
Article:
Roberts, Leah orcid.org/0000-0002-5666-6667 and Liszka, Sarah (2021) Grammatical aspect and L2 learners' processing of temporarily ambiguous sentences:a self-paced reading study with German, Dutch and French learners. Second Language Research. p. 1. ISSN 0267-6583

https://doi.org/10.1177/0267658319895551

Grammatical aspect and L2 learners' processing of temporarily ambiguous sentences: A self-paced reading study with German, Dutch and French learners

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Abstract

The results of a self-paced reading study with advanced German, Dutch and French second language (L2) learners of English showed that their on-line comprehension of early closure (EC) sentences which are initially misanalysed by native English speakers (e.g., While John hunted the frightened rabbit escaped) was affected by whether or not, like English, their first language (L1) encodes aspect grammatically (French) or only via lexical means (German, Dutch). The English and the higher proficiency French participants showed a processing asymmetry in their on-line reading of the temporarily ambiguous sentences, assumed to be caused by the difference in the aspectual perspective a comprehender takes when initial verbs appear in the past simple vs. the past progressive (c.f., e.g., Frazier, Carminati, Cook, Majewski, & Rayner, 2006). In contrast, the German and Dutch learners, irrespective of proficiency, treated both progressive and simple sentences in the same way, despite the fact that all the L2 learners were matched according to their metalinguistic knowledge of English aspectual distinctions. Furthermore, despite patterning with the German learners on-line, the Dutch L2 learners' offline judgments were more akin to those of the English native speakers and the French L2 learners, showing an effect of aspect, which could be argued to lend support to the idea that progressive aspect may be becoming grammaticalized in Dutch (Behrens,

Flecken & Carroll, 2013; Flecken, 2011). Taken together, the results of this study add to our growing understanding of cross-linguistic influences during on-line L2 sentence processing, and differences between L2 parsing and learners' metalinguistic L2 performance.

Introduction

Assessing second language (L2) learners' knowledge of grammatical phenomena in the L2 often involves the use of judgement, gap-filling and other tasks thought to tap into metalinguistic, and/or explicit knowledge (e.g., Ellis, 2005). In the current study, we make use of on-line comprehension (via a self-paced reading task) to investigate L2 learners' word-by-word incremental parsing to examine knowledge of aspectual differences in English (here, the contrast between past simple/progressive) that can be argued to be *implicit*. Specifically, we investigate the extent to which the aspect (+/- progressive) of a previously encountered verb affects learners' subsequent processing of the potential direct object and the following input.

Like native speakers, evidence from on-line processing studies using time-sensitive methods like self-paced reading has shown that—given sufficient lexical information—L2 learners incrementally process the input, making real-time processing commitments during comprehension (e.g., Jackson, 2008; Jackson & Roberts, 2010; Juffs & Harrington, 1995; 1996; Roberts & Felser, 2011; see Roberts, 2013 for a review). In both the monolingual and L2 processing literature, much evidence for incremental processing comes from studies on the processing of temporarily ambiguous sentences, where the input is misanalysed[1]. For instance, native English readers are highly likely to

interpret a temporarily ambiguous DP like *the song* in (1) as the direct object of an initial optionally transitive verb like *played*. This leads to processing difficulty in cases where this direct object, or 'late closure' analysis, turns out to be incorrect, and an 'early closure' interpretation is required, with the DP being re-interpreted as the subject of the main verb (*pleased*, in [1]).

(1) While the band played the song pleased all the customers.

The initial expectation for[2] and/or the strength of the parser's commitment to such an erroneous interpretation of an ambiguous DP been found to differ as a function of various factors. These include how plausible the ambiguous DP may be as a direct object (Pickering & Traxler, 1998; Roberts & Felser, 2011), the subcategorisation preferences of the initial verb (Garnsey, Pearlmutter, Myers, & Lotocky, 1997; Pickering, Traxler, & Crocker, 2000), or the length of the ambiguous DP (Ferreira & Henderson, 1991). Specifically, the findings show that the longer the parser is committed to the wrong analysis, and/or if the erroneous parse is up until that point semantically supported, the more effortful recovery from misanalysis is. In terms of measuring behavioural responses to these underlying processes, this means that in cases where plausibility, animacy and subcategorization biases support the initial erroneous parse, comparatively more processing difficulty following disambiguation is observed. L2 learners' reading of temporarily ambiguous sentences show that they are also sensitive to such factors as plausibility of the initial analysis (Roberts & Felser, 2011), subcategorization biases (Jackson & Bobb, 2009) and animacy (Jackson & Roberts, 2010), and to a similar extent to native speakers. However, despite often performing in a native-like manner, cross-

linguistic influences have been observed in L2 learners' processing of such constructions where subcategorization differences exist between the two languages (e.g., Dussias & Cramer Scaltz, 2008; Frenck-Mestre & Pynte, 1997), and non-native like on-line processing has been found for learners of a lower proficiency, even if off-line performance is native-like (Jackson, 2008; Jackson & van Hell, 2011). It has been argued that L2 learners' slower lexical access may underlie such differences (Hopp, 2015; Miller, 2013). Overall, the L2 parsing results show that given the requisite knowledge, learners are as able as native speakers to make use of lexical-semantic information during real time processing but L2 parsing performance may be affected by (differing) properties of the L1 and/or L2 proficiency.

In monolingual studies, another factor that has been found to affect real time processing commitments during on-line processing is grammatical aspect. For example, in an eye-tracking experiment, Frazier, Carminati, Cook, Majewski, and Rayner (2006) showed that the grammatical aspect of the initial verb influences the strength of a reader's commitment to a direct object interpretation in the type of subject-object ambiguity constructions that are the focus of this paper. The authors investigated how English native speakers processed sentences like (2) and (3), which differed in that the initial, subordinate verb appeared either in the past simple (2) or the past progressive (3).

(2) a. *Past simple, early closure*

As John hunted the frightened deer *escaped* through the woods.

b. *Past simple, late closure*

As John hunted the frightened deer *it escaped* through the woods.

(3) a. *Past progressive, early closure*

As John was hunting the frightened deer *escaped* through the woods.

b. *Past progressive, late closure*

As John was hunting the frightened deer *it escaped* through the woods.

It was found that even though there was evidence that the English speaking readers misinterpreted the ambiguous DP as direct object in both past simple and past progressive conditions at the point of disambiguation (i.e., in the region of the main verb *escaped*), following this, processing the early closure past simple items (2a) later in the sentence was significantly more costly both in comparison to the late closure version of the sentence where the direct object analysis is correct (2b), and to the early closure past progressive (3a) items. The authors assume that this asymmetry in processing cost between the two early closure sentences was caused by the different perspectives that readers take when encountering a past simple versus a past progressive verb. Specifically, an eventive or external perspective tends to be adopted when reading a verb in the past simple (2a), and therefore a completed or bounded event is preferred. That is, if a (semantically appropriate) definite DP such as *the frightened deer* follows this past simple verb (*hunt*), it can happily serve as a direct object, and as such, provides an endpoint which completes the preferred bounded event. In the past progressive sentences on the other hand (3a), on reading the initial verb, readers are more likely to adopt an internal perspective which means that a completed event is less expected and an endpoint is not necessary. Therefore even when the DP is initially misanalysed as direct object of the initial progressive verb, recovery from misanalysis is much easier, arguably because the parser is not required to relinquish a preferred analysis for a dispreferred one, as is the

case in the past simple sentences. The results of the Frazier et al. study showed that the progressive/non-progressive aspectual difference between the two sentences has an observable behavioural consequence—affecting the parser's commitments to ongoing analyses—and suggests that such semantic information is rapidly assessed to inform parsing decisions, at least for native English speakers. This general finding with regards aspect fits with studies showing that (monolingual) speakers' real-time construal of events is affected by whether or not a language has grammaticalized aspect, with speakers of [-] grammaticalized aspect languages (German, Dutch, Norwegian) having more of a tendency to take an external perspective, preferring an endpoint for ongoing events (Carroll, Natale & Starren, 2008; Carroll, von Stutterheim, & Nüse, 2004; Nüse, Carroll, & von Stutterheim, 2006; von Stutterheim & Nüse, 2003; von Stutterheim, Nüse, & Murcia Serra, 2002).

In the current study, we take the Frazier et al. experiment as a model and ask whether German, Dutch and French advanced L2 learners of English are similarly affected by such aspectual differences in their on-line processing of these types of sentences in English. In other words, does the learners' knowledge of English aspectual distinctions, specifically between the past simple and past progressive (as demonstrated via a traditional paper-and-pencil 'gap-filling' production task) lead to similar on-line parsing expectations/commitments to those of native English speakers? Given the findings of earlier L2 sentence processing research, we know that learners make use of lexical-semantic information during parsing, but what is of particular interest is whether or not (or to what extent) the L2 learners' processing of the English past simple and past progressive is affected by their L1: specifically, whether their L1 has grammaticalized

aspect (French) or not (German, Dutch). Before presenting the method and results, we first set out the cross-linguistic differences in tense and (grammatical) aspect between the languages under investigation.

Cross-linguistic differences in tense and aspect between English, French, German and Dutch

Grammatical tense encodes the deictic temporal relations of present, past and future between what is reported in an utterance and the time it is said. Klein (1994) proposes that the semantics underlying this relationship can be characterized by the notions of topic time (TT) and by the time of the utterance (TU). These abstract temporal relations may be grammatically instantiated in a language by verbal morphology (e.g. Dutch, Italian) or they may not (e.g. Mandarin Chinese, Burmese), in which case deictic relations are expressed either lexically, such as via adverbials (e.g. last week, next year), or via context. Klein further differentiates TT from the situation time (TSit), where the former refers to the time in the past, present or future for which an assertion is made (e.g. She *was* working – past time – before TU) and the latter refers to the time span at which the situation occurs. This is realized by the non-finite part of the utterance (e.g. She was work-*ing*). By establishing a connection between time span TT and time span TSit, this system is able to also capture aspectual relationships, such as BEFORE, AFTER, (partly) SIMULTANEOUS (in 'She *was* working', the TT is SIMULTANEOUS with the time of the situation TSit *work*). Lexical devices, such as temporal adverbs, can also be used to mark these temporal relations by specifying the internal and external properties of a time

span, and they are able to modify either the TT (Last Sunday) or the TSit (all day), depending on their position in a sentence:

(4) Last Sunday she was working all day.

As noted above, languages vary as to how these deictic temporal relations are established, i.e. from those that require mandatory tense/aspect marking to those that are dependent on the use of temporal adverbials and context. In terms of this study, the languages under scrutiny, i.e. English, French, German and Dutch, belong to the former type as they all grammatically instantiate [+/past] for Tense. For example, (5a-e) below exemplify the present simple across the four languages.

(5)	a. English;	*She works*	present
	b. French:	*Elle travaille*	present
	c. German:	*Sie arbeitet*	present
	d. Dutch:	*Ze werkt*	present

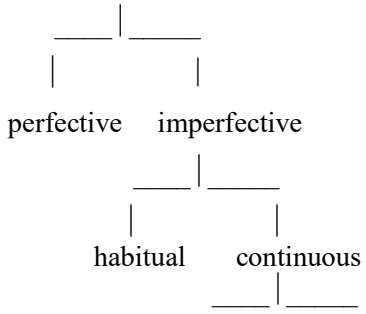
Turning now to the past simple in the four languages (6a-g below), preterit meaning in English it is overtly realized by the simple past (6a). Similarly, French has a past simple (6b), but this is usually only used in written French or in very formal spoken contexts (Hawkins & Towell, 2001) otherwise the compound past is used for preterit meaning in written and spoken French (6e). German also has past simple tense (6c). However, in many varieties of German, the compound past form (6f) has become either a past simple allomorph or the only past tense form (Comrie, 1976). As with French, in dialects where

the past simple is used, it is mainly used as a formal, narrative tense. Finally, Dutch has a past simple form (6d) and a compound past form (6g), both of which are used to express preterit meaning.

(6)	a. English:	*She worked*	simple past
	b. French:	*Elle travailla*	simple past
	c. German:	*Sie arbeitete*	simple past
	d. Dutch:	*Ze werkte*	simple past
	e. French:	*Elle a travaillé*	compound past
	f. German:	*Sie hat gearbeitet*	compound past
	g. Dutch:	*Ze heeft gewerkt*	compound past

Having considered tense, we can now turn to grammaticalized aspect (aka 'viewpoint aspect'), which is expressed through grammatical marking on verbs and is said to alter the internal temporal contour of an event/situation, irrespective of any reference time. Following Comrie (1976, p.25) the semantic features of grammatical aspect are hierarchically classified in terms of aspectual oppositions:

Figure 1: Grammatical Aspectual Oppositions



| |
nonprogressive progressive

At the core of this hierarchy is the perfective/imperfective dichotomy: perfective aspect represents a situation/event in its totality, i.e. it has a beginning, middle and an end and the situation/event is viewed externally. Conversely, imperfective aspect views the event/situation internally, without any explicit reference to its beginning, middle or end, and typically expresses either 'ongoingness' or 'habituality'. Returning to Klein's terminology, this distinction is captured by the TT at TSit (perfective) versus TT included in TSit (imperfective) configurations. The extent to which these features are grammaticalized is language specific. French and Modern Greek, for example, have a straight grammaticalized perfective/imperfective distinction.[3] In addition to instantiating the perfective/imperfective distinction, a second set of languages further distinguishes between progressive and non-progressive meaning grammatically (e.g. Italian and Spanish). Other languages (e.g. German, Norwegian and Dutch) do not grammaticalize aspect, and a fourth set of languages, such as English and Mandarin Chinese, partially instantiate the contrast.

Focusing first on English, the straight perfective/imperfective distinction is not grammaticalized, but it does encode a progressive/non-progressive distinction. Thus, progressive aspect, realized by (*be*+v-*ing*), is distinguished from habitual (present) and completed (past) interpretations associated with the simple forms as shown in (7a&b) and also distinguished from the periphrastic constructions *used to* and *would + V* for habitual actions in the past (7a&c).

(7) English: a. She is/was working. Progressive

b. She works/worked. Non-progressive

c. She used to/would work. Non-progressive

French, on the other hand (as mentioned above), grammaticalizes a straight perfective/imperfective opposition, as exemplified in (8) below:

(8) French: a. Elle travaillait ('She was working'). Imperfective

b. Elle travaillait ('She used to/would work'). Imperfective

c. Elle a travaillé/ travailla ('She worked'). Perfective

As (8a&b) demonstrate, the imperfective subsumes both the 'ongoing/durative' meaning of progressive aspect (a) and habitual aspect in the past (b), and both meanings of the imperfective contrast with the perfective past forms shown in (8c). Furthermore, in addition to having imperfective forms to express progressive meaning, French has periphrastic constructions, such as the expression *être en train de* 'to be in the middle of' (e.g. *Elle est/était en train de travailler*/*She is/was in the middle of working*) and less frequently, the verb *aller* 'to go'+present participle (e.g. *Elle va travaillant*) (Ayoun & Salaberry, 2008).[45]

Moving onto German, because it is 'a language which lacks any overt morphemes to mark aspect' (Schilder, 1997: 28), verbal inflection neither shows the perfective/imperfective distinction, nor the categories subsumed by imperfectivity, such as progressive and habitual aspect. Thus, the range of meanings for *sie arbeitete*, for example, would include *she worked*, *she was working* and *she used to work*. Adverbial,

contextual and periphrastic means are nevertheless available to capture the differences in these meanings, such as in (9) below using the temporal adverb *während* (*while, during*) to suggest progressive meaning:

(9) German: *Während* sie arbeitete, sang sie vor sich hin.
(While she was working, she sang to herself).

In terms of periphrasis, an example is provided by Comrie (1976: 8) who shows that the difference between *he read the book* and *he was reading the book* can be expressed in German by *er las das Buch* and *er las im Buch* ('he read in-the book') respectively. However, this construction is limited to a small set of verbs, (*ibid*), suggesting that adverbial and contextual means would be more common. Finally, similar to German, the Dutch past simple form covers tense and aspectual meaning, thus *ze werkte* can mean *she worked*, *she was working* and *she used to work*. However, it should be noted that as in French, Dutch has a periphrastic construction, *zijn+aan het+inf* (to be+at/on+inf), which can be used to express progressive aspect. Indeed, in certain environments it appears to be obligatory, such as in simultaneity contexts, where it is necessary to use it in contrast to the past simple (e.g. *vertrok,* in [10]). In sum, for Dutch, it may be the case that such periphrastic constructions are at present becoming grammaticalized, or *desemanticized* (Behrens, Flecken & Carroll, 2013; Bybee, Perkins & Pagliuca, 1994; Flecken, 2011; Traugott & Heine 1991).

(10) Dutch: Ze *was* aan haar proefschrift *aan het* werken toen hij vertrok.

(She was working on her thesis when he left).

To sum up the temporal representations of the four languages pertinent to this study, table (1) indicates which oppositions are grammatically encoded in each case.

Language	English	French	German	Dutch
past / non-past	√	√	√	√
perfective / imperfective	X	√	X	X
progressive / non-progressive	√	X	X	?X

Table 1: Grammatically encoded tense and aspectual oppositions across the four languages

First, for tense, it shows that all four languages grammaticalize the past/non-past distinction. In terms of aspect, however, unlike English, neither French, German nor Dutch encodes progressive aspect *obligatorily*. However, German and Dutch differ from French in that in French the perfective/imperfective distinction is grammatically encoded, and progressiveness is a component of imperfectivity (c.f. Comrie, 1976). It therefore encodes progressive aspect indirectly. Finally, German and Dutch may differ if indeed progressive aspect is currently undergoing grammaticalization in Dutch. These similarities and differences give rise to concrete predictions about L1 influences and how they might affect the L2 acquisition of the properties underlying these temporal phenomena. We consider these predications at the end of the following section.

L2 acquisition of tense/aspect

Research into the L2 acquisition of tense and aspect has been carried out across the range of functional and formal theoretical frameworks within the field of SLA. A main difference between functional and formal approaches is that the former tends to concentrate on questions of how learners establish tense/aspect distinctions (e.g. Dietrich et al., 1995; Giacalone Ramat, 1992; Klein & Perdue, 1992; Skiba & Dittmar, 1992; Starren, 2001), rather than on the acquisition of overt morphological marking of temporal systems, which is associated with more formal approaches. A well-established and prolific functional line of enquiry has been to test the predictions of the Aspect Hypothesis (AH), and research suggests that in the early stages of acquisition L2 speakers are inclined to use verbal inflection to mark the inherent aspect (aka lexical or situation type aspect) of the verb and/or its predicate, regardless of a morpheme's specific function, with target-like inflectional morphology being established incrementally with increasing proficiency (e.g. Andersen, 1991; Andersen & Shirai, 1994; Robison 1990, 1995). Unlike grammaticalized aspect, inherent aspect is universal and non-grammaticalized, defined by the internal semantic properties of a verb or its predicate, which fall into one of four categories: *states, activities, accomplishments and achievements* (Comrie, 1976; Vendler, 1967). Based on these categories, the AH predicts distinct developmental stages of L2 acquisition for temporal forms (achievements-accomplishments-activities-states) (Andersen, 1991; Andersen & Shirai, 1994, 1996; Bardovi-Harlig, 1999; Costello and Shirai, 2011). However, its explanatory power lies at the early stages of development, as higher-proficiency learners are expected to have

moved away from marking verbs for inherent aspect in favour of native-like marking. Also note that this is regardless of L1 background, as the AH is based on universals and is therefore cross-linguistic, which suggests that performance across learners should be similar. It is thus unable to explain optional use of forms at advanced levels from speakers of particular L1 backgrounds (see below). Linked to this, there is no recourse to L1 transfer at any point in development and any grammaticalized tense/aspect differences in L1-L2 pairings are irrelevant. This contrasts with more formal approaches, where the issue of L1 transfer is of central concern.

Those working within more formal approaches, such as the Generative Grammar/Minimalist Program framework, are interested in the acquisition of overt morphological marking of temporal systems and concerned with the development of learners' underlying knowledge of overt forms in the context of the presence or absence of functional categories and their featural properties (e.g. T[+/-past], Asp[+/-prog]). Much of the discussion has centred on how much, if at all, the L1 influences the development of such categories and features in terms of the transfer of L1 properties. It also asks whether or not these influences are permanent. This debate has partly arisen in light of evidence to suggest that advanced-level L2 speakers are susceptible to the optional use of L2 forms in production that do not have corresponding underlying representations in the L1. For example, L2 English tense marking in L1 Chinese has received attention as Chinese lacks T [+/-past] (e.g. Hawkins & Liszka, 2003; Lardiere, 1998 a/b, 2000). L2 Spanish aspect marking in L1 English, which lacks the Asp [+/perfective], has also been a focus of enquiry (e.g. Montrul & Slabakova, 2003; Slabalova, 2001; 2002; Slabakova & Montrul, 2002). The question of the permanency of

L1 transfer is integral to the issue of how much access to Universal Grammar older L2 learners have. On the one hand, full-access to UG entails that featural properties of the L2 that are not selected in the L1 are available regardless of L1 influences. Montrul and Slabakova (2003), for example, testing the L2 acquisition of the preterit-imperfective contrast in Spanish, argue that learners have full access to the properties of UG in this domain. They support this with evidence from their L1 English-L2 Spanish advanced participants performing with 70% native-like accuracy. On the other hand, Hawkins and Liszka (2003) claim that post-puberty learners only have partial access to the properties made available by UG. In the case of L1 Chinese-L2 English learners, T[+/-past] remains unspecified as Chinese lacks this feature. Furthermore, this L1 influence is considered to be permanent. To support this claim they compare performance in a free oral production task with highly proficient German, Japanese and Chinese groups, where German and Japanese instantiates [+/-past] and Chinese does not. The results show that the Chinese group is significantly different from the other two groups, by producing inflected regular verbs in two thirds of unambiguously past tense environments (62.5%), compared with the German and Japanese groups, who perform near-natively with 96.3% and 92% respectively.

Roberts and Liszka (2013) also considered the issue of L1 influences on the L2 acquisition of temporal phenomena. However, this time it was framed within the question of how advanced learners put to use their knowledge of tense/aspect distinctions automatically in real-time comprehension in the processing of anomalous sentences. They investigated whether French and German learners show implicit knowledge of such distinctions and whether this is dependent on the presence/absence of such distinctions in

their L1. Specifically, they tested the learners' sensitivity to tense/aspect agreement mismatches in their on-line processing of English past simple tense and (British) English present perfect aspect by using an on-line self-paced reading task involving a mismatch between fronted temporal adverbials and the inflected verb (e.g., **Yesterday, John has gone swimming*). The results revealed that even though both L2 groups judged the violations as unacceptable in the off-line AJ task to native-like levels, only the French were sensitive to violations in both simple past and present perfect environments on-line, unlike the Germans, who showed no processing cost at all for either type of mismatch. The authors suggest that the difference between the two groups could be attributed to L1 influences, i.e. the French were sensitive to the tense/aspect violations as their L1 encodes aspectual distinctions (albeit differently to English), whereas (as noted above) German does not grammaticalize aspect at all, thus potentially influencing the non-instantiation of implicit knowledge of English aspectual distinctions, even though explicit knowledge of the aspectual contrast was evident.

The current study also investigates L2 implicit knowledge using self-paced reading, but rather than using a violation paradigm (e.g., Hopp, 2010; Juffs & Harrington, 1995/1996; Roberts & Liszka, 2013) we tested learners' on-line commitments during processing. We focus on temporary subject-object ambiguities in English past simple and past progressive constructions, all of which ultimately turn out to be grammatical. Based on the similarities and differences detailed in the previous section on English tense/aspect distinctions and summarized in table (1) between English and the three learner-L1s, and given that there is evidence from previous studies of an L1 influence on L2 processing of

temporarily ambiguous sentences (e.g., Dussias & Cramer Schulz, 2008; Frenck-Mestre & Pynte, 1997), we can make predictions about L1 influences from each learner group.

Thus, with the instantiation of T[+/-past] in their native L1s, we predict that the results will show native-like performance in English for the simple past in all three L2 groups. With regards to progressive aspect, however, we might expect to see differences across the three groups in terms of grammatical proximity to English. Since French encodes the distinction via Asp[+/-perfective], albeit indirectly, and given the findings in Roberts and Liszka (2013), we predict their processing to be most similar to the English control group. In contrast, the German and Dutch groups are predicted to be the least native-like, given that aspect is not encoded obligatorily. However, if the periphrastic *aan+het+inf* construction to express progressive aspect in Dutch is indeed becoming grammaticalized, the Dutch group may perform more like the English controls in comparison to the German L2 learners.

The Current Study

In this study, two main tasks, self-paced reading to tap implicit processes and acceptability judgments to assess explicit knowledge, were used to gain a more composite picture of learners' knowledge of the constructions under investigation (Ellis, 2005; Ellis et al., 2006; Hulstijn, 2005; Rebuschat, 2015; Roberts & Liszka, 2013; Tokowicz & MacWhinney, 2005). A metalinguistic, cloze production task in which the learners were required to distinguish the past simple from the past progressive was employed to pre-select participants for the study, as we were interested in how learners who have demonstrated their 'off-line' knowledge of English aspect would put this knowledge to

use during real time comprehension, and all learners also undertook a test of English proficiency. More details are set out in the method sections below.

Method

Participants

The participants were all paid a small fee and comprised 32 German (mean age: 24.6; 19-30), 24 Dutch (mean age: 26.1; 19-33); 24 French (mean age: 37.4; 20-66), and a control group of 20 native (British) English speakers (mean age: 35; 21-58). All the L2 learners were studying English at university in their home country. All learners undertook the grammar part of the Oxford Placement Test (Allan, 1992) which placed them in the 'advanced' range (table 2). A cloze test was used to select participants on the basis of their ability to distinguish the past simple from the past progressive (see Appendix A), which involved reading a short narrative text, and inserting into the gaps in the text the correct form (past simple/progressive) of the verb[6]. Only those who scored above 70% were selected, leading to 20 Dutch, 19 French and 19 German participants (see table 2). According to the results of two one-way ANOVAs with Group (Dutch, French, German) as between-group factor, there were no significant differences in either the proficiency test ($F(2, 57) = .767$; $p > .4$) or the production task scores ($F(2, 57) = .334$; $p > .7$). Thus, the L2 learners were matched in terms of their proficiency (although there was somewhat more variation in the German learners) in English and their ability to distinguish the past simple from the past progressive. Despite the fact that the learners' proficiency scores were matched, given that proficiency/off-line knowledge has been found to affect L2 learners' processing of temporary ambiguities (Jackson, 2008; Jackson & van Hell,

2011), the scores on the proficiency task later entered into the analyses of the on- and off-line tasks.

	English Proficiency			Cloze Production		
	Mean	SD	Range	Mean	SD	Range
Dutch (n=20)	83.50	605	70-98	80.60	7.88	72-98
French (n=19)	85.37	7.09	70-98	81.37	8.81	70-98
German (n=19)	82.53	8.32	64-100	82.89	9.92	72-98

Table 2. L2 learners' scores (%) on English proficiency test and cloze production task.

Materials and Procedure

The word-by-word self-paced reading study contained 20 experimental sentences[7] (Appendix B) in four conditions (11/12), randomized and set amongst 72 fillers of different types. Each experimental sentence comprised a preposed adjunct with an optionally transitive verb[8] in the past simple (11) or past progressive (12) tense, and followed an introductory sentence (*John and Sam took their guns out into the woods.*)[9]. A definite singular DP followed which always contained an adjective to extend the length of the ambiguity (c.f., Ferreira & Henderson, 1991), temporarily ambiguous between a subject (early closure) and object reading (late closure), and then the main clause verb (plus subject pronoun in the late closure version of the sentences [a]) followed by 2 - 4 words, most often a prepositional phrase.

(11) a. *Simple past, late closure*

As John <u>hunted</u> the frightened rabbit <u>it escaped</u> through the dark trees.

b. *Simple past, early closure*

As John <u>hunted</u> the frightened rabbit <u>escaped</u> through the dark trees.

(12) a. *Past progressive, late closure*

As John was hunting the frightened rabbit it escaped through the dark trees.

b. *Past progressive, early closure*

As John was hunting the frightened rabbit escaped through the dark trees.

The materials were based on those from the Frazier et al. (2006) paper[10] with some lexical items adapted so that they were more appropriate for L2 learners.[11] We also wanted to ensure that (for English speakers) the constructed past progressive sentences would be equally acceptable with (12a) and without a direct object (12b) and that the past simple sentences with no direct object (11b) would be dispreferred to those with a direct object (11a). A group of 10 native speakers (who did not take part in the main experiment) rated the acceptability of the 20 experimental items set among 72 fillers on a scale from 1 (least acceptable) to 6 (most acceptable). The results are presented in chart 1.

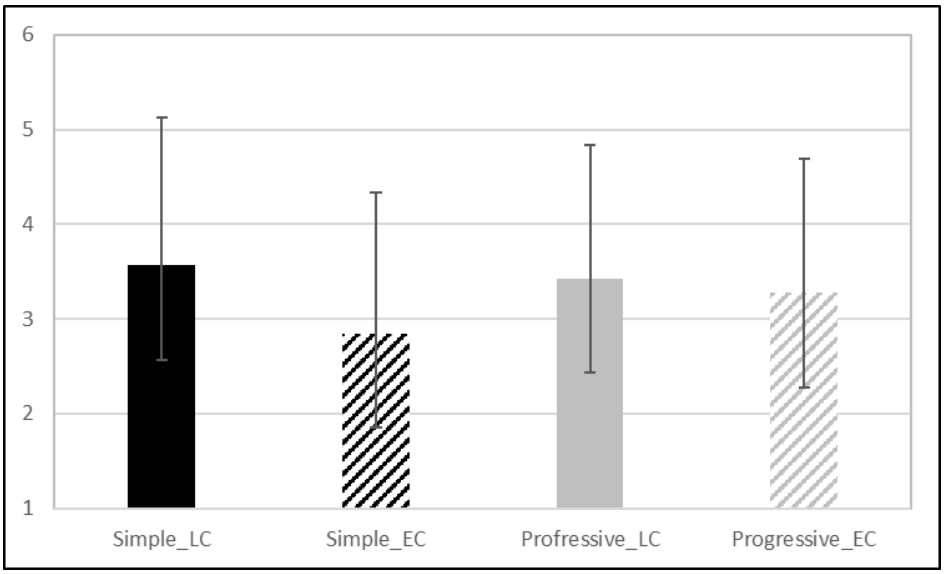


Chart 1. Pre-test: Acceptability judgments of experimental items by 10 English native speakers (LC=late closure; EC=early closure).

The past simple early closure condition (11b) was rated the least acceptable (2.9, SD=1.7) overall, and importantly this was the case when compared to both the past simple late closure condition (11a) (3.6, SD=1.8), the late closure past progressive condition (12a) (3.5, SD=1.9) and the past progressive early closure condition (12d) (3.4; SD=1.9), where there is no direct object for the initial verb. We were therefore confident that for native English speakers, the experimental manipulation should lead to differences in on-line processing commitments during the self-paced reading study, as seen in the earlier Frazier, et. al study. This latter acceptability judgment task was later employed in the study proper as a measure of the L2 learners' off-line (explicit) judgments of the sentences used in the self-paced reading experiment, and we compared all groups' off-line interpretations with their on-line processing behaviour.

Four experimental lists were created and each participant was assigned to one, such that everyone saw each of the 20 experimental items but no item more than once. For the SPR study, participants sat approximately 60cms away from a computer screen, and pressed a button to bring up each word of each text which appeared in the center of the screen, replacing the previous word. To keep the participants on task, a yes/no comprehension question followed two-thirds of all items.[12] Accuracy was high (English 92%, SD = 8.6; German, 94%, SD = 7.8; Dutch, 93%, SD = 6.2; French, 91%, SD = 8.2). The learners undertook the AJT, then the proficiency and cloze test after the on-line task.

Results

SPR Data Treatment. To clean the data of extreme outliers, for the English group, individual reading times (RTs) over a timeout of 5000ms were removed, affecting 0.5% of the data, and over 6000ms for the L2 learners, affecting, 0.2% of the French; 0.4% of the Dutch and 0.5% of the German data. Further to this, individual outlying RTs that fell beyond 2SDs of an individual's mean per condition were removed (English: 0.8%; French: 0.9%; Dutch: 1.0%, German: 0.7%). A series of linear mixed-effects models on length-adjusted RTs[13] were adopted for all analyses in R (lme4 package, Bates, Maechler, & Bolker, 2012), and maximal models were used in all cases (c.f., Barr, et al., 2013). More details on the specific analyses is set out below.

We examined RTs on four critical segments. Firstly, we investigated the processing of the ambiguous DP itself (*the frightened rabbit* (11/12). Although pre-tests had ensured as far as possible that the ambiguous DP was felicitous in both past simple and past progressive contexts, we were interested to see if on-line reading times would reflect an expectation (or not) of a DP following a past simple vs. a past progressive verb, irrespective of later interpretations. That is, if a DP is less expected/preferred following a progressive versus a simple verb, then it was hypothesized that RTs on the ambiguous DP should be higher following the former versus the latter. RTs were then examined on three critical segments: the disambiguating word(s) (*it/ran*), the spillover segments (e.g., *through the*) and the sentence-final word (*trees*). Given that the sentences were presented word-by-word, the disambiguating segment contained the main verb in the early closure conditions (*ran*), and the subject pronoun plus main verb in the late closure conditions (*it ran*). For the analysis on the disambiguating segments, we therefore collapsed the data

across two segments in the late closure condition (the subject pronoun and main verb) to compare statistically with the early closure residual RTs on the segment containing the disambiguating verb.[14] RTs were also collapsed in the spillover segments. The first step in the analysis involved comparing the L2 learners to native English speakers. A series of omnibus analyses[15] were run on each of the 4 critical segments, with all groups to see if, and if so where, there were any effects of Aspect (progressive/simple) and Type (early closure/late closure) on RTs, and potential differences between the groups. Analyses were then run on the L2 learners' RTs per critical segment, to examiine effects of proficiency on their on-line processing. Finally, the L2 learners' off-line metalinguistic judgments of the experimental items were investigated.

RTs on the ambiguous DP. Reading times on the ambiguous DP (*the frightened rabbit*) are shown in Table 3.

	Past Progressive	Past Simple
English	413 (188)	391 (158)
Dutch	476 (181)	468 (177)
French	518 (203)	534 (227)
German	413 (205)	419 (206)

Table 3. Mean raw RTs (SD) on the ambiguous DP.

A linear mixed-effects model was applied to the residual RTs with the fixed factors Aspect (simple/progressive) and L1 background (Dutch/English/French/German), random intercepts for subjects and items, and included by-subjects, the random slope Aspect, and random slopes Aspect and L1 background by-items[16]. The results found only significant effects of L1 (see appendix) because all learners read the items more slowly than the English. No other effects or interactions were found.

RTs from the disambiguating segment. Effects of the experimental manipulations of Aspect (past simple vs. past progressive) and Type (early vs. late closure) were examined on the three segments following the presentation of the ambiguous DP (the disambiguating VP, the spillover region and the sentence-final segment). Table 4 shows the participants' mean raw reading times for these three segments.

Insert table 4 about here

In each of the three linear mixed-effects models applied to the residual RTs per segment, the fixed factors were Aspect (simple/progressive), Type (early closure/late closure) and L1 background (Dutch, English, French, German), with random intercepts for subjects and items, and with Aspect and Type as random slopes by-subjects, and Aspect, Type and L1 background included as random slopes by-items.

For the disambiguating segment, there was only a significant effect of Type (Type: LC: β = -57.68, SE = 27.08, t = -2.12, p = 0.03) because, as shown in Table 4, all groups read the early closure items more slowly than the late closure items (572ms; SD: 316 vs. 464ms; SD 209). Thus, a misanalysis effect was observed on disambiguation for the EC items, irrespective of language background or the aspect of the previously encountered verb.

Following disambiguation, the analysis on the RTs for the spillover segment found effects of Aspect: Simple (β = 41.50, SE = 13.99, t = 2.97, p = 0.003), L1: French (β = -75.54, SE = 25.08, t = -3.01, p = 0.003) and L1: German (β = -75.44, SE = 25.23, t

= -2.99, p = 0.004). There was also an interaction between Aspect: Simple and Type: LC (β = -47.50, SE = 19.81, t = -2.40, p = 0.017) and a three-way interaction between Aspect: Simple, Type: LC and L1: German (β = 62.53, SE = 28.26, t = 2.21, p = 0.03). To investigate these effects further, individual analyses were run per L1 group.

For the English, there was a simple effect of Aspect (β = 44.18, SE = 8.48, t = 2.39, p = 0.025) and an interaction between Aspect and Type (β = -46.40, SE = 22.34, t = -2.08, p = 0.047). This interaction was caused by the fact that for only the past simple was there a significant simple effect of Type (β = -77.87, SE = 18.99, t = -4.10, p = 0.0005), whereas there was no difference between the early and late closure RTs for the past progressive (Type: LC: β = -32.70, SE = 20.33, t = -1.61, p = 0.12). Therefore, the English data replicate those reported in the Frazier et al. (2006) study, with recovery from the earlier misanalysis evident only for the past progressive condition.

This effect also continued into the spillover region for the L2 learners, however, unlike for the English, there was no effect of Aspect as this was the case for both the past simple and the progressive items, with only an effect of Type significant for the German L2s (EC: 416ms, SD = 196 vs. LC: 388ms, SD = 177: β = -39.76, SE = 16.90, t = -2.35, p = 0.032), and Dutch (EC: 536ms, SD = 269 vs. LC: 446ms, SD = 151: β = -72.81, SE = 20.02, t = -2.80, p = 0.001), and marginal for the French (EC: 640ms, SD = 187 vs. LC: 507ms, SD = 181: β = -40.03, SE = 20.10, t = -1.90, p = 0.073). There were no effects or interactions on the sentence-final RTs[17].

Off-line judgments. Chart 2 shows L2 learners' acceptability judgments of the experimental items and shows that there appears to be an effect of aspect only for the

French and Dutch L2s. Analysis confirmed this observation. For analysis, the scores (1=least acceptable to 6=most acceptable) were Z-transformed and were the outcome variables, with fixed-effects predictors Aspect, Type, L1 (Dutch, English, French, German) and with subjects and items as random intercepts, and Aspect and Type as random slopes by-subjects, and Aspect and Type and L1 included by-items. There was an effect of Aspect: Simple (β = -0.48, SE = 0.19, t = -2.57, p = 0.01), and an interaction between Aspect and Type (β = 0.64, SE = 0.26, t = 2.43, p = 0.02). Furthermore, there was a significant two-way interaction between Aspect and L1: German (β = 0.55, SE = 0.23, t = 2.40, p = 0.014) and a significant three-way interaction between Aspect, Type and L1: German (β = -0.70, SE = 0.32, t = -2.18, p = 0.03).

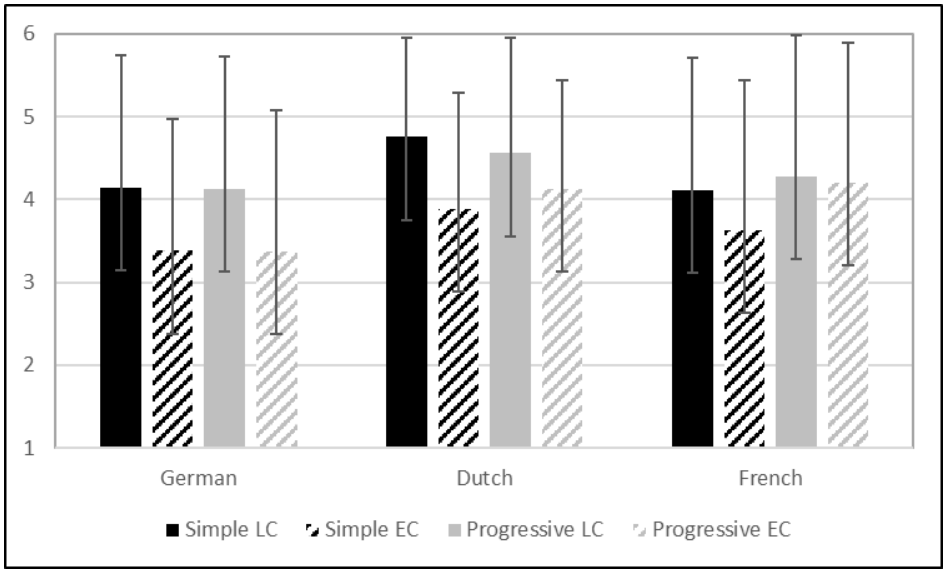


Chart 2. L2 learners' mean acceptability judgments.

As can be seen in Chart 2, looking at the German data alone, there was no difference in the learners' ratings depending on aspect, with early closure items equally less acceptable

than late closure items for both progressive and simple conditions (Type: LC: $\beta = 0.56$, SE = 0.15, t = 3.14, $p = 0.007$). For the French and Dutch, there were effects of Aspect on the acceptability judgments, although not identical. For the French, there was only an effect of Aspect ($\beta = -0.35$, SE = 0.19, t = -2.11, $p = 0.048$) because the progressive items were rated more highly acceptable than the simple items overall. Similarly, there was an effect of Aspect in the Dutch data ($\beta = -0.40$, SE = 0.13, t = -3.10, $p = 0.0034$), as well as an interaction between Aspect and Type ($\beta = 0.56$, SE = 0.19, t = 3.03, $p = 0.004$). Separate analyses of the Dutch progressive and simple scores found that this interaction was caused by the fact that there was no difference in judgments between the early and late closure progressive items (Type: LC: $\beta = 0.33$, SE = 0.19, t = 1.68, $p = 0.11$), whereas the past simple late closure items were judged as significantly more acceptable than the early closure items ($\beta = 0.90$, SE = 0.16, t = 5.69, $p < 0.0001$), a pattern similar to that found for the English.

Summarising the findings of the main analysis, the on-line data revealed effects of misanalysis for all L2 learners on the disambiguating and immediately following spillover segments, with RTs higher for early closure versus late closure items, but in contrast to the English, this was not affected by the aspect of the previously encountered verb. Off-line, the French and Dutch learners treated the items differently depending on aspect, with the past simple early closure items being the judged as less acceptable than the past progressive early closure items. There was no difference between on- and off-line responses for the German L2 learners. Below we examine potential effects of proficiency in the L2 learner group data.

Post-hoc Analyses: Effects of Proficiency. To investigate effects of proficiency, analyses were run per group, with L1 (Dutch, French, German), Proficiency Score as predictor variables, together with Aspect and Type and, and with Aspect and Type included as random slopes by-subject, and Aspect, Type, L1 and Proficiency by-items. Effects of Proficiency were observed only observed RTs for the disambiguating VP and the sentence-final segment: there were no interactions with Proficiency on RTs on the ambiguous DP, the spillover segments, nor on the acceptability judgments (see Appendix C).

On the disambiguating VP, there was a significant interaction between Type: LC and Proficiency (β = -14.64, SE = 40.92, t = -2.14, p = 0.039), because there was a trend across all L2s that the higher their proficiency, the longer the reading times were for the early closure items. On the sentence-final segment, there was an effect of L1: French (β = 2234.00, SE = 954.69, t = 2.34, p = 0.022), which interacted with Aspect: Simple (β = -2788.53, SE =1384.55, t = -2.01, p = 0.048), Type: LC (β = -2749.90, SE = 1346.72, t = -2.04, p = 0.045), and Proficiency (β = -27.05, SE = 11.29, t = -2.40, p = 0.019). L1: French and Proficiency also entered into significant three-way interactions with Type: LC (β = 33.71, SE = 15.91, t = 2.12, p = 0.037), and marginally with Aspect: Simple (β = 32.17, SE = 16.37, t = 1.97, p = 0.054). These results suggest that only for the French did proficiency interact with Aspect and Type influence the learners' on-line reading. This was supported by three analyses per group, with Aspect, Type and Proficiency entered into the model. There were no effects of proficiency for either the Dutch or the German Group (See Appendix C).

For the French, there was a significant interaction between Type: LC and Proficiency (β = 24.65, SE = 10.21, t = 2.41, p = 0.022), a marginal interaction between Aspect: Simple and Proficiency (β = 26.17, SE = 12.71, t = 2.060, p = 0.053), and a marginal three-way interaction between Type: LC, Aspect: Simple and Proficiency (β = -31.06, SE = 15.88, t = -1.96, p = 0.061). An examination of the progressive aspect RTs separately from the simple aspect RTs found that these effects were driven by the fact that for the progressive items, there was an effect of both Type: LC: (β = -2012.85, SE = 837.23, t = -2.40, p = 0.023), Proficiency (β = -17.174, SE = 6.10, t = -2.82, p = 0.006) and an interaction between the two (β = 23.77, SE = 9.76, t = 2.44, p = 0.022), whereas there were no effects for the past simple items. In sum, on the sentence-final segment, the more highly proficient French learners read the progressive items with a DP (i.e., the late closure items) more slowly than the early closure progressive items.

General Discussion

In this study, we investigated L2 learners' implicit and explicit knowledge of the distinction between the past simple and past progressive in English, using self-paced reading and an acceptability judgment task. Below we discuss the findings.

English native speakers

Our English native speaker results replicate those of Frazier et al. (2006), showing that recovery from misanalysis during on-line processing is easier in progressive versus simple temporary subject-object ambiguities. Frazier et al. argue that recovery from initial misanalysis is mitigated in progressive versus simple sentences because of the

differences in the perspective that readers take on events. A simple verb induces an external perspective, and so when a DP is encountered it serves as direct object, providing an endpoint for the event (*hunted the rabbit*). Thus, on encountering the disambiguating VP, when the DP must be reanalyzed as the subject of the main verb, reanalysis involves relinquishing the preferred direct object analysis in favour of an unbounded event interpretation. In contrast, they argue that readers are ambivalent when it comes to an endpoint for a progressive event (*was hunting the deer* vs. *was hunting*), because of the internal, unbounded perspective taken, and so reanalysis is comparatively easier.

Below we discuss the L2 learner findings, in comparison to the native English, and according to the predictions based on the learners' L1 differences in tense/aspect set out above (table 1).

Native-like incremental processing – past simple

Since Tense is instantiated in all the learner-L1s, we predicted that the learners should all perform like native speakers in their processing/interpretation of the past simple items. This was the case, as all L2 groups slowed down in the early closure past simple condition, a finding that adds to the evidence of incremental L2 on-line processing (e.g., Jackson, 2008; Juffs & Harrington, 1995; 1996; Roberts & Felser, 2011). For all the learners, this was evident immediately on the disambiguating segment (like the native English speakers), and then spilled over into the following segment(s). The on-line pattern for the past simple was reflected in all the learners' off-line judgments: the early

closure past simple items elicited lower acceptability ratings in comparison to the late closure condition.

L1 influences – past progressive

As predicted on the basis of differences in the learner-L1s with regards to grammaticalized aspect, it was with the progressive items that the three L2 groups performed differently. The French group were expected to perform most like the native speakers in the past progressive, whereas we predicted the Germans would not be affected by the progressive/simple distinction, since this was found in the on-line results of Roberts and Liszka (2013). The Dutch group were predicted to pattern more akin to the French/English, if it is indeed the case that the periphrastic *aan het+infinitive* construction is becoming grammaticalized Dutch.

These predictions were on the whole realized. The German learners' on- and off-line performance did not differ, and both aspectual conditions were treated the same (an equivalent GP-effect on-line, and lower off-line acceptability ratings for the early closure conditions, irrespective of aspect), despite performing no differently from the Dutch or French in the cloze production task. Thus the German learners demonstrated metalinguistic knowledge of the distinction between the progressive and simple, but this was not reflected in their on-line/off-line expectations/preferences for a direct object in these temporarily ambiguous sentences, with both aspectual types being treated as [+]telic and a direct object expected equally[18]. It may be that (post-puberty) L2 learners' knowledge of distinctions not instantiated in their L1 may not become fully acquired, or may at least be delayed (Hawkins & Liszka, 2003; Roberts & Liszka, 2013).

The French L2s performed most similarly to the natives, with aspect affecting on-line RTs at least for the higher proficiency group. However, RTs were not identical to the native speakers: specifically, while recovery from misanalysis in the progressive context was easier for the English, the French found the progressive early closure items easier to process than the progressive late closure items, despite the judgment data showing that both early and late closure progressive sentences were equally acceptable. Despite these differences in comparison to the natives, it is in fact striking that the French group were affected by aspect on-line although the *imparfait* in French is not identical to the English past progressive in that it can express both ongoing and habitual events in the past (Comrie, 1976). Roberts and Liszka (2013) similarly found that French L2 learners were sensitive on-line to English aspectual distinctions, so it may be that the mere presence/absence of grammaticalized aspect (even if not instantiated in the L2 in exactly the same way as in the L1) affects L2 comprehenders' processing commitments. If this is the case, then these findings should generalize to native speakers and learners of other languages which distinguish grammatically between the perfective/imperfective. There is in fact some evidence of this, for instance, Papadopoulou and Tsimpli (2005) found that native Greek speakers expect an atelic event with imperfective verbs, i.e. they did not misanalyse the ambiguous DP in early-closure sentences that are comparable to those tested in the current paper, although they did not include sentences with perfective verbs, which could be investigated in future studies.

The Dutch group performed similarly to the French off-line, showing an effect of aspect, whereas on-line, like the German L2s, no such effects were observed. Therefore, overall, although aspect is not marked obligatorily in either Dutch or German, the Dutch

learners were more sensitive to English aspectual distinctions. Like in German, progressive aspect can be realized via lexical means, but it may be that the Dutch periphrastic locative construction (*zijn+aan het+inf*) is in the process of becoming grammaticalized, perhaps similarly to the English progressive, which is arguably derived from locative expressions e.g., *be on hunting* (Bybee, et al. 1994; Comrie, 1996; Jespersen, 1954; Vlach, 1981; but see Ziegeler, 1999). Although a similar construction is available in German, it is argued to be much more widespread in modern Dutch, and there is evidence that Dutch (native) speakers are to be more sensitive to the un/boundedness of progressive events experimentally (Behrens, Flecken & Carroll, 2013; Bybee, Perkins & Pagliuca, 1994; Flecken, 2011; Traugott & Heine 1991). This could explain why, at least off-line, the Dutch distinguished the progressive from the simple in English, that is, they may have a partial L1 grammatical representation which makes them sensitive to viewpoint aspect in the L2.

Types of knowledge

Effects of proficiency have been observed in other studies investigating L2 learners' processing of temporary ambiguities (e.g., Jackson, 2010; Jackson & van Hell, 2011). There was an effect of proficiency for all L2 learners on the disambiguating segment, with those of higher proficiency showing a stronger misanalysis effect. However, despite the fact that the Dutch (and not the German) learners were influenced by grammatical aspect in their off-line judgments, only the highly proficient French learners in the current study recovered from misanalysis on-line. If the Dutch are indeed on their way to being conceptually/sematically primed towards a grammaticalized means

of expressing ongoingness (as opposed to the Germans), this may be underpinned by a partial L1 grammatical representation, which is more developed/instantiated in the L2 at higher levels of proficiency. Thus, without a full representation, the Dutch did not show on-line effects of aspect in contrast to the more target-like higher-proficiency French. Other L2 sentence processing research has found differences between off- and on-line performance (e.g., Roberts & Liszka, 2013; Roberts, Gullberg & Indefrey, 2008). For instance, it has shown that when merely reading for meaning, if L2 learners show native-like processing, this may be in evidence later in the sentence, or only if a metalinguistic task accompanies the reading task (Havik, Roberts, van Hout, Schreuder, & Haverkort, 2009: see also Indefrey, 2006, for discussion on different brain regions being involved when comprehension is accompanied by metalinguistic judgments). Future research could investigate whether a group of Dutch L2 learners might show evidence of L2 aspectual knowledge on-line, if they were required to undertake a task additional to reading for meaning.

The results of this study suggest that L1 background may have effects at different levels of linguistic knowledge. Metalinguistic knowledge appeared to be unaffected by the presence/absence of grammaticalized aspect in the learners' L1: in fact, we only selected participants scored well-above chance on the cloze test. This task can be successfully completed by matching temporal adverbials to verb forms, and all the L2 learners could perform this task successfully. This is unsurprising, given their advanced level, and that all had acquired English in a classroom context. As regards the AJT, we argue that it is a measure of explicit knowledge, but rather than tapping into knowledge of un/grammaticalities as in a number of other L2 studies, in the current experiment, it

assessed the extent to which a bounded event interpretation is ultimately preferred in temporarily ambiguous sentences with simple vs. progressive verbs. Here, the Dutch patterned with the English and French. Finally, only the French most highly proficient learners showed implicit knowledge of this distinction, arguably because French encodes the distinction via Asp[+/-perfective], albeit indirectly. In sum, and taking all the L2 learner results together, it appears that the grammatical proximity to English with regards grammatical aspect influences the extent to which such L2 knowledge is observable in implicit tasks.

Conclusions

The data from this study show that for the English, the progressive/non-progressive distinction led to a discernable behavioural consequence, affecting the parser's commitment to ongoing analyses. This was the case on-line for the most advanced French, and off-line for the Dutch and French, but not the German learners. Given that the learners were matched in terms of metalinguistic knowledge of the progressive/simple distinction, proficiency, population-type (university students in their home country) and context of exposure (classroom), we argue that their L2 processing and off-line interpretations (implicit and explicit knowledge, respectively) in this study was influenced by whether or not their L1 encodes progressive aspect via syntactic (French) or only lexical means (Germans). The Dutch appear to be 'on their way' to more English-like knowledge of the examined aspectual distinctions, and we argue that this is due to the periphrastic Dutch construction becoming grammaticalized, allowing for greater sensitivity to aspect in L2 English. Furthermore, from a formal perspective, these

results would appear to align more with the predictions of partial access to UG accounts (re: Hawkins & Liszka, 2003), rather than those hypothesizing full access to the properties of UG (re: Montrul & Slabakova, 2003). In the case of the latter, we would expect to see similar results across the proficiency-matched groups, regardless of the linguistic properties of tense and aspect underlying their L1s, which contrasts with the former, suggesting that an L1 influence is maintained even at high levels of proficiency.

Nevertheless, we are aware that this is speculative, and that there are a number of limitations in the current study. It could be the case that despite being matched, the Dutch in general had more naturalistic exposure to English than the German group, given that English in general is more widely in evidence in the Netherlands. Furthermore, we acknowledge that we had too few participants and items to make a strong claim for on-line proficiency effects observed. Future studies could investigate further whether native-like knowledge of phenomena not instantiated in a learner's L1 are ultimately acquirable, by focusing on a wider range of participants of various exposure experience (end-state participants with naturalistic exposure) and examine in more detail the relationship between metalinguistic, explicit and implicit knowledge.

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Appendix A**.** Cloze test to elicit past simple and past progressive forms

Quite late one evening I _____(walk) home alone from college. The wind _____(blow) hard and it _____(pour) with rain, so there _____(be) no one around. Anyway, this big black van _____(drive) past me and _____ (stop), just where the road _____(curve) round. I _____(decide) to go on, though I _____(feel) increasingly uneasy. However, as soon as I _____(get) close to the van, it _____(drive) off. This _____(happen) twice more further down the same road. Each time the van _____(pull up) fifty metres ahead of me, _____(wait) until I almost _____(draw up) with it and then _____(pull away) again. By this stage I _____(be) absolutely petrified. So I _____(stand) for a moment under a tree. The rain _____(come down) in torrents now. I _____(shake) and _____(wonder) what to do next, when a policeman _____(come) past. He _____(push) his bike because of the heavy rain. I _____(grab) him by the arm and _____(make) him stop. Then I completely _____(go) to pieces. While he _____(try) to calm me down, I _____(hear) the van drive off, thankfully for the last time. I've never walked home on my own since.

Appendix B. Experimental Items

1 It was late and the bar was full. As the men drank/were drinking the strong beer was/it was spilled on the floor.

2 Alice and Jim decorated their house every year. When Alice painted/was painting the kitchen walls were/they were covered with many drops.

3 Tony and his friends loved to sing at parties. When Tony sang/was singing the drinking song sounded/it sounded like opera.

4 John and Sam took their guns out into the woods. As John hunted/was hunting the frightened rabbit escaped/it escaped through the dark trees.

5 Susan and her children lived far from her parents. When Susan visited/was visiting the friendly neighbours wanted/they wanted to have a party.

6 The flat was very old and dirty. Even when Joe cleaned/was cleaning the small kitchen smelled/it smelled like old rubbish.

7 The couple sitting next to me at the restaurant got up to leave. As I watched/was watching the drunk man tripped/he tripped over my chair.

8 There were two Italian chefs working in the restaurant. Because Mario cooked/was cooking the fresh pasta was/it was made to real perfection.

9 There were many differecallnt kinds of vehicles at the company. When George drove/was driving the big lorry made/it made loud and strange noises.

10 The opera company had three different conductors. When Mr Osaka conducted/was conducting the symphony orchestra played/it played better than anyone else.

11 On Saturday nights, the police department was very busy. When the sheriff patrolled/was patrolling the whole town was/it was safe and secure.

12 Jenny and Sam went out for a ride. While Jenny rode/was riding the young horse decided/it decided to jump a high fence.

13 Maggie and Fred were the two supervisors at the factory. When Maggie supervised/was supervising the night staff worked/they worked extremely efficiently.

14 In the park, two children were eating some ice-cream. As the boy ate/was eating the chocolate ice-cream dropped/it dropped down his clean shirt.

15 In the garden, a boy and girl wanted to go up into the tree-house. While the girl climbed/was climbing the tall tree started/it started to shake dangerously.

16 Sarah and Jane owned a shop selling old furniture. When Sarah polished/was polishing the cheap furniture looked/it looked new and expensive.

17 Rita and Violet took turns to do the washing. When Rita washed/was washing the delicate clothes were/they were torn to pieces.

18 The lawyers' office was rather busy. As the secretary typed/was typing the eviction notice was/it was cancelled very suddenly.

19 Yesterday in my art class, the model sat in the same position for hours. As I drew/was drawing the patient woman tried/she tried very hard to keep still.

20 The driving instructor almost gave up on Mrs. Brown. When the woman parked/was parking the new car was/it was always at an angle.

Appendix C. Full Results

Ambiguous DP: Formula (residrt ~ Aspect*L1 + (Aspect|subject) + (Aspect+L1|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	20.424	18.394	1.110	0.2716
Aspect: Simple	-19.795	9.224	-1.146	0.3571
L1: Dutch	-89.581	18.327	-4.888	5.88e-06 ***
L1: French	-108.641	18.566	-5.852	1.29e-07 ***
L1: German	-98.501	18.539	-5.313	1.14e-06 ***
Aspect: Simple*L1: Dutch	16.785	13.011	1.290	0.2010
Aspect: Simple*L1: French	19.031	13.197	1.442	0.1534
Aspect: Simple*L1: German	19.508	13.019	1.498	0.1386

Disambiguating VP: Formula (residrt ~ Aspect*Type*L1 + (Aspect*Type|subject) + (Aspect*Type+L1|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	81.973	30.030	2.730	0.00711**
Aspect: Simple	28.523	31.016	0.920	0.35787
Type: LC	-57.675	27.075	-2.130	0.03327*
L1: Dutch	-12.855	36.356	-0.354	0.72377
L1: French	-63.769	35.530	-1.795	0.07325
L1: German	-67.350	36.593	-1.840	0.06621
Aspect: Simple* Type: LC	-36.016	38.222	-0.942	0.34615
Aspect: Simple*L1: Dutch	-16.976	44.752	-0.379	0.70447
Aspect: Simple*L1: French	31.248	44.362	0.704	0.48126
Aspect: Simple*L1: German	-30.144	44.326	-0.680	0.49654
Type: LC*L1: Dutch	-50.270	39.284	-1.280	0.20080
Type: LC* L1: French	9.336	38.540	0.242	0.80861
Type: LC* L1: German	-21.688	39.025	-0.556	0.57843
Aspect: Simple* Type: LC *L1: Dutch	9.529	54.664	0.174	0.86164
Aspect: Simple* Type: LC *L1: French	-21.796	54.689	-0.399	0.69027
Aspect: Simple* Type: LC *L1: German	72.387	54.038	1.340	0.18054

Spillover: Formula (residrt ~ Aspect*Type*L1 + (Aspect*Type|subject) + (Aspect*Type+L1|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	34.3796	20.5398	1.674	0.09716
Aspect: Simple	41.4992	13.9901	2.966	0.00303**
Type: LC	-27.4169	17.0842	-1.605	0.11052
L1: Dutch	-31.4543	24.8806	-1.264	0.20890

L1: French	-75.5375	25.0815	-3.012	0.00326**
L1: German	-75.4385	25.2310	-2.990	0.00346**
Aspect: Simple* Type: LC	-47.4979	19.8195	-2.397	0.01660*
Aspect: Simple*L1: Dutch	0.7744	20.0510	0.039	0.96919
Aspect: Simple*L1: French	-35.0539	20.2501	-1.731	0.08352
Aspect: Simple*L1: German	-38.4612	19.9818	-1.925	0.05433
Type: LC*L1: Dutch	-44.9793	24.3460	-1.848	0.06648
Type: LC* L1: French	-10.8074	24.5918	-0.439	0.66091
Type: LC* L1: German	-16.1073	24.6973	-0.652	0.51520
Aspect: Simple* Type: LC *L1: Dutch	16.5816	28.3403	0.585	0.55852
Aspect: Simple* Type: LC *L1: French	43.8366	28.6834	1.528	0.12652
Aspect: Simple* Type: LC *L1: German	62.5299	28.2644	2.212	0.02700 *

English spillover: Formula (residrt ~ Aspect*Type + (Aspect*Type|subject) + (Aspect*Type|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	36.10	21.56	1.674	0.1050
Aspect: Simple	44.19	18.49	2.390	0.0247*
Type: LC	-31.61	20.49	-1.542	0.1389
Aspect: Simple* Type: LC	-46.41	22.35	-2.077	0.0473*

Dutch spillover: Formula (residrt ~ Aspect*Type + (Aspect*Type|subject) + (Aspect*Type|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	0.9996	27.6257	0.036	0.97139
Aspect: Simple	43.8943	29.2942	1.498	0.14931
Type: LC	-72.8118	26.0163	-2.799	0.00977**
Aspect: Simple* Type: LC	32.4040	34.4567	-0.940	0.35817

French spillover: Formula (residrt ~ Aspect*Type + (Aspect*Type|subject) + (Aspect*Type|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	-42.282	23.885	-1.770	0.0898
Aspect: Simple	11.274	24.196	0.466	0.6470
Type: LC	-40.034	21.095	-1.898	0.0726
Aspect: Simple* Type: LC	-3.329	37.941	-0.088	0.9312

German spillover: Formula (residrt ~ Aspect*Type + (Aspect*Type|subject) + (Aspect*Type|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	-43.591	20.067	-2.172	0.0401*
Aspect: Simple	3.299	18.881	0.175	0.8630
Type: LC	-39.759	16.899	-2.353	0.0315*
Aspect: Simple* Type: LC	9.870	21.287	0.464	0.6481

Sentence-final: Formula (residrt ~ Aspect*Type*L1 + (Aspect*Type|subject) + (Aspect*Type|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	155.1922	83.4926	1.859	0.0667
Aspect: Simple	-14.7702	69.5666	-0.212	0.832
Type: LC	4.9273	80.2172	0.061	0.9511
L1: Dutch	92.4467	95.9909	0.963	0.3378
L1: French	-37.5566	96.8745	-0.388	0.6991
L1: German	-15.2723	94.4154	-0.162	0.8719
Aspect: Simple* Type: LC	-26.6699	93.4678	-0.285	0.7754
Aspect: Simple*L1: Dutch	137.0003	97.1594	1.41	0.1596
Aspect: Simple*L1: French	67.6803	98.367	0.688	0.492
Aspect: Simple*L1: German	71.3092	91.0437	0.783	0.4345
Type: LC*L1: Dutch	-184.958	110.3309	-1.676	0.0953
Type: LC* L1: French	0.8155	111.4354	0.007	0.9942
Type: LC* L1: German	-131.885	105.3983	-1.251	0.2128
Aspect: Simple* Type: LC *L1: Dutch	-88.8395	132.0159	-0.673	0.5011
Aspect: Simple* Type: LC *L1: French	-105.444	133.5208	-0.79	0.4298
Aspect: Simple* Type: LC *L1: German	27.0672	121.8026	0.222	0.8242

Acceptability Judgments: Formula (Zscore ~ Aspect*Type*L1 + (Aspect*Type|subject) + (Aspect*Type+L1|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	0.09166	0.15504	0.591	0.555
Aspect: Simple	-0.4778	0.18592	-2.57	0.0103*
Type: LC	-0.01702	0.22797	-0.075	0.9406
L1: Dutch	-0.1988	0.17816	-1.116	0.2656
L1: French	-0.03112	0.17885	-0.174	0.862
L1: German	-0.40242	0.1808	-2.226	0.0269*
Aspect: Simple* Type: LC	0.63872	0.26273	2.431	0.0152*
Aspect: Simple*L1: Dutch	0.07519	0.22522	0.334	0.7386
Aspect: Simple*L1: French	0.12908	0.22689	0.569	0.5695
Aspect: Simple*L1: German	0.54546	0.22746	2.398	0.0166*
Type: LC*L1: Dutch	0.36247	0.27649	1.311	0.192

Type: LC* L1: French	0.21132	0.27831	0.759	0.4489
Type: LC* L1: German	0.59863	0.28023	2.136	0.0343*
Aspect: Simple* Type: LC *L1: Dutch	-0.08477	0.31835	-0.266	0.7901
Aspect: Simple* Type: LC *L1: French	-0.57875	0.32067	-1.805	0.0713
Aspect: Simple* Type: LC *L1: German	-0.69876	0.32133	-2.175	0.0298*

English AJT: Formula (Zscore ~ Aspect*Type + (Aspect*Type|subject) + (Aspect*Type|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	0.08562	0.20731	0.413	0.6842
Aspect: Simple	-0.46250	0.19080	-2.424	0.0221*
Type: LC	0.01832	0.24552	0.075	0.9415
Aspect: Simple* Type: LC	0.58668	0.23226	2.526	0.0125*

Dutch AJT: Formula (Zscore ~ Aspect*Type + (Aspect*Type|subject) + (Aspect*Type|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	-0.1092	0.1123	-0.972	0.34120
Aspect: Simple	-0.4003	0.1295	-3.090	0.00366**
Type: LC	0.3456	0.1918	1.802	0.08571
Aspect: Simple* Type: LC	0.5606	0.1853	3.026	0.00424**

French AJT: Formula (Zscore ~ Aspect*Type + (Aspect*Type|subject) + (Aspect*Type|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	0.07424	0.1975	0.536	0.5976
Aspect: Simple	-0.3534	0.1973	-2.112	0.0477*
Type: LC	0.18824	0.1811	0.989	0.3357
Aspect: Simple* Type: LC	0.05675	0.1684	0.234	0.818

German AJT: Formula (Zscore ~ Aspect*Type + (Aspect*Type|subject) + (Aspect*Type|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	-0.29113	0.1669	-2.12	0.04929*
Aspect: Simple	0.03267	0.1783	0.208	0.83729
Type: LC	0.55627	0.1507	3.144	0.00665**
Aspect: Simple* Type: LC	-0.01852	0.2045	-0.092	0.92793

Post-hoc Analyses: Proficiency

Ambiguous DP: Formula (residrt ~ Aspect*L1*Prof + (Aspect*Type|subject) + (Aspect +Prof|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	4.4659	157.3052	0.028	0.977
Aspect: Simple	-84.2205	128.2633	-0.657	0.515
L1: French	6.0054	212.5924	0.028	0.978
L1: German	47.5988	196.8405	0.242	0.810
Prof	-0.8821	1.8891	-0.467	0.642
Aspect: Simple*L1: French	-82.1272	176.3971	-0.466	0.644
Aspect: Simple*L1: German	188.4395	163.8905	1.150	0.256
Aspect: Simple: Prof	0.9710	1.5446	0.629	0.533
L1: French*Prof	-0.2725	2.5224	-0.108	0.914
L1: German*Prof	-0.6982	2.3679	-0.295	0.769
Aspect: Simple*L1: French*Prof	0.9679	2.0942	47.9856	0.646
Aspect: Simple*L1: German*Prof	-2.2246	1.9704	-1.129	0.264

Disambiguating VP: Formula (residrt ~ Aspect*L1*Prof + (Aspect|subject) + (Aspect+L1+Prof|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	-918.019	39.6958	-1.812	0.0775
Aspect: Simple	1.5002	47.0376	0.002	0.998
Type: LC	1096.663	41.1576	1.926	0.061
L1: French	-69.5336	35.5727	-0.103	0.9186
L1: German	734.3692	41.3312	1.133	0.2639
Prof	11.9885	40.1427	1.959	0.0571
Aspect: Simple* Type: LC	-38.466	51.1761	-0.057	0.9547
Aspect: Simple*L1: French	892.4367	46.2203	1.071	0.2896
Aspect: Simple*L1: German	249.6933	48.9331	0.319	0.7509
Type: LC*L1: French	-134.26	38.9485	-0.174	0.8625
Type: LC*L1: German	-915.959	43.7314	-1.249	0.2185
Aspect: Simple*Prof	0.1444	46.825	0.02	0.9844
Type: LC*Prof	-14.6373	40.9204	-2.138	0.0386*
L1: French*Prof	-0.1503	35.6549	-0.019	0.9852
L1: German*Prof	-9.5951	40.9915	-1.231	0.2254
Aspect: Simple*Type: Simple*L1: French	-614.232	50.6535	-0.665	0.5089
Aspect: Simple*Type: Simple*L1: German	-334.573	52.9807	-0.387	0.7007
Aspect: Simple*Type: Simple*Prof	0.1623	50.8527	0.02	0.9841
Aspect: Simple*L1: French*Prof	-10.0703	46.2185	-1.018	0.3138
Aspect: Simple L1: German*Prof	-3.4171	48.6135	-0.363	0.718
Type: Simple*L1: French*Prof	2.7326	38.936	0.299	0.7666
Type: Simple*L1: German*Prof	11.5721	43.3365	1.312	0.1965
Aspect: Simple*Type: Simple*L1: French*Prof	6.9736	50.6241	0.636	0.5274
Aspect: Simple*Type: Simple*L1: German*Prof	4.9917	52.5835	0.48	0.6335

Spillover: Formula (residrt ~ Aspect*L1*Prof + (Aspect|subject) + (Aspect+L1+Prof|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	-65.1957	263.5491	-0.247	0.8055
Aspect: Simple	-238.9378	297.5655	-0.803	0.4253
Type: LC	234.3637	238.2011	0.984	0.3297
L1: French	-118.9535	353.6587	-0.336	0.738
L1: German	70.9126	332.1772	0.213	0.8318
Prof	0.7947	3.1687	0.251	0.8029
Aspect: Simple* Type: LC	225.5151	396.7564	0.568	0.572
Aspect: Simple*L1: French	546.6092	410.2599	1.332	0.1879
Aspect: Simple*L1: German	366.3714	378.9	0.967	0.3375
Type: LC*L1: French	88.676	327.7719	0.271	0.7878
Type: LC*L1: German	-501.3037	308.5245	-1.625	0.1097
Aspect: Simple*Prof	3.3966	3.5835	0.948	0.3471
Type: LC*Prof	-3.6938	2.8663	-1.289	0.2032
L1: French*Prof	0.8683	4.2021	0.207	0.8371
L1: German*Prof	-1.342	3.9954	-0.336	0.7383
Aspect: Simple*Type: Simple*L1: French	-750.1754	548.4799	-1.368	0.1767
Aspect: Simple*Type: Simple*L1: German	-142.2554	505.0524	-0.282	0.7792
Aspect: Simple*Type: Simple*Prof	-3.1133	4.7789	-0.651	0.5174
Aspect: Simple*L1: French*Prof	-6.8838	4.8705	-1.413	0.1629
Aspect: Simple L1: German*Prof	-4.9604	4.559	-1.088	0.281
Type: Simple*L1: French*Prof	-0.5408	3.8876	-0.139	0.8899
Type: Simple*L1: German*Prof	6.3733	3.7025	1.721	0.0906
Aspect: Simple*Type: Simple*L1: French*Prof	9.1705	6.509	1.409	0.1642
Aspect: Simple*Type: Simple*L1: German*Prof	2.288	6.078	0.376	0.708

Sentence Final: Formula (residrt ~ Aspect*L1*Prof + (Aspect|subject) + (Aspect+L1+Prof|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	-803.717	737.5482	-1.09	0.2789
Aspect: Simple	702.3573	1036.809	0.677	0.5005
Type: LC	918.248	1015.697	0.904	0.3687
L1: French	2234.338	953.6881	2.343	0.0218*
L1: German	103.7524	905.8335	0.115	0.9091

Prof	11.5782	8.783	1.318	0.191
Aspect: Simple* Type: LC	-301.12	1357.683	-0.222	0.8249
Aspect: Simple*L1: French	-2788.53	1384.551	-2.014	0.0481*
Aspect: Simple*L1: German	-135.135	1282.119	-0.105	0.9164
Type: LC*L1: French	-2749.9	1346.715	-2.042	0.0445*
Type: LC*L1: German	-701.917	1257.792	-0.558	0.5784
Aspect: Simple*Prof	-7.0316	12.3872	-0.568	0.5722
Type: LC*Prof	-12.1228	12.116	-1.001	0.3201
L1: French*Prof	-27.0455	11.2857	-2.396	0.0191*
L1: German*Prof	-1.7031	10.8156	-0.157	0.8753
Aspect: Simple*Type: Simple*L1: French	2616.639	1815.784	1.441	0.1528
Aspect: Simple*Type: Simple*L1: German	-19.2588	1673.524	-0.012	0.9908
Aspect: Simple*Type: Simple*Prof	2.2671	16.2219	0.14	0.8891
Aspect: Simple*L1: French*Prof	32.1705	16.373	1.965	0.0536
Aspect: Simple L1: German*Prof	0.2741	15.3476	0.018	0.9858
Type: Simple*L1: French*Prof	33.7147	15.9138	2.119	0.0373*
Type: Simple*L1: German*Prof	8.4046	15.0164	0.56	0.5773
Aspect: Simple*Type: Simple*L1: French*Prof	-30.9954	21.4726	-1.443	0.1521
Aspect: Simple*Type: Simple*L1: German*Prof	1.9598	20.0182	0.098	0.9222

Sentence Final French L2s: Formula (residrt ~ Aspect*Type*Prof + (Aspect|subject) + (Aspect*Type+Prof|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	1564.032	545.129	2.869	0.00536
Aspect: Simple	-2178.063	1089.176	-2.000	0.05924
Type: LC	-2091.432	875.609	-2.389	0.0234*
Proficiency	-17.045	6.321	-2.697	0.0087**
Aspect: Simple*Type: LC	2516.872	1360.688	1.850	0.07607
Aspect: Simple*Proficiency	26.178	12.706	2.06	0.0526
Type: LC*Proficiency	24.65	10.211	2.414	0.02209*
Aspect: Simple*Type: LC*Proficiency	-31.056	15.878	-1.956	0.06163

Sentence Final French L2s Progressive items: Formula (residrt ~ Type*Prof + (Type|subject) + (Type+Prof|item)

	β	SE	*t*-value	*p*
(Intercept)	1572.956	526.003	2.99	0.00335***
typeLC	-2012.85	837.232	-2.404	0.02336
prof	-17.174	6.099	-2.816	0.00566**
typeLC:prof	23.774	9.763	2.435	0.0218*

Sentence Final French L2s Simple items: Formula (residrt ~ Type*Prof + (Type|subject) + (Type+Prof|item)

	β	SE	*t*-value	*p*
(Intercept)	-508.245	1070.258	-0.475	0.64
typeLC	265.72	1227.414	0.216	0.831
prof	7.925	12.477	0.635	0.533
typeLC:prof	-4.556	14.322	-0.318	0.754

Sentence Final Dutch L2s: Formula (residrt ~ Aspect*Type*Prof + (Aspect|subject) + (Aspect*Type+Prof|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	0.5214	702.674	25.7829	0.999
Aspect: Simple	547.3866	860.8628	141.9724	0.526
Type: LC	48.056	905.6536	38.5107	0.958
Proficiency	1.958	8.4266	25.3691	0.818
Aspect: Simple*Type: LC	-227.927	1187.126	332.5696	0.848
Aspect: Simple*Proficiency	-5.1306	10.3391	140.1086	0.621
Type: LC*Proficiency	-1.7152	10.8879	38.2529	0.876
Aspect: Simple*Type: LC*Proficiency	1.3558	14.2698	327.888	0.924

Sentence Final German L2s: Formula (residrt ~ Aspect*Type*Prof + (Aspect|subject) + (Aspect*Type+Prof|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	-447.874	584.7959	29.8521	0.45
Aspect: Simple	283.4709	711.2906	28.8844	0.693
Type: LC	-129.092	847.801	28.5394	0.88
Proficiency	7.2155	7.019	30.5653	0.312
Aspect: Simple*Type: LC	-84.1969	1198.083	15.0923	0.945
Aspect: Simple*Proficiency	-3.8251	8.4609	27.7089	0.655
Type: LC*Proficiency	0.3657	10.116	27.3939	0.971
Aspect: Simple*Type: LC*Proficiency	1.331	14.3301	14.6649	0.927

AJT: Formula (Zscore ~ Aspect*L1*Prof + (Aspect|subject) + (Aspect*Type+Prof|item)

Fixed Effects	*β*	SE	*t*-value	*p*
(Intercept)	1.27E+00	7.69E+01	0.876	0.3837
Aspect: Simple	-3.39E+00	6.61E+01	-1.734	0.0876
Type: LC	3.50E-01	5.02E+01	0.151	0.8809
L1: French	-5.61E-01	6.78E+01	-0.3	0.7654
L1: German	-5.56E-01	7.65E+01	-0.31	0.7572
Prof	-1.64E-02	7.60E+01	-0.952	0.3439
Aspect: Simple* Type: LC	8.55E-01	5.35E+01	0.303	0.7628
Aspect: Simple*L1: French	3.04E+00	6.62E+01	1.164	0.2485
Aspect: Simple*L1: German	2.47E+00	6.53E+01	1.026	0.3088

Type: LC*L1: French	-1.51E+00	4.93E+01	-0.488	0.6281
Type: LC*L1: German	-6.89E-01	5.19E+01	-0.237	0.8139
Aspect: Simple*Prof	3.58E-02	6.61E+01	1.533	0.1301
Type: LC*Prof	-7.91E-05	4.97E+01	-0.003	0.9977
L1: French*Prof	8.86E-03	6.77E+01	0.401	0.69
L1: German*Prof	3.95E-03	7.58E+01	0.184	0.8542
Aspect: Simple*Type: Simple*L1: French	-5.80E-01	5.31E+01	-0.154	0.8781
Aspect: Simple*Type: Simple*L1: German	-1.10E+00	5.27E+01	-0.315	0.754
Aspect: Simple*Type: Simple*Prof	-3.59E-03	5.36E+01	-0.107	0.9155
Aspect: Simple*L1: French*Prof	-3.58E-02	6.62E+01	-1.16	0.2504
Aspect: Simple L1: German*Prof	-2.37E-02	6.54E+01	-0.819	0.4157
Type: Simple*L1: French*Prof	1.60E-02	4.90E+01	0.435	0.6654
Type: Simple*L1: German*Prof	1.12E-02	5.16E+01	0.322	0.7484
Aspect: Simple*Type: Simple*L1: French*Prof	1.06E-03	5.31E+01	0.024	0.9812
Aspect: Simple*Type: Simple*L1: German*Prof	5.61E-03	5.28E+01	0.134	0.8936

Table 4

	Disambiguating verb				Spillover				End			
	PS_LC	PS_EC	PP_LC	PP_EC	PS_LC	PS_EC	PP_LC	PP_EC	PS_LC	PS_EC	PP_LC	PP_EC
English	406 (177)	504 (302)	416 (159)	462 (224)	391 (143)	465 (236)	401 (159)	419 (173)	512 (389)	543 (399)	547 (383)	542 (346)
Dutch	469 (233)	623 (396)	491 (198)	626 (381)	429 (142)	567 (313)	462 (157)	502 (206)	641 (409)	816 (577)	632 (391)	756 (522)
French	554 (533)	706 (459)	546 (236)	641 (390)	524 (204)	558 (195)	490 (194)	522 (179)	741 (411)	878 (642)	801 (513)	785 (540)
German	450 (295)	514 (351)	396 (184)	516 (339)	414 (176)	426 (196)	379 (164)	421 (179)	623 (431)	739 (697)	558 (483)	665 (618)

[1] Traditionally known as 'garden-path' sentences.
[2] Higher RTs in such GP sentences could be evidence of input that runs contrary to parsing expectations, or could indicate comparative difficulty of integration. It extremely difficult, even with highly time-sensitive methods, to tease these two parsing processes apart (see e.g., Mitchell et al., 2010, for discussion).
[3] As tense is also specified in these languages, morphosyntactic verb marking for grammatical aspect co-occurs with grammatical tense marking
[4] In discussing the imperfective here, it should be noted that as well as inflecting for inherently dynamic verbs, such as *travailler/to work*, the imperfective inflects for prototypical states, such as *savoir/to know* (e.g. *Elle savait*), which is not generally licensed by the progressive (*!She was knowing*).
[5] A reviewer notes that the French example of periphrastic expression of the imperfect "V + present participle" ("va travaillant") which we took from Ayoun and Salaberry (2008) in fact requires a different form "V + en + present participle" "chante en travaillant". Nevertheless, the discussion with regards to the French imperfective here remains.
[6] The production task was undertaken after the experiment, and was used to select participants who could demonstrate their offline knowledge of English tense/aspect.
[7] We acknowledge that more items could have been included in the current experiment, and that this may have enhanced the results. Despite this, there are group differences in the processing of the items, and a replication of the Frazier et al. (2006) results for the English.
[8] A reviewer notes that subcategorization biases can affect readers' preferences for a direct object. We did not control for biases (e.g., Garnsey, et al. 1997), but a future study could cross subcategorization biases with grammatical aspect, to investigate the strength of such lexical cues in online processing.
[9] A reviewer notes that the use of temporal adverbs with the past progressive may be rated as odd.
[10] A reviewer rightly notes that the verbs used in this study are in the main activity verbs, and that this may influence subcategorization preferences. We did not control for such preferences, as the materials were taken from Frazier, et. Al (2006). However, it would be interesting for a future study in which aspect and subcategorization biases are manipulated, to investigate which verbal cue has the most impact on interpretation of an ambiguous direct object.
[11] As a further control, we used a pretest to select those verbs which do not have an intrinsic endpoint (e.g., *exit*), by asking 10 naive native English speakers (who did not participate in the main study) to rate the acceptability (from 1 = least acceptable to 5 = most acceptable) of 30 verbs which appeared in the past simple, and which were presented in sentences with a *for*-durative (e.g., *Sarah polished the furniture <u>for hours</u>*). Sentences with verbs with intrinsic endpoints were expected to receive a comparably low rating (e.g., *??John arrived for hours*). Of the 30 verbs tested, the 20 most highly rated were chosen (mean rating = 4.2; mean rating of total 30 = 3.7).
[12] When a comprehension question followed an experimental item, it did not target the experimental manipulation. For instance, the question would very often focus on the introductory sentence, rather than the critical sentence.
[13] This procedure allows for the control of mean differences in raw RT across subjects, and variations in the sensitivity to the effect of word length across subjects and involved running linear mixed-effects regression analyses on all the participants' data (apart from the practice items and the comprehension questions) to get the expected RTs depending on word/segment length. The model included a main effect of word length, a random intercept for subjects and a random slope for length by subject (c.f., Fine, Jaeger, Farmer, & Qian, 2013; Trueswell, Tanenhaus & Garnsey, 2004). The predicted RTs were then subtracted from the raw RTs to obtain the length-adjusted residual RTs for the data analyses proper.
[14] We were not concerned about collapsing the data for two reasons (i) (at least for the English speakers) we the late closure conditions to elicit shorter reading times in comparison to the early closure items at the point of the subject pronoun/main verb, and (ii) analyses were computed on residual RTs, and thus all segments were corrected for length (see note 4 above).
[15] See Appendix C for full results of all analyses.
[16] The maximal models failed to converge. Given that there is as yet no agreement as to how best to deal with non-convergence, particularly for natural language/psycholinguistic data (Barr, et al., 2013; Bates, et al. 2015; Matuschek, et al., 2017), we follow Linck & Cunnings (2015) and Linck (2016) by simplifying the random effects structure. This was done by removing the higher-order interaction between L1 background and the experimental factor Aspect (i.e., from (Aspect*L1|item) to (Aspect+L1|item).

[17] See Appendix C.

[18] Seven of our items introduced the adjunct clause with 'as' and 11 with 'when. A reviewer rightly points out that 'als' in German introduces a completed event in the past, whereas 'wenn' is used for habitual actions, past, and future. To check that that sentences with 'as-adjuncts' did not bias the German learners towards a late closure analysis, we checked the 'as-adjunct' sentences separately from the 'when' items, and found a main effect of Type for both (As = EC - 516ms vs. LC – 407ms; β = -105.54, SE = 49.88, t = -2.12, p = 0.036; When = EC - 524ms vs. LC – 426ms; β = -124.95, SE = 49.85, t = -2.51, p = 0.013). This suggests there were no differences between the two adjunct types, and therefore the late closure preference across the board was not driven by transfer from the German L1 in the 'as-adjunct' items.