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1. Introduction[1]

Telicity is one of the aspectual notions. It refers to the internal temporal make-up of an eventuality and describes whether or not it has a natural moment at which it culminates, which is typically an endpoint. Of the four aspectual Vendler classes, accomplishments and achievements have such culmination points (they are telic), but states and activities do not (they are atelic). For accomplishments the culmination point comes after an activity (they are telic and durative), while for achievements a momentaneous change of state or change of location constitutes the culmination point (they are telic and punctual).

Telicity is a linguistic category that refers to a property of happenings in the world. The telicity of events in the world is not inherently given by the happenings themselves. On the contrary, it is language that establishes whether the event a particular clause refers to is carved out out of the array of happenings with or without a natural culmination moment. In other words, there is an only indirect relation between the linguistic and the cognitive categories of telicity, or culmination. Language establishes the cognitive "contents" of events with the exact meanings of verbs and their occurrences in particular morpho-syntactic environments. It is grammatical categories that shape the contents of events by specifying how much of the happenings that might constitute a single event are actually part of it, and, hence, whether or not a culmination point is included. For example, the scene of a turtle slowly crawling across the street may be conceived of in many different ways, and hence

[1]I carried out the research and write-up of this paper at the Institute for Research in Cognitive Science at the University of Pennsylvania the support of which I hereby gratefully acknowledge. Ongoing conversations with a number of people have greatly stimulated this research: Lila Gleitman, Helen de Hoop, Bart Hollebrandse, Manfred Krifka, Thomas Roeper, Yael Sharvit and Laura Wagner. I have profited from comments and questions from various audiences: the UMass Perspectives conference, the 1996 and 1997 BU conferences, the 1997 LSA workshop on event structure, the 1998 Max Planck workshop on the acquisition of argument structure, the baby-lab meetings at IRCS and colloques at various universities.

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described accordingly. Particular choices of verb and verbal inflections can mark this scene down as an atelic activity (and one might say: *The turtle was crawling* or *His feet were moving*), or as a telic event, an activity plus its culmination (and one might say: *He crossed the street* or *He crawled across the street*), or even as the moment of culmination itself (e.g., *He reached the other side of the street*), to mention a couple of the more obvious carvings-outs among the many possible ones for this scene of motion.

The grammatical categories that make up telicity are multiple (see e.g. van Hout 1996 on Dutch). First of all, the lexical semantics of a verb determines its basic aspectual class: whether it is stative or dynamic, whether it is durative or punctual and whether it is telic or atelic. For example, based on what they mean, *know* and *sit* are stative verbs (and thereby also atelic), *laugh*, *sleep*, *run* and *eat* are durative, *reach* and *knock* are punctual and *die* and *break* are telic. In addition, the morpho-syntactic context in which the verb appears may add to or alter its basic aspectual class. In Dutch and English, combining a motion verb that is basically atelic with a directional phrase (e.g., *run to the beach* and *swim away*) adds an endpoint to the original durative activity, turning the predicate into a telic accomplishment. Using an activity verb in a resultative construction (e.g., *laugh yourself silly*, *sleep yourself better*) is another way of turning the predicate into an accomplishment. For many pairs of simple verb-particle or prefixed verb, the particle or prefix adds a culmination point, turning the atelic simple verb into a telic one (e.g., Dutch *eten-opeten* `eat-eat up', *branden-verbranden* `burn-burn up' and *bloeien-opbloeien* `blossom-revive'). Finally, as has been widely discussed in the aspectual literature, with transitive verbs the semantics of the direct object plays a role: a cumulative object does not provide a culmination point, whereas a quantized object does, yielding an atelic or telic predicate, respectively (e.g., atelic *eat cake* versus telic *eat a slice of cake*).

To complicate telicity matters even further, the set of grammatical categories that co-determine telicity varies from language to language. Some languages have dedicated aspectual morphemes that determine or affect telicity (e.g., the perfective prefixes in Slavic languages, see below). By far not all languages have resultative constructions or constructions with motion verbs and directional phrases. Instead, they may have one or more other constructions that affect telicity, such as serial-verb constructions or verb-verb compounding. In some languages the direct object does not play a role (e.g., in the Slavic languages), while in others it is a most important source for telicity (e.g., Finnish).

Telicity thus lies at the cross-roads of the verbal lexicon and the aspectual morphology and syntax of a language. The acquisition task involves learning these modules and their interfaces. It involves acquiring the event-semantic lexical specifics of individual verbs (i.e., the exact meanings of verbs which determine basic aspectual properties such as stative-eventive, punctual-durative and telic-atelic). Specifically, it means finding out what parts of scenes verbs refer to exactly (for example, that *cross* does, but *crawl* does not entail an endpoint). It furthermore involves learning the mappings between the morpho-syntactic elements and constructions and their aspectual semantics, that is, discovering which morphological encodings the language employs to mark telicity and which syntactic ways are used to express telicity.

In this paper I concentrate on the role of the direct object for telicity. I first discuss its role across various languages, showing that it is crucial in Dutch and English and also Finnish, but not so in Slavic languages. I will then present an experimental study that looked at what Dutch and English learners know about the role of the direct object for telicity. As it turns out, learners up to the age of five are not at all clear on its role which suggests that the correlation between telicity and direct objects is a pretty tough connection to acquire. This raises interesting learnability questions which will be formulated towards the end of the paper.

2. Direct objects and telicity in Dutch, English, Czech and Finnish

For transitive verbs that take a so-called incremental theme, the telicity of the clause depends crucially on the direct object. Verkuyl (1972) was the first to point out the relevance of the semantic nature of objects. Consider the Dutch and English pairs in (1).

(1) a. Het paard heeft brood gegeten.
The horse has bread eaten
`The horse ate bread.'
b. Het paard heeft een appel gegeten.
The horse has an apple eaten
`The horse ate an apple.'

The object *brood* `bread' in (1a) is a mass term and refers cumulatively: one can refer to the collection of two entities to which the term *brood* applies as *brood. Een appel* `an apple' in (1b) on the other hand is a count term and does not refer cumulatively: one cannot refer to the collection of two entities to which *een appel* applies as *een appel* (those are two apples, rather). The opposite of cumulative is quantized; a noun phrase such as *een appel* is quantized. The cumulative or quantized semantics of the direct object carries over to the temporal constitution of the event: a cumulative object yields an atelic predicate and a quantized object yields a telic one. This can be established using one of Dowty's (1979) well-known tests for telicity: the contrast between durative versus time-frame adverbial phrases. Durative phrases (e.g., *urenlang* `for hours') select for an atelic predicate, while time-frame adverbials (e.g. *in een uur* `in an hour') select for telic ones. Compare the possible modifications in (2a) versus (2b).

(2) a. Het paard heeft urenlang / *in een uur brood gegeten.
The horse has hours-long / in an hour bread eaten
`The horse ate bread for hours / *in an hour.'
b. Het paard heeft *urenlang / in een uur een appel gegeten.
The horse has hours-long / in an hour an apple eaten
`The horse ate an apple *for hours / in an hour.'

One can quantize a mass term by specifying a specific amount which then makes the predicate it appears in telic; compare (2a) with (3a). Using bare plurals is the way to turn a count term into a cumulative noun phrase which turns the predicate atelic; compare (2b) with (3b).

(3) a. Het paard heeft *urenlang / in een uur een snee brood gegeten.
The horse has hours-long / in an hour a slice bread eaten
`The horse ate a slice of bread *for hours / in an hour.'

b. Het paard heeft urenlang / *in een uur appels gegeten.
The horse has hours-long / in an hour apples eaten
`The horse ate apples for hours / *in an hour.'

The semantics of the object is thus crucial for determining telicity. What if the object is not present, i.e., when these verbs occur as intransitives? If there is no object to specify the amount of stuff to which the event applies, the event should be unbounded. And indeed it is, as (4) shows.

(4) Het paard heeft urenlang / *in een uur gedronken.
The horse has hours-long / in an hour drunk
`The horse drank for hours / *in an hour.'

The data so far show that it is the presence of a quantized object that is necessary for a telic interpretation. It is not sufficient, however. The verb itself must also measure the object out (as Tenny 1994 calls it) and run an odometer along it (as Verkuyl 1993 calls it). While *eat* and *drink* measure out the event if a proper (i.e., quantized) object is present, not all verbs have this property. Consider *duwen* `push' in (5) and *zien* `see' in (6).

(5) a. Kees heeft urenlang / *in een uur de kruiwagen geduwd.
Kees has hours-long / in an hour the wheelbarrow pushed
`Kees pushed the wheelbarrow for hours / *in an hour.'

b. Kees heeft urenlang / *in een uur kruiwagens geduwd.
Kees has hours-long / in an hour wheelbarrows pushed
`Kees pushed wheelbarrows for hours / *in an hour.'

(6) a. Kathy heeft urenlang / * in een uur de schapen gezien.
Kathy has hours-long / in an hour the sheep seen
`Kathy saw the sheep for hours / *in an hour.'

b. Kathy heeft urenlang / * in een uur schapen gezien.
Kathy has hours-long / in an hour sheep seen
`Kathy saw sheep for hours / *in an hour.'

The quantized objects in the a-examples as well as the cumulative (bare plural) objects in the b-examples give atelic readings. The objects here do not matter for telicity: the predicates are all atelic.

The imperative effects of direct objects on the telicity of the whole clause only comes into play with a subset of the two-argument verbs, namely ones whose objects are incrementally submitted to the event. These include verbs of destruction (object disappears in the course of the event) such *eat, drink* and *read* and also verbs of creation (object comes into existence by the event) such as *write, draw, paint, build, construct, dig, knit* and *sow*. For these verbs, the object serves as an odometer for the progression of the event. For other verbs

like *duwen* `push' and *zien* `see', however, the event's temporal constitution is independent of the cumulative or quantized properties of the object.

For verbs with an incremental theme, the correlations between cumulativity and atelicity on the one hand and between quantization and telicity on the other feel natural in the sense that if you are eating some unbounded amount of stuff, there is no natural endpoint to the eating, while the opposite holds for eating a specific amount of stuff, i.e., the eating is over when that amount is finished. Krifka (1986, 1992) has developed a lattice-theoretic account of these natural correlations, working out formally the similarities between noun denotations and verb denotations. A homomorphism from objects to events preserves the lattice structure of the former and arranges that the cumulative or quantized nature of the direct object is directly carried over to that of the event. Krifka calls this homomorphism Mapping-to-objects, and the one that applies the other way around, Mapping-to-events. The correlations between quantization and telicity and cumulativity and atelicity thus fall out of this model. The homomorphism is defined on the properties of the thematic relation that mediates between verb and object. If this thematic role involves graduality, the object is subjected to the event in a gradual way, each further part of the entity mapping onto the event as progressing one step further.[2] The objects of *eat an apple*, *write a letter* and *read a book* are such graduality objects; those of *push a wheelbarrow*, *see the sheep* and *touch a cat* are not, and hence never yield telic readings.

Notice that in Dutch and English quantization or cumulativity of a noun phrase is expressed by the presence or absence of an article, respectively. Mass terms and bare plurals do not appear with an article, but singular count terms must appear with an article (definite or indefinite). Telicity is thus ultimately associated with presence-absence of articles on the object noun phrase. Many languages, however, do not have articles, among them, Finnish and the Slavic languages. Telicity is encoded differently in these languages.

In Finnish the direct object is involved in establishing telicity, specifically, the case that it bears is crucial. A subset of Finnish two-argument verbs are flexible case-assigners in that they can assign accusative or partitive case to their objects. The two different cases correlate with telicity: accusative case on the object yields telicity (or resultativity) whereas partitive case gives atelicity (or irresultativity). Compare the sentences in (7).

(7) a. Kalle söi omenan.
K. ate apple$_{ACC}$
`K. ate an apple (all of it).'

b. Kalle söi omenaa.
K. ate apple$_{PART}$
`K. was eating an apple (without finishing it).'

[2]Graduality is comprised of the properties Uniqueness-of-objects, Mapping-to-objects and Mapping-to-events (Krifka 1992:42).

Finnish is thus similar to Dutch and English, in the sense that telicity is sensitive to properties of the object. As Krifka points out, his homomorphism applies Mapping-from-objects-to-events here as well.

Only a subset of the Finnish two-argument verbs have this case-marking option for their objects to express (a)telicity. Essentially it seems to be verbs with an incremental theme. Other verbs are not as flexible and have only one case to assign. Yet other ones can assign both cases, but the meaning differences have to do with the definiteness of the object and not with telicity. I refer to Heinämäki (1984) and especially to Kiparsky (to appear) for an in-depth survey of the semantics of the partitive-accusative case distinction in Finnish (which Kiparsky also links to the perfective-imperfective paradigm in Slavic). For the purposes of the present overview of cross-linguistic variation, it suffices to note the paradigm as exemplified by (7) and the generalization that in Finnish it is the object's case that is associated with telicity. Object case is the aspectual equivalent of articles with Dutch and English objects.

Like Finnish, the Slavic languages do not have articles either. Both mass terms (e.g., Czech *víno* `wine') and count terms (e.g., *hruška* `pear') occur by themselves and can have a definite or indefinite reading. Mass terms such as *víno* are ambiguous between `the wine' and `wine' and count terms such as *hruška* can mean `the pear' or `a pear'. Likewise, plural terms are bare; they are ambiguous between a definite and indefinite reading, e.g., *hrušky* `pears' can mean `the pears' or `pears'.[3] So, unlike Dutch and English, an object noun phrase in Slavic cannot determine the telicity of the clause, because it does not bear quantized or cumulative properties.

Slavic has a different way of marking cumulativity or quantization of the direct object which on its turn affects telicity. Quantization of the object is marked on the verb, not on the object itself. Every verb form in Slavic is aspectually marked as either perfective or imperfective. Perfective aspect conveys the notion of completion of the event, while imperfective aspect conveys on-goingness with no entailments about the outcome. In addition to these so-called grammatical aspect functions, the perfective and imperfective affixes on the verb also have an effect on the definiteness of the direct object, and thereby on its quantized nature (for Russian, see Smith 1991 and Kiparsky to appear; for Czech, Filip 1993; for Polish, Piñon 1995). Compare the Czech minimal pairs in (8) through (10) from Krifka (1992: 49-50) (who collected his data from Filip 1985) and consider the relation between perfective-imperfective marking on the one hand and definiteness-indefiniteness of the direct object on the other.

(8) a. Ota pil^{I} víno.
`Ota drank wine / ?the wine.' (imperfective)
b. Ota vypil^{P} víno.
`Ota drank *wine / the wine.' (perfective)

[3]Nouns may be preceded by quantifiers, in which case the quantifier determines their quantized or cumulative nature, as in Dutch and English.

(9) a. Jedl^{I} hrušku.
`He ate a pear / ?the pear.' (imperfective)
b. Snědl^{P} hrušku.
`He ate a pear / the pear.' (perfective)

(10) a. Jedl^{I} hrušky.
`He ate pears / ?the pears.' (imperfective)
b. Snědl^{P} hrušky.
`He ate *pears / the pears.' (perfective)

Grammatical aspect marking on the verb distinguishes between definite and indefinite readings of the mass term object in (8) and the plural object in (10), with perfective aspect being only compatible with a definite reading and imperfective aspect preferring an indefinite reading. With the count term object in (9), i.e., a quantized noun, perfective aspect is compatible with both definite and indefinite readings. Generalizing across these paradigms, Krifka concludes that perfective aspect marking requires quantization (not definiteness). He explains the data by assuming that one of the meaning components of the perfective is that it applies to quantized predicates. In other words, in addition to presenting a completive viewpoint, another meaning effect of the perfective operator is to force quantization of the object.[4,5] Krifka's homomorphism between verb and object denotations accounts for these effects as well: in Czech it is the Mapping-from-events-to-objects that gives the proper outcome.[6]

Comparing telicity matters in Czech, Dutch, English and Finnish, perfective-marking on verbs with incremental themes in Czech yields telicity. It is the equivalent of the presence of an article with the object of such verbs in Dutch and English and accusative case-marking on the object in Finnish.

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[4]Note that even in Dutch and English, certain particle verbs have a similar effect and require a quantized object (even though these languages do not have a perfective/imperfective aspect paradigm). Filip shows the same point in German. Consider *opdrinken* `drink up' in (i) and compare it with (8).

(i) a. *Hij heeft wijn opgedronken.
he has wine up-drunk
*`He drank up wine.'
b. Hij heeft de wijn opgedronken.
he has the wine up-drunk
`He drank up the wine.'

The similarities between perfective verbs in Czech and particle verbs in Dutch and English holds up for mass term objects, but not for bare plural objects. Compare (ii) with (10b).

(ii) Marie heeft peren opgegeten.
Marie has pears up-eaten
`Marie ate up pears.'

Unlike perfective verbs in Czech, particle verbs may take bare (i.e., indefinite) plural objects. See van Hout & Sharvit (in preparation).

[5]In a similar, but much weaker way, Krifka says, the imperfective aspect may force a non-quantized interpretation of the object.

[6]Filip (1993) observes that different perfectivizing prefixes have different quantificational effects on the object. She extends Krifka's model in order to account for these effects.

3. On acquiring the role of the direct object for telicity

The task of learning telicity that a Czech child is faced with is different from the one for a Dutch, English or Finnish child. The Czech child must learn the semantics of perfective-imperfective marking on the verb and figure out its double semantic function: establish an imperfective or perfective viewpoint and yield cumulative or quantized event denotations. The Dutch/English child must learn the cumulative or quantizing semantics of the presence or absence of an article with the object with respect to its quantized nature in addition to learning to draw inferences from the object's semantics to the temporal contour of the event (i.e., she must learn to apply Krifka's homomorphism from objects to events). The Finnish child's task is similar to that of the Dutch/English one in that she must also learn to apply the Mapping-of-objects, in particular, that accusative versus partitive case-marking on the object corresponds with telicity versus atelicity of the event, respectively.

For all of these languages, the telicity generalizations hold only partially. Not all perfective-marked verbs are telic in Slavic; only the transitive ones with incremental theme objects are. All telic transitive predicates in Dutch and English have a quantized direct object, but not all transitives with a quantized direct object are telic (see *duwen* `push' in (5) and *zien* `see' in (6)). In Finnish the correlations between telicity and accusative case on the one hand and atelicity and partitive case on the other do not hold up across the board; it only works for a particular set of verbs. In all four languages the mappings between a particular syntactic or morpho-syntactic form and its meaning are imperfect. This complicates the issue further. In addition to figuring out what is the formal marking of telicity in their own language, all children must learn to distinguish two-argument verbs with incremental themes from those with other themes.

Glossing over the cross-linguistic variation that one already finds among these four languages under discussion, one may say that the acquisition task looks pretty tough. There is not one specific locus for encoding telicity in the clause, unlike tense which by and large seems to always get marked on the verb (if it is encoded in the first place). On the contrary, the possible encodings of telicity marking in various languages are spread over the whole verb phrase, at least the verb and/or the object. Universal Grammar (UG) most probably offers the basis for this spreading of telicity information across verb and object. A number of researchers in the fields of both syntax and semantics have made various proposals in the past decade as to how to integrate the aspectual role of the direct object, among them: Krifka (1986, 1992); Tenny (1987, 1994); Verkuyl (1993); Borer (1994); Levin and Rappaport Hovav (1995); van Hout (1996); Kiparsky (to appear). Assuming that some syntax-semantics model along these lines is right, UG will direct and restrict the search space of where to look for telicity clues. Still, the child has to figure out which exact clues her language employs.

An additional complicating issue is that the telicity encoding in a particular language is almost always confounded in that it also serves other purposes. Presence or absence of articles in Dutch and English also serves to express the specificity and definiteness of noun phrases; in fact, it does so primarily. In Finnish, partiality versus completeness and definiteness versus indefiniteness of noun phrases is also dependent on accusative-partitive marking. The perfective-imperfective verb paradigm in Czech also, and primarily, serves to

express viewpoint selection. In most cases, these other semantic functions are more obvious, as they apply across the board for all verbs and all noun phrases. The telicity functions seem additional and apply only within a subset of verbs.

Seeing how hard the acquisition task is, one may expect that learning the role of direct objects for telicity comes in rather late. For Dutch and English, the child initially will not recognize that the count term versus mass term distinction as indicated by presence or absence of an article co-determines telicity. That is, as for the aspectual interpretations they initially assign to clauses with bare or full object noun phrases and intransitive clauses, children will not distinguish between them. As for the other languages discussed above, similar predictions can be drawn up. In particular, Finnish learners are expected to initially not recognize the aspectual function of accusative-partitive marking. Czech learners would be expected to initially only recognize the viewpoint aspectual function of the perfective-imperfective paradigm, but not the telicity function and its quantificational effects on the object.

The following section describes experimental results from Dutch and English learners when probed for their aspectual interpretation of clauses with various kinds of direct objects. The predictions for Finnish and Czech (and other Slavic languages) will have to wait to be confirmed or falsified by future research.

4. Experimental results on the interpretation of direct objects and telicity

The experimental set-up, materials and procedures were the same for the Dutch and English studies. After describing these, I first present the adults' results of Dutch and English to show what the exact grammars are that learners are aiming towards. Next come the Dutch children's results and those of the English children.

Subjects Forty five Dutch children (3, 4 and 5 year-olds) participated in the Dutch study, 15 in each age group, and sixteen adults. Forty six American children participated in the English study, 19 3 year-olds, 17 4 year-olds and 11 5 year-olds, and sixteen adults. All subjects were native Dutch or English speakers. They were tested individually. The children were tested at their kindergarten or day-care; these sessions were recorded on audio tapes. The adults were tested at the experimenter's home or at the university.[7]

Design and Materials The experiment tested the aspectual interpretation of four types of sentences by asking *yes/no*-questions about story characters involved in atelic and telic events. The materials consisted of stories and accompanying flash cards. The story characters are involved in eating or drinking events. Each story has two sub-stories with similar characters involved with similar foods or drinks: e.g., a white mouse and a red one are each eating a piece of cheese; one boy wearing a red cap and another with a white cap are each drinking

[7]I was very happy with the hospitality from the following places for running my child subjects: basisschool *St. Jan Baptist* in Oerle, peuterspeelzaal *'t Sterretje* in Veldhoven and day-cares *Bright Start*, *Discovery*, *Green/Byrne*, *Magic Years* and *Rocking Horse* in Philadelphia.

a glass of coke. One character completes his/her eating or drinking by proceeding to the natural endpoint, e.g., finishing all of the cheese or all of coke in the glass. This was the *telic* event type: an activity part plus a natural final state given by the disappearance of the food or drink. The other character does not complete his/her eating or drinking, but stops somewhere in the middle, e.g., after a couple of bites or sips, so that the event does not reach its natural endpoint: some of the food or drink is left over. This was the *atelic* event type, consisting only of the atelic activity part. Note that the events in both sub-stories ended. For the telic one, the final moment was one of completion, while for the atelic one it was one of termination (these are Smith's 1991 terms). The story about the mice illustrates an example story in Dutch in (11) and the same one in English in (12):

(11) Hier is een witte muis. Hij heeft een net stuk kaas gevonden. Kijk, hier is hij aan het eten. Hij knabbelt er een beetje af, maar dit stuk is veel te groot voor hem. Hij laat nog wat over voor later. *atelic event*
En hier is een rode muis. Hij heeft ook een stuk kaas gevonden. Kijk, hier is hij aan het eten. De rode muis vindt zijn kaasje erg lekker. Dat kan je wel zien ook: er blijft niets van over. *telic event*

(12) Here's a white mouse. He just found a piece of cheese. Look, here he's eating. He takes a couple of bites, but his cheese is too big for him for now. He leaves a piece for later. *atelic event*
And here's a red mouse. He also found a piece of cheese. Look, there he's eating. The red mouse likes his cheese very much. You can see that here: his cheese is all gone. *telic event*

The stories were counterbalanced within subjects as to which event type was presented as the first sub-story and which second.

The first flash card introduces the character. The second card shows the protagonist in the middle of his/her eating or drinking described with an intransitive sentence with an imperfective tense form, i.e., the *aan-het* plus infinitival verb construction in Dutch (see (11)) and the present progressive in English (see (12)). The quantity of food or drink is clearly depicted in the picture and mentioned in the story (e.g., a piece of cheese, a glass of coke). The last card depicts the outcome, showing either the natural endpoint for the telic event types (e.g., the red mouse with all of the cheese is gone) or the left-over for the atelic event types (e.g., the white mouse with half of the cheese lying next to him on the floor). The story-telling focusses on these different outcomes.[8]

[8]Hana Filip and Richard Weist (independently) worried that the dichotomy in my materials is not one of telic versus atelic events, but rather, one of perfective versus imperfective events, both events being telic in the middle picture. I nevertheless believe that the eating and drinking events in the ways I presented them both show a perfective viewpoint, since both events are over with by the end of the story. They are pointing out the important and tricky issue of the relation between (a)telicity and (im)perfectivity which definitely needs further reflection for the design of follow-up experiments.

Four different sentence types were tested: intransitives, transitives with a bare object, transitives with an object preceded by a possessive pronoun and transitives with the resultative particle *op/up*. These sentence types were asked as *yes/no* questions. After presenting a story, one of the sentence types was asked about each of the characters separately. The story/sentence type combinations were counterbalanced across subjects. For the mice-eating-cheese story, a subject would get one of the following question types for each of the characters, (13).

(13) a. *intransitive*: Heeft de rode/witte muis gegeten?
Did the red/white mouse eat?

b. *bare transitive*: Heeft de rode/witte muis kaas gegeten?
Did the red/white mouse eat cheese?

c. *full transitive*: Heeft de rode/witte muis zijn kaasje gegeten?
Did the red/white mouse eat his cheese?

d. *particle verb*: Heeft de rode/witte muis zijn kaasje opgegeten?
Did the red/white mouse eat up his cheese?

For half of the eight items, the character in the telic sub-story was asked about first and the one in the atelic sub-story next; for the other half this order was reversed. This was counterbalanced across subjects. Subjects got two items for each of the sentence types, yielding a total of eight items, four of them eating stories and four drinking stories. Each subject got a different order.

In order to be able to cycle the four sentence types across all stories for cross-balancing, I used objects that could be referred to by mass terms as well as count terms. With most stories this meant that the noun itself was basically a mass term which was type-lifted to a count term by adding the possessive pronoun in the full transitive and particle verb conditions. In the bare object condition, it was used as a bare mass term (e.g., *cola-haar cola* `soda-her soda', *water-zijn water* `water-his water'). In some cases in Dutch, in addition to the possessive pronoun, a diminutive suffix was added to the noun which is as an additional quantization encoding (e.g., *ijs-zijn ijsje* `ice cream-his ice cream', *kaas-zijn kaasje* `cheese-his cheese').[9]

The questions were phrased in a perfective tense form: the present perfect in Dutch and the simple past in English (see (13)). By using a perfective tense form, both the telic and the atelic event types in the stories are presented as complete events including their final moments. They have happened at some point in the past and are over now, differing only in the nature of the final moment: whether it was a moment of completion (the telic events) or just termination (the atelic events). Notice crucially that only a perfective tense form can bring out

[9]Judy Bernstein remarked that a possessive pronoun does not necessarily quantize (*his ice cream* may refer to an unbounded heap of ice cream). The objects here always involved a specific and bounded quantity and are explicitly specified so in the stories and pictures. So, for the purposes of this study, a possessive pronoun can be taken as quantizing the object. However, further studies need to be done to look at the effects of articles (definite and indefinite) as well as specific measure phrases (e.g., *a piece of cheese*).

this difference between telic and atelic events. If the questions had been asked in an imperfective tense form (such as the progressive in English, e.g., *Was the red mouse eating his cheese?*), the answers would be *yes* for both characters in the present story set-up, since both were involved in eating or drinking.

Procedure The child subjects were introduced to a blindfolded puppet. They were told that the puppet goes to sleep during story-telling. He would wake up after each story and want to know what happened. The adults were simply asked to listen to stories and answer some simple questions about them. Each subject started with one training item to get used to the story-questioning procedure. After the subject was presented with a story, a set of *yes/no*-questions were asked about the events, including the two trigger questions and three filler ones about the colors of the characters' clothes and the tails and noses of the animals, etc.

Predictions As discussed in the previous section, I expected children in both language groups to initially not differentiate their aspectual interpretation of intransitive verbs, transitives with a bare object and transitives with a quantized object, such as those in (13a,b,c). This might lead to various answer patterns. Subjects may be overly liberal in their interpretations and not care about the telicity or atelicity of the story (and thus say *yes* to the questions about both characters), or they may assign telic or atelic interpretations at chance. I expected correct aspectual interpretations for sentences with particle verbs such as (13d), as the particles *op* in Dutch and *up* in English are overt and transparent indicators of telicity.[10] So, children should initially only differentiate sentences with particle verbs from the other three sentence types and restrict their answers to "telic" interpretations (i.e., only the telic character ate/drank up his food/drink).

Results There were basically two answers subjects would give in response to the two trigger questions for each item: either (i) a *yes* for each character, giving a "both" reading and thus allowing both a telic and an atelic interpretation of the sentence type, or (ii) a *yes* for the telic and a *no* for the atelic character, yielding a "telic" reading and thus restricting their interpretation to a telic reading. In the tables below I present percentages of "telic" answers for the four sentence types (the rest of the answers in each cell up to 100% were "both" answers").[11] Consider first the adults.

[10]See also van Hout 1998 where I discuss the acquisition of telicity in terms of the amount of the transparency of its morpho-syntactic encoding. Particle verb sentences, being more transparently telic than the other three sentence types, were expected to be interpreted as telic from early on.

[11]Or one of the other two possible answer combinations, but these hardly ever occurred.

(14) Results Dutch and English Adults:
Mean percentage of **telic** answers as a function of sentence type:

	Intransitive	Transitive w/ bare object	Transitive w/ full object	Transitive w/ particle *op* 'up'
Dutch (n=16)	.13	.16	.78	1
English (n=16	.06	0	.25	.81

Neither Dutch nor English differentiates the intransitives and the bare transitives; these get both atelic and telic readings in both languages. Adults in the two languages do differentiate the other two sentence types both from each other as well as from the former two sentence types (t-values of the difference scores yield significance at the $p<.04$ level or better). That is, particle verbs are interpreted differently from transitives with a full object which are treated differently from the collection of intransitives and transitives with a bare object together. *Op/Up* is a clear telicity marker in both languages, categorically so in Dutch and to a somewhat lesser extent in English.

Dutch and English differ markedly, however, in their interpretation of the full transitives with a *his/her* object ($t=4.0$; $p<.001$). These turn out to be judged ambiguously in both languages, but the preferred interpretations are reversed: Dutch prefers to restrict the interpretation to a telic one (78%), while English often allows atelic readings as well (only 25% is restricted to telic). Whereas Dutch overall behaves much as expected on the basis of semantic theories on the aspectual effects of quantization or cumulativity of the object, even though not categorically so, English clearly deviates with sentences with full objects: quantized objects do not necessarily trigger telic readings. I am not sure why the two languages differ. Possibly, the conversational implicatures associated with the present perfect in Dutch and the simple past in English differ.

The results from the Dutch as well as the English children show, basically, that particle verbs are treated differently from all the other sentence types. While particle verbs are correctly restricted to telic readings only (even by the three year olds to a significant extent), transitives with a full object, those with a bare one and intransitives are all treated the same and get very mixed readings, subjects sometimes allowing both readings and sometimes restricting to telic readings only. Clearly, children have not yet picked up on the relevance of the semantics of the direct object for telicity. Here are first the Dutch results.

(15) Results Dutch Children and Adults:
Mean percentage of **telic** answers as a function of sentence type:

	Intransitive	Transitive w/ bare object	Transitive w/ full object	Transitive w/ particle *op* `up'
3 yr (n=15)	.23	.17	.17	.50
4 yr (n=15)	.33	.37	.50	.87
5 yr (n=15)	.40	.37	.47	.90
adults (n=16)	.13	.16	.78	1

For each age group, ANOVA's show massive effects for sentence type (for the three year-olds: $F=7.13$, $p<.02$; for the four year-olds: $F=10.45$; $p<.001$; for the five year-olds: $F=21.9$, $p<.001$). Looking more closely at where the effects are located, I find that from the youngest children on, only particle verb sentences are distinguished from the intransitives and transitive with a bare object as having more telic readings (t-values of the difference scores yield significance at the $p<.01$ level or better). All Dutch child groups do not distinguish among the transitives with a full object, those with a bare object and the intransitives. These are distinguished in the target language, however, as the adults differentiate the transitives with a full object from the other two at a significant level (difference score $t=7.547$, $p<.001$).

As predicted, initially the first three sentence types are not differentiated. Only particle verbs are taken as telicity markers, even though not unambiguously so by the 3 year-olds. Even at 5 years old, Dutch children differ markedly from the adults in their interpretation of *his/her* sentences, allowing more atelic readings than the adults do. This is only a preference difference, though, since the adults do not give exclusively telic readings for this category either. Now follow the results from the English learners.

(16) Results English Children and Adults:
Mean percentage of **telic** answers as a function of sentence type:

	Intransitive	Transitive w/ bare object	Transitive w/ full object	Transitive w/ particle *op* `up'
3 yr (n=15)	.45	.29	.45	.66
4 yr (n=15)	.50	.38	.56	.62
5 yr (n=15)	.37	.37	.56	.91
adults (n=16)	.06	0	.25	.81

For the 3 year-olds and for the 5 year-olds, ANOVA's show significant effects for sentence type (for 3 year-olds: $F=4.1$, $p<.03$; for 5 year-olds: $F=9.9$, $p<.001$). For the 4 year-olds, all sentence types seem equal. Just as with the Dutch children, even the youngest English children differentiate sentences with particle verbs from the intransitives and transitives with a bare object as being more restricted to telic readings (t-values of the difference scores yield significance at the $p<.02$ level or better). Also, none of the English child age groups distinguish among their interpretations of full object transitives, bare object transitives and intransitives. The adults made a significant difference between the transitives with a full object on the one hand and the other two sentence types on the other (difference score $t=2.587$, $p<.04$). So, for English learners too, as predicted, only particle verbs are recognized as telicity markers from early on while the other sentence types are not distinguished.

Notice finally that all children groups in both languages deviate quite a bit in their interpretation of the first three sentence types from the adults; they are overly restrictive. Children, even at five years old, still have to learn to allow both telic and atelic readings for intransitives and bare object transitives.

5. Conclusions and acquisition issues

Why do children not distinguish their aspectual interpretation of sentences with bare or full noun phrases? I will go over a number of reasons and discuss their likelihood and further implications for acquisition.

It might be that children do not yet know that the presence or absence of an article is related to a mass term versus count term semantics of noun phrases, so that they cannot properly compute telicity because of their incomplete or incorrect object denotations. This seems unlikely, though. In a study with English learners, Brown (1957) has already shown that children can employ the noun semantics of count/mass syntax. Children were shown two pictures, one that depicted an object and one that depicted a substance. They had to choose a picture prompted by one of two conditions: a novel noun with count noun syntax (*Show me a sib*) or mass noun syntax (*Show me sib*). Both 3 and 5 year olds were able to do this task. In a follow-up study, Bloom (1994) tested whether children can extend the semantic implications of count/mass syntax to non-material entities. This time children were taught novel names for perceptually ambiguous stimuli which could be construed as either a set of individuals or as an unindividuated portion (in the food condition, e.g., spaghetti; in the sound condition, e.g., a string of bell sounds). Children had to act out the instruction prompted by one of two conditions: count noun syntax (*These are feps. Give the puppet a fep/Make a fep*) or mass noun syntax (*This is fep. Give the puppet fep/Make fep*). Again, 3 and 4 year olds are able to perform the task which shows that they have an understanding of the mappings between the syntax and semantics of mass term versus count term noun phrases. There are no similar studies of Dutch acquisition that I know of, but it is likely that Dutch and English acquisition are similar in this domain. So, the delay in the aspectual computation of the effects of the semantics of the direct object must be due to something else.

Assuming that they have the right noun denotations, the experimental results seem to indicate that Dutch and English children up to the age of five do not apply the Mapping-of-objects-to-events when they compute their aspectual interpretations of transitive sentences, and intransitives, for that matter. This may be related to a number of issues in the grammar.

For one, children may still have problems with the aspectual semantics of the tenses that were used in the trigger sentences (present perfect in Dutch and simple past in English). Only if they know that these tenses yield perfective viewpoints, are they able to answer the questions correctly. If on the other hand they would allow an imperfective viewpoint for the trigger sentences ("hearing" them as *Was he eating/drinking...?*), they would say *yes* to the questions about both story characters, no matter what the direct object was, and thus would seem overly liberal for the full object transitives. In an experimental study on the acquisition of tense and aspect in English, Wagner (1998, this volume) finds that children up to the age of five still have some trouble when asked to perform in a task that employs the so-called imperfective paradox. In a forced-choice paradigm, a subject is shown the results of two puppets' actions (e.g., a half-done drawing of a house and a complete drawing of a house). Both puppets then appear and make statements about their actions, one using a past progressive (e.g., *I was drawing a house*), the other a simple past tense (e.g., *I drew a house*). The subject has to match each puppet with his drawing. Three year-olds could not perform this task, showing that they had not yet mastered the aspectual semantics of the past progressive/simple past paradigm. And even the 5 year-olds still had some trouble. They performed at ceiling when the simple past sentence was asked first. However, when asked to match the imperfective past progressive sentence first, they would put it on either drawing showing chance-like behavior. Given that the subjects in my study were in the same age range, 3 through 5 year-olds, it may well be that their incomplete knowledge of the viewpoint semantics of the trigger sentences caused them to fail on the telicity task. While something like this may be at play, it cannot be the full story, though. If the English learners in my study gave imperfective and perfective readings to the trigger sentences at chance, they would also be wrong (at least half of the time) in their answers to particle verb questions, but they were not. There are no studies on Dutch acquisition of the semantics of the present perfect, so one cannot tell if such problems have interfered with the task here.

A second possibility is that children have problems with the pragmatics of the tenses. Considering the adult results again, one can see that the trigger sentences yield rather vague inferences about how much food or drink may be left over. The results do not show 0% or 100% percentages in all cells. On the contrary, in most cells, subjects allow telic as well as atelic readings, at least to some extent. This means that the pragmatic strength of almost all sentence types is that of a conversational implicature w.r.t. having some left-over food/drinks -- and conversational implicatures may be cancelled. For the intransitive and bare transitive conditions in both languages the implicature seems to be that some food/drink may be left over, but in some cases subjects required it to be finished. The same holds for the full transitives in English. For the Dutch full transitives and the English particle verbs, the implicature is that the food/drink is finished, but in some cases subjects allowed some left-overs. Only particle verbs in Dutch have the stronger strength of an entailment about the food/drinks: if some is left over, the sentence does not apply (these got 100% telic answers). So, if the semantics of Mapping-to-objects is aligned with the pragmatics of implicatures, it

might be that children judge the pragmatics of the stories in this experiment differently form the adults (i.e., the strength of the implicatures and their "cancelability"), and so their percentages of telic and atelic answers become different as well.[12]

Thirdly, children may still have problems with the morpho-syntax of telicity. If the syntactic connection between telicity and direct objects is put in terms of a morpho-syntactic feature, it may be that children have not yet learnt that the values of this feature depend on the properties of the object in Dutch and English or how to compute its settings exactly. More specifically, in the theory on the aspectual syntax-semantic interface that I develop in van Hout (1996), I propose that the interface is defined by checking event-semantic features in syntactic configurations, in particular, a telic feature must be checked in AgrOP by so-called strong object Case. De Hoop (1992) distinguishes strong versus weak object Case to explain quantificational properties of noun phrases that are marked by overtly different cases in languages such as Finnish (see (7) above) and Turkish, and, by assumption, also in languages such as Dutch and English, albeit abstractly. According to De Hoop strong Case assignment involves scrambling of the object out of the verb phrase and gives a generalized quantifier interpretation of the noun phrase. Weak object Case is assigned within the VP with the object in base-generated position where it gets semantically incorporated (see also van Geenhoven 1996 who develops a theory of semantic incorporation). Employing this Case distinction for the atelic-telic differences, I propose that an object must move out of the VP to AgrOP and picks up strong Case in order to check telicity (see also Borer 1994 for an independent and similar proposal). If it stays in its original position inside the VP, it gets weak Case and yields an atelic predicate. Given that the strong/weak Case distinction is abstract in Dutch and English, one may expect that its acquisition is delayed and, hence, that children are late in learning the syntax of the telicity feature, so that they do not yet recognize the aspectual effects of different kinds of objects.

Coming back finally to telicity matters in Finnish and Czech, it would be insightful to see when children acquire the telicity encodings in these languages. In particular, one would want to see if learners of Finnish - that encodes telicity with partitive/accusative case on the object - have equal trouble acquiring Mapping-to-objects as the Dutch and English learners in this study did. Since in Czech telicity is encoded on the verb, it would be interesting to compare and see how learners deal with Mapping-to-events in this language.[13]

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[12]In this context, Krifka (personal communication) mentioned to me that in languages such as Hindi, Japanese and Chinese full transitives are telic by conversational implicature only, and one may readily say something like: *I ate the cheese, but there is still some left.* Even quite some English speakers I have come across allow it. The same sentence in Dutch sounds awful to me, though. A more structured (i.e., experimental) study should look at these pragmatic effects directly.

[13]Of related interest here, although not exactly on the topic of telicity, is an experimental study by Weist, Wysocka and Lyytinen (1991) who studied the acquisition of viewpoint aspect in English, Polish and Finnish. Shown two sets of pictures, one portraying a completed story and the other an on-going one, subjects had to match a perfective and an imperfective sentence with the pictures in a forced-choice task. By 3 years old English learners were able to correctly distinguish simple past from past progressive, as were Polish learners with perfective and imperfective verb forms (Polish is similar to Czech in this respect). Finnish learners on the other hand, even 6 year-olds, were not able to handle the task correctly. They had to match sentences with

All in all, the present study raises many more questions than it answers on the issue of the acquisition of telicity. The results show that children do not distinguish their aspectual interpretation of sentences with bare or full noun phrases, suggesting that they do not yet apply the semantic computation of Mapping-to-objects. No further conclusions can be drawn based on this, since too much about the development of closely associated syntactic, semantic and pragmatic issues is still unknown. Further research should look at the acquisition of the semantics of noun phrases (definites, indefinites and measure phrases) and their type-shifting properties (from mass to count and vice versa) in connection with telicity as well as the acquisition of the aspectual properties of the tenses and their pragmatic inferences. Further cross-linguistic research is also needed, especially in languages that encode telicity differently, for example the Slavic languages that mark it on the verb. Comparing developmental patterns across languages will shed light on which aspects of telicity learning are universal and which language-particular.

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objects with accusative or partitive case. The latter result is another indication that it is indeed hard to acquire the aspectual semantics associated with objects, i.e., when Mapping-to-objects needs to be applied.

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