense and aspect, then they should be sensitive to the mismatch between a fronted temporal adverbial and the tensed clause that follows in both off- and on-line comprehension.

III   Method

1   *Participants*

Twenty German (mean age: 23.5; 19–28) and 20 French (mean age: 39.4; 20–66) L2 learners of English participated in the experiment, together with a control group of 20 native (British) English speakers (mean age: 35; 21–58). The 20 German speakers were taken from a pool of 32, and the 20 French speakers from a pool of 24. These participants were selected on the basis of their ability to distinguish the past simple from the present

perfect in an off-line cloze test. In this task, the learners were asked to read 10 sets of 6 sentences in which the verb was missing, and then to choose the correct verb from a set of infinitival forms, inserting it in its correct morphological form (see the examples in Appendix 1). Twenty French and 20 German L2 learners who all scored above 60% on the task were selected. Although the cut-off point was somewhat arbitrary, the accuracy for both groups was above chance. Critically, the resulting groups were highly matched, and their mean scores on this task did not differ from each other (German mean = 76.14%, SD: 10.9; French mean = 75.85%, SD: 9.6; t (38) = .088; p = .930).

All of the French learners and the majority of the German learners were studying English at university in their home country.[5] The groups were matched for English proficiency as determined by their accuracy scores on the grammar part[6] of the Oxford Placement Test (Allan, 1994): French 85.6% (SD = 6) and Germans 83.7% (SD = 9); mean scores which were not significantly different (t (38) = .808 > p = .4). According to this test, both groups can be classed as 'advanced' L2 learners of English.

2   Materials

Twenty-four past simple (11) and 24 present perfect (12) experimental items were created (for the full set, see Appendix 2).[7] All experimental items comprised two sentences. The first was the critical sentence and it contained a temporal adverbial (a prepositional phrase or adverbial expression) in the topic position, thus modifying the time being talked about (the Topic Time, TT; see Klein, 1994). The experimental manipulation (the tense/aspect violation) was created by having the immediately following verb either match in temporal features with the adverb (11a, 12a) or not (11b, 12b).

(11)   Past simple: match
   a.   Last week, James went swimming every day. Now he's getting bored of it.
          Past simple: mismatch
   b.   * Since last week, James went swimming every day. Now he's getting bored of it.

(12)   Present perfect: match
   a.   Since last week, James has gone swimming every day. Now he's getting bored of it.
          Present perfect: mismatch
   b.   * Last year, James has gone swimming every day. Now he's getting bored of it.

3   Tasks and procedure

For the main experiment, two tasks were undertaken: an off-line acceptability judgment task measuring explicit knowledge and a self-paced reading experiment to tap into implicit knowledge. Identical materials, including the items containing tense/aspect violations, were used in both tasks. Twenty-four experimental items were pseudo-randomized and set within 60 fillers of different types. Participants were randomly assigned to one of four experimental lists, such that each participant saw one experimental item, but only in one condition.

In the acceptability judgment task, participants were asked to read each sentence and then to assess its acceptability on a scale from 1 (least acceptable) to 6 (most acceptable).

They were instructed to use any criteria they chose in making their assessment. In the self-paced reading task, the participants sat in front of a laptop computer, approximately 600 mm from the screen. Each session began with a cross in the centre of the screen. The sentences were presented word by word. The participant used a push-button box to bring up the first word of the sentence, and then continued to push the button on the box to bring up each subsequent segment, which replaced the former in the centre of the screen. The final segment was indicated by a full stop. All of the experimental items and half of the fillers were followed by a yes/no comprehension question, requiring equal numbers of 'yes' and 'no' responses (e.g. 'Last week/Since the summer, James went/has gone swimming every day. Now he's getting bored of it. *Is James bored of swimming?*'). Participants pressed the right key to indicate a 'yes' and the left key a 'no' response, which corresponded to a visual prompt on the screen (a cross on the left side and a tick on the right side of the screen). The comprehension questions were included in the experiment to ensure as far as possible that the participants were paying attention, and the questions never targeted the experimental manipulation itself.[8] Accuracy was high for all groups (Germans 97%; SD: 16; French 96%; SD: 21; English 93%; SD: 23), and reading time analyses were performed only on those items which the participants had answered correctly. The experiment was run and the reading and response times were recorded by the software package NESU (Baumann et al., 1993).

   The participants were each seen in a dedicated quiet room. Each session began with the self-paced reading experiment, followed by the acceptability judgment task (although below, the results from the judgment task will be reported first, for ease of exposition). The L2 learners were also required to complete the cloze production task and the English proficiency test (The Oxford Placement Test; Allan, 1992). Finally, the learners filled out a language background questionnaire to elicit biographical information. The participants were able to rest as long as they wished between and within tasks and so the session in total took between 1.5–2 hours. The German L2 learners were paid a small fee for their participation, and the French learners received teaching feedback on their performance on the cloze production task by one of the experimenters. This feedback was provided at least three weeks after the participants had fully completed the study.

4   Results

For all analyses, an ANOVA was run on the data, with the within-participants factor Type (match/mismatch) and the between-participants factor Group with 3 levels (native English speakers/German L2 learners/French L2 learners). This factor was treated as a within-participants factor in the items analyses. Although the past simple and the present perfect items were mixed together in the experimental lists, we report the results below separately for each because the critical regions differ by one word between the past simple and the present perfect, as the latter comprises an auxiliary plus past participle.

5   Acceptability judgment task

Table 1 shows the three groups' mean responses on the acceptability judgment task for the past simple items. As can be seen, the English were more conservative in their

Table 1. Acceptability judgments: past simple (SD is given in parentheses).

	Match	Mismatch
English native speakers	4.27 (1.0)	3.24 (1.3)
French L2 learners	5.10 (0.7)	3.49 (1.2)
German L2 learners	4.98 (0.9)	3.82 (1.2)

Table 2. Acceptability judgments: present perfect (SD is given in parentheses).

	Match	Mismatch
English native speakers	4.57 (1.1)	2.53 (1.5)
French L2 learners	4.80 (0.8)	3.08 (1.3)
German L2 learners	4.79 (0.9)	3.90 (1.2)

judgments overall, but irrespective of this, all groups found the match conditions more acceptable than the mismatch conditions. This finding was confirmed in the analysis, which found a main effect of Type (F_1 (1, 57) = 61.17; $p < 0.001$; $\eta^2 = .52$; F_2 (1, 23) = 44.27; $p < 0.001$; $\eta^2 = .66$), and a main effect of Group (F_1 (2, 57) = 4.14; $p < 0.05$; $\eta^2 = .13$; F_2 (2, 46) = 15.68; $p < 0.01$; $\eta^2 = .66$). Post-hoc Tukey HSD test found no significant differences between the groups ($ps > .07$).

Table 2 shows the mean acceptability judgment responses for the present perfect items. Like in the past simple responses, all groups found the match condition significantly more acceptable than the mismatch condition, reflected in the analysis which found a significant main effect of Type (F$_1$ (1, 57) = 99.73; $p < 0.001$; $\eta^2 = .64$; F$_2$ (1, 23) = 76.14; $p < 0.001$; $\eta^2 = .77$). Again, the English judged the items as less acceptable overall, as indicated by the main effect of Group, significant by items (F_1 (2, 57) = 3.03; $p = 0.056$; $\eta^2 = .10$; F_2 (2, 46) = 12.43; $p < 0.01$; $\eta^2 = .35$). However, unlike for the past simple items, there was also an interaction between Type and Group, significant by participants (F_1 (2, 57) = 5.51; $p < 0.01$; $\eta^2 = .16$; F_2 (2, 46) = 3.61; $p = 0.056$). This appeared to have been caused by the fact that mismatch condition was judged as far less acceptable by the native speakers (2.53) than either the German L2 learners (3.9) or the French L2 learners (3.10). However, post-hoc Tukey HSD tests to compare the means between the three groups found that the only significant difference was between the German and English scores ($p = .044$). Despite this between-group difference, planned *t*-test comparisons (run to compare the match versus mismatch conditions per group) found that the match condition was judged as significantly more acceptable than the mismatch condition for all three groups (English *t1* (19) = 7.66; $p < 0.001$; *t2* (23) = 3.79; $p < 0.01$; German *t1* (19) = 4.25; $p < 0.01$; *t2* (23) = 2.30; $p < 0.0$; French *t1* (19) = 5.48; $p < 0.001$; *t2* (23) = 8.37; $p < 0.001$). There were no differences between the groups' responses for the match conditions ($p > .2$).

In sum, the L2 learners and the native speakers found the mismatch conditions significantly less acceptable than the match conditions for both the past simple and the present perfect items.

Table 3. Mean RTs in milliseconds (SD is given in parentheses) to past simple items across the 4 critical segments.

		verb	verb+1	verb+2	verb+3
English native speakers	match	426 (126)	389 (115)	455 (187)	482 (196)
	mismatch	424 (119)	408 (115)	477 (177)	480 (150)
French L2 learners	match	592 (211)	525 (159)	550 (212)	732 (305)
	mismatch	598 (202)	549 (468)	674 (256)	691 (277)
German L2 learners	match	467 (201)	460 (171)	523 (295)	465 (131)
	mismatch	479 (242)	473 (188)	507 (230)	539 (292)

The L2 learners appeared to have metalinguistic or explicit knowledge of the English past simple and present perfect, in particular as measured by this acceptability judgment task. We then ask whether this knowledge would be available implicitly, in the learners' on-line processing of tense/aspect violations and report the results of the self-paced reading experiment below.

6   Self-paced reading task

Before analyses were run on the reading time data, to remove outlying data points, responses that fell 2 standard deviations away from an individual's mean were removed per segment that was analysed, affecting 1.22% of the English, 0.92% of the French and 1.23% of the German data.

a   Past simple items. Given that the match or the mismatch manipulation came into effect on the tensed clause, for the past simple items analyses were run on the segment in which the inflected verb was presented, as well as the three following segments (verb+1, verb+2, verb+3) to catch any spillover effects (see other reading time studies with L2 learners, e.g. Hopp, 2006; Marinis et al., 2005; Roberts, 2003). The mean reading times of the 3 groups for these segments are shown in Table 3. In Figure 1, the processing cost effects are represented: the mean response times (RTs) for the mismatch conditions have been subtracted from those of the match conditions, thus a minus RT shows that the mismatch condition took longer to process than the match condition.

The French group were slower than the other two groups, and the native speakers were the fastest of all three, and this was reflected in the main effect of Group across each of the critical segments (verb: $F_1 (2, 57) = 5.13$; $p < 0.01$; $\eta^2 = .65$; $F_2 (2, 46) = 19.94$; $p < 0.001$; $\eta^2 = .46$; verb+1: $F_1 (2, 57) = 4.74$; $p < 0.05$; $\eta^2 = .14$; $F_2 (2, 46) = 19.82$; $p < 0.001$; $\eta^2 = .46$; verb+2: $F_1 (2, 57) = 3.04$; $p = 0.056$; $\eta^2 = .10$; $F_2 (2, 46) = 18.79$; $p < 0.001$; $\eta^2 = .63$; verb+3: $F_1 (2, 57) = 6.40$; $p < 0.01$; $\eta^2 = .18$; $F_2 (2, 46) = 22.57$; $p < 0.001$; $\eta^2 = .67$).

There were no significant differences between the match and the mismatch conditions on the verb nor on the segment immediately following it. However on the second segment following the verb (verb+2), there was a significant interaction between Type (match/mismatch) and Group ($F_1 (2, 57) = 3.26$; $p < 0.05$; $\eta^2 = .10$; $F_2 (2, 46) = 3.51$; $p < 0.05$; $\eta^2 = .24$). As can be seen in Table 3, and as illustrated in Figure 1, this interaction was caused by
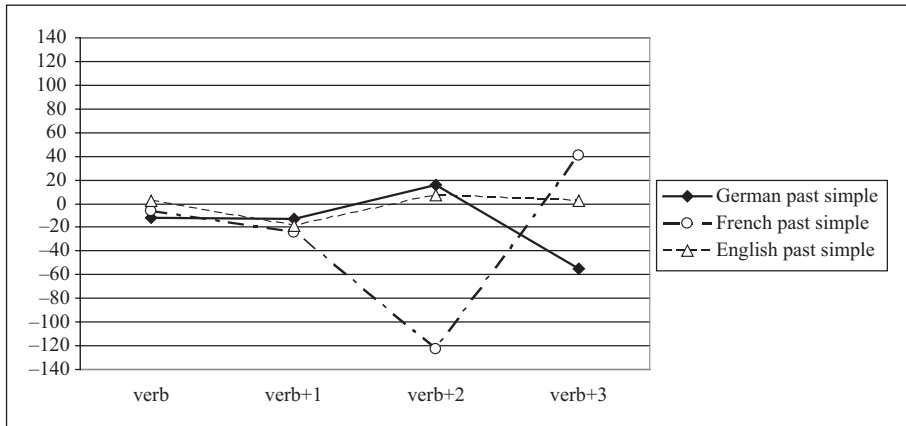
Figure 1. Response times (RTs) on match conditions minus mismatch conditions for the past simple items.

the fact that for the French L2 learners, the mismatch condition elicited significantly longer reading times than the match condition, a difference of 124 ms (674 ms vs. 550 ms: *t1* (19) = 2.37; $p < 0.05$; *t2* (23) = 2.39; $p < 0.05$), whereas there was no difference in reading times between the two conditions for either the German L2 learners or the native English speakers. There were no other significant effects following this segment.[9]

In sum, despite the fact that all three groups judged the mismatch conditions as significantly less acceptable than the match conditions in their off-line acceptability judgments, only the French L2 learners showed a processing cost to the mismatch condition in their on-line reading times and this effect did not show up on the verb itself, but in the region following it.

b   Present perfect items. As with the past simple items, analyses were run on the segments from the VP (here starting with the auxiliary verb) and then across the three segments following it, the past participle and the two subsequent words. Table 4 shows the mean reading times for these conditions, and the processing cost effects are visualized in Figure 2.

As in the analysis of the past simple items, on the VP there was only a main effect of Group (aux: F_1 (2, 57) = 3.18; $p < 0.05$; η^2 = .10; F_2 (2, 44)[10] = 23.48; $p < 0.001$; η^2 = .52; Part: F_1 (2, 57) = 2.78; p = 0.07; F_2 (2, 44) = 24.84; $p < 0.001$; η^2 = .53). On the immediately following segment (Part+1), there was also a main effect of Type, significant by participants (F_1 (1, 57) = 5.84; $p < 0.05$; η^2 = .09; F_2 (1, 44) = 2.05; p = 0.17), of Group F_1 (2, 57) = 2.73; p = 0.074; F_2 (2, 44) = 12.65; $p < 0.001$; η^2 = .37) and a significant interaction between the two factors (F_1 (2, 57) = 3.97; $p < 0.05$; η^2 = .12; F_2 (2, 44) = 3.34; $p < 0.05$; η^2 = .13).

The interaction on segment Part+1 was caused by the fact that the mismatch conditions elicited higher reading times than the match conditions for both the native English (476 ms vs. 408 ms: *t1* (19) = −3.54; $p < 0.01$; *t2* (22) = −2.24; $p < 0.05$) and the French L2 learners (610 ms vs. 511 ms: *t1* (19) = −2.63; $p < 0.05$; *t2* (22) = −3.10;

Table 4. Mean RTs in milliseconds (SD is given in parentheses) to present perfect items across the 4 critical segments.

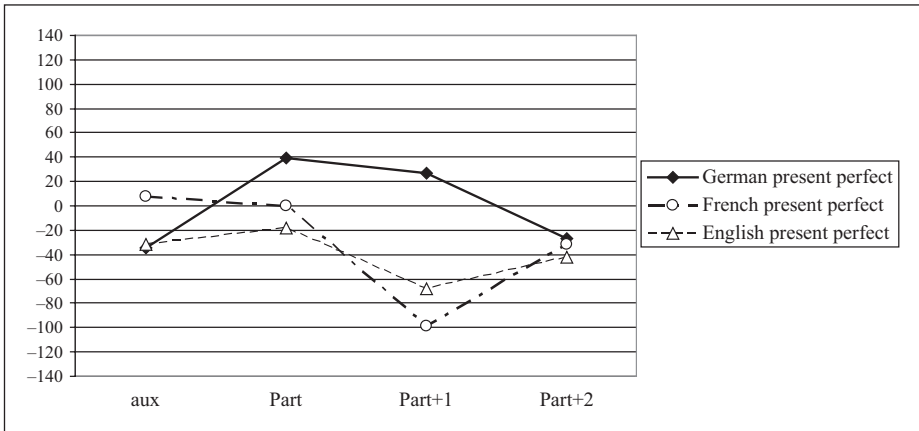|		aux	Part	Part+1	Part+2
English native speakers	match	391 (105)	433 (139)	408 (102)	450 (113)
	mismatch	423 (123)	451 (149)	476 (129)	492 (175)
French L2 learners	match	515 (141)	559 (146)	511 (135)	587 (244)
	mismatch	507 (140)	559 (169)	610 (198)	619 (236)
German L2 learners	match	427 (154)	486 (232)	510 (250)	478 (200)
	mismatch	462 (180)	447 (196)	483 (207)	505 (248)

Figure 2. Mean response times (RTs) in milliseconds (SDs) to present perfect items across the 4 critical segments.

$p < 0.01$). In contrast, and as in their processing of the past simple items, the German learners' reading times did not significantly differ from each other between match and mismatch conditions (483 ms vs. 510 ms: ps > .5). There were no significant effects on the following segment (Part+2).[11] Below we discuss the findings from this study.

IV General discussion

In this article, we presented the results from an off-line acceptability judgment task and an on-line self-paced reading study designed to investigate the explicit and implicit knowledge of English tense/aspect violations of German and French L2 learners. The main results are summarized as follows:

- For both the past simple and the present perfect sentences, the results of the judgment task showed that all three groups found the mismatch conditions less acceptable than the match conditions. Thus they all demonstrated their explicit knowledge of the English past simple and present perfect.

- Despite this, the two L2 groups patterned differently from each other in their on-line processing of the experimental sentences. The French L2 learners' processing reflected their off-line, metalinguistic judgments: they found the mismatch conditions more difficult to process than the match conditions of both the past simple and the present perfect items. In contrast, the German L2 learners did not show a processing cost for either the past simple or the present perfect mismatch items.
- The native speakers processed the experimental items differently from both the learner groups: the mismatch condition elicited higher reading times than the match condition, but only for the present perfect experimental items.

1 L1 influences

The major finding of the current study was that the French but not the German L2 learners were sensitive during on-line processing to the mismatch between the fronted temporal adverbial and the inflected verb. This suggests that of the learners, only the French were able to access and apply the knowledge that both groups could display explicitly as demonstrated in the judgment task, in the real-time processing of the experimental items. There are various possible reasons for this difference between the learners, including differences between the groups' proficiency, age, or educational background. Proficiency differences are unlikely to be the cause, because, first, both groups of L2 learners were matched on their general proficiency in English and, second, because both were similarly able to distinguish the past simple from the present perfect in the off-line cloze production task. The French group were indeed older (mean age: 39) than the Germans (mean age: 24), and age has been found to influence real-time processing (Christianson et al., 2006). However, in a post-hoc analysis to investigate the possible effect of age on the results, no differences were observed in the pattern of results for younger or older participants. Finally, both learner groups were similarly matched on their educational experience at the time of the experiment: both were studying at university with classes in English. Given these similarities between the learner groups, we believe it is more likely that the resulting difference between the learners' performance is attributable to their different L1s.

Results of other studies of L2 learners' real-time computation of agreement phenomena suggest that a learner's first language may indeed influence the extent to which knowledge of inflectional morphology is 'automatized', or can become implicit, at least for learners of a lower level of proficiency. For instance, Jiang (2004) found that Chinese L2 learners of English were not sensitive to subject–verb agreement violations in their on-line L2 processing, even though they were able to select a correctly inflected verb in an off-line forced choice task. Like the German L2 learners in the current study, Jiang's learners did not show a processing cost for agreement violation sentences. Given that Chinese lacks inflectional morphology, it is certainly possible that an L1 influence in this respect was the reason for their lack of sensitivity in real-time comprehension (see also Wen, 2007). L1 influences were also found in Hopp (2006, 2010), in learners' processing of case-marking and subject–verb agreement of German L2 at advanced, versus near-native levels of proficiency. Specifically,

of the advanced groups, only the Russian learners (with a highly inflected L1) were reliably sensitive to agreement violations in on-line processing. This was in contrast to Dutch and English L2 learners, even though all three learner groups were able to assess the ungrammaticality of similar violations in judgment tasks. Thus it appears that a learner's L1 may influence the extent to which they are sensitive to agreement violations in on-line comprehension. If indeed L1 influence underlies the observed on-line differences in the current study, the question then arises as to what it is that is transferred between the L1 and the L2.

It may seem surprising that groups did not perform similarly, given that French and German specify [+/−past] for T, like English. However, on the basis of the results of the processing of the past simple items, the French were sensitive to the mismatch condition but the Germans were not. In this instance, as French patterns like English in that a temporal adverbial denoting current relevance would not be permissible with the preterit (13a,b), whereas in German it would be possible (albeit infrequently), a semantic clash arises for the French.

(13) a. English: * Since last week, I was at the cinema three times.
      b. French: * Depuis la semaine dernière, j'étais trois fois au cinéma
      c. German: Seit letzter Woche war ich drei mal im Kino.

Furthermore, recall that unlike English and German, French grammaticalizes the perfective/imperfective distinction (see examples 5a and 5b above), and a compound past form in a simple past context (e.g. with an adverb that collocates with the simple past) has perfective meaning. As perfective aspect represents a situation/event in its totality, i.e. it has a beginning middle and an end, the present perfect reading would clash here, as current relevance specifically precludes an endpoint which is necessary for an event's totality. If the learners were directly interpreting the English sentences according to their L1 grammar, this could explain the difference between the two L2 learners in their processing of the past simple items.

Turning now to the present perfect, for the French, as [+/−perfect] is specified unlike in German, we might expect the mismatch conditions to be more difficult to process than the match conditions. For the German group, on the other hand, a processing cost is not predicted for the mismatch items. In other words, aspect is grammaticized in French but not in German and this may affect their on-line processing of English present perfect items. The results suggest that this is the case.

However, it seems that this explanation may not be the whole story. For example, regardless of English and French specifying [+/−perfect] there are differences between the two languages. As we have seen, English has two separate forms distinguishing preterit from perfect meaning, whereas both meanings map onto one form in French. Linked to this, even if the syntax underlying the French compound past differs from the German compound past, the way perfect meaning is disambiguated from preterit meaning in both languages is via temporal adverbials or pragmatics. We mention pragmatics here for disambiguation, which connects with the Liszka & Roberts (2011) reference above. A further similarity between French and German is that a present tense form is used in

'perfect of persistent situation' contexts (Comrie, 1976/1998), where a present perfect form is required in English,[12] as exemplified in (14a–c).

(14)	a.	English:	I *have been* sick for a week.	present perfect
	b.	French:	Depuis la semaine dernière je *suis* malade.	present
	c.	German:	Seit letzter Woche *bin* ich krank.	Present

These factors suggest that we might expect the results from the two L2 groups to show a closer similarity. However, the learners did significantly differ from each other. Therefore, we would like to propose a further influence from the learners' L1, rather than assuming forms that are similar on the surface between their L1 and L2 perform the same function. That is, it may be that apart from perfect aspect, it is the difference in whether or not their first language distinguishes aspectual differences grammatically (French: im/perfective) or not (German) that underlies some of the differences in performance that we observed. Moreover, and crucially, this might be the case even though aspect is not realized grammatically in exactly the same way in the L1 and the L2. This influence may come into play because speakers of languages with encoded aspect, like English and French, must pay attention to the aspect of an event in order to produce the correct morphological form, perhaps hundreds of times a day. It may well be that because of this, they are more likely to be sensitive to the aspect of events in their production and comprehension of their L2, and the two languages need not mark aspect in identical ways (see, for example, Slobin, 1991). In other words, French learners could be more susceptible to the salience of aspect in English in general, as French also overtly marks aspect, creating a heightened sensitivity in these learners, as we suggested above with the processing of simple past items in the study. This is of course speculative, requiring further development and more data from different L1–L2 pairings, and thus we leave it for future research.

2 Native speakers' processing of past simple vs. present perfect violations

Another striking finding of this study was the unexpected processing cost asymmetry that was observed in the native speakers' processing of the experimental items. That is, it was only the mismatch condition in the present perfect sentences that caused a processing cost for the native speakers (*Last year, Jill has wanted …* vs. **Since last year, Jill wanted*), even though both mismatch conditions were assessed as significantly less acceptable than the corresponding match conditions in the off-line acceptability judgment task. This suggests that at least in on-line comprehension, there is a difference in the strength of ungrammaticality between the two mismatch conditions for native speakers. Why might this be? We suggest that it is because the present tense component in the present perfect constructions *has wanted* means the time that is being talked about (TT) includes the time of the utterance and, therefore, one cannot use an adverbial that singles out a specific time in the past (*last year, yesterday, at five*). This is because the time of the utterance would be excluded and entails. Thus these items were fully ungrammatical and that is perhaps why they elicited the observed processing

cost. In contrast, in the past simple items, although it may be semantically odd to use an adverbial that also includes the time of the utterance (*for months now, since last year*) because the topic time is situated before the time of the utterance, the resulting construction may not be fully ungrammatical because the time span referred to by the adverbial at least includes the past time (*Since last year, Jill wanted …*). These processing differences may reflect the current trend for some varieties of British English to use adverbs plus the past simple to denote current relevance (*I already did that*) in spoken discourse, more akin to North American English usage as noted above. This suggests that this is an aspect of English grammar that is currently in flux. Also, the fact that this construction may be in the process of becoming more widely used in British English would explain why the French learners performed differently from the English native speakers with the past simple items: it is plausible to assume that a learner may need more and naturalistic exposure in the L2 environment to fully acquire such constructions. However, what is of interest is that this difference was only observable in the native speakers' on-line comprehension: when all interpretative processes are brought into play, and a metalinguistic judgment needed to be made, these items were classed as 'unacceptable', like the past simple items. Given this, one might ask whether the native speakers and the German L2 learners were in fact processing the past simple items differently from each other. We cannot answer this question categorically either way, particularly given that the native speakers were sensitive to the ungrammaticality of the present perfect items whereas the German learners were sensitive to neither sentence-type, and therefore this issue clearly requires further investigation. To this end, we are currently running an EEG study on the processing of different types of tense/aspect violations (past/future/present perfect) in native English speakers and different groups of L2 learners.

3   Further L2 processing research

Further research is necessary to address many issues that are raised in this study. For instance, it is not clear what the L2 learners' and the native speakers' final interpretations for the mismatch conditions were, because we did not specifically ask the participants for their interpretations of either the match or the mismatch sentences. One possibility is that because lexical means for expressing temporal relations characterize early learners' tense/aspect productions, seemingly irrespective of the properties of the L1 (e.g. Starren, 2001), then such lexical means may ultimately exert more influence in L2 learners' interpretations This may be so even when the inflectional morphology appears to be in place, and can be used in real-time processing. Perhaps in contrast, in monolingual processing the morphology 'wins out'. A recent study by Van Patten and Keating (2007) is informative as regards this question of which might drive ultimate interpretation. The authors investigated how English learners of Spanish interpret tense-violation constructions like **Ayer mi Buena amiga Susana habla con muchas personas* ('Yesterday my good friend Susana speaks with many people'). The authors asked English learners of Spanish of different proficiency levels to match such Spanish sentences to English translations and found that more highly proficient learners' interpretations appeared to be driven by the verbal morphology, as were those of native speakers.[14]

In contrast, when the less proficient learners followed the authors' 'lexical preference principle' and relied more on the adverbial for interpretation. Interestingly, though, there was a difference between the two groups of native speakers: while the Spanish natives relied on verbal morphology, the English natives appeared to rely on lexical means.[15] It should be noted that the authors tested sentences with adverbials in different positions, and this no doubt affects temporal processing (for an overview, see Dickey, 2001) and perhaps complicated the overall picture. Nevertheless, these findings together with ours reported in the current article, suggest that there may be very subtle cross-linguistic differences, as well as within-language differences in the processing of lexical versus morphological means for marking temporal reference, all of which need to be investigated further.

Another question that is raised by the current study is whether L2 learners who have much more exposure to the L2 would be able to display automatized knowledge of the relevant tense/aspect distinctions, or whether this is only ever the case if a learner's L1 has grammaticized aspect. It would be ideal to test learners of different L1–L2 pairings, and of much more advanced levels, to investigate these issues. We leave these open questions to future research.

V Conclusions

Based on the results of this study, it was argued that the learners' L1 had an influence on their processing of tense/aspect violations in L2 English. In addition to an effect of direct transfer, i.e. whether or not the L1 encodes Asp[+/−perfect], it was further suggested that indirect transfer also plays a role. This was proposed to account for the results in terms of the differences between English and French, and similarities between French and German, complementing the direct transfer account, which considers the similarities between English and French and the differences with German. It was argued that whether or not the learners' L1 has grammaticized aspect (French) or not (German) more generally may underlie the differences in sensitivity to tense/aspect agreement violations, rather than the effect being driven only by the L1 and the L2 making exactly the same distinctions. According to the results on the cloze test, both L2 groups appeared to have acquired the relevant tense/aspect distinctions in their L2, at least as measured by traditional L2 acquisition tasks, yet on-line only the French group were sensitive to the tense/aspect violations. Therefore we further argue that using on-line methods measuring implicit knowledge together with tasks measuring more explicit (eg metalinguistic) knowledge gives us a clearer picture of what it means when we say a learner has 'acquired' a phenomenon in their L2.

Declaration of Conflicting Interests

Funding

Notes

1. Terminology in German can be misleading. The *Perfekt* refers to the compound past form and the *Imperfekt* refers to the past simple.

2. There are many different semantic analyses of tense and aspect (for a recent survey, see for example see Rothstein, 2008), and we follow Klein's (e.g. 1994) account of temporality rather than Reichenbach's (1947) system, because the latter defines the three basic temporal parameters – point of speech (S), point of event (E) and point of reference (R) – as time points, rather than time spans. One of the implications of this system is that time points cannot include each other. When temporal notions are viewed as time spans, however, they can potentially overlap, and therefore aspectual notions such as im/perfectivity can be explained via the same system. However, nothing in the current experiment or the interpretation of the results hangs on the use of one over the other account of tense/aspect.

3. Comrie (personal communication).

4. This may be the case specifically for English fronted adverbials, and we refer the reader to Alexiadou (2004) for interesting discussions and cross-linguistic analyses of adverbials.

5. Eight of the German L2 learners were studying in the Netherlands at the time of testing, but all were taking university courses in English. In every other respect they were matched with the other German learners according to age and educational experience. Following a comment from a reviewer, we checked whether this group, no doubt being highly proficient in Dutch, may have affected the results of the group of German learners as a whole. This was not the case, as the pattern of results remained the same when this sub-set of participants was removed.

6. As a reviewer notes, we only asked the participants to undertake the grammar part of the Oxford Placement Test. We agree with this reviewer that indeed this may not give a complete picture of their competence in English. However, this was done for practical reasons, and because the study involved learners' grammatical knowledge of English.

7. In the analyses, we compared the grammatical and ungrammatical past simple and present perfect items separately, because the critical segments (the VP) were different between the two conditions.

8. A reviewer points out that the fact that the comprehension questions only targeted the latter portion of the experimental sentences may have led to the participants' developing a strategy whereby they did not fully process the earlier parts of the experimental items. Although we agree that this is indeed possible, we feel that it is unlikely, given that differences between the processing of the experimental items was in evidence, at least for the French and the English native speakers.

9. Following a comment by a reviewer, we also analysed the final segments, to check for any end-of-sentence wrap up effects. The mean RTs are shown in the table below. There were no significant main effects or interactions.

Final segment	Match	Mismatch
English past simple	531 (154)	504 (213)
English present perfect	502 (200)	498 (167)
French past simple	735 (266)	670 (287)
French present perfect	692 (242)	613 (189)
German past simple	593 (314)	594 (289)
German present perfect	579 (319)	574 (344)

10. One item was removed from the analysis because of a coding error in the experimental software, therefore, analyses were run on the remaining 23 items.
11. As a reviewer points out, there is a numerical trend (in both conditions) in the German data of a processing cost for the mismatch conditions. We investigated this numerical trend and found that there were no significant differences between the conditions. We note the large standard deviations (past simple match = 131 ms, past simple mismatch = 292 ms; present perfect match = 200 ms, present perfect mismatch = 248 ms) and, given this, we analysed in greater detail the German data, running ANOVAs on the critical and spill over segments with the covariates Oxford Placement Test Score, Production test score, age, and mean RT. There were no significant effects. However, there was a marginal interaction between Type and OPT (Oxford Placement Test) score ($p = 0.097$) for the critical segment verb+3 in the past simple condition. We therefore split the German group according to the median OPT score (85), and there were no statistically significant effects (ps all above .1); however, interestingly, the numerical trend becomes greater for the more highly proficient Germans (past simple match = 465 ms, past simple mismatch = 539 ms), and this is suggestive of the fact that perhaps a group of more highly proficient German learners may show the effect on-line. It would therefore be interesting in future research to investigate German learners of much greater proficiency in (and/or exposure to) English.
12. For the 'four types of perfect' (experiential perfect, perfect of result, perfect of persistent situation, perfect of recent past), see Comrie, 1976/1998: 56–61.
13. We are aware that using the above-60% cut-off point in the off-line production task as a selection criterion for the study is rather arbitrary. To check that the results were not caused by this, we ran the same analyses on the data but using the higher cut-off point of 75% as a selection criterion. This led to a group of 12 German and 10 French learners. In all tasks, the results pattern in the same way.

Past simple		verb	verb+1	verb+2	verb+3	AJT
French (10)	Match	619 (156)	570 (154)	602 (228)	709 (354)	5.0 (0.7)
	Mismatch	623 (154)	585 (182)	770 (186)	716 (207)	3.0 (1.1)
German (12)	Match	472 (206)	459 (132)	483 (208)	488 (104)	4.8 (1.0)
	Mismatch	441 (123)	462 (139)	493 (196)	515 (204)	3.6 (1.1)

Note. AJT = acceptability judgment task.

Similarly to the results reported for the 60%-cut-off group, in the AJT task there was a main effect of Type (F_1 (1, 39) = 40.36; $p < 0.001$; $\eta^2 = .54$; F_2 (1, 23) = 24.6; $p < 0.001$; $\eta^2 = .52$). There were no differences between the groups, both found the mismatch condition more acceptable than the match conditions (French: *t1* (9) = 4.18; $p < 0.001$; *t2* (23) = 6.60; $p < 0.001$; Germans *t1* (11) = 3.10; $p = 0.01$; *t2* (23) = 3.60; $p = 0.02$). The results for the self-paced reading (SPR) experiment also patterned the same way, but with less robust statistical results (the only effects visible on the second segment following the verb: a marginal interaction between Type and Group by participants F_1 (2, 39) = 3.39; p = 0.064; $\eta^2 = .08$; F_2 (2, 46) = 2.42; p = 1.00; $\eta^2 = .10$). Only the French group showed elevated RTs for the mismatch condition (*t1* (9) = 2.20; $p = 0.055$; *t2* (23) = 2.08; $p = 0.048$; Germans *t1* (11) = .22; $p = 0.831$; *t2* (23) = .40; $p = 0.694$).

For the present perfect items, again the results pattern in the same way as with the full groups of learners. For the AJT, there was a main effect of Type (F_1 (1, 39) = 71.55; $p < 0.001$; $\eta^2 = .65$; F_2 (1, 22) = 56.21; $p < 0.001$; $\eta^2 = .71$) and an interaction between

Present perfect		aux	Part	Part+1	Part+2	AJT
French (10)	Match	518 (89)	597 (135)	553 (133)	533 (116)	4.8 (0.7)
	Mismatch	552 (145)	585 (193)	686 (195)	576 (145)	2.8 (1.1)
German (12)	Match	436 (126)	461 (140)	480 (195)	468 (159)	4.7 (1.0)
	Mismatch	454 (135)	423 (124)	447 (127)	476 (179)	3.9 (1.1)

Type and Group (F_1 (2, 39) = 4.31; p = 0.02; η^2 = .18; F_2 (2, 44) = 5.46; p = 0.012; η^2 = .33). Both groups found the match conditions less acceptable than the match conditions (French: *t1* (9) = 4.67; p = 0.01; *t2* (22) = 8.37; p < 0.001; Germans *t1* (11) = 2.71; p = 0.02; *t2* (23) = 3.30; p = 0.003). As previously, the analysis of the SPR data found significant effects on the Part+1 segment, although here significant by participants only. As well as main effects of Type (F_1 (1, 39) = 6.72; p = 0.013; η^2 = .15; F_2 (1, 22) = 1.72; p = 0.20) and Group (F_1 (2, 39) = 6.90; p = 0.003; η^2 = .26; F_2 (2, 44) = 9.80; p = 0.003; η^2 = .31), there was an interaction between the two by participants (F_1 (2, 39) = 4.34; p = 0.02; η^2 = .18; F_2 (2, 46) = 1.22; p = .290). As with the past simple items, only the French group's RTs showed an effect of the mis/match manipulation (*t1* (9) = 2.31; p = 0.046; *t2* (22) = 1.23; p = 0.232; Germans *t1* (11) = .729; p = 0.481; *t2* (23) = .40; p = 0.690).

14. Note that Spanish, too, has grammaticized aspect, and so according to our account of cross-linguistic influence argued in the current article, we would indeed predict that they should perform like native English speakers, at least at more proficient levels. It would be interesting to see the performance of a proficiency-matched non-grammaticized aspect L2 group on this translation task.

15. Interestingly, Krantz and Leonard (2007) report a study in which both specific language impairment (SLI) and mean length of utterance (MLU) matched English children produce fewer utterances marked morphologically for past tense when also producing a temporal adverbial, suggesting that the adverbial carried the required temporal information in many cases.

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Appendix 1

Example of items in the cloze production task.

CRASH   If something crashes somewhere, it hits something else violently.
GROW   When you grow plants, you put seeds into the ground and take care of them as they develop.
FLY   When something flies, it travels through the air.
TAKE   If you take something you remove it from its place.
THINK   If you think that something is true, you believe it to be true, but you are not sure.
WALK   When you walk, you move along by putting one foot in front of the other on the ground.

1.   Adam's eyes were closed, so Jill _____ he was asleep. But he wasn't!
2.   Should I tell my mother that I _____ her car into a lamp post last night? It's going to be expensive to repair.
3.   Now that my uncle _____ his own vegetables for the last 5 years, he refuses to buy them from supermarkets.
4.   Dad, can I _____ some money out of your wallet, in case the bank is closed?
5.   Jane always _____ to work, even in the winter.
6.   Don't be afraid of aeroplanes. Remember that they _____ safely for many kilometres since the Wright brothers invented the first one in 1903.

Appendix 2

Experimental materials.

The same lexical items were used to create the past simple (match/mismatch) and present perfect (match/mismatch) items, as illustrated in (1) below.

1   a)   Past simple, match/*mismatch:
         At first, Joe liked Mary's old school-friends. He doesn't think they're boring.
         * Since he met them, Joe liked Mary's old school-friends. He doesn't think they're boring.
    b)   Present perfect, match/*mismatch:
         Since he met them, Joe has liked Mary's old school-friends. He doesn't think they're boring.
         * At first, Joe has liked Mary's old school-friends. He doesn't think they're boring.
2   Initially/Since last week, the cat ate / has eaten only fish. She now also eats meat.
3   Yesterday/Since he moved in, my old neighbour visited / has visited our house. He brought us a cake.
4   When he saw her/Since he first saw her, Sam thought / has thought Jenny was beautiful. However, he's far too nervous to speak to her.
5   Last week/Since the summer, James went / has gone swimming every day. Now he's getting bored of it.
6   When she was ten years old/Since she was ten years old, Brenda wanted / has wanted to be an actress. She now works in a hospital.
7   Last Friday/Since last Friday, Mark saw / has seen the same film three times. He really loved it.
8   A year ago/For a year now, William met / has met his best friend after work every Friday. Now he spends every night with his girlfriend.
9   Once many years ago/Since he was twenty, Matt was / has been a successful businessman. He now feels unsatisfied with his life.
10 Before her baby was born/Since her baby was born, Jenny wanted / has wanted to escape from her life. She was very stressed out.
11 Three days ago/For the last three days, Tom felt / has felt very unwell. He couldn't even go to work.
12 Last year/Since last year, Kate studied / has studied French in her spare time. She now wants to learn German.
13 When she first started her job/Since she first started her job, Emma loved / has loved the work very much. It's not very exciting now.
14 Initially/Since the beginning, the band was / has been very successful. They sold a million records.
15 Last spring/Since spring, Bert planted / has planted many roses in the garden. He wanted to enter into a gardening competition.
16 At Christmas/Since Christmas, Barbara spent / has spent too much money. Her credit card bill was enormous.
17 On his birthday/Since his birthday, Paul met / has met two lovely women. He wants to go out with both of them.
18 Many years ago/For many years now, Judith thought / has thought about joining the army. It's a dangerous profession.
19 When he first started cooking/Since he first started cooking, Alan enjoyed / has enjoyed making pasta most of all. He now likes making desserts.

20   When he finished university/Since he finished university, Jerry thought / has thought about starting a business. He wanted to be a millionaire.

21   Last month/For the last month, Sandra felt / has felt unhappy at work. She even thought about leaving.

22   At first/For months now, Christine wanted / has wanted to marry Gary. Now she finds him unpleasant.

23   In February/Since February, Ben crashed / has crashed his car four times. He now pays a lot for his insurance.

24   Last year/Since the summer, Michael learnt/has learnt to play poker. He now wants to become a professional.