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Grammatical Aspect influences Event Duration Estimations: Evidence from Dutch

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Abstract

This study investigates the effect of grammatical aspect marking in Dutch sentences, on speakers' estimations of the duration of highly familiar, everyday events. We first established the 'inherent' or natural duration of different events (Exp. 1). This was then used for the manipulation of aspect (Exp. 2). Participants dragged a slider across the computer screen to estimate the duration of progressive and non-progressive event descriptions. Findings show how the progressive form *extends* duration estimations for *short* events, whereas it *shortens* the perceived duration of inherently *medium* and *long* events. We interpret this as psycholinguistic evidence for the function of aspect in Dutch, i.e., giving an 'inside' view of the event and focusing a specific internal time span of the event.

Keywords: grammatical aspect, event representation, Dutch.

Introduction

Time is an important domain of human experience. For example, most people are able to roughly estimate how long it takes to open a window, to prepare a certain meal or to watch a movie, given normal circumstances. This information about the time course of events is part of world knowledge and our experience with different events and situations. When people talk about events (in finite sentences) the grammar of the language they speak may require them to make specific distinctions which relate to time explicit. They may be required to provide information on whether an event is taking place in the present, or took place in the past (grammatical category of tense). People may also need to specify whether an event has just begun, is in progression, or has reached a state of completion (grammatical category of aspect). However, it is not clear, in what ways world knowledge about temporal features of events and the distinctions provided by the language system interact: how do specific linguistic structures influence the way people represent events? In this study we address this question, and ask specifically how the use of aspectual verb forms in a sentence context affects people's general knowledge about the temporal contours of events, i.e., the duration of events.

Background

Linguistic theories on grammatical aspect (also viewpoint or verbal aspect) state that the function of *progressive aspect* is

to modulate the inherent temporal contours of an event, thereby defocusing its boundaries (e.g., Comrie, 1976; Dahl, 2000). Specifically, it expresses a particular perspective on an event in that it is represented as a specific 'ongoing' instance of an event: For example, the semantic difference between 'he passes the ball' and 'he *is passing* the ball'. The progressive defocuses the boundaries of the event, to give an 'inside' view of a situation and thus 'highlight' its intermediate phases (e.g., Comrie, 1976). It is important to note that event descriptions that mark information regarding tense or aspect ('finite' expressions) do not directly refer to the time span defined by inherent temporal features of an event. With regard to aspect, Klein (1994) for example, distinguishes two temporal layers in language and describes aspect as denoting the relation between the linguistically unspecified time of an event (Time of Situation, TSit), and the specific time span that is being talked about (Topic Time, TT). The function of *progressive aspect* is to express that this time span (TT) falls within the boundaries of the event (Figure 1). This means that the time span at issue will be viewed as having extended duration (event marked as *in progress*), but it will be shorter than that of the entire event, as the time span in question does not include the boundary phases. Events not marked for progressive aspect, on the other hand, are unspecific in this regard and can include the entire event ('passes the ball'), thus highlighting a qualitatively different time span compared to events marked for progressive aspect.

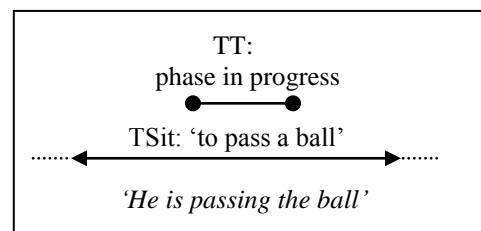


Figure 1: Time-relational analysis of progressive aspect (cf. Klein, 1994)

The present study addresses the psycholinguistic reality of the above claims on the function of aspect in a sentence context: how exactly does this grammatical structure influence the way in which events, as expressed by verbal

predicates, are perceived? We focus on potential modulations of the perceived inherent or natural *duration* of events.

Initial steps in understanding the role of grammatical aspect in event conceptualization have been made from a psycholinguistic perspective in production and comprehension studies. A production study, comparing mono-/bilingual speakers of aspect and non-aspect languages, has looked at event descriptions and patterns in gaze allocation (measured with eye tracking), while subjects were preparing to speak about *causative events* (which involve an agent acting on an object, e.g., a person knitting a scarf) (Flecken, 2011a). Speakers who used progressive aspect to describe the events (English, Dutch), predominantly allocated gaze to features of the ongoing action (the knitting), and less to the agent of the event (which was the German pattern, non-aspect language). Progressive aspect thus focuses visual attention to ongoing aspects of an event, online, in production.

Comprehension studies have focused on the role of grammatical aspect for our understanding of situations or events, and the relations between different events. Magliano and Schleich (2000), for example, show how grammatical aspect constrains mental models of situations, when connected within a narrative structure. In their comparison of readers' comprehension of sentences marked for progressive and perfective aspect in the past tense, and embedded in a stretch of discourse, they found differences between comprehenders' conceptions of events, despite use of the same lexical information. When reading 'Betty was delivering a baby' versus 'Betty delivered a baby' two different mental representations of the event were formed with consequences for the way in which further contextual information was understood. Using a question-answer paradigm, they explicitly asked whether the critical events were finished or not, at specific points in the story line. In one experiment, they addressed the question whether 'general knowledge' on the duration of events interacted with aspect marking. They included events with a long and a short duration (long duration: ranging from 'watching a movie' to 'writing a novel'; short duration: ranging from 'scratching your nose' to 'packing a suitcase'). Likelihood scores indicated that 'long' events, marked as in progress by means of progressive aspect, were still perceived as ongoing at later sentence positions, in contrast to 'short' events. As they used a rather coarse measure (yes/no questions), we cannot be sure how exact this difference for aspect marking between short and long events is. Furthermore, the events within each category showed a great range in duration ratings, and included events that may not be familiar to all participants (such as 'giving birth'). A person's lack of experience with a situation or action may result in a less precise mental model of the event. Their findings may be interpreted as showing that the *duration* of the event described with progressive aspect is interpreted as prolonged, in comparison to the same event described by non-progressive verb forms.

Madden & Zwaan (2003) also show how verbal aspect constrains speakers' representations of events. In a sentence picture matching task, with pictures showing events at different phases, they found that sentences marked with progressive aspect (in the past tense) elicit an equal amount of choices for pictures showing a completed or an incompleting event. The authors interpret this as showing that speakers can represent different phases of an event as in progression.

Bergen & Wheeler (2010) also study the effect of aspect on 'mental simulation'. They find that speakers mentally simulate the *nucleus* of an action, when described in English sentences marked with progressive aspect, in contrast to sentences with perfective aspect.

In, e.g., Anderson et al. (2008) a different methodology was adopted, aiming to get a closer look at online processing of aspectually marked event sentences. They used a mouse tracking paradigm, in which speakers were asked to place a figure on a path, on its way to an endpoint, when listening to sentences describing motion events with and without progressive aspect in the past tense ('was walking to school' versus 'walked to school'). Figures were placed closer to the goal of the motion in the non-aspect condition, indicating that the past progressive focuses attention on internal phases of the past event.

These experiments provide important insights, as they reveal more clearly how aspect influences the processing of event structure. Important questions remain, however: For example, how does progressive aspect modulate event duration estimations for different event types?

In the present study, we take Dutch as our test case, as there is the advantage that this language allows use of sentences describing events in the present tense, both with and without morphological marking of progressive aspect. Production studies on Dutch have shown how progressive aspect is used frequently, but not for all event types. Unlike in English, use is not obligatory in any context (von Stutterheim, Carroll & Klein, 2009; see for acceptability judgements of progressive and non-progressive event descriptions, Flecken, 2011b). With the investigation of a language other than English, we set out to explore whether the temporal relations described above for progressive aspect (Comrie, 1976; Klein, 1994) apply when Dutch speakers use the progressive *aan het* construction. In linguistic terms, progressives in different languages will follow the same temporal logic; but do speakers' responses reflect their role so as to modulate their perception of the internal phases of a dynamic situation when estimating event duration? Dutch is a language in which use of progressive aspect is not fully grammaticalized in contrast to English, for example. A comparison with English would have to be carried out on the basis of the same stimuli, however. We thus take first steps in exploring the influence of aspect marking on event duration in Dutch.

Aims of the present study

In the present study, we draw a distinction between the ‘inherent’ duration of an event (i.e., the infinite and unspecified time interval or duration of an event, as expressed by bare (infinite) verb phrases, for example ‘to write a paper’), which relates to world knowledge about the normal course of an event, and the finite expression of event duration by means of finite sentences or verb phrases, relating to a specific situation (‘finite’ event duration). Finite expressions of event duration can include a verbal marker of progressive aspect, or not.

We ask whether speakers of Dutch perceive the duration of an event differently, depending on the specific type of verb form used (progressive or non-progressive) in a sentence context. An example is ‘Wij zijn een artikel *aan het* schrijven’ (lit.: we are a paper at-the-write; ‘we are writing a paper’, progressive verb) versus ‘Wij *schrijven* een artikel’ (we write a paper, non-progressive verb form). In Dutch, *both* instances relate to a specific event, taking place in the here and now.

Dutch speakers estimate the duration of events of different types, described in written sentences, by dragging a slider across a computer screen, using the mouse. Previous studies show how performance on a spatial task may accurately capture speakers’ conceptions of temporal dimensions, such as duration (Casasanto & Boroditsky, 2008). Event sentences will be presented twice, once in a progressive and once in a non-progressive condition. To prevent participants from memorizing the estimated duration of an event, as each is repeated, participants will estimate duration in the absence of a concrete time scale. Sentences will be presented in pairs, which remain the same in both conditions, meaning that the ‘pair partner’ of an event is thus the main point of reference for duration estimation, rather than an absolute time line. Estimations in minutes/seconds may be more susceptible to memory effects, and may overrule subtle effects of (non-) aspect marking.

We aim to find out how aspect interacts with the ‘natural’ or inherent duration of events, as judged by speakers on bare verb phrases describing actions and events.

Experiment 1: ‘Inherent’ event duration

In experiment 1 native speakers of Dutch were asked to rate all kinds of everyday events and actions described by bare (non-finite) verb phrases (e.g., ‘to walk the dog’). Three different samples were asked to rate their familiarity with the events, in how far they are imaginable (to what extent is the event likely to occur in the real world?) and the inherent duration of the events or actions. All ratings were carried out on a five-point scale.

Method

Participants In total, 30 native speakers of Dutch took part in the experiment, consisting of three parts. They were (PhD) students and postdoctoral researchers at Radboud

University Nijmegen (age range 19-35, balanced for gender).

Materials Stimuli used were written infinite action phrases (bare VPs) relating to everyday actions and events, and described with infinite verb phrases, e.g., ‘to peel an apple’, ‘to open a can’, ‘to watch a football game’. Sentences were placed in an online questionnaire in a randomized order, and speakers were asked to give online ratings, and specify their age and gender. In total, there were 150 different events/actions.

Procedure Three different samples of 10 native speakers of Dutch took part in three different short experiments, designed as web questionnaires. First of all, the infinite action phrases were rated for familiarity (‘how familiar are you with this type of action?’) on a scale from 1 (highly unfamiliar) to 5 (highly familiar). Only highly familiar events were selected (ratings of 4 and 5) for Experiment 2. A second sample rated the phrases as to what extent the action was imaginable (rating 1: not imaginable at all, rating 5: highly imaginable). Furthermore, another sample of 10 speakers rated the duration of the infinite action phrases in relation to a ‘standardized’ event, i.e., to boil pasta, which was specified as lasting for about 7-8 minutes (rating 1: much shorter than boiling pasta, rating 5: much longer than boiling pasta). This latter rating was conducted to ensure homogeneity of inherent event duration estimations.

Results

The three rating tasks in Experiment 1 resulted in the selection of 78 different events. All other items were discarded due to a low degree of familiarity, the fact that they were not imaginable, or whether duration ratings showed a high degree of heterogeneity. All in all, 72 items were discarded. The 78 events were divided into three categories of inherent event duration (26 items in each category), on the basis of the duration ratings obtained: short (e.g., ‘to turn a key’, ‘to light a candle’), medium (e.g., ‘to set the table’; ‘to polish a shoe’) and long (e.g., ‘to watch a dvd’, ‘to wash a car’). Items with an average rating of between 1 and 2 were characterized as ‘short’ events (range of ratings: 1 – 1.67). Items with an average rating of between 4 and 5 were classified as ‘long’ events (range of ratings: 4.11 – 5). Medium events were items with an average rating of between 1.67 and 4.11.

The 78 items with homogeneously-rated inherent event duration, categorized in three groups (short, medium and long), were used as materials for Experiment 2.

Experiment 2: ‘Finite’ event duration

In Experiment 2 we asked native speakers of Dutch to estimate the duration of events, as described in whole sentences, marked with or without progressive aspect.

Method

Participants In the present study 27 native speakers of Dutch took part, who were all students at Radboud University (age range: 18-32, 16 female, 11 male), and did not have an advanced level of proficiency in a second (or third) language. This was established on the basis of their answers in a language background questionnaire. Students, who reported a stay of over three months in a foreign language country, were excluded from participation.

Materials Stimuli consisted of written sentences describing everyday situations and events. There were in total 78 items, describing 78 different events. Each item was used for a progressive and non-progressive sentence and paired with an item with matching inherent event duration. There were thus 13 pairs in each duration category (short-short pairs, medium-medium pairs, long-long pairs). For the pairings, care was taken to avoid any thematic or semantic relatedness between the two items. Sentences were presented as pairs to provide a kind of reference point for the duration estimations, within each trial. Pairs were always presented in the same aspect (either progressive or non-progressive). The agents of all actions (the subjects of the sentences) were described with two specific names, ‘Jan’ and ‘Paul’ in all cases.

Procedure Before subjects came to the lab, they were asked to carry out the same online familiarity rating task as in Experiment 1, dealing with all 78 bare event phrases. Ratings were again made on a scale from 1 to 5. In the lab, subjects were told that on each trial they would read two sentences describing the situations in which two specific persons, i.e., ‘Jan’ and ‘Paul’ were involved right now. They were asked to imagine the situations of both Jan and Paul, and to estimate how long the two agents would be engaged in the activities described. Numbered sentences appeared below each other on a computer screen in a centred position. Within trials, sentences were of approximately the same length, to avoid any visual bias. Lower down, two sliders were presented and subjects were instructed to use the mouse to drag the sliders from left to right, starting with the top one, to estimate duration (Figure 2).

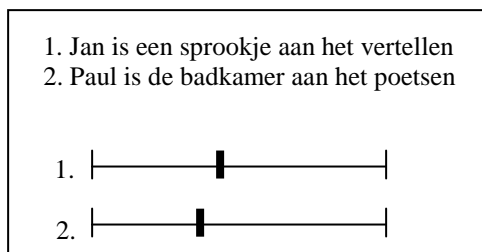


Figure 2: computer screen with sliders dragged slightly to the right (progressive aspect condition, ‘long’ events: ‘John is telling a fairytale’, ‘Paul is cleaning the bathroom’)

Subjects were instructed that the further they dragged the mouse to the right, the longer they estimated the agent to be engaged in the activity. Furthermore, it was explicitly stated that if they dragged the slider to the right only slightly, this would mean that Jan or Paul are engaged in the activity for a very short time. If they dragged the slider to the utmost right, this would mean that Jan or Paul are performing the activity for a long period of time. The particular part of the slider that was dragged, turned red. Subjects were able to adjust their estimations. After estimating the duration of both sentences, they proceeded to the next trial by clicking a button.

In order to ensure that participants were actually aware of the surface sentence structure, and did not only focus on the bare event characteristics, a question relating to the contents of one of the preceding sentences appeared randomly. Subjects were asked to decide whether they had read that sentence before, by clicking yes or no on a button box. The question sentences were correct half of the time, and the other half contained errors with regard to the type of object described (e.g., for sentence 2 above: Paul is cleaning the kitchen) or the type of aspect used (e.g., for sentence 2: Paul cleans the bathroom). Each sentence pair appeared twice, once in the non-progressive condition, and once in the progressive condition. All trials were pseudo-randomized, so that each repeated item appeared in the second half of the experiment (the second set of 39 trials), to ensure enough distance between repeated items. The occurrence of progressive or non-progressive sentence pairs in the first or second half of the experiment was varied between subjects.

After filling out a sociolinguistic questionnaire, subjects were asked to estimate the precise duration of the different events (described in bare VPs) in minutes (pencil-and-paper test). This was done to double-check, whether the events were rated as belonging to the same duration categories as those established in Experiment 1.

Results

a) Familiarity ratings All 78 event phrases were rated as familiar (4) to highly familiar (5), replicating the results from experiment 1.

b) Online event duration estimations of sentences For the analysis, we focused on the values of the x-coordinates on the computer screen only, equalling the distance the mouse was dragged towards the right side of the screen. We analyzed our data using mixed effects models (R, lme4 package). Our goal was to fit a model that would explain the estimations made by the subjects as the result of the impact of various variables, i.e. fixed and random effects. Our fixed effects were ‘inherent duration’ (‘dur’) (long, medium, short) and ‘aspect’ (progressive, non-progressive). The variables were coded as follows: for ‘dur’, the short event category was coded as the base level (-1 short, 0 long, 1 medium) and for ‘aspect’ we coded the non-progressive verb form as the base level (-1 non progressive form, 1 *aan het* form). We also aimed at controlling further influences

caused by the experimental design, by taking into account random effects in our model.

The random factors we originally considered were *subject*, *item*, and *pair*. For ‘subject’ we included *by-subject* random intercepts, as well as a *by-subject* random slope, which allowed the predictions for ‘inherent duration’ to shift by a fixed amount for each subject¹. With respect to the random factor ‘item’, two things are important. First, every item (event) belongs to one and only one event duration category. *Item* is thus a nested random factor. We incorporated this by adding a variable which covered the ‘item:dur’ interrelationship; this term was also included as a random factor. Second, subjects always rated event *pairs* and not single events. The pairing of items remained fixed throughout the experiment, for each subject. We thus did not add *pair* as a separate random factor, as the nested ‘item:dur’ term would sufficiently capture the variance stemming from random item selection. In general, we follow an approach by Barr et al. (2012) in which the authors argue for a maximal approach, that is, “valid statistical inferences using LMEMs require maximal random-effects structures wherever possible ...”(p.1).

We log-transformed and centred all duration estimations (see Footnote 1 for the formula in R).

Let us turn directly to the fixed effects section in our model (Table 1 below: asp.1 is *aan het* condition; dur.0 is long, dur.1 is medium event type)

Table 1: Fixed effects in the mixed model

	Estimate	Std. Error	t value	p value
Intercept	-0.96918	0.10877	-8.910	
dur.0	1.90106	0.12323	15.427	<.001**
dur.1	1.00654	0.09792	10.279	<.001**
asp.1	0.04819	0.02364	2.039	.041*
dur.0:asp.1	-0.07118	0.03343	-2.129	.033*
dur.1:asp.1	-0.06721	0.03341	-2.012	.044*

As predicted, for ‘inherent duration’ (‘dur’) we find high t-values (long events $t = 15.43$; medium events $t = 10.28$), showing that, in contrast to the base level (short events), the two other event types are estimated as significantly longer. There was a significant main effect of ‘aspect’ ($p = .041$)², meaning that short events were estimated as having a longer duration in sentences marked with the *aan het* form, when compared to the same events described with non-progressive verbs. Looking at the interaction effects, we find that, compared to our base level, medium and long events marked with the progressive form are estimated as significantly *shorter* (both p values > .05).

¹ The formula in R was the following:
`scalet ~ 1 + dur * asp + (1+dur | subject)+(1 | nes.item)`.

² We calculated p values on the basis of the t-values, using the following code in R:
`tvalues <- fixef(model) / sqrt(diag(vcov(model)))`
`pvalues <- 2*(1-pnorm(abs(tvalues)))`

To exclude the possibility that the above pattern of results is due to the presence of outliers, 32 extreme values (.008 %), with a standardized residual at a distance greater than 3 standard deviations from zero, were removed from the data, and the model was refitted.

Table 2: Fixed effects in the mixed model on trimmed data

	Estimate	Std. Error	t value	p value
Intercept	-0.97638	0.10859	-8.991	
dur.0	1.93245	0.12593	15.345	<.001**
dur.1	1.03100	0.09883	10.432	<.001**
asp.1	0.04781	0.02157	2.217	.027*
dur.0:asp.1	-0.06942	0.03056	-2.272	.023*
dur.1:asp.1	-0.08131	0.03052	-2.665	.008*

The trimmed model (Table 2) shows the same significant results for the predictors and their interactions. We conclude that the statistical inferences made in the original model are not confounded by extreme values in the data set.

c) Inherent event duration estimations (bare VPs) Table 3 below displays the average and SD of the duration estimations for the infinite event phrases; these estimations were carried out after the actual experiment. The numbers displayed are duration estimations in minutes.

Table 3: Inherent duration estimations, in minutes

	Short	Medium	Long
Average	2.25	11.20	80.24
SD	1.52	11.27	50.52
Lower	1	2	14.50
Upper	6.01	58.67	206.38

The absolute duration estimations support the division into the three categories of inherent event duration, based on Experiment 1.

General discussion

In Experiment 1, we established three categories of highly familiar, everyday events of different ‘inherent’ duration (short, medium, long events), on the basis of three rating tasks. In Experiment 2, we used those items and specifically assessed the effect of aspect marking on subjects’ duration estimations of the three event types, by means of the ‘drag-the-slider-technique’.

First of all, with respect to the different ‘inherent’ event duration categories, the findings indicate that the method is valid; medium and long events were estimated as lasting significantly longer than short events. The duration estimations made by subjects using a slider on the computer screen, without a fixed time scale, reflect the time spans which are inherently part of the conceptual representation of events, showing that spatial tasks are informative about people’s thinking about time (Casasanto & Boroditsky, 2008).

Second, we find a significant interaction between aspect marking and inherent event duration, suggesting that aspect affects the perceived duration of events described in sentences in a specific way: In Dutch, short events are estimated as having a *longer* duration when described in the progressive *aan het* form, whereas medium and long events are estimated as having a *shorter* duration, when compared to estimations of the same events described by non-progressive verb forms.

The mechanism underlying the patterns found is explained by a time-relational analysis of aspect: As described above (Klein 1994), progressive aspect marks that the time span being talked about (TT) is placed *within* the total event time (TSit) whereas unmarked (non-progressive) verb forms are unambiguous in this regard. With the progressive, an internal time span is focused and explicitly viewed as ‘in progress’. Short events inherently have a short TSit, which can include a transition phase or change in state (‘to open a bottle’: from ‘not open bottle’ to ‘open bottle’). If language users describe such an event with progressive aspect, the time span at issue is located within the event time (Tsit), and attention is thus directed to the transition phase. Language users experience this as stretching and prolonging the duration of the event in their mental model. For medium/long events, the temporal boundaries (beginning and end) lie further apart (TSit is longer). There are also phases with changes of state with the event ‘to repair a bicycle’, for example, but it will typically have longer duration. When events are described with progressive verbs, attention is directed to a *specific* time interval that lies *in between* the beginning and end of TSit, and, crucially, it does not extend over the entire event. The duration of the event will thus be perceived as *shorter*, compared to the total time span for the entire event (TSit), as expressed in non-progressive sentences.

World-knowledge about a specific event seems to play a role for the interpretation of aspect – and both layers of duration interact in our subjects’ mental models of the events. In general, we provide further evidence that grammatical aspect influences people’s representations of events or situations (e.g., Anderson et al., 2008; Madden & Zwaan, 2003).

Conclusions

In this study we investigated in how far grammatical aspect has an influence on how people mentally represent the duration of everyday, highly familiar events, described in Dutch sentences. We distinguish between two ‘layers’ of event duration, which are packaged together in sentences, and which both contribute to the perceived duration of an event. The first ‘layer’ consists of the ‘inherent’ duration of an event, which is based on world knowledge. The second layer consists of ‘finite’ temporal information, expressed by tense and aspect. Our results imply that the inherent duration of events is shared among speakers of a language/culture. This inherent event duration is modulated

by grammatical aspect (*aan het* in Dutch; previous studies show this for the *-ing* form in English).

We find psycholinguistic evidence for the function of grammatical aspect in Dutch. By means of *progressive aspect*, speakers take an ‘inside’ perspective on an event, by selecting a time interval that falls within the total time period of the event - leading to a complex interaction between aspect marking and the inherent duration of events.

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