‘Punctuality’ and Verb Semantics

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1 Introduction

Whether verbs have to be marked as punctual vs. durative has been a controversial issue from the very beginnings of research on aktionsarten in the last century right on up to modern theories of aspectual classes and aspect composition. Debates about the linguistic necessity of this distinction have often been accompanied by the question of what it means for a verb to be temporally punctual.

In this paper I will, firstly, sketch the history of research on the punctual-durative distinction and present several linguistic arguments in its favor. Secondly, I will show how this distinction is captured in an event-structure-based approach to lexical semantics. Thirdly, I will discuss the extent to which a precise definition of the notions used in lexical representations helps avoid circular argumentation in lexical semantics. Finally, I will demonstrate how this can be done for the notion of ‘punctuality’ by clarifying the logical type of this predicate and relating it to central cognitive time concepts.

2 Evidence for Punctuality in the Lexicon

The notions of ‘punctuality’ and ‘durativity’ have been extensively employed in research on aspectuality, i.e., research on grammatical aspect, aktionsarten, Vendler classes and the like. Among the earliest approaches to these phenomena are theories on grammatical aspect, in particular the distinction between the classical Greek aorist stem and present stem and on the aspect system in Slavic languages. The perfective aspect in Greek and Slavic has often been described as ‘punctual’, the imperfective aspect as ‘durative’ (e.g. Schleicher 1855, Pott 1859, Curtius 1863). This approach has not proven very fruitful but it should be kept in mind that until the early twentieth century a distinction between grammatical aspect and lexical phenomena like aktionsart had not been made.[1]

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[1]Aspect is nowadays usually understood to be a grammatical category alongside others such as tense, mode, etc., which is paradigmatically applied to verb forms by means of inflection, derivation or stem formation, while aktionsart is taken to be a

Little by little, phenomena more closely related to the lexical meaning of verbs entered into linguistic discussion.[2] Observations concerning the distribution of adverbials denoting a span of time go as far back as Romberg (1899). These adverbials (e.g., *in two hours*) usually combine with verbs denoting durative events with a result state (1)[3]. If combined with punctual change of state verbs they often sound odd (2), unless a preceding event can either be anchored in context as a reference point for the beginning of the interval (3), or is lexically presupposed. In (4), for example, it is presupposed that Rebecca had been moving towards the summit:

(1) Rebecca wrote the paper in six weeks
(2) ??Rebecca's vase broke in two minutes
(3) Rebecca pressed the button and the bomb exploded in two minutes
(4) Rebecca reached the summit in two hours

Two things should be noticed: Firstly, even if the interval denoted by the *in*-phrase is very short, the beginning of the interval seems to be anchored in some contextually salient event when the phrase is combined with a punctual verb. In (3) the beginning of the interval is the event when Rebecca pressed the button; the sentence is not interpreted in the sense that the explosion itself took three seconds. This is reflected by the fact that in these cases the *in*-phrase can be replaced by a PP headed by *after* (cf. Piñon 1997): (3) is equivalent to (5) but (1) is not equivalent to (6).

(5) Rebecca pressed the button and the bomb exploded after two minutes
(6) Rebecca wrote the paper after six weeks

Secondly, punctual verbs that *presuppose* a preceding durative event are characterized by the fact that punctual adverbials unambigously refer to the end of the event as in (7) while this is not the case with normal accomplish-

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lexical category derived from the lexical meaning of verbs and which - if it is related to specific morphemes at all - is expressed mainly by derivational affixes. The mingling of aspect and aktionsart phenomena in the last century was partly due to the emphasis that was put on the investigation of Gothic, where the morphem *ga*-reached a certain degree of grammaticalization as a prefix expressing perfectivity.

[2]Cf. Engelberg (1998:64ff) for a more detailed discussion of these phenomena.

[3]As is well known this does not hold if a bare plural or a mass noun occurs in object position: ??*she wrote papers* / *stuff in two weeks*.

ment verbs (i.e., verbs in which a durative event leading to a change of state is *implied* by the meaning of the verb) as can be seen in (8): If the verb is in the future tense, the adverbial always refers to the beginning of the whole event, and if it is in the past tense, it is likely to do so.

(7) Rebecca won / will win the race at five
(8) Rebecca cleaned up / will clean up her room at five

Durative adverbials have been used as a diagnostics for verbs semantics since Romberg (1899) and Streitberg (1900). These adverbials (e.g., *for two hours*) usually combine with non-resultative durative verbs (9). They may also combine with non-resultative punctual verbs, in which case the verbs receive an iterative interpretation as in (10). This even seems to hold when the temporal adverbial denotes an extremely short period of time (11):

(9) Rebecca jogged / was jogging for a couple of minutes
(10) Rebecca hit / was hitting him for a couple of minutes (→ repeatedly)
(11) Rebecca hopped / was hopping for two seconds (→ repeatedly)

Streitberg (1900) also noticed that punctual verbs do not occur as complements of aspectual verbs like *beginnen* 'to start' or *aufhören* 'to stop' as in (12). Again, this is possible if they can get an iterative interpretation as in (13), which is usually available for non-resultative punctual verbs:

(12) *The vase started / stopped breaking
(13) Jamaal started / stopped hopping (→ repeatedly)

Another long standing puzzle has been the question why some verbs cannot occur in the progressive aspect. Leaving aside restrictions on stative verbs for the moment, an approximate solution might be the following: While all durative verbs allow the progressive form, for punctual verbs there are occurrence and interpretation restrictions. Firstly, such restrictions include that non-resultative punctual verbs are interpreted iteratively when they occur in the progressive (14). Secondly, punctual verbs that presuppose a preceding event occur in the progressive, as in (15), where it is presupposed that Rebecca participated in the race or was nearing the completion of her journey. In this case, the progressive sentence is related to the time of this preceding event. Finally, punctual verbs that do not belong to these two types

- especially those that lead to cognitive states - do not allow the progressive (16) (Engelberg 1998:74ff).

(14) Rebecca was pinching Jamaal / was hopping (→ repeatedly)
(15) Rebecca was winning the race / was arriving
(16) ??Rebecca was noticing that / ??that was astonishing Rebecca

Other phenomena related to punctuality concern syntactic structures. Among these is a valence alternation between an accusative object and a PP headed by *an*. This alternation is restricted to verbs that refer to events that i) are non-punctual and ii) are followed by a result state; i.e., it is restricted to durative verbs (DUR) verbs that express a change of state (CS) like *schreiben* 'to write', *bauen* 'to build', *nähen* 'to sew', in contrast to punctual verbs (PCT) like *sprengen* 'to blast, to blow up', *brechen* 'to break', *knicken* 'to fold' (Engelberg 1994):

(17) Rebecca baute eine Hundehütte / an einer Hundehütte [DUR; CS]
approx.: 'she built / was building a doghouse'
(literally: "she built a doghouse / at a doghouse")
(18) Rebecca streichelte ihre Katze / *an ihrer Katze [DUR]
'she petted / was petting her cat'
(19) Rebecca sprengte die Brücke / *an der Brücke [PCT; CS]
'she blew up / was blowing up the bridge'
(20) Rebecca schlug ihren Freund / *an ihrem Freund[PCT]
'she hit / was hitting her friend'

Finally, according to Oya (1996), punctuality is among the conditions that determine the occurrence of the expletive reflexive pronoun *sich* with those intransitive verbs that take part in the causative-inchoative alternation in German. Verbs that do not occur with the reflexive pronoun are those that refer to punctual events (*zersplittern* 'to shatter', *zerbrechen* 'to break', *abreißen* 'to tear off'), events that originate naturally (*reifen* 'to ripen', *schmelzen* 'to melt', *gären* 'to ferment'), or to events that constitute movements like *rollen* 'to roll', *segeln* 'to sail', or *fliegen* 'to fly':

(21) der Zweig biegt sich / *der Zweig biegt 'the twig bends'
(22) *der Zweig bricht sich / der Zweig bricht 'the twig breaks'

3 Describing the Data: A Lexical Event Structure Approach

The descriptive value of a lexical-semantic theory of verbs depends on the extent to which it is able to map the distinctions in the syntactic and semantic behavior of verbs onto distinctions in the lexical representations of these verbs. Having this in mind, notice that popular lexical semantic theories like thematic role approaches, decompositional theories or Pustejovsky-style event structure theories do not represent the punctual-durative distinction (see examples below).

With respect to data that cover the breadth of phenomena relevant to lexical semantics, it has been argued in Engelberg (1998) that a lexical event structure theory of a certain type is needed to describe and explain these phenomena. According to this lexical event structure (LES) theory, the meaning of a verb is to be represented as an event structure which has the following characteristics:

i) Complexity of events: Verbs refer to events that are internally structured in the sense that they consist of different subevents (e^1, e^2, ..., e^n) and a possible result state (s).

ii) Sorts of subevents: Subevents are durative (e^{DUR}) or punctual (e^{PCT}).

iii) Relations between subevents: Subevents are causally and temporally related; a subevent can, e.g., precede another subevent ($<$), or subevents can be temporally parallel ($<>$).

iv) Participation in subevents: The event participants which correspond to the verb arguments are not necessarily involved in all subevents, but rather only in some of them; participants and subevents are related by semantic relations like ‘control’, ‘move’, ‘volition’, etc., out of which thematic relations can be computed.

v) Implication vs. presupposition: The occurrence of a subevent can be entailed ($==>^{I}$) or presupposed ($==>^{P}$) by the verb’s meaning.

A verb like *to dry off* as in *Ron dried off the table* is represented in a thematic role approach as in (23) and in a decompositional approach (e.g., Levin and Rappaport Hovav 1996) as in (24), which also contains an additional sorted event argument *e* that is assumed in some decompositional theories (e.g., Wunderlich 1996). In Pustejovsky-style event structure theories the representation is as in (25) in which the event in the event structure ES is represented as consisting of a process and a state. Decompositional propositions are related to each subevent in an LCS’ structure out of which a familiar cause-become decomposition (LCS) can be constructed (Pustejovsky 1991).

The representation of *to dry off* in the above described LES theory, as developed in Engelberg (1998), is shown in (26). It says that *to dry off* implies that the event it refers to consists of two subevents e^1 and e^2 and a result state s. The first durative subevent (e.g., Ron's wiping the table), involving a controller (agent) and a theme is temporally parallel to the second durative subevent (the becoming dry of the table) which is followed by a result state (the table being dry)[4]:

(23) *dry off*: x = Agent, y = Theme
(24) *dry off*: (CAUSE (x, BECOME(DRY (y)))) ($e^{TRANSITION}$)
(25) *dry off*: ES: [[Process] [State] $]_{Transition}$
LCS' [[act(x,y) & ¬dry(y)] [dry(y)]]
LCS cause(act(x,y), become(dry(y))
(26) *dry off*: ($==>^{I}$ $e^{1\text{-}DUR}$: $x^{Control}$, y^{Theme}) <>
($==>^{I}$ $e^{2\text{-}DUR}$: y^{Theme}) < ($==>^{I}$ s: y^{Theme})

To what extent this theory is able to adequately map distinctions in the behavior of verbs onto lexical representations depends of course on what kinds of syntactic or semantic phenomena are considered to be relevant for lexical semantics at all. According to my understanding the objective of a lexical semantic theory is to support explanations for at least the following four types of phenomena. To illustrate each objective, the data described in section 2 will be revisited, and it will be shown how the relevant meaning distinctions are represented in the LES format.

i) Semantics-syntax mapping: The theory should explain the relations between semantic argument structures and their corresponding syntactic structures ('linking'). Example: The valence alternation between an accusative object and an *an*-construction is restricted to durative verbs followed by a result state as is represented in the partial event structure[5] in (27).
ii) Grammatical-categorial restrictions: The theory should account for the (non-)occurrence of lexical items in certain grammatical categories. Example: The restriction of the progressive to those punctual verbs that

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[4]The representation in (26) is an abbreviated form of a meaning postulate in a type-driven predicate logic with a lambda operator, the framework in which the LES theory has been elaborated in Engelberg (1998).

[5]The LES in (27) - (30) is partial in the sense that verb specific information that does not influence the restrictions is omitted, which is indicated by "...".

either do not involve a result state or that presuppose a preceding event involves verbs with an event structure as in (28) and (29).

iii) Co-occurrence restrictions: The theory should express selectional restrictions. Example: PPs of the type *in two hours* are typically combined with verbs with an event structure as in (30).

iv) Interpretation restrictions: The theory should represent systematic restrictions concerning the interpretation of certain classes of lexical items. Example: The iterative interpretation in the progressive aspect involves verbs with the LES in (28).

(27) ... $(==>^{I}\ e^{n\text{-}DUR}: x^{Agent}, y^{Theme})$ ... $< (==>^{I}\ s: y^{Theme})$

(28) $(==>^{I}\ e^{n\text{-}PCT}: ...)$

(29) $(==>^{P}\ e^{1\text{-}DUR}: ...) < (==>^{I}\ e^{2\text{-}PCT}: ...) < (==>^{I}\ s: ...)$

(30) ... $(==>^{I}\ e^{n\text{-}DUR}: ..., y) < (==>^{I}\ s: y)$

The last two sections have shown that the punctual-durative distinction plays a central role in lexical semantics since it involves all four types of phenomena. Furthermore, I have demonstrated that the lexical origin of the phenomena discussed can in principle be accounted for in the framework presented.

4 Explaining the Data: The Meaning of ‘Punctuality’

I have argued elsewhere (Engelberg 1998, 1999) that although most lexical semantic theories are more or less successful in mapping distinctions in the semantic and syntactic behavior of verbs onto distinct structures in lexical representations, these theories do not put much effort into clarifying the semantics of these structures. The meaning representations are often semantically extremely vague, with the result that the syntactic and semantic phenomena to be explained tend to shape the representations in a circular way, thereby yielding empirically weak theories.

To obtain meaning representations that can be examined independently of the phenomena they are supposed to explain three types of clarifications have to be obtained. Firstly, the logical type of the predicates used in the representations has to be determined, e.g., if ‘AGENT’ is a function or a relation between thing and event individuals, or between predicates and argument positions, etc., and if ‘PUNCTUAL’ is a first-order property of events or a second-order property of verbal predicates. Secondly, the truth conditions of these predicates have to be worked out more clearly than has been done so far in most lexical semantic theories. Finally, by developing identity criteria for the basic ontological sorts of individual variables it has to be shown what these variables stand for, i.e., it must be clear what, for example, the event variable *e* represents. In the following, I will pursue the first two questions with respect to the predicate ‘PUNCTUAL’.

There have been only very few approaches which, like Vendler (1957), relate the class of expressions which are called ‘punctual’ in this paper to the notion of an ‘instant’ in temporal logic. Vendler (1957:157) writes about achievements like *win the race*[6]:

> ”*A* won a race between t^1 and t^2, means that *the* time instant at which *A* won that race is between t^1 and t^2.”

While this might be justified for the few examples given by Vendler, it seems that most ‘punctual’ events (as expressed in *to break, to jump, to blast, to knock*, etc.) have a certain duration. This has been noticed by most researchers before and after Vendler, too, beginning with Herling (1840:107), Pott (1859:178), Goodwin (1889:16f), and others. Sarauw (1905:147) observes:

> “Since a shot lasts for a moment, it does take up some time, that is to say, the beginning and the end do not coincide: the shot is not a point in the sense of mathematics, but a point as it stands on a sheet of paper, a point with a certain extension.”[7]

What is then the meaning of the predicate ‘punctual’ if it does not refer to an instant or an instantaneous event in the sense of temporal logic? A claim often made is that an event can simply be linguistically presented as having no duration, or some hint is made at a cognitive device for conceiving of events as punctual even if they are not.

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[6]The only elaborated approach to ‘instantaneous’ events I’m aware of is Piñon (1997). Introducing boundaries in the basic ontology he can formalize the seemingly contradictory idea, that an event, i.e., an entity that involves a change, can occur at an instant.

[7]My translation of: "Der schuss dauert einen moment, also dauert er, also fallen anfang und ende nicht ganz zusammen: der schuss ist kein punkt im sinne der mathematik, sondern ein punkt wie er auf dem papier steht, mit einer gewissen ausdehnung."

An early example is Curtius (1863), who like many other researchers of that time develops a distinction between punctuality and durativity with the aim of capturing the distinction between perfective and imperfective verb stems in classical Greek. His notion of punctuality involves, like many others, a spatial analogy:

> "The expression 'point of time' is familiar. It is this notion I'm taking up when I say that the action of the aorist can be compared to a p o i n t . A point has no extension, and surely no less can be said of the action expressed by the aorist, whose temporal extension is left out of consideration. Actions expressed by speakers as simply occurring [i.e., which are referred to by aorist forms] appear as points to the spectator, just as objects that are far away or receding into the background do, despite their factual extension in space."[8] (Curtius 1863:174)

An early example of an explanation which postulates an ability to conceive of events as punctual can be found in Pott (1859), who treats aspectual pairs and verb pairs related by aktionsart differences on a par and therefore makes punctuality a lexical distinction. He claims that with verb pairs in Slavic and pairs in German like *sitzen* 'to sit' / *sich setzen* 'to sit down' one can discover "[...] that in these pairs reference to the same kind of temporal property is made, which involves - to illustrate the matter briefly and aptly by borrowing a spatial metaphor - whether they are thought of as being p u n c t u a l in their duration (which, of course, is impossible in the strongest mathematical sense and therefore only relatively true) or being l i n e a r " (Pott 1859:178).[9]

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[8]My translation of: "Der Ausdruck Zeitpunkt ist geläufig. An ihn knüpfe ich an, wenn ich sage, dass die Handlung des Aorists einem P u n k t e verglichen werden könne. Dem Punkte kommt bekanntlich gar keine Ausdehnung zu, ebenso wenig kommt bei der durch den Aorist bezeichneten Handlung ihre zeitliche Erstreckung in Betracht. Und wie entfernte oder in den Hintergrund tretende Gegenstände, trotz ihrer factischen Ausdehnung im Raume, doch als Punkte erscheinen, so auch vom sprechenden *die* Handlungen, die er eben nur als eintretende aufführt."

[9]My translation of: "[...] in beiden Rücksichtnahme auf eine gleiche Eigenschaft der Zeit, nämlich danach, ob sie - um die Sache durch ein vom Raume entlehntes Bild in Kürze und schlagend zu veranschaulichen - ihrer Dauer nach

A more poetic variant of this kind of semantics we owe to Gildersleeve (1902:251):

> "Tense of duration, tense of momentum, would not be so objectionable, but, unfortunately, duration has to be explained and the seat of the duration put where it belongs, in the eye of the beholder, in the heart of the sympathizer, and not in the action itself. Describe a rapid action and you have the imperfect. Sum up a long action and you have the aorist."

Interestingly, more recent and partly formalized approaches to aspectuality do not differ very much from the older definitions. Platzack (1979:93) claims that punctual verbs refer to events "that do not last in time (or rather, are not conceived of as lasting in time)" and Moens (1987:102) states:

> "[...] processes and culminated processes can be »compressed« into points. This [...] does not mean that they cease to have a temporal duration, but rather that their internal structure is no longer of importance."

While the claim that 'punctual' verbs refer to logical instants is not justified by the reference of most of these verbs, the assumption that we conceive of events as being punctual or that punctuality is a property of verbs does not make much sense either. Concrete events involve a change over time, i.e., duration is an essential property of these events.[10] What it is that we are in fact doing in conceiving of events as having no duration is not conceiving of them as events anymore. It is for this reason that attempts to clarify the meaning of the notion of 'punctuality' have not been very satisfying so far.

At first sight, it seems surprising anyways that languages distinguish between verbs that refer to short events and those that refer to longer events. Most other central concepts in lexical semantics like 'cause', 'agent' or 'will' play a central role in our overall cognitive architecture. I will present evidence that this holds for the durative-punctual distinction, too. A look at

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p u n k t u e l l gedacht wird (was freilich in strengster mathematischer Strenge unmöglich und demnach nur beziehungsweise wahr), oder l i n e a r ."

[10]Cf. Engelberg (1998:216ff) for an extensive discussion on event ontology.

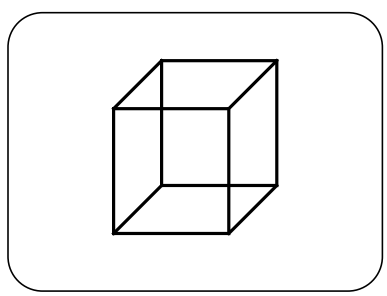
the research on cognitive time concepts reveals that a short interval of 2 to 3 seconds plays a crucial role for perception, behavior, and speech production. The following phenomena involve this three-second interval which I will refer to as the 'cognitive moment'[11]:

i) Errors in the estimation of the length of intervals: Experiments show that the length of short acoustic or visual stimuli is overestimated while the length of long stimuli is underestimated; the threshold between over- and underestimation lies between 2 and 2.5 seconds (Pöppel 1978).

ii) Oscillation of extremely faint sounds: Faint, barely audible acoustic stimuli like the ticking of a watch held some distance from the ear are only perceived periodically; the rhythmic appearance and disappearence of the sound perception occurs every couple of seconds (Urbantschitsch 1875).

iii) Rhythm of metronome beats: Regular metronome beats of equal acoustic quality are perceived as units of two (or more); this "tick-tock" effect disappears if the distance between two beats exceeds about 2.5 seconds (Wundt 1911).

iv) Oscillation of ambivalent patterns: The perception of ambivalent patterns like the Necker cube below oscillates between the two readings of the pattern at least every three seconds or so; to a large degree this occurs independently of the will of the observer (Pöppel 1985).



v) Distance between pauses in speech production: Crosslinguistic investigations of spoken lyrics show a tendency towards rhythms with short pauses about every 3 seconds (Turner and Pöppel 1985). Comparable rhythms can be found in normal speech (Pöppel 1985). It

[11]For a more thorough presentation and discussion of the following phenomena, cf. Engelberg (1999).

has independently been noticed that rhythmic pauses in speech are not explained by the demands of breathing rhythms (Handel 1989).

vi) Rhythm of actions: Intercultural investigations show that simple actions like scratching, hand-shaking, knocking, chopping a tree, waving, or hammering tend to be bundled into rhythmic groups with a length of two to three seconds, interrupted by short breaks (Feldhütter, Schleidt and Eibl-Eibesfeldt 1990).

The cognitive moment or "subjective present" as this interval has been called is determined by a neural mechanism that integrates successive events into a perceptual gestalt whose duration is restricted to an upper limit of about three seconds (Pöppel 1985:53). This gestalt creates something like a "window of consciousness" that induces a "feeling of nowness". Since the perception of events and the structure of our own actions is determined by the cognitve moment, it can be assumed that our general cognitive concept of events involves a classification of events that is mirrored in the way we use verbs to talk about events: punctual events are events that don't take longer than the time of the cognitive moment while durative events exceed this three-second interval.

Since the proposed conception of punctuality is based largely on our perceptual system, it relates to relatively simple, concrete events. The basic readings of verbs can be defined as those readings in which reference is made to events that are immediately available perceptually, as for example in (31). But metaphorical readings often involve reference to more abstract events in which the temporal structure of the basic reading is not completely preserved as in (32) which we can hardly call 'punctual' in the sense that it refers to an interval shorter than three seconds. Nevertheless, in both readings the accusative object cannot be replaced by the *an*-construction showing that the basic reading of the verb determines its behavior.[12]

(31) sie spaltete das Brett / *an dem Brett
'she split the board / was splitting the board'

(32) sie spaltete die Partei / *an der Partei
'she divided ("split") the party / was dividing the party'

Thus, finally, if we want to conceive of 'punctuality' as a second-order property we can call those verbs punctual that refer to punctual events in their basic reading.

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[12]Cf. for a more detailed discussion Engelberg (1999).

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