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van Hout, Angeliek

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Lexical and Grammatical Aspect

Angeliek van Hout

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Abstract and Keywords

The topic of this chapter is the acquisition of lexical and grammatical aspect. Given wide cross-linguistic variation in aspect expression, the learnability issues center around form-meaning associations: how do learners determine the meaning of a certain aspectual form? Focusing on the literature on telicity and on the perfective-imperfective distinction, two main results stand out. Predicate telicity is easier than compositional telicity. The completion entailment of perfective is acquired at different ages across different languages, somewhere between 2.6 and 5. One novel direction of research asks whether aspect is acquired easier in some languages than in others. The answers will uncover possibly universal aspectual primitives and heuristics that guide children with their task of acquiring temporal meanings.

Keywords: acquisition, grammatical aspect, telicity, perfective, imperfective, form-meaning mapping, cross-linguistic variation

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25.1 Introduction

THE temporality of a given situation “out there in the world” can be described in many ways. Tense and aspect offer the essential parameters. Lexical aspect characterizes the temporal profile of event descriptions; a situation with a sleeping child can be referred to as a state of affairs (*be asleep*) or as a happening (*sleep, wake up*). Grammatical aspect imposes a perspective by focusing a particular time slice of a situation, such as the ongoing process (*the baby was sleeping, mom was waking up the baby*), the event as a whole (*the baby slept, mom woke up the baby*), or the resulting state (*the baby has slept, mom has woken the baby up*). Tense locates a situation at a certain time (*was sleeping, is sleeping, will sleep*).

Temporality is thus determined by the three grammatical notions of lexical aspect, grammatical aspect, and tense. Tense anchors the time of an event vis-à-vis a reference time, often the moment of speech. Aspect imposes one or more layers of temporal structure on the event time thus defining its temporal properties. Lexical aspect (also called “situation

type,” “inner aspect,” “Aktionsart”) characterizes the temporal contour, while grammatical aspect (or “viewpoint aspect,” “outer aspect”) determines the temporal viewpoint on the run-time of the event. The grammatical expression of aspect varies enormously: while there are languages with one, a few or many types of aspectual markers, other languages have no dedicated aspect markers whatsoever. In some languages tense and aspect morphology is conflated. This cross-linguistic variation makes aspect an interesting domain of linguistic investigation and a wide variety of acquisition studies have investigated aspect development in children, raising questions about its universal versus language-specific properties.

In this chapter I review the acquisition literature of lexical and grammatical aspect; tense is beyond its scope. Section 25.2 summarizes the fundamental generalizations and

(p. 588) linguistic analyses of the two types of aspect, and presents the cross-linguistic variation in aspect expression which raises questions of learnability. Section 25.3 presents the acquisition literature for lexical aspect, and section 25.4 does the same for grammatical aspect. Section 25.5 draws conclusions about the coverage of aspect acquisition research to date and presents an outlook on novel directions of research.

25.2 Aspectual Generalizations and Cross-linguistic Variation

Sections 25.2.1 and 25.2.2 review the fundamental generalizations of lexical and grammatical aspect, and the connections between these two aspectual notions. Section 25.2.3 presents the range of cross-linguistic variation. For recent overviews of aspect theories, I refer to Rothstein (2004), van Hout et al. (2005), Verkuyl (2005), Klein (2009), and Filip (2012). Dahl (2000) presents a comprehensive volume on tense-aspect typology.

25.2.1 Lexical Aspect

Situations “out there in the world” are not of a particular type and do not have any intrinsic temporal structure. It is the linguistic description of a situation that individuates an event or state in the world by “carving out” a certain “time slice” of a situation (Parsons 1990; Filip 1993; Partee 1999). Lexical aspect is a property of a linguistic description as given by the verb phrase, without tense and grammatical aspect. It involves lexical features as well as syntactic-semantic properties. Analyzing the lexical and formal-semantic properties of different aspectual classes in terms of event types, theories of aspect aim to explain why the different classes behave as they do in various linguistic tests.

Vendler (1957) distinguishes four “time schemata”—nowadays referred to as aspectual classes or event types: state, activity, accomplishment, and achievement. Smith (1991a) defines these aspectual classes with the temporal properties of dynamism, durativity, and telicity (Table 25.1).

States involve a period of undifferentiated time, whereas dynamic situations involve temporal activity and change. Durativity refers to the length of an event time: extended or instantaneous. Telicity (from the Greek *telos* 'goal') has been characterized as "culmination," "natural endpoint," and "set terminal endpoint." Over the years researchers have proposed alternative classifications for the Vendler classes: collapsing the two telic classes into one category called "event," taking accomplishments as a special subclass of activities; adding other (sub)classes (e.g. "semelfactives"). Aspectual classes are a useful linguistic tool, because they behave differently linguistically. Dowty (1979) presents a comprehensive overview of tests that serve as diagnostics to establish aspectual class, a few of which are listed in Table 25.2. Instead of aspectual features, formal-semantic (p. 589) theories on the other hand use the properties of homogeneity and cumulativeness to describe different event types (Bach 1986; Krifka 1989b; Kamp and Reyle 1993). Atelic predicates are homogeneous and cumulative; telic predicates are not (a predicate X is homogeneous if any subpart of the denotation of X can also be referred to as X; a predicate X is cumulative if two or more events in the denotation of X taken together can also be referred to as X). Thus defined, the telic-atelic distinction brings out specific implications and entailments, see Table 25.2.

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Table 25.1 Vendler classes characterized by aspectual features

	Dynamic	Durative	Telic	
State	–	+	–	<i>be asleep, believe, trust, love</i>
Activity	+	+	–	<i>sleep, run, sing</i>
Accomplishment	+	+	+	<i>run a mile, make a chair, write a book</i>
Achievement	+	–	+	<i>wake up, reach the top, recognize, die</i>

Table 25.2 Aspectual tests and entailments

	Diag- noses	OK	not OK
Progressive <i>-ing</i>	dynam- icity	<i>sleeping</i> <i>waking the</i> <i>baby up</i> <i>making a</i> <i>chair</i>	<i>*being asleep</i> <i>*loving the ba-</i> <i>by</i> <i>*knowing the</i> <i>answer</i>
Durative adver- bials <i>for an</i> <i>hour</i>	telicity	<i>be asleep for</i> <i>an hour</i> <i>sleep for an</i> <i>hour</i>	<i>*make a chair</i> <i>for an hour</i> <i>*wake the baby</i> <i>up for an hour</i>
Time-frame ad- verbials <i>in an</i> <i>hour</i>	telicity	<i>make a chair</i> <i>in an hour</i> <i>wake the ba-</i> <i>by up in an</i> <i>hour</i>	<i>*be asleep in a</i> <i>hour</i> <i>*sleep in an</i> <i>hour</i>
<i>V-ing</i> entails <i>has</i> <i>V-ed</i>	telicity	<i>the baby</i> <i>was sleeping</i> → <i>she has</i> <i>slept</i>	<i>she was wak-</i> <i>ing up the baby</i> ~~→~~ <i>she has wok-</i> <i>en her up</i>
Subinterval property <i>V from</i> <i>1-3</i> entails <i>V</i> <i>from 1-2</i>	homo- geneity	<i>sleep from</i> <i>1-3</i> → <i>sleep from</i> <i>1-2</i>	<i>make a chair</i> <i>from 1-3</i> ~~→~~ <i>make a chair</i> <i>from 1-2</i>
<i>V from 1-2 and</i> <i>2-3</i> entails <i>V</i> <i>from 1-3</i>	cumula- tivity	<i>sleep from</i> <i>1-2 and</i> <i>sleep 2-3</i> → <i>sleep from</i> <i>1-3</i>	<i>make a chair</i> <i>from 1-2 and</i> <i>make a chair</i> <i>from 2-3</i> ~~→~~ <i>make a chair</i> <i>from 1-3</i>

(p. 590) Even though the term “lexical aspect” is widely used, which is why I employ it in this chapter, the label is rather unfortunate, because aspectual class is not determined by the lexical properties of the verb on its own. “Compositional telicity” refers to the effect that the semantics of the verb’s arguments (whether or not they specify a particular quantity) co-determines telicity; compare telic *write a letter* versus atelic *write letters* and *write poetry* (Verkuyl 1972, 1993; Bach 1986; Krifka 1989b). This effect is modulated by a lexical factor: it arises only with verbs whose objects undergo an incremental change (*write a letter* is telic, the letter comes into existence over the course of writing), but not when the object is not so affected (*push a cart* is atelic, even if the object is quantized). Other predicative elements in the VP furthermore contribute to “predicate telicity,” including verb particles, prefixes, and directional PPs. Compare atelic *run* versus telic *run to the store*, and atelic *eat* versus telic *eat up* (Brinton 1985; van Hout 1996; Filip 2003). Finally, the mapping of the verb’s argument structure onto syntax plays a role. Direct objects (but not indirect objects) contribute to compositional telicity. This generalization extends to unaccusatives (Borer 1994; van Hout 2000). It reveals that telicity is also determined by syntax (Tenny 1987, 1994). The aspectual function of direct objects and unaccusative subjects in the syntax of telicity has been analyzed in many different theories of syntax: with a special thematic role (Tenny 1987; Dowty 1991; Krifka 1992), object case (van Hout 1996; Schmitt 1996; Ramchand 1997;), an aspect projection for aspect checking (Travis 1994; Demirdache and Uribe-Etxebarria 2000; Borer 2005; MacDonald 2008), and a telicity parameter (Slabakova 2001; Filip and Rothstein 2005).

Summarizing the fundamentals, lexical aspect is a property of VPs and depends compositionally on the verb, its arguments, and other predicative elements. Aspectual classes are characterized by aspectual features and behave differently in various linguistic tests. Different theories engage different sets of features, and propose various classifications. Lexical aspect, in particular, the robust association between telicity and direct objecthood, involves the syntax-semantics interface.

25.2.2 Grammatical Aspect Theories

There are many possible ways of looking at a given situation “out there in the world.” While lexical aspect presents a situation as a certain event type, grammatical aspect defines a particular viewpoint on it. Informally, grammatical aspect involves the “different ways of viewing the internal temporal constituency of a situation,” with perfective aspect as “the view of the situation as a single whole,” while imperfective aspect “pays essential attention to the internal structure of the situation” Comrie (1976: 3, 16). Formal-semantic theories define aspectual viewpoints in terms of aspectual operators which specify a relation between the run-time of an event—the interval along which an event stretches out in time—and a reference time (Smith 1991a; Kamp and Reyle 1993; Klein 1994; de Swart 1998; Demirdache and Uribe-Etxebarria 2007). Thus, perfective aspect includes the event’s run-time inside the reference time interval (Figure 25.1), (p. 591) whereas imperfective aspect includes the reference time inside the run-time interval (Figure 25.2).

Figure 25.1 Perfective aspect.

Figure 25.2 Imperfective aspect.

Different aspectual implications and entailments follow. With perfective aspect, the entire event including the initial and final boundaries falls within a reference time interval. As a result, telic predicates modified by perfective aspect have an entailment of completion, and atelic predicates have an entailment of termination, and so the event has culminated or terminated. In contrast, imperfective aspect makes an assertion about part of the event's run-time, and so there is no completion or termination entailment. The continuation test in (1) is based on this entailment; imperfective aspect in the first conjunct allows continuation in the second conjunct, (1a), but perfective aspect leads to a contradiction, indicated by # in (1b).

(1)

- a. John was making a chair, and he may still be making a chair.
- b. # John made a chair, and he may still be making a chair.

The definition of imperfective aspect as inclusion of the reference time in the run-time also explains the so-called “imperfective paradox,” the fact that a telic predicate when it is modified by imperfective aspect can refer to an incomplete event. If Mary is crossing the street, she may be interrupted and never reach the other side, and so the crossing is incomplete. Thus, culmination as given by the telicity of the predicate is cancelled by imperfective aspect. This follows because imperfective aspect lacks a completion entailment. Note that there is no imperfective paradox for atelic predicates: an atelic description modified by either perfective or imperfective aspect is true, also when an event is interrupted. Incompleteness of an event matters only for telic predicates and not atelic ones. This insight has often been used in experimental designs that test for telicity and/or perfective aspect.

Other aspect operators define more aspects. Progressive aspect focuses the ongoing progress excluding the initial and final boundaries of the run-time. Perfect aspect focuses the resulting state immediately following the final boundary. Inchoative aspect focuses the start of the run-time immediately at the initial boundary. Delimitative aspect specifies

a certain duration of the run-time. In addition to operators that yield episodic events, iterative and habitual aspect involve quantification over the run-time variable.

(p. 592) Grammatical aspect is linguistically encoded by morphology, periphrasis, and aspectual adverbials, which modify the event description as determined by the verb phrase. There can be several grammatical aspect markers in one clause; the event description is modified by more layers of aspectual modification, with two or more operators applying in succession (for example, progressive and perfect aspect in *has been sleeping*). Thus, lexical and grammatical aspect together define the temporal properties of an event description. Tense marks the relation between the time of the described event and a deictically given reference moment, often the moment of speech, or else a moment established in the discourse. I do not review tense semantics (see Klein 1994, 2009; Binnick 2012), nor the acquisition of tense in this chapter (see Weist 2002; Wagner 2012).

25.2.3 Cross-linguistic Variation

Cross-linguistically, the linguistic elements that determine lexical aspect and aspectual class do not essentially vary; the verb's lexical aspect plays the most crucial role. The way in which the quantificational properties of the direct object affect telicity seems fairly constant across languages; the same goes for the aspectual role of verb particles and prefixes, directional PPs, and resultative constructions, to the extent that a given language has those constructions.

As for grammatical aspect, all languages have ways to express notions such as stop or start an action, or be in the middle of it, if only with aspectual adverbials. However, there is a lot of cross-linguistic variability with grammatical encoding—whether or not it is encoded at all, and, if so, which aspects are expressed how (Comrie 1976; Dahl 1985, 2000). In some languages aspect is a morphological category, which means that verbs obligatorily carry aspect, as they come in aspectual pairs of perfective and imperfective forms. Another source of variation is how aspect is encoded: with morphology on the verb; with conflated aspect-tense morphology, with particles, periphrasis, or in some other, more indirect way.

Table 25.3 illustrates different types of perfective-imperfective marking. Languages with morphological aspect, such as the Slavic languages and Greek, differ as to how the pairs are formed morphologically; the number of different (im)perfectivizing prefixes or infixes and the extent to which these combine with any verb or are lexically restricted; whether the aspectual opposition only surfaces in finite verbs, or also in nonfinite verbs; the possible uses of each member of a pair, etc. For many Slavic pairs the imperfective form of the verb is morphologically simple and the perfective form is derived from it by prefixation, stem change, or stress shift. Greek aspectual pairs are formed by stem alternation. The Romance languages contrast perfective and imperfective aspect in the past tense, conflating aspect and tense morphology, for example, imperfective Pretérito imperfecto and perfective Pretérito definido in Spanish. Aspect particles (also called “converbs”) present another type. These are invariable, short words that directly precede or follow the verb, for

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example, imperfective *zai* and perfective *le* in Mandarin Chinese. Their status is somewhere in between verb morphology and temporal adverbs. The (p. 593) meaning of some particles is specifically aspectual; with others aspect is conflated with tense, for example Mandarin *le* entails a past tense. Other languages with aspect particles include Bahasa Indonesia, Tagalog, and Yoruba; moreover, creole languages typically have aspect (and tense) particles, for example Papiamentu and Sranan. Perfective verb forms entail completion (with telic predicates) or termination (with atelic ones), whereas imperfective verbs are typically used for ongoing actions and for habitual events (hence the two English translations in the Imperfective column).

Table 25.3 Various types of perfective-imperfective marking

Aspect formation	Imperfective form	Perfective form	Language
Aspectual pairs	Klaun budował most. CLOWN BUILD.IMPERF.PAST bridge	Klaun z-budował most. CLOWN PERF-build.PAST bridge	Polish
Aspectual pairs	O kloun ehtize mia yefira. the clown build.IMPERF.PAST a bridge	O kloun ehtise mia yefira. the clown build.PERF.PAST a bridge	Greek
Aspectual tenses	El payaso construía un puente. THE CLOWN BUILD.IMPERF.PAST a bridge	El payaso construyó un puente. THE CLOWN BUILD.PERF.PAST a bridge	Spanish
Aspect particles	Zhe4-ge4 xiao3-chuo3 zai4 xiu1 qiao2. THE CLOWN ASP build bridge	Zhe4-ge4 xiao3-chuo3 xiu1-le yi2-zuo4 qiao2. THE CLOWN BUILD-ASP a-CL bridge	Mandarin Chinese
	'The clown was building a bridge.' 'The clown used to build a bridge.'	'The clown built a bridge.'	English gloss

Aspect marking can also involve analytical constructions, consisting of an auxiliary and nonfinite form of the main verb. Many languages have a Perfect (formed by auxiliary *have* or *be* plus past participle), (2), and a Progressive (formed by auxiliary *be* plus gerund or a

periphrasis form), (3), illustrated here for Italian, Dutch, and English. The meaning of the Progressive construction is essentially uniform across languages; it refers to the ongoing action. The Perfect on the other hand is more variable: while its form (auxiliary plus participle) and its essential meaning (focus on the result state after the event) are the same across languages, its use varies considerably, which affects possible combinations with adverbials and has effects in narratives (de Swart 2007).

a.	Il pagliaccio ha costruito un ponte.	(Italian)
(2) b.	De clown heeft een brug gebouwd.	(Dutch)
c.	The clown has built a bridge.	(English)
a.	Il pagliaccio stava costruendo un ponte.	(Italian)
(3) b.	De clown was een brug aan het bouwen.	(Dutch)
c.	The clown was building a bridge.	(English)

(p. 594) Some languages have no aspectual marking on the verb; instead, aspectual effects are associated with other elements in the clause. In Finnish and Estonian, different direct object cases mark a perfective-imperfective contrast, (4).

a.	Kloun ehitas silda.	(Estonian)
	Clown build.PAST bridge.PART	
	‘The clown was building a bridge.’	
(4) b.	Kloun ehitas silla.	
	Clown build.PAST bridge.GEN	
	‘The clown built a bridge.’	

25.3 Learnability Issues in Aspect

This brief cross-linguistic review shows that acquiring aspect fundamentally involves learning the form-meaning associations of a given language. Given the variation in aspect expression, the learner can take little to nothing for granted, not even a cue such as “look for aspect markers on the verb” (cf. (4)). The learner’s task therefore is to discover if, in her language, aspect is grammatically encoded at all, and if so, how: which aspects are expressed by which morphosyntactic form, and vice versa, which forms carry which aspectual meaning. How does the learner determine the proper meaning of a certain form? Does she initially posit incorrect mappings, and if so, what brings her to give them up? This relates to more general questions in form-meaning acquisition. Is the learner equipped with universal meaning primitives which guide her to discover the forms in her language that carry them? Alternatively, do certain aspect forms stand out, possibly because they are morphologically salient or occur frequently, and call out to be associated

to a meaning? Are certain meanings more basic than others, and therefore easier to acquire? And how does cognitive development of temporality interfere in this process?

Two classic learnability theories are scaffolded on universal aspectual primitives: Bickerton's (1984) Language Bioprogram and Slobin's (1985) Basic Child Grammar. For Bickerton human grammars are designed with the semantic distinctions state/process and punctual/non-punctual, whereas for Slobin the notions result and process are the two major temporal perspectives, with result as a particularly salient cognitive category. These theories essentially argue that children face the acquisition task equipped with a universal and uniform set of pre-linguistic semantic notions, or "cognitive prerequisites" (Slobin 1973). Such privileged concepts prompt learners to discover which grammatical forms map onto them in their language, thus setting up a semantic space which "provides the Basic Child Grammar with a level of organization that serves as an opening wedge to the acquisition of language-specific grammatical distinctions, without at first biasing them towards any particular language" (Slobin 1985: 1184).

(p. 595) In their Introduction to a special volume of *First Language* Shirai et al. (1998) take stock with 25 years of tense-aspect acquisition research and the learnability issues involved. They observe that young children seem to be universally sensitive to salient event characteristics (such as "result" and "change of state"), which leads to early acquisition when a language marks this characteristic in a reliable way (by way of inflection, a verb form, or particle). However, the authors warn against concluding that there is "a predetermined set of universal temporal-aspectual categories—whether innately specified or the result of prelinguistic cognitive and social development" (1998: 249). Rather, typological differences in the exact semantics of tense-aspect markers suggest that "individual languages draw upon the same general stock of distinctions, but with differing levels of granularity and with different 'packagings' for morphosyntactic expression" (1998: 249). Bowerman (1985) finds that there is an immediate influence of the variable semantics of the target language in children learning different languages and concludes that the "starting semantic space is flexible, not tightly structured" (Bowerman 1985: 1303). Inspired by the increasing evidence for the cross-linguistic diversity of form-meaning mappings already manifested in the earliest meanings of children's utterances, Slobin (1997) radically revises his initial position replacing it with a form of linguistic determinism: "Children use linguistic cues to discover the collections of semantic elements that are packaged in the lexical and grammatical items of the language" (Slobin 1997: 318). Shirai et al. (1998) concur that the cross-linguistic variation in the levels of "granularity" of temporal semantics reveals itself in the child's earliest constructions of temporal space which develop into "particular 'packages' of features that receive linguistic expression.... Accordingly, learning a language is learning how to think in the terms of that language in order to speak and to understand" (Slobin 2008: 8, 11). Cross-linguistic differences in children's earliest tense-aspect forms show that learners establish this level of granularity in their language from early on. While Shirai and colleagues concede that there may exist aspectual primitives, albeit at a lower granular level than typically assumed in developmental theories, they conclude that "(l)inguistic marking guides the child to the formation of language-specific categories. It remains to be determined precisely what event

characteristics are salient, and whether they are all universal and available to children everywhere” (Shirai et al. 1998: 250).

I now review the aspect acquisition literature in order to evaluate if any such universal event characteristics have been established in developmental research (before 1998 and since). The central question is therefore: Are there any aspectual primitives, possibly innate, that help children in the task of acquiring the form-meaning relations of aspect? I focus in particular on telicity and on the perfective-imperfective distinction, as these are the most widely studied aspectual features in acquisition research. The literature review is organized along methodology: studies on tense-aspect marking in spontaneous speech in section 25.4, experimental studies on telicity comprehension in section 25.5 and experimental studies on grammatical aspect in section 25.6. For earlier reviews about the acquisition of aspect, I refer to Shirai et al. (1998), Li and Shirai (2000), Slabakova (2002), Weist (2002), and Wagner (2012).

(p. 596) 25.4 Tense and Aspect in Spontaneous Speech

Since the mid-1970s there have appeared many studies that analyze the acquisition of tense and aspect markers in spontaneous and elicited production in many different languages. Without exception, all studies find a remarkably consistent trend in the first stages of tense-aspect marking: Perfective aspect or past tense appears mostly on telic verbs, whereas imperfective aspect or present tense appears mostly on atelic verbs. Children reserve particular tenses or aspects for verbs of certain aspectual classes, undergeneralizing tense-aspect forms according to the lexical-aspectual feature of telicity. And so most verbs appear in just one tense or one aspect. This phenomenon of skewed production is referred to as the Aspect-First pattern, because the first markings seem to reflect (lexical) aspect.

What varies from language to language is which particular tense-aspect forms appear in the Aspect-First pattern. In English, progressive *-ing* typically appears on activity verbs such as *playing* and *holding*, and not on telic verbs, while simple past tense (*-ed* and irregular forms) is mostly produced on telic verbs such as *found*, *fell*, and *broke* (Bloom et al. 1980). The French perfect (*passé composé*) is produced with telic verbs, *a sauté* ‘has jumped,’ while actions that do not lead to any result are mostly described in the present tense, *flotte* ‘floats’ (Bronckart and Sinclair 1973). The Italian past participle (*passato prossimo*) is initially only used (without auxiliary) with change-of-state verbs: *caduto* ‘fallen’ and *trovato* ‘found,’ while the present tense appears predominantly on atelic verbs: *corre* ‘runs’ and *vole* ‘flies’ (Antinucci and Miller 1976). Similar such asymmetrical patterns are attested in languages as diverse as Brazilian Portuguese, Dutch, German, Greek, Hebrew, Japanese, Inuktitut, Mandarin Chinese, Turkish, Polish, and Russian (De Lemos 1981; Stephany 1981; Berman 1983; Weist et al. 1984; Aksu-Koç 1988; Behrens

1993b; Shirai and Andersen 1995; Li and Bowerman 1998; Shirai 1998; Swift 2004; Gagarina 2008; van Hout and Veenstra 2010).

The Aspect-First pattern is striking because children underuse their tense–aspect forms in very specific, non-target-like ways. The pattern occurs when children first start to use tense–aspect marking, and lasts several years. In order to explain these patterns, many researchers concluded that children initially form mismappings between forms and meanings; in particular, the tense or aspect morphemes are claimed to carry the semantics of (a)telicity—a lexical aspect notion—instead of the temporal or grammatical aspect semantics that these morphemes carry in the target languages. This type of explanation is called the Primacy of Aspect hypothesis (alternatively, Aspect-before-Tense hypothesis, Defective Tense hypothesis, Aspect hypothesis). The origins of the various incarnations of the Primacy of Aspect explanation are related to equally various sources, and there is a deep tension between those that posit some form of aspectual primacy versus input-driven, frequency-based theories.

(p. 597)

- (i)** Immature cognitive development: Young children initially lack the cognitive category of time, therefore they cannot map tense inflection on the target temporal category (Bronckart and Sinclair 1973; Antinucci and Miller 1976).
- (ii)** A predisposition: Children map the verb inflection system onto certain basic, aspectual notions, thus using aspect to learn tense (Bloom et al. 1980).
- (iii)** Incomplete grammar: Children's very initial grammars do not yet have a proper tense category (Weist et al. 1984).
- (iv)** Prototypes: The learner creates the best exemplars of the prototypical tense–aspect associations: [progressive, dynamic, atelic] and [past tense, result, telic].

These prototypical associations of tense–aspect features are not innate, but deduced from the input. The learner performs a distributional analysis of the input by extracting patterns of associations between tense and aspect markers (Shirai and Andersen 1995; Andersen and Shira 1996; Li and Shirai 2000).¹

The prototype explanation relies crucially on the assumption that the distribution of tense–aspect markers is also skewed in the adult language, possibly less prominently so, but at least as a weakly discernible pattern. Some studies of tense–aspect in adult speech indeed find similar patterns in the input (Shirai and Andersen 1995). However, after re-analyzing some of the same corpora used by Shirai and Andersen, Olsen and Weinberg (1999) find that the patterns of the caregivers do not completely match those of the children. Van Hout and Veenstra (2010) reach the same conclusion comparing a Dutch child's speech versus her mother's speech. Wagner (1998), moreover, points out that the essence of temporal semantics is missing in the prototype explanation. Tense semantics has a classical and not a prototypical structure; past and present are defined very precisely with necessary and sufficient conditions. Semantically, grammatical and lexical aspect are more closely aligned with each other than either is with tense (in fact, some semantic theories do not even distinguish the two aspect levels). Morphosyntactically, tense and gram-

grammatical aspect are more closely aligned than either is with lexical aspect. Furthermore, no language reliably grammaticizes the distinction between telic and atelic predicates. An explanation based on prototypes therefore does not seem plausible.

A different explanation of the Aspect-First phenomenon says that it reflects a learning strategy according to which a learner begins by assuming she is acquiring a grammatical-aspect-only language (Olsen and Weinberg 1999). Following the Subset Principle, this is the most restrictive hypothesis given that in some languages perfective markers are indeed restricted to telic predicates and imperfective markers to atelic predicates (e.g. Mandarin Chinese, Smith 1991a). When the learner encounters positive counterevidence, she discovers that her language is in fact more liberal. She will then break the strict one-to-one rule, relaxing her initial undergeneralization. On this explanation, it is unexpected, however, that the Aspect-First pattern lasts for a number (p. 598) of years, as counterexamples which can trigger the relaxation are readily available in the input.

There are more general arguments against Primacy of Aspect type theories. All the explanations discussed in this section have in common that the presumed mappings are essentially redundant with the lexical-aspectual semantics of verbs. This raises theoretical suspicion: in the languages of the world (that we know of so far), telicity is not typically expressed by verbal inflections (section 25.2). Theories that posit incorrect form–meaning mappings need to explain why child grammars initially posit atypical mappings—tense or aspect inflections associated with the semantic notion of (a)telicity—which are moreover not strictly obeyed and will have to be abandoned later on in development. The early use of inflection is effectively a mismatching or a too restricted mapping, and so the child must unlearn her initial, incorrect form–meaning mappings in order to progress to the target ones. But no theory spells out the triggers for such a re-mapping (with the exception of Olsen and Weinberg 1999). Furthermore, the skewed form–meaning mappings in child language are not absolute associations between tense–aspect forms and lexical aspect class, but rather strong tendencies (Smith 1980; Weist et al. 1984). However, theories that posit an association between tense–aspect morphemes and lexical aspect, predict an absolute pattern.

There are, at least, two other alternative explanations for the Aspect-First pattern in child languages, both of which are grounded in semantic theory. Bohnemeyer and Swift (2004) suggest that it can be explained with their formal-semantic notion of event realization. They relate the so-called natural connection between telicity and perfectivity to the imperfective paradox: for an event to be realized (i.e. to assert that the event occurred), a telic eventuality description is dependent on perfective aspect. When the event is interrupted, it cannot be truthfully described with a telic predicate. Bohnemeyer and Swift argue that children’s Aspect-First distribution pattern reflects a “preference for aspectual reference under event realization” (2004: 292), assuming that children are cognitively biased to talk about realized events.² This preference triggers the use of perfective aspect marking for telic verbs, because for telics only perfective gives event realization. For atelics, however, imperfective marking as well as perfective marking yields event realiza-

tion, so on this theory one would expect both markings on atelic predicates, contrary to the Aspect-First pattern.

The notion of aspect coercion (Kamp and Reyle 1993; de Swart 1998) is central in an explanation that relies on the complexity or extra processing costs involved in coercion. With overt perfective, progressive, or perfect aspect marking, there is regular aspect shift; a precisely defined operator applies to the event type given by the predicate. Aspect coercion, on the other hand, applies when the predicate is not of the right type, that is, when there is a mismatch between the requirements of an aspect or tense operator and the event type of the predicate. For example, when present tense combines with a telic predicate, the present tense operator wants to locate the event's run time (p. 599) simultaneously with the moment of speech. This conflicts with the telic event type variable which includes culmination, and so a hidden operator first coerces the predicate into an ongoing process, so that the present tense operator can apply. Another case of coercion applies when an atelic predicate appears with perfective aspect in order to create an event type with a final boundary. Aspect coercion is not straightforward: it is open to subtle meaning effects, since a hidden operator must be inferred, which moreover must fit in the context. Possibly, children initially avoid aspect coercion, either because it is semantically-pragmatically complex or because it involves costly processing resources (Slabakova 2002; van Hout 2007a, 2007b). If so, they will not mark telic verbs with present tense nor atelic verbs with perfective aspect, because both of these combinations require aspect coercion. This exactly reflects the Aspect-First pattern (van Hout and Veenstra 2010).

Recently, the Aspect-First pattern, which is a generalization about finite verbs, has been compared to aspectual patterns in nonfinite verbs in spontaneous speech, that is in root-infinitive clauses. The Aspect-First literature and the root-infinitive literature have been essentially disconnected. However, new findings reveal telicity and perfectivity effects in nonfinite clauses too, with remarkable parallels to the Aspect-First pattern (Hyams 2007, 2012). By far most of the bare verbs in English that appear in past-time contexts are telic, while most of the bare verbs that occur in present-time contexts are atelic (Torrence and Hyams 2004). Most root infinitives in Russian that occur in past-time contexts are perfective, while those that occur in present-time contexts are imperfective (Brun et al. 1999). Thus, "[i]n finite clauses past tense/perfective morphology is largely restricted to telic predicates; in nonfinite clauses past tense interpretation is largely restricted to telic predicates. In finite clauses present/imperfective morphology is restricted to atelic predicates; in nonfinite clauses present ongoing interpretation is restricted to atelic predicates" (Hyams 2007: 261). These parallels suggest that there is one underlying cause for both the undergeneralization of tense-aspect morphology to restricted aspectual classes in the Aspect-First pattern and the temporal-aspectual interpretation of root infinitives. Hyams advances the notion of "event structure" (defined by the combination of lexical and grammatical aspect) as an explanation: in nonfinite clauses, which have no tense marking, event structure determines temporal reference, while in finite clauses, event structure influences the interpretation of tense-aspect markers. She argues that the Aspect-First pattern arises in the early grammars as an artifact of an alternative temporal reference system based on event structure, specifically, the topological property of

event closure assigns temporal reference; this in its turn spells out morphologically on the verb.

The Aspect-First explanations aim to explain a certain pattern in production, whether they posit alleged form-meaning mismappings, undergeneralization of rules, learnability restrictions, avoidance strategies, or an alternative temporal interpretation systems. The question is if the theories hold up more generally, in particular, do they extend to comprehension? Since the end of the 1990s a series of comprehension studies has emerged. The real test case for any Aspect-First theory is to formulate precise predictions and test them in a structured experimental setting; some comprehension (p. 600) studies were explicitly designed to test an Aspect-First theory (e.g. Wagner 2001, to be discussed in section 25.6).

25.5 The Acquisition of Telicity

The acquisition puzzle for telicity involves lexicon, syntax, and semantics, as it revolves around the following pieces: the lexical semantics of the verb, the quantization of the direct object, the event type-shifting contribution of particles and PPs, and the composition of verb and object. There are at least five questions about the process of telicity acquisition (van Hout 2007c). Two concern lexical learning: How does a child establish for each verb (i) whether or not it carves out an eventuality with a natural culmination point, and (ii) whether the theme participant is undergoing the event in an incremental way? Two further issues lie at the syntax-semantics interface: (iii) the compositional telicity rule for verb and object, and (iv) the predicate telicity rule for combining a verb with verb particles or directional PPs. Finally, one may wonder (v) whether telicity is easier to acquire in some languages than in others, and if so, why.

How does a child deduce the aspectual properties of individual verbs from the input in the process of lexical learning? Wagner (2006, 2010) argues that syntactic bootstrapping helps with the acquisition of telicity of individual verbs. Syntactic bootstrapping exploits the idea that lexical learning is aided by structural cues, including the number and position of a verb's arguments (Landau and Gleitman 1985; Gleitman 1990). Exploiting the relation between transitivity and telicity, Wagner claims that children follow a simple heuristic "transitive sentences have telic meaning" (2006: 52), using it as weak structural cue to learn verb meanings. Of course, not all transitive verbs in the adult lexicon are telic. Yet, the rule can serve as a bootstrap into the system: it offers an initial hypothesis and reasonable first guess for transitive verbs, as well as a cue for intransitive verbs as atelic verbs. As for the origin of this transitivity-telicity heuristic, Wagner alludes briefly to typological work which shows telicity as one of the prototypical properties of transitivity (Hopper and Thompson 1980; Dowty 1991), suggesting that it may reflect an innate pre-supposition. As an alternative source, she points to statistical patterns in the input. One might add the universal role of the direct object in the calculation of telicity as further support for the possibly innate status of the heuristic (Tenny 1987, 1994; Verkuyl 1993; see section 25.2).

Employing the essentially different ways of event individuation of telic and atelic predicates, Wagner and Carey (2003) developed an event-counting task. The child must count how many times an action happens. For example, after showing an animated movie with a girl painting a flower in three brush strokes, the experimenter either asks “how many times does the girl paint a flower?” or “how many times does the girl paint?” For telic predicates, the criterion for deciding how many times is sensitive to their endpoint orientation; it is independent of the number of pauses in the action. For atelic predicates, there is no natural criterion to count events; instead the spatio-temporal (p. 601) pauses in the action provide a natural counting criterion. The results in Wagner (2006) show that the 2-year-olds indeed have a bias in the event-counting task, interpreting transitive verbs as implying culmination more often than the 3-year-olds. However, contrary to the predictions of a strict heuristic (transitivity implies telicity), the 2-year-olds did not assign all transitive clauses a telic interpretation equally often. There were fewer telic interpretations for atelic transitive predicates such as *poke the balloon* and *push a ball* than for telic transitives such as *paint a flower* and *build a house*. Wagner (2006) does not really discuss this finding, but Wagner (2010) presents a follow-up study with novel verbs based on the same event individuation principle. These results reveal the bias to interpret transitive verbs with a result orientation and intransitives with a process orientation more clearly, underscoring even more poignantly the idea that transitivity is taken to reflect culmination, at least initially. So the bootstrapping theory that transitivity implies telicity is supported.

If the association between transitivity and telicity is a driving force in learning a verb’s inherent telicity, the prediction is that the learner initially takes all transitive verbs to be telic. Since not all verbs in the adult lexicon are telic, she will subsequently have to relax this bias. Transitive verbs of creation (*make, build, draw*) and destruction (*eat, melt, erase*) fit the telicity-transitivity cue, but verbs from the *push*-class verbs which are transitive and atelic do not, because their theme is not incremental. There are further constructions for which the telicity heuristic is incorrect, or which it does not cover: the subtle effects of count versus mass objects in compositional telicity, the class of telic intransitive verbs, and the “de-culminating” effect of imperfective aspect on telicity. So, while syntactic bootstrapping can help with question (i) about lexical telicity, it is not clear what prompts the learner to give up the heuristic. This is the essence of question (ii) about incremental theme-hood, which has not received any attention in the literature.

Focusing on telicity issues at the syntax-semantics interface, (iii) and (iv), Van Hout (1997, 1998, 2000, 2007c) investigates the question: what is easier to acquire: predicate telicity or compositional telicity? The question is inspired by typological generalizations: temporal and aspectual meanings are most naturally expressed on verbs, not on nouns, because they are relevant to the verb (Bybee 1985). Slobin connects the typological notion of relevance to acquisition in his theory about “local cues,” which “can be interpreted without taking the entire sentence into account. The cue is local because it operates in a localized sentence element” (Slobin 1982: 162). This theory explains why certain forms are acquired earlier than others. One example that Slobin (1985) discusses, is that tense-aspect marking on verbs is acquired early, whereas marking of gender and definiteness of

objects on the verb is difficult to acquire; clearly, tense–aspect is more relevant to the verb than information about the object. Pursuing the theory of relevance further for tense–aspect marking, Van Hout (2007c) argues that predicate telicity is easier to acquire than compositional telicity, because it is carried by verbs (morphology and other elements close to the verb—particles and prefixes), whereas compositional telicity relies on the integration of quantificational properties of the direct object. I even offer the suggestion that this may be so because there is an innate bias towards expecting aspectual distinctions to be marked on the verb.

(p. 602) The hypothesis that predicate telicity is easier than compositional telicity has been investigated by comparing particle verbs to their simple transitive counterparts. Several studies employ a paradigm that capitalizes on the incompatibility of telic predicates with incomplete or ongoing events: If a learner has acquired the telicity of a given form, she will give a *no* for yes/no-questions or reject the sentence in a Truth Value Judgment (TVJ) task. Some studies use static pictures, while the more recent studies use short movies. Table 25.4 illustrates two different telic conditions for particle verb *eat up* and simple transitive verb *eat* in Dutch, English, and German, and the atelic conditions with intransitive *eat* and transitive *eat* with a mass term object (as investigated by van Hout 1997, 1998; Schulz and Penner 2002; Penner et al. 2003; Schulz and Wittek 2003; Jeschull 2007; Ogiela 2007). In Spanish, verbs with and without aspectual *se* were contrasted; like particles, *se* also involves predicate telicity (Hodgson 2001). While just two verbs (*eat*, *drink*) were tested with and without particles in van Hout’s (1998) study and the German replication in Schulz and Penner (2002), the other studies investigated a larger range of (particle) verbs, Table 25.5.

Table 25.4 Conditions and sample sentences in designs that compare predicate and compositional telicity

Lan- guage	Predicate telicity	Compositional telicity	Atelicity
Dutch	Heeft de jongen het broodje opgegeten?	Heeft de jongen het broodje gegeten?	Heeft de jon- gen (brood) gegeten?
Ger- man	Hat der Junge aufgegessen?	Hat der Junge das Brötchen gegessen?	Hat der Junge gegessen?
Span- ish	¿Se comió el sánd- wich?	¿Comió el sánd- wich?	—
English	Did the boy eat up the sandwich?	Did the boy eat the sandwich?	Did the boy eat (bread)?

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The hypothesis about predicate telicity is supported in all mentioned studies, across different methods, materials, verbs, and languages.³ Children essentially know telicity in the Predicate Telicity condition, mostly rejecting incomplete situations, but not in the Compositional Telicity condition, where they sometimes accepted incomplete situations, the degree of which varying from study to study.⁴ The effect is already there for (p. 603) 3-year-olds, and becomes more robust with age (4, 5, 6-year-olds). Children furthermore accepted atelic predicates for incomplete situations.

Table 25.5 Verbs and particle verbs in various telicity studies

Lan- guage	Verbs	Study
Dutch	<i>(op)eten</i> 'eat up,' <i>(op)drinken</i> 'drink (up),' <i>bouwen</i> 'build'; <i>lezen</i> 'read,' <i>schrijven</i> 'write' <i>(op)eten</i> 'eat up,' <i>(op)drinken</i> 'drink (up)'	van Hout (1997) van Hout (1998)
German	<i>essen</i> 'eat,' <i>trinken</i> 'drink' <i>aufmachen</i> 'open,' <i>abmachen</i> 'take off,' <i>anmachen</i> 'turn on,' <i>zumachen</i> 'close'	Schulz and Penner (2002) Schulz and Wittek (2003)
Spanish	<i>comer(se)</i> 'eat (up),' <i>beber(se)</i> 'drink (up),' <i>hacer(se)</i> 'do,' <i>leer(se)</i> 'read,' <i>limpiar(se)</i> 'clean'	Hodgson (2001)
English	<i>eat (up), drink (up)</i> <i>eat (up), drink (up), fold (up), wrap (up)</i> <i>eat (up), drink (up), build, fix, carry (out), push (over)</i>	van Hout (1998) Jeschull (2007) Ogiela (2007)

The question about predicate versus compositional telicity can also be examined from a cross-linguistic perspective: Is telicity easier to acquire in languages with predicate telicity than in languages with compositional telicity (van Hout 2007c)? Weist et al. (1991) find that Finnish learners at the age of 6 have not yet acquired the aspectual implications of the two object cases (accusative entails completion, partitive does not). Comparing

Finnish to the telicity studies in Dutch, English, and German just discussed, Van Hout (2007c) argues that Finnish supports her theory further, because it presents another case of compositional telicity which is acquired late.

Children's ambiguous interpretation of simple transitive verbs in the studies discussed here raises questions about compositional telicity, in particular, what do children know of the role of quantization of the direct object in telicity acquisition? Two recent dissertations looked into this issue. Ogiela (2007) compares verbs which she hypothesized to be more (*build, fix*) or less (*eat, drink*) sensitive to the quantization of the object, and finds that children derive more completion entailments for the former type (as do adults). She furthermore investigated if a cardinal number (*build two bridges, eat two oranges*) more explicitly quantizes the object than a definite determiner (*build the bridges, eat the oranges*). Children indeed gave more completion entailments, but only with *eat*-type verbs. Children are sensitive to the lexical-aspect properties of particular verbs (whether the relation between verb and object is more or less incremental), and moreover, that this interacts with explicitness of quantization on the object. The conclusion seems to be that English learners are sensitive to the quantization of the object in deriving completion entailments, thus revealing some knowledge of compositional telicity.

(p. 604) Hacoen (2010) examined several properties of direct objects to see how these affect compositional telicity in Hebrew: mass / count (*color cloth—the cloth*), singular / plural (*color the square—the squares*), and definite / indefinite (*color a square—squares*). She also tested the children on independent tests of definiteness and mass/count. Even though the participants in the Hebrew study were much older than those in the other telicity studies (7;9 up to 17), none of them did well on the telicity task, accepting telic predicates for incomplete situations. Finding that the same children did not do well on the definiteness and mass / count tasks either, Hacoen concludes that the non-adult-like performance on telicity is caused by children's immature knowledge of quantization. This conclusion strengthens the earlier conclusions that compositional telicity is acquired late. The Hebrew learners in Hacoen (2010) did not show any sensitivity to quantization of the object, in contrast to the English learners in Ogiela (2007).

Taking stock, two universal rules have been proposed in the telicity acquisition literature. Transitive sentences have telic meaning (Wagner 2006, 2010). Aspectual distinctions are marked on the verb (van Hout 2007c). The two heuristics seem at odds with each other: the transitivity heuristic assigns an important role to the object in compositional telicity, whereas the aspect-on-the-verb bias focuses the verb (particles and prefixes) as the main cue for predicate telicity. The former predicts that transitivity provides an early cue for telic interpretation, whereas the latter predicts that compositional telicity will be acquired late. Despite these conflicting predictions, the studies reviewed in this section provide support for each heuristic. One possible explanation to resolve the conflict may be that the different heuristics apply at different stages in acquisition. Note that only the youngest children in Wagner's event counting studies, 2-year-olds, were sensitive to transitivity; the older children (mean age 3;6) did not show the transitivity bias anymore. The children in the studies using the complete-incomplete paradigm (van Hout 1998; and fol-

low up studies) were 3 and older. It may well be after the transitivity bootstrap has functioned as a very first, but overly general heuristic to acquire some rough lexical-aspectual semantics of verbs, that the aspect-on-the-verb rule sets the stage for fine-tuning and modifying verbs' lexical specifications.

The acquisition theories for the two types of telicity will need to connect at some point, but it is unclear yet how. Furthermore, there remain questions about many telicity details, specifically how learners acquire the subtle aspectual role of the object (mass versus count, incremental versus non-incremental theme, object case), most of which have not been (fully) investigated.

25.6 The Acquisition of Perfective-Imperfective Aspect

The learnability question for grammatical aspect concerns form–meaning: which aspects are expressed by which morphosyntactic forms, and vice versa, which forms (p. 605) carry which aspectual meaning? The Aspect-First pattern has been explained as a mismatching: tense–aspect markers initially are incorrectly mapped onto lexical aspect features telic and atelic (section 25.4).

Alternatively, the Grammatical Aspect-First hypothesis claims that children initially use verbal morphology to mark grammatical aspect, instead of tense or lexical aspect; in particular, past forms carry the grammatical aspect of completion and present forms carry ongoingness, and no temporal information. In a set-up with props and a road drawn on the table with three marked locations, Wagner (2001) employs the relation between locations and real time. A puppet walks along the road and must play the same game at each location, for example, she must do three puzzles. As the puppet moves along the road, the first location becomes past time. While the puppet is playing at the second location, the present time, the experimenter asks a *where* question. In control conditions with explicit adverbials (*before, now, later*), the children did fine. In the test conditions, tense was marked on the auxiliary (*where was / is the puppet doing a puzzle?*). Two-year-olds correctly distinguished past and present only when the action played out at the first, past-time location showed the event to its completion. In the other condition where the situation at the first location was incomplete, however, they did not differentiate the two tenses. Wagner concludes that children seem to take past forms to entail completion, thus supporting the Grammatical Aspect-First hypothesis. There is partial support from Van der Feest and van Hout (2002) with Dutch learners. The problem with the Grammatical Aspect-First hypothesis is the same learnability puzzle pointed out above for the Primacy of Aspect theories (section 25.4): what is the trigger for the child to re-map the forms to their target meanings?

A different perspective on grammatical aspect learning derives from a theory about semantic complexity. The essence is that certain combinations of lexical and grammatical aspect are semantically simpler than others, for example, telic plus perfective is simpler

than telic plus imperfective. Telic predicates implicate a culmination moment, hence, a telic eventuality description creates an expectation of culmination. Perfect and perfective aspect are compatible with this expectation, but imperfective and progressive aspect cancel the culmination expectation. With the former combination, lexical and grammatical aspect thus line up in a transparent way, perfect(ive) aspect preserving the temporal character of a telic event description. In contrast, with a telic plus imperfective combination, there is an aspectual shift which “takes away” the culmination moment; the event description is changed by the semantic operation of aspect shift or aspect coercion (de Swart 1998; see section 25.4). Van Hout (2007b, 2007c, 2008) posits that the semantics of simple semantic operations is acquired early, and hypothesizes that children initially avoid aspect coercion and aspect shift. This theory of Semantic Complexity predicts an asymmetry in the development of perfective and imperfective aspect as related to telicity. For telic predicates, perfective aspect is acquired earlier than imperfective aspect; telic plus imperfective is semantically more complex, because aspect shift or coercion takes away the final event boundary. There is a further, mirror-image prediction for atelic predicates: imperfective aspect is acquired earlier than perfective aspect. An atelic plus perfective combination is more complex, because aspect (p. 606) shift or coercion must add a final boundary which is not implicated in an atelic predicate’s meaning. While the latter prediction has not been investigated, several studies were designed to investigate the former prediction. Moreover, many other aspect studies contain relevant data.

The relevant paradigms use complete situations in which an event reaches its natural culmination versus incomplete or ongoing versions of the same event, capitalizing on the completion entailment of telic plus perfect(ive), and the lack of this entailment for telic plus imperfective (section 25.2). Comprehension studies with Dutch, Polish, and Italian learners support the theory (van Hout 2005, 2007a, 2007b, 2008): children were target-like on perfect and perfective aspect, choosing the complete situation; furthermore, they were overly liberal with imperfective aspect or tense, choosing ongoing as well as complete situations. The fact that this effect held cross-linguistically shows that the Semantic Complexity theory is independent of the language-specific encoding of these aspects, be it as a dedicated morphological category in Polish, as tense form in Dutch, or as aspectual tense in Italian.

There are many more results in the aspect comprehension literature that show that learners have acquired the completion entailment of perfective or perfect aspect at an early age (2;6 or 3), depending on the study. Furthermore, some of these studies point out imperfect comprehension of imperfective aspect. For example, Russian and Greek learners do not always accept imperfective aspect for incomplete situations, even at the age of 4–6, whereas adults do (Kazanina and Philips 2007; Gagarina 2008; Konstantzou et al. 2013).⁵ Table 25.6 presents an overview of studies which tested interpretation of telic predicates with perfective-imperfective aspect, using a relevant form that encodes this distinction in the language under investigation. All studies used a paradigm which contrasted complete situations versus ongoing or incomplete situations. I have indicated the youngest age at which the completion entailment of perfective aspect is in place and the age at which children still gave a non-targetlike interpretation of imperfective aspect. As

a very rough criterion, I used 70 percent targetlike interpretation as a cut-off point. The overview shows that there is quite some variation in the age at which the completion entailment of perfective is acquired. Even so, targetlike interpretation of perfective is earlier than imperfective, as predicted by the Semantic Complexity hypothesis. All studies establish the result that the interpretation of imperfective aspect is still not targetlike at the ages of 5 and 6. However, it is difficult to draw general conclusions about the acquisition of perfective-imperfective aspect on the basis of this overview, as different studies used different paradigms, tasks, verbs, and aspect forms.

The Semantic Complexity theory has been tested in comprehension, but it also extends to production (section 25.4). Do children produce their aspects or aspectual tenses in a targetlike manner, using all possible combinations, or is there a similar (p. 607) (p. 608) asymmetry as in comprehension? The absence of certain combinations in children's spontaneous speech as established by the Aspect-First pattern points to an asymmetry: children seem to avoid the combinations of telic plus imperfective or progressive aspect and atelic plus perfect or perfective aspect. However, there is another twist to the Semantic Complexity theory. Modeling aspect in bidirectional Optimality Theory, Van Hout (2007a, 2007b, 2008) argues that children initially apply unidirectional optimization (de Hoop and Krämer 2005; Hendriks and Spenader 2005). On the one hand, this hypothesis explains why children have non-optimal comprehension of telic predicates plus imperfective aspect, as it involves aspect shift or coercion. On the other hand, it expects children to be targetlike in their production, thus predicting a surprising comprehension-production asymmetry (production << comprehension). While this prediction needs to be investigated, there are some first indications that aspect production is indeed fine (Gagarina et al. 2010; Konstantzou 2014).

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Table 25.6 Summary aspect comprehension studies across languages

Age PERF: Youngest age at which completion entailment of perfective aspect is in place.

Age IMP: Oldest age investigated at which imperfective is still non-target-like.

Language	Study	Ages tested	Age PERF = Target	Age IMP = Non-target
Basque	García del Real and Ezeizabarrena 2011	5;0–5;11	5 ^a	
Chinese	Li and Bowerman 1998		5	6 ^b
Finnish	Weist et al. 1991	2;6–6;6		6;6 ^c
Dutch	van Hout 2007a,b, 2008	3–5	3 ^d	5
English	Matsuo 2009 Wagner 2002 Weist et al. 1991	1;6–6;8 1;11–5;7 2;6–6;6	5 ^e 5 ^e 2;6 ⁶	4;7 5 2;6 ^f
Italian	van Hout and Hollebrandse 2001; van Hout 2008	3;0–6;1	4	5

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Spanish	García del Real and Ezeizabarrena 2011 Hodgson 2003	5;0-5;11 3;0-8;0	5 ¹ 5 5	5 5 6
Greek	Delidaki 2006 Konstantzou 2014	3;0-6;5 4;0-6;11	6;5 4	6;5 6
Polish	van Hout 2005, 2008 Weist et al. 1991	2;0-4;11 2;6-6;6	3 2;6 ^f	5 2;6 ^f
Russian	Gagarina 2008 Kazanina and Philips 2007 Stoll 1998 Vinnitskaya and Wexler 2001	3;0-6;11 2;10-6;9 2;0-6;11 3;0-6;5	3 3 2;6 ^g 3	5 6 3

(^a) This study did not test any children younger than 5. These 5-year-olds were on target for both PERF and IMP.

(^b) This reflects the data for their lexical verb class categories Accomplishment Resultative and Locative.

(^c) Not even the oldest Finnish learners of 6;6 interpreted accusative versus partitive case to appropriately distinguish complete versus incomplete situations.

(^d) The Dutch 3-year-olds correctly rejected the perfect for incomplete situations by 63%, which was different from chance, but far from ceiling.

(^e) The three studies with English learners find a sharply different age at which the completion entailment of perfective aspect seems to be in place (in English *-ed* in simple past or in a prenominal participle). In contrast to Weist et al. (1991), Wagner (2002), and Matsuo (2009) only showed the object at the end of the event, not the agent of the action. The presence of agent-oriented information may be required by the younger children to be able to succeed in this task (Wagner 2002).

(^f) Weist et al. concludes that the English and Polish learners in his study with a forced-choice selection task correctly differentiate the perfective-imperfective distinction at the age of 2;6. However, since no percentages correct are given for each aspect, it is impossible to tell from these data how firmly these young learners have acquired the completion entailment of the perfective, nor can one say anything about the extent to which they still have problems with the imperfective.

(^g) Stoll (1998) only tested perfective forms, no imperfective forms.

Further support for the claim that aspect shift is hard comes from L2 acquisition (Slabakova and Montrul 2007) and adult processing (Piñango et al. 1999; Wagner 2009). This suggests that Semantic Complexity is not purely a developmental theory. Semantic Complexity does not claim that children cannot do aspect shift or coercion all together; rather, they seem to avoid it. After all, it is inherent in the semantics of aspect, especially, the way lexical and grammatical aspect build on each other. The question is: why do they avoid it? The answer may come from processing: aspect shift coercion is more costly. Children may have to develop sufficient processing resources in order to overcome the bias to avoid aspect shift.

Finally, given the wide cross-linguistic variation in aspect expression, there is a pertinent question: Is aspect acquired more easily in some languages than in others? And if so, what does it depend on? Van Hout et al. (2010) conclude that there are indeed differences in ease of acquisition in the twelve languages in their cross-linguistic study. Markedness and grammaticalization determine ease of acquisition: perfective aspect is learned earlier when it is a marked category and moreover, when it is highly grammaticalized (e.g. perfective aspect in the Slavic languages and Greek). Their study is one of the first to raise this cross-linguistic learnability question. Many more issues and languages need to be explored, for example, how do languages with only aspect marking compare to languages with both tense and aspect? How do the various types of aspect encoding compare to each other: are certain types of marking easier to acquire than others (van Hout 2008)?

25.7 Conclusions and Broader Questions

In the 1970s and 1980s, aspect acquisition studies analyzed tense–aspect marking in spontaneous speech and discovered a robust pattern in many languages, described as the Aspect-First pattern. Children’s first tense–aspect forms appear on verbs of just one (p. 609) lexical aspect class: past or perfective marking on telic verbs and present or imperfective marking on atelic ones. The many different theories explain this atypical production pattern by positing form–meaning mismappings, undergeneralization of rules, learnability restrictions, avoidance strategies, or an alternative temporal interpretation system. The question is if these theories hold up more generally, in particular, if they extend to comprehension.

We defined the task of learning aspect as: How does the learner discover if, in her language, aspect is grammatically encoded at all? And if it is, how does she determine which aspects are expressed by which morphosyntactic forms—a form–meaning mapping issue? Given the wide variation in aspect expression, Shirai et al. (1998) concluded that the aspectual markings in a given language (the forms) prompt the learner to form language-specific, aspectual categories (the meanings), a process whereby learning goes from forms to meanings. This process is probably aided by particular salient event characteristics and so Shirai et al. ask which “characteristics this may be, and whether they are all universal and available to children everywhere” (1998: 250). Let us review if any progress has been made.

As for aspectual primitives, section 25.5 on telicity concluded that there are two, possibly innate heuristics which guide the child in the task of acquiring the form-meaning relations of aspect, each of which have been supported. Transitive sentences have telic meaning (Wagner 2006, 2010). Aspectual distinctions are marked on the verb (van Hout 2007c). The two rules seem contradictory, however: the transitivity heuristic assigns an important role to the object in compositional telicity, whereas the aspect-on-the-verb bias focuses on the verb (particles and prefixes) as the main cue for predicate telicity. It is unclear yet how these acquisition theories for the two types of telicity can be connected. Possibly they operate one after the other: the transitivity rule functions as a rough and universal heuristic at the earliest stage where aspectual meanings are bootstrapped from verb frames; it needs to be let go of anyway, because it is only a weak structural cue (not all transitives are telic). At this point the aspect-on-the-verb bias can direct the learner in gathering more aspectual detail from prefixes and verb particles.

Overall, while there are many acquisition studies of the perfective-imperfective distinction, it remains difficult to draw any general conclusions about the acquisition of perfective-imperfective aspect across languages, as different studies used different paradigms, tasks, verbs, and aspect forms. The completion entailment of perfective is acquired at different ages across different languages, in some at the age of 2;6, but in others not until 5. Even so, target-like interpretation of perfective is earlier than imperfective. This asymmetry is predicted by the Semantic Complexity hypothesis, a theory about semantics which posits that certain combinations of lexical and grammatical aspect are simpler than others (van Hout 2008). Combining this theory with a general developmental theory about semantic processing (avoid costly processing operations such as aspect shift and aspect coercion), the Aspect-First pattern is expected both in production and comprehension.

(p. 610) The literature review in this chapter has identified many remaining questions in aspect acquisition. In the domain of telicity research, how do learners acquire the subtle aspectual role of the object (mass versus count, incremental versus non-incremental theme, object case)? From a cross-linguistic perspective on grammatical aspect, how do languages with only aspect marking compare to languages with both tense and aspect? Are certain types of aspect marking easier to acquire than others? These questions require research into specific languages with particular aspectual properties.

This chapter has focused on telicity and perfective-imperfective aspect. There are just a few acquisition studies that investigated other aspects: habitual aspect (Jackson 1998; Jackson and Green 2005) and remote past (Green and Roeper 2007) in African American English, delimitative ingressive, and semelfactive aspect in Russian (Stoll 1998), and telicity in transitive versus locatum constructions (such as, *the man covered the piano with a blanket* versus *the blanket covered the piano*, Hodgson 2010). Aspects such as these and many others remain to be explored in acquisition.

Despite decades of formal-semantic work on aspect, there is as yet no consensus in the theory about the primitives that determine different aspectual interpretations and their representation in the grammar. Acquisition research can contribute to this debate, as it

shows which aspectual notions and heuristics, if any, seem to be candidates for universal primitives and rules. Aspect theory should thus incorporate the two heuristics, to the extent that they are not yet part of the theory. Vice versa, typological and formal semantic theories should inform developmental theories. Ideally they should resolve the debate about whether or not aspectual primitives or biases are plausible assumptions in view of the cross-linguistic diversity in aspect forms and meanings. Is there anything aspectual shared among languages?

There are several points at which the acquisition work on aspect relates to broader issues in linguistics. In cross-linguistic work on aspect with adults, Von Steutterheim et al. (2009) find that adults focus on different temporal properties in the same scene depending on the language they speak. This work suggests that there are no innate aspectual primitives. Rather aspectual concepts are formed anew by each learner on the basis of the types of marking she encounters in the input. This would then mean that the learner cannot rely on any innate heuristics.

The acquisition and psycholinguistic fields could learn from each other's methodologies. They may also find that certain aspect topics pose similar issues. For example, aspect coercion is hard in adult processing (Piñango et al. 1999) as well as in first and second language acquisition (van Hout 2007a, 2007b; Slabakova and Montrul 2007). And prototypical tense–aspect associations are processed faster by adults (Wagner 2009), which parallels the Aspect-First pattern in L1 and L2 acquisition.

In the acquisition literature, the topic of production–comprehension asymmetries has recently become hot, especially the counterintuitive idea that comprehension is delayed in relation to early production. It remains to be seen if aspect is another such domain.

Notes:

⁽¹⁾ Wagner (2009) finds that the same prototypical associations are processed more quickly by adults than non-prototypical associations, which suggests that there is some linguistic basis for the prototypes.

⁽²⁾ Nina Hyams (p.c.) points out that this assumption is challenged, however, given that children also produce verbs with a modal interpretation Hoekstra and Hyams 1998; Hyams 2007).

⁽³⁾ With the exception of Jeschull (2007), whose child participants did not always reject particle verbs for incomplete situations.

⁽⁴⁾ Interestingly, even the control adults occasionally or even regularly accepted simple transitives for incomplete situations, which suggests that simple transitives do not always yield compositional telicity, possibly because they are ambiguous between telic and atelic (Schulz and Penner 2002), or because telicity is merely a conversational implicature (Jeschull 2007; Hachohen 2010).

(⁵) However, Kazanina and Philips (2007) also found that Russian children accepted past-imperfective forms for incomplete situations when there is an explicit adverbial (e.g. *while the boy was watering the flowers, the girl was cleaning the table*). They conclude that children initially need help determining the intended interval against which they are supposed to evaluate imperfective aspect.

Angeliek van Hout

Angeliek van Hout is Professor of Linguistics at the University of Groningen. Her work focuses on the acquisition of form-meaning associations, connecting grammatical theory and experimental methods, especially with crosslinguistic designs. Comparing Germanic, Romance and Slavic languages and beyond, Van Hout has investigated many themes in tense-aspect. Her research on the acquisition of Dutch syntax and semantics furthermore covers topics such as definiteness, quantification, wh-questions, embedding, pronouns and unaccusatives.