Title: A Cross-Linguistic Syntactic Analysis of Telicity in Motion Predicates in Southern Tati, Mandarin, and Ghanaian Student Pidgin

Subtitle: A cross-linguistic analysis of motion telicity

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This paper proposes an analysis of telicity in motion predicates within the framework of the Exo-Skeletal Model (Borer 2005b). We hypothesize that a motion event is syntactically represented by a Path component, the core of which is a *v*P that introduces a Figure argument. This Path component is interpreted as quantity in the sense of Borer (2005b) when there is a certain type of morpheme present in the structure, such as a verb that denotes the reaching of an endpoint. A quantity Path component can then assign a semantic value to a functional projection called Asp_QP, which returns a telic interpretation. Data from Mandarin, Ghanaian Student Pidgin, and Southern Tati show Asp_QP can be assigned a value either with or without overt head movement. We further propose a distinction between Path and direction, which explains data that were left unexplained in previous studies and seemingly contradict our claim.

Keywords: Cross-Linguistic; Motion Predicates; Telicity; Mandarin; Tati; Ghanaian Student Pidgin; Motion Events

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0. Abstract

This paper proposes an analysis of telicity in motion predicates within the framework of the Exo-Skeletal Model (Borer 2005b). We hypothesize that a motion event is syntactically represented by a Path component, the core of which is a *v*P that introduces a Figure argument. This Path component is interpreted as quantity in the sense of Borer (2005b) when there is a certain type of morpheme present in the structure, such as a verb that denotes the reaching of an endpoint. A quantity Path component can then assign a semantic value to a functional projection called Asp_QP, which returns a telic interpretation. Data from Mandarin, Ghanaian Student Pidgin, and Southern Tati show Asp_QP can be assigned a value either with or without overt head movement. We further propose a distinction between Path and direction, which explains data that were left unexplained in previous studies and seemingly contradict our claim.

1. Introduction

The notion of telicity has received much attention from researchers interested in event structure. Notable recent studies that have analyzed telicity include Krifka (1989), Bertinetto (2001), Borer (2005a, b), Ramchand (2008), Rappaport Hovav and Levin (2010), Beavers (2012), and Rappaport Hovav (2014), to name a few. A consensus about the formalization of telicity, however, is yet to be reached. Additionally, many of the authors referenced above have pointed out that telic interpretation of a predicate may be obtained in various ways, depending on the type of predicate in question. For predicates denoting incremental creation or consumption, there is a direct connection between telicity and semantic properties of the internal argument (see (1))—an observation already made by numerous studies, the most notable among which are Verkuyl (1972, 1989, 1996). For predicates with a frequentative reading, telicity seems to be tied to the presence of a frequentative expression (see (2)). For motion predicates, the focus of this study, we shall argue that telicity stems from the presence of a morpheme denoting a type of locational transition that renders the entire motion event **quantity** in the sense of Borer (2005b). A typical example of such morphemes is a preposition or a verb denoting the reaching of an endpoint (see (3)).

(1) a. The cat ate the fish (in twenty seconds). Telic
b. The cat ate fish (*in twenty seconds). Atelic

(2) I jumped five times (in two seconds/*for two seconds).

(3) I pushed the cart to the tree (in ten seconds/*for ten seconds).

This paper proposes a formal analysis of telicity in motion predicates based on evidence from three genetically unrelated languages: Southern Tati (Indo-European, Indo-Iranian, SOV, and categorized as "definitely endangered" by UNESCO), Mandarin (a Sinitic language), and Ghanaian Student Pidgin (GSP, henceforth, an English-lexified expanded pidgin spoken in Ghana). Building upon previous work by Benedicto and Salomón (2014), Zheng (2015), Chen (2017), Taherkhani (2019), Osei-Tutu (2019a), and many others, we argue that a motion predicate yields a telic reading when a functional projection termed Asp_QP is projected and its open value is assigned range (to be defined in the next section) by a path that has been rendered quantity in the sense of Borer (2005b) by a certain type of verb or preposition. Furthermore, we will discuss certain predicates that look like motion predicates on the surface (and, indeed, have often been treated as such in the literature) but employ a different method to assign range to the open value of Asp_Q. That difference, as will be shown, has syntactic and semantic consequences.

The rest of the paper is organized as follows: in section 2, we present the theoretical assumptions and hypothesis upon which our analysis is based. In particular, we define what a motion event is and introduce the theoretical framework for our analysis. Then, in section 3, we describe our data collection methods and the rationale underpinning our methodology. In section 4, we present our analysis and the evidence that supports it in detail, followed by an in-depth discussion of its theoretical implications in section 5. Next, in section 6 we bring up some remaining questions that should be addressed more deeply in the future. In the final section, we summarize our conclusions.

2. Theoretical Assumptions and Hypothesis

In this section, we discuss the theoretical framework adopted for this study and some of the fundamental assumptions behind it. Importantly, we discuss the definition of telicity that is derived from this framework. Then, a definition of motion events follows. Finally, we present our hypothesis for how telicity obtains in motion predicates.

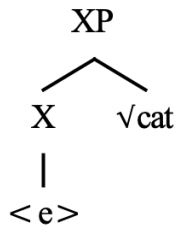
2.1. Theoretical Framework

The present study takes a root-based approach and adopts the Exo-Skeletal Model (XSM) developed in Borer (2005a, 2005b, 2013)[1]. In XSM, the core of syntax consists of several functional projections whose heads are radically empty. That is, instead of being projected from a word, morpheme, or phonologically null feature, as commonly assumed in many endocentric systems, a functional projection in XSM is, as it were, a scaffold that exists independently of those linguistic elements typically labeled as "heads." To illustrate, consider how a Determiner Phrase (DP) may come into existence.

[1] See Borer (2005a) for the theoretical advantages of XSM and, more generally, the rationale behind a root-based approach to syntax.

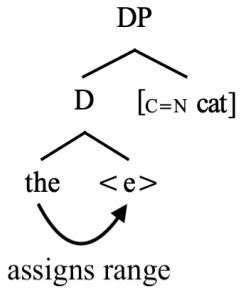
In (4), a root—i.e., an inherently category-less lexical item, √*cat* in this case—merges with an empty functional head, denoted by <e>. At this point, the functional projection XP cannot return any interpretation, as the empty head is not assigned any semantic content.

(4)



In (5), the determiner *the* takes the empty head position and assigns semantic content (i.e., *range*, in the terminology of Borer (2005a, b)) to it. With a determiner assigning range to the head, the functional projection has now become a DP and is able to return whatever interpretation that the phrase *the cat* has in English. The root √*cat* has now been categorized as a noun by virtue of being embedded in a nominal syntactic structure[2].

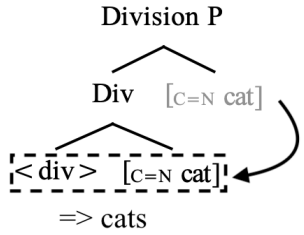
(5)



In XSM, range may be assigned to an empty head in several ways. Besides having an overt range assigner in the head position, as illustrated above, another way is for a phonologically null feature to occupy the empty head. Take Borer's (2005a) analysis of the English count noun for example, as illustrated in (6). The abstract feature <*div*> (for division) assigns range to the empty head, turning the functional projection into a Division Phrase, which in turn can return a count reading of an otherwise mass noun. XSM assumes that abstract features need support from elements that have phonological content to be spelled out. In this case, the root √*cat* undergoes movement to the head of Division P and forms a head pair with the abstract feature <*div*>. The pair eventually spells out as /kæts/.

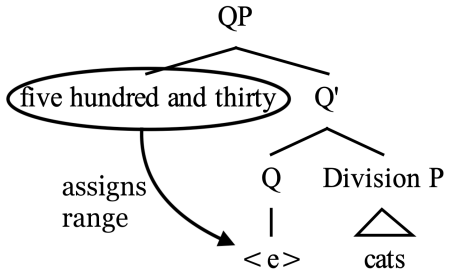
[2] See Borer (2013) and Acquaviva (2014) for their accounts of the nominalization of roots. Also see Embick and Marantz (2008) for a slightly different account, in which roots are categorized by heads like little *n* and little *v*.

(6)



Yet another way to assign range is to have an assigner occupy an adjunct or specifier position of the functional projection and assign range to the empty head from there. Consider, for example, the Quantity Phrase (QP) *five hundred and thirty cats*. Since the quantity expression *five hundred and thirty* is clearly not a minimal projection, it must occupy an adjunct/specifier position rather than the head of the QP and assign range from there:

(7)



In XSM, it is possible for a range assigner to move from its base position to another position in order to assign range. Let us use Borer's (2005a, p. 97) analysis of the English article *a* as an example (see below). Although *a* is base-generated in the head position of Division-P and assigns range to [Div<e>], giving rise to a count reading, it nevertheless moves to the head of QP in order to assign range to [Q<e>], yielding a quantity—specifically, singular—interpretation. In line with most generative models, movement may be overt or covert in XSM[3].

(8) [$_{QP}$ a <e> [$_{DIV\text{-}P}$ a <e> [$_{C=N}$ √cat]]]

There is one restriction on range assignment in this system. Once an empty head has been assigned range, no other range assigners can assign range to that head again. Having an empty head assigned range more than once would result in what Borer terms *double marking* and would lead to ungrammaticality. An example of double marking can be found in Borer (2005a, p. 40), reproduced below in (9c). Her analysis of the example is reproduced in (9d). Here, *the dog's* occupies the specifier of DP and receives its genitive case there. Being a definite expression, *the*

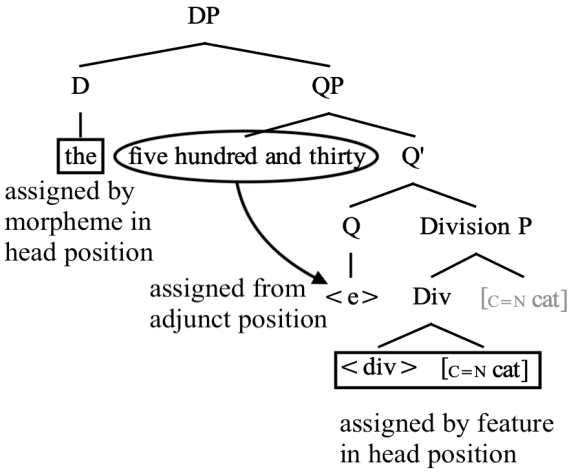
[3] See Borer's (2005a) analysis of proper names for an example of covert movement. She argues that in English there is covert N-to-D movement. Unlike many Minimalist accounts, however, she does not treat covert movement as a post-Spell-Out operation. In XSM, when an element moves, a copy of it is made and merged in a higher position. The difference between covert and overt movement is that with the former, the lower copy is spelled out whereas with the latter, the higher copy is. See Borer (2005a), specifically footnote 11 on page 72 in that work.

dog's assigns range to the empty head of D (notated as <e>$_d$) from Spec DP, giving rise to a definite reading of the whole DP (see (9a)). Now, if a definite article is inserted in the head position of that DP, it will assign range to the same empty head again, and this will lead to double marking as in (9c) even though both range assigners—*the dog's* and *the*—yield a definite interpretation.

(9) a. the dog's ear
b. the ear
c. *the dog's the ear
d. [$_{DP}$ [$_{DP}$ the dog's]<e>$_d$…[$_{NP}$ ear]] ((9c) and (9d) from Borer (2005a))

One can summarize the architecture and mechanisms presented above with the diagram in (10)[4]. The main takeaways are (1) that functional projections in XSM have radically empty heads, (2) that they need to be assigned semantic values, i.e., range, to properly return an interpretation, and (3) that one empty head can only be assigned range once.

(10)



2.2. Telicity Defined

Following Borer's (2005b) analysis, we define a telic event as an event that is quantity, which in turn is defined as follows (Borer 2005b, p. 74):

(11)
a. *P* is homogeneous iff *P* is cumulative and divisive.

[4] For a much more detailed exposition, see Chapter 1 of Borer (2013). We leave out range assignment methods that have been proposed by others but are not in Borer's original work (2005a, b, 2013). For instance, Wang (2018) develops an XSM analysis of the Mandarin morpheme *-le* and proposes that this morpheme can assign range to the empty head of an outer aspect projection through the AGREE operation. We thank an anonymous reviewer for pointing out that long-distance AGREE can be reduced to any of the methods listed here coupled with covert movement, which is available in the original formulation of XSM (see footnote 3).

i. P is divisive iff $\forall x\,[P(x) \rightarrow \exists y\,(P(y) \wedge y < x)] \wedge \forall x,y\,[P(x) \wedge P(y) \wedge y < x \rightarrow P(x - y)]$
ii. P is cumulative iff $\forall x\,[P(x) \wedge P(y) \rightarrow P(x \cup y)]$

b. P is quantity iff P is not homogeneous.

As defined in (11ai), P is divisive if and only if its parts are the same as the whole. Let's take, for example, an event of *flying*. No matter how the event is divided, each of its sub-events will also be an event of *flying*. As for (11aii), it states that P is cumulative if and only if its union with another instance of P results in something that is also a P. For instance, consider an event of *flying* and call it x. If there is another event of *flying*—call it y—such that it immediately follows x on a timeline, the sum of these two events will be an event that begins with the initiation of x and terminates at the end of y. This sum event, just like x and y, will be an event of *flying*. Based on the definition in (11a), therefore, we can conclude that events that can be properly referred to as *flying* are both divisive and cumulative. They are homogeneous or—in the event domain—atelic.

The opposite of homogeneity/atelicity is the notion of *quantity*—i.e., *telicity* in the event domain. We may rephrase the definition in (11b) in a less formal format as follows:

(12) P is quantity/telic if it is non-cumulative, non-divisive, or both.

To see how this definition applies, consider an event of *flying ten miles*. Call it E. E is non-divisive because it consists of sub-events of *flying less than ten miles* rather than *flying ten miles*. Since parts of E are different from E, E must be non-divisive. Thus, according to (12), E is a quantity/telic event.

It can also be shown easily that E is non-cumulative. Suppose that immediately after E, there is another event of *flying ten miles*. Let's call it E'. The union of E and E'—i.e., the event that spans from the beginning of E to the end of E'—should be referred to as *flying twenty miles* rather than *flying ten miles*. Being non-cumulative, E is telic according to the definition in (12).

2.3. Motion Events Defined

For the present analysis, we largely follow Talmy's (2000) and Benedicto and Salomón's (2014) work in defining a motion event as follows.

(13) A motion event is an event in which an entity changes its location in the time under consideration.

The definition provided here is roughly the same as that of *translational motion* in Talmy's (2000) work (p. 25). This excludes events where an entity undergoes motion without changing its location in space, e.g., events of rotation, oscillation, or vibration. Borrowing Talmy's terminology, an entity that undergoes translational motion is called a *Figure*. In this study, we elaborate on the

concept of motion events by introducing some new ideas and distinctions that have not been proposed before. Let us turn to them now.

Conceptually speaking, when a Figure changes its location by undergoing translational motion, it creates a trajectory that leads from the Figure's earlier location to its later one. We will call this trajectory created by the Figure a *Path*. In this study, we propose to make a conceptual distinction between a Path and a direction: A Path is always determined by an event of translational motion. Specifically, a Figure must be identified in each space first, and only after its earlier and later locations are known can a Path be calculated. In other words, if there is no motion or Figure, there is no Path to speak of. A Path is **dependent** on the presence of a Figure and its motion. In contrast, a direction is not determined by translational motion. One can think of a direction as an imaginary trajectory in a space without there being a Figure undergoing translational motion. For instance, we can talk about someone *looking up* or *looking down*. Here, the particles *up* and *down* denote directions rather than Paths, as there is no Figure or translational motion to speak of in an event of looking. This notion of *direction* is quite similar to that of *abstract ordered structures* in Fong's (2001) analysis of directional prepositional phrases and locatives. In sum, directions can be thought of as trajectories or spatial transitions **independent** of the presence of a Figure and its motion.

It may be helpful to think about the conceptual distinction between Path and direction in terms of a series of derivations. To construct a Path, one must proceed as follows:

(14) i. Identify a Figure.
ii. Find the location of the Figure at the beginning of the event. Call it A.
iii. Find the location of the Figure at the end of the event. Call it B.
iv. Find the trajectory that goes from A to B, which is the trajectory the Figure traveled along. The trajectory is the Path.

To construct a direction, proceed as follows:

(15) i. Identify one location. Call it A.
ii. Identify another location. Call it B.
iii. Find the trajectory that goes from A to B. The trajectory is the direction.

As should be clear from the derivations above, a Path is Figure-centered in that its derivation halts at the first step immediately if no Figure can be specified. A direction, on the other hand, is location-centered in the sense that its construction is dependent only on whether A and B—both being locations—can be identified. Although the distinction proposed here is conceptual, we hypothesize that this distinction is reflected in syntax via the interface with the Conceptual-Intentional (C-I) system[5].

[5] We borrow the term *Conceptual-Intentional system* from Chomsky (2015) and use it to refer to non-linguistic cognitive systems responsible for meanings, concepts, intention, and other tasks. Crucially, we assume that cognitive modules responsible for the perception and conception of motion and space fall under this umbrella term.

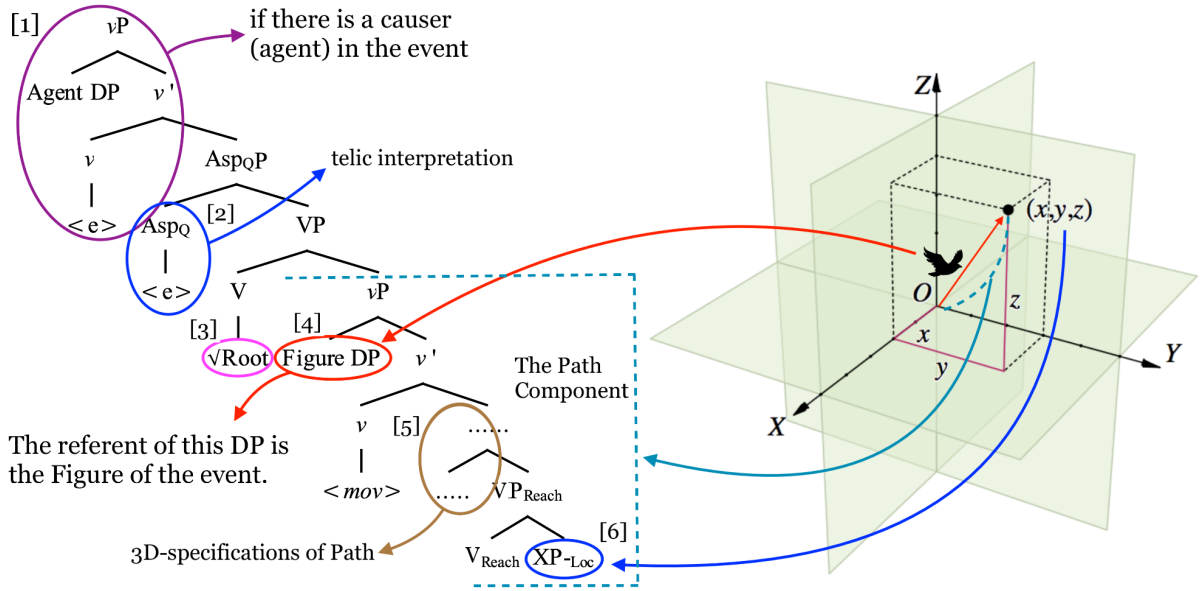
It is worth mentioning that a Figure in a motion event must be specific. This is because a motion event—given the definition above—is essentially an event of tracking the location of a Figure. (And as mentioned above, it is through this tracking that we determine the Path in a motion event.) In order to track the location of something, one must first specify what that something is so that its location can be identified in space.[6] We shall explore the syntactic implications of this point in later sections.

To sum up, the existence of a motion event entails the existence of a Figure and Path, and vice versa. In contrast, the existence of a direction does **not** entail the existence of a motion event, Figure, or Path. The proposed distinction is highly important for section 4.2, where we analyze cases that seemingly contradict our hypothesis, as well as for section 5, where we discuss problems faced by other analyses that do not make this distinction.

2.4. Hypothesis

Building upon previous work (Zheng 2015, Osei-Tutu 2019a, Taherkhani 2019, Chen et al. 2019, Chen 2021), especially on Benedicto and Salomón's (2014) proposal that a motion event can be conceptualized as a 3-D Cartesian coordinate system, we propose that a motion event can be represented syntactically as shown in (16).

(16)



[6] Note that simply being an unspecified member of a specific set does not help. To illustrate, imagine there is a specific set of ten marbles outside a box in front of me. Now, I learn that one of them has been displaced from this set but do not know which one. Then, I see one marble inside the box. Based on this information only, I cannot draw a Path from the outside to the inside of the box and say this is the Path of the displaced marble, for there is no way to be sure the marble inside is the same as the one that was displaced. For all I know, the marble inside the box may have been there all along, and the displaced one may have gone somewhere else outside the box. The point here is that tracking the location of something requires that the tracker know the specific identity of that something.

Starting from the top, the Agentive little *v*P[7] (labeled as [1]) is the Agentive Component of a motion predicate. This piece of functional structure introduces the external argument, which is interpreted as the *Agent* or *Causer*[8] of the motion event. An example of a Tati motion predicate with an Agent is below, with *tit:tiɛ* 'the girl' being the Agent:

(17) tit:tiɛ feri ˈholɛ+midiɛ vijɛ mon
girl.F boy.ACC push+give.3SG.F water in
'The girl pushes the boy into water' [9]

Following Borer's (2005b) proposal, we hypothesize that when an event is telic, there is a functional projection called Asp$_Q$P (labeled as [2] above, Q for *quantity*) in the structure. The absence of Asp$_Q$P results in an atelic interpretation. We will argue that in a motion predicate, the empty head of Asp$_Q$P (notated as [Asp$_Q$<e>] henceforth) is assigned range by a Path that has been rendered quantity by some morpheme, often a verb or preposition marking the reaching of an endpoint.

Labeled as [3] is a root that has been categorized as a verb by virtue of being embedded in an event structure. In Mandarin, Tati, and GSP, this verb typically denotes the manner in which a Figure undergoes motion (e.g., *fly* in the GSP example in (18)). For this reason, we will call this verb *Manner V* from now on.[10]

(18) The bird fly go the tree
DET bird fly go DET tree
'The bird flew to the tree' (Osei-Tutu 2019b)

Two things are worth mentioning here. First, the presence of a Manner V does not guarantee that the predicate in which it is found is a motion predicate. For instance, although the English verb *run* is often used to describe how a person can move from one point to another, we clearly have no problem using it in a non-motion event, such as *running on a treadmill*. Another example

[7] There is, of course, more structure above what is shown here. By common assumption, there are at least a functional projection for outer (viewpoint) aspect and another for tense, omitted here for simplicity.

[8] The Agent/Causer role in this hypothesized structure is roughly equivalent to the *Initiator* in Ramchand (2008) and the *Originator* in Acedo-Matellán and Mateu (2014).

[9] All the data used as examples are sourced from authors' native speaker knowledge, unless otherwise specified.

[10] Questions remain as to where an Agentive Manner V should be in this hypothesized structure. An Agentive Manner V denotes the way in which an Agent brings about a motion event, e.g., *push*, *throw*, etc. For the purposes of this work, we assume an Agentive Manner V—initially a root—can merge at the location labeled as [3] in (16) and subsequently undergo head movement to the Agentive little *v*. This is compatible with the kinds of structure seen in Borer (2005b, p. 94), Huang et al. (2009, p. 67), and, to a lesser extent, Ramchand (2008, p. 116). However, we leave open the possibility that it can also directly merge with the Agentive *v*P structure in the way described in Folli and Harley (2020, p. 452) without undergoing head movement. We assume both options are universally available, and that different languages adopt different options based on their unique conditions, e.g., the presence or absence of serial verb constructions. (This position is similar to the one taken by Folli and Harley (2020).) We also do not rule out the possibility that the two options can be seen in one language, depending on certain morphological and/or phonological factors that might be at play.

is the Mandarin Manner V *fei* 'fly', which can be used to describe the manner in which a hummingbird hovers in situ. In these cases, the Figures' locations do not change during the events, and thus they are not motion events according to our definition in (13). Second, while we call the V in [3] a Manner V in this paper, it is only because in the three languages under discussion here, manner is typically encoded by the main verb. For verb-framed languages (Talmy 2000), where the path of motion is expressed by the main verb, Manner V is obviously not the right nomenclature[11].

Following previous work, we hypothesize that the piece of structure that determines whether a predicate denotes a motion event or not resides in what is called the *Path Component* (see Chen 2021, Osei-Tutu 2019a, Taherkhani 2019, Benedicto and Salomón 2014), which is essentially the *v*P that introduces the Figure DP (labeled as [4]) and everything below it. The referent of the Figure DP is the entity whose location changes over the course of the motion event (e.g., the bird that moves from the origin to point (x, y, z) in the Cartesian coordinate system on the right in (16)). We hypothesize further that in the three languages under discussion here, there is a feature <*mov*>—which stands for *move*—that can assign range to the empty head of the Figure little *v*P, which is the core of the Path Component. The Figure little *v*P, once assigned range, returns an interpretation of translational motion, and the argument in its specifier position is interpreted as a Figure.

The part of the structure labeled as [5] is where we find elements that encode the 3-D specifications of the Path. These elements are the ones in a language that encode three major spatial dimensions: horizontal, vertical, and deictic relations (see Benedicto and Salomón (2014) for details on how the three dimensions of a Cartesian coordinate system map onto the syntax of motion predicates).[12] The bolded morphemes in (19) are examples of such elements in Mandarin.

[11] Although the structure in (16) is proposed with the three languages under discussion in mind, it can potentially apply to other languages, including those classified as verb-framed. If we adopt Folli and Harley's (2020) view that verb-framed languages require Res-to-*v* head movement while satellite-framed ones do not, we can capture this typological distinction by saying that in verb-framed languages, the V in [3] is actually an internally-merged copy of a verbal head that is in the Path Component, specifically in the area labeled as [5] or even below it. In satellite-framed languages, the V in [3] is externally merged, and there is no movement from the Path Component. The specific details are beyond the scope of this work, but see Folli and Harley (2020) for their analysis, the core idea of which can be easily implemented in the XSM framework.

[12] In the model proposed by Chen (2021), the projections in the area of [5] and below are functional. He calls the projections responsible for the 3-D specifications Hor(izontal)-P, Ver(tical)-P, and Dei(ctic)-P. These three functional projections map onto the three light green planes shown in the Cartesian coordinate system in (16). (For details about the three planes and the mapping, see Benedicto and Salomón (2014) and Chen (2021).) If these projections really are functional, their heads must be assigned range according to XSM, and those range assigners, being functional elements, must form a paradigm. Put differently, they must form a closed class. Chen (2021, pp. 41-46) argues this is the case in Mandarin. If treating the projections in [5] and below as functional is the right move, the fact that some languages use prepositions and particles—both functional elements—to express a Path is no surprise. In English, for instance, we suggest that functional elements such as *up*, *down*, *across*, *over*, etc. assign range to the functional heads in [5] and below. But what about languages that use verbs to express a Path? In Mandarin, for example, Chen (2021) argues that the elements in Path are semi-grammaticalized verbs, meaning they form a closed class but still retain grammatical properties associated with typical verbs, such as the ability to take on the verbal suffix *-le*. We suggest the following account: If the area of [5] and below is part of the functional spine of an event structure, it is reasonable to assume that a root embedded in there will be categorized as verb, just as a root

(19) E zou-le **shang** **qu**.
Goose walk-LE go-up go
'The goose walked up and away.'

Finally, there is a locative phrase (labeled as [6]) that denotes a reference object—or *Ground* in Talmy's (2000) terminology—with respect to which the motion event is described. For example, the locative phrase (XP-Loc, henceforth) may denote something that the Figure crosses, enters, exits, moves onto, moves off of, or arrives at, depending on what element it merges with. In (16), the endpoint in the Cartesian coordinate system, (x, y, z), maps onto the XP-Loc that merges with a morpheme denoting the reaching of an endpoint, and in the three languages under consideration here, this morpheme is realized as semi-grammaticalized verbs, which we will call *V-Reach*[13] from now on.

Importantly, the presence of a V-Reach renders the Path of a motion event (encoded by the Path Component in the syntactic structure) quantity. A structure that represents a quantity Path can,

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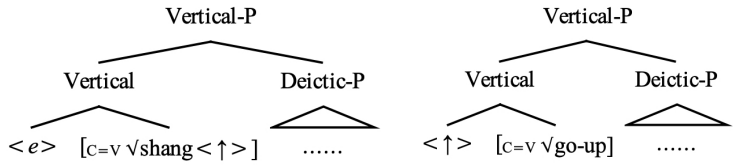
embedded in, say, Asp$_Q$P or *v*P will be categorized as verb too, according to XSM. One can come up with at least two possibilities that conform with the present theoretical framework:

i) ii)



In (i), a root bundled with an "upward" feature (<↑>) form a head pair with [Vertical<e>] and assigns range to it. By being embedded in Vertical-P, the root is categorized as verb (notated as c=v). This may be the case for Mandarin, where perhaps only a closed set of roots are bundled with features that can assign range to the relevant heads. (The Mandarin verb *shang* means "to go up.") The other possibility is in (ii), where the head of Vertical-P is already assigned range by the feature <↑>, and a root adjoins it to provide phonological support. This may be the case for GSP, where the root *go-up* can be easily replaced by another root—say, *ascend* (see (iii))—without losing the intended interpretation because range is assigned to [Vertical<e>] independently of the root. Regardless of whether the elements in the Path Component are semi-grammaticalized or full-fledged verbs in the three languages under discussion, it seems that the theoretical apparatus of XSM can handle both possibilities easily, and that is all we intended to show here. Whether this is the right account or not is obviously outside the scope of this study and must await more thorough analysis. In this work, we use the label "V(P)" for the functional heads and projections in [5] to capture the fact that these languages employ serial verb constructions for motion predicates.

iii) The bird fly go-up/ascend go.
DET bird fly go-up/ascend go
"The bird flies up and away."

[13] According to our discussion in footnote 12, the VP-Reach in (16) should be a functional projection. We have nevertheless chosen the label V(P)-Reach because in our three languages, elements that can appear in the head position of VP-Reach retain the grammatical properties associated with typical verbs in those languages, such as the ability to take on certain inflectional morphemes. (One exception is the Mandarin word *zhi* 'arrive', which appears to have completely grammaticalized.) The fact that they retain verbal properties is especially important to our discussion about the Mandarin suffix *-le* in later sections. By assumption, the empty head of VP-Reach is assigned range by a V-Reach.

in turn, assign range to [Asp$_Q$<e>] and thereby yield a telic reading.[14] While a V-Reach is not the only linguistic element that can make a Path quantity, we will use it in most of our examples from now on for expository purposes.

3. Methodology

The data for the study were collected from nine speakers—three speakers for each language—with an instrument consisting of a battery of 175 animated video clips designed to elicit and contrast the following set of parameters: telic, underspecified-atelic, and unspecified-atelic[15] (Benedicto 2017). The video clips, which were organized around a variety of nineteen themes (e.g., a goose, a plane, etc.), were presented to the participants by means of a randomized self-paced application. This paper draws from the data[16] collected from a subset of 162 clips (78 telic and 84 atelic), which were designed to elicit data about the parameter of (a)telicity. These video prompts were organized into three sets:

a. Telic events; for example, a bird flying from a fence to the top of a tree (as in Figure 1).

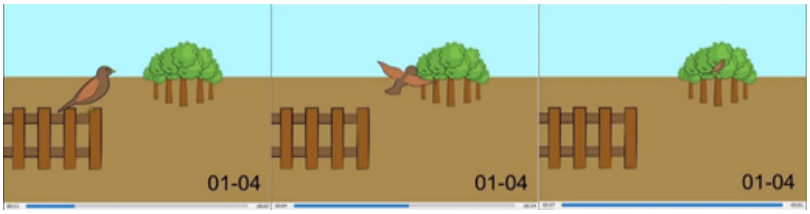


Figure 1. clip 01-04 (beginning, middle and end)

[14] Of course, this will happen only when Asp$_Q$P projects. If it does not project, the whole event will remain atelic. Now, can a quantity Path project without Asp$_Q$P? In principle, nothing in our hypothesis forces the projection of Asp$_Q$P in the presence of a quantity Path. However, while it is possible to have a quantity Path without Asp$_Q$P, the resulting interpretation is often at odds with common sense. Such an interpretation is usually found in special contexts:

i) Sisyphus pushed the boulder to the hilltop for years. (Every time the boulder reached the top, it magically rolled back to the bottom.)

Here, the PP *to the hilltop* is functionally equivalent to our VP-Reach in that it can render a Path quantity. Yet, the predicate can be modified by *for years*, suggesting that the whole event is still atelic, and that there is no Asp$_Q$P. The resulting interpretation is that Sisyphus pushed a specific rock to a specific location again and again, ad infinitum. Of course, such an atelic event defies common sense without proper context. Therefore, in this paper we do not take this type of event into account when we notate the acceptability of our example sentences.

[15] As Figures 1-3 show, what distinguishes the three parameters (i.e., telic, underspecified-atelic and unspecified atelic) is the endpoint and how the figure interacts with it. In other words, with telic event there is a clearly defined endpoint (e.g., the tree in Figure 1) which the bird goes to perch on; whereas, with the underspecified-atelic, even though there is a potential endpoint (e.g., the tree in Figure 3), we do not know whether or not the bird reaches it. Finally, with the unspecified atelic event, there is no endpoint (potential or otherwise) at all, as illustrated by Figure 2.

[16] All the prompts and elicited data (from Mandarin and GSP) are available on the Purdue University Research Repository (PURR). The Tati data has not been separately published to respect the participants' wishes.

Figure 1 shows a series of stills from the animation that respondents were shown to elicit a telic sentence. In the video, a bird perched on a fence flies to perch on a tree. The video, therefore, clearly shows motion from the origin-point (the fence) to the end-point (tree).

b. Unspecified atelic events; for example, a bird flying off into the distance (as in Figure 2).

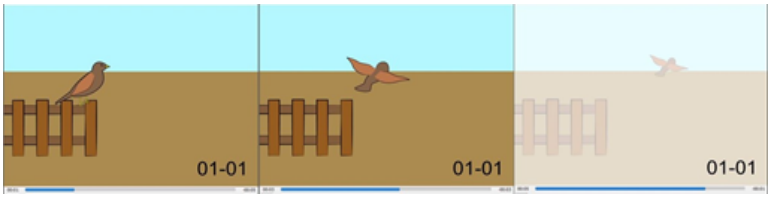


Figure 2. clip 0101 (beginning, middle and end)

Figure 2 shows a series of stills from clip no. 01-01. Though this animation is similar to the one in clip no. 01-04, the difference here is that there is no tree for the bird to go to and land on. Consequently, the clip ends with the bird still flying into the horizon. This clip was shown to respondents to elicit a sentence that describes an (unspecified) atelic event.

c. Underspecified atelic events; for example, a bird flying towards a tree without actually reaching it (as in Figure 3).

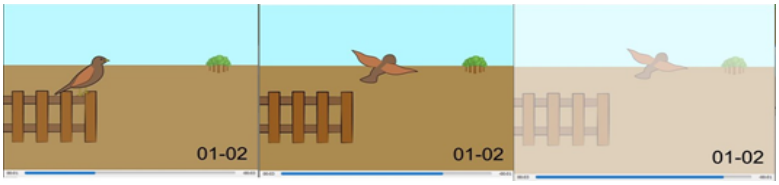


Figure 3. clip 0102 (beginning, middle and end)

Figure 3 shows the (underspecified) atelic event. Here the bird flies from the fence and appears to be moving towards the tree in the distance; however, the video clip ends before the viewer can determine whether it gets there or not. Hence, the difference between the unspecified atelic event and the underspecified atelic event is that the latter has what might be construed by the participant as a possible endpoint.

Regarding the nine participants from whom the data were elicited, all three speakers of GSP acquired the language in high school (as is typically the case) and continued to speak it once they went to the university. Apart from speaking GSP, all the respondents spoke Standard Ghanaian English as well as Akan (a Ghanaian language). In addition, one of the respondents spoke Ga and another spoke both Ga and Ewe (which are also Ghanaian languages). The three Ghanaian languages spoken by the participants all belong to the Kwa language family, which researchers (Dadzie 1985; Dako 2002a and 2002b; Huber 1999) believe to be the substrates of GSP. The Tati participants also have Persian as another native language, and they learnt both languages starting from an early age. All three participants of Tati were from Takestan, in which people speak the Takestani dialect of Tati. The Mandarin speakers all lived in Taiwan and spoke the Taiwan variety of Mandarin as their native language. All of them could speak English as a second language with

differing degrees of proficiency. One of them also spoke Hakka as a first language in childhood, but she indicated that her fluency in Mandarin was higher.

It should be noted that the data collection process was not structured to be experimental in nature but was designed to enable the elicitation of qualitative data. Consequently, participants were sometimes prompted to provide more clarification on some of the elicited sentences. For instance, in cases where we were under the impression that the participant may have misunderstood a video-clip, we would ask them one or more follow-up question(s) that sought to confirm their initial judgement. In addition to the data elicited via the video-clips, we also constructed some of the data used in the study; however, in all such cases, the sentences were cross-checked with other native speakers to ensure that our native speaker intuitions were right.

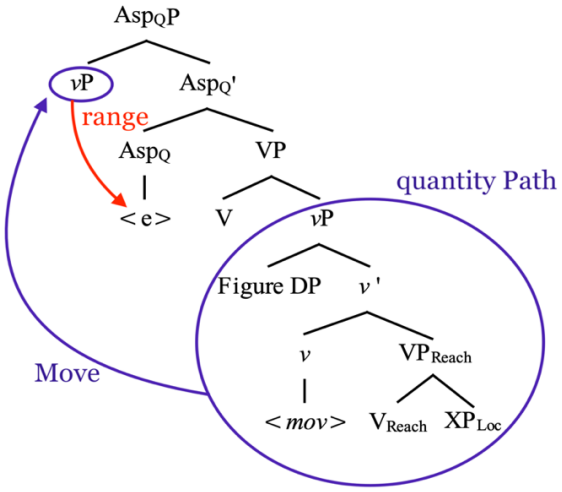
4. How Telicity Arises: Range Assignment to [Asp$_Q$<e>]

In what follows, we will discuss how telicity arises based on the hypothesis above. Specifically, we will explain how our hypothesized structure predicts the presence and absence of certain syntactic patterns in the three languages. Then, we shall examine various cases that appear to contradict our account and explain why they are in fact entirely consistent with it.

4.1. Quantity Path as a Range Assigner for [Asp$_Q$<e>]

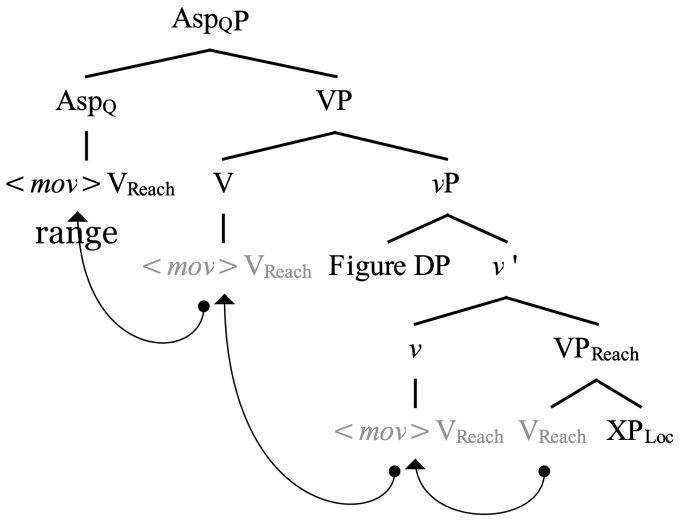
In section 2.4, we hypothesized that in a motion predicate, a quantity Path could assign range to [Asp$_Q$<e>] and give rise to a telic reading. Based on the range-assignment mechanisms discussed in section 2.1, there are—a priori—at least two ways this can happen. First, [Asp$_Q$<e>] can send out a probe into its c-command domain and search for a head or constituent that has a quantity semantic value. When it finds a quantity Path, the Path will move to the specifier of Asp$_Q$P—either overtly or covertly—and assign range to [Asp$_Q$<e>] from there, as shown in (20). Notice that the Path in (20), i.e., the Figure little *v*P, has been rendered quantity by a V-Reach.

(20) Range Assignment from Specifier of Asp$_Q$P



Second, range can be assigned to [Asp$_Q$<e>] through head movement. Specifically, the V-Reach (or any other morpheme that can make a Path quantity) undergoes head movement and forms a complex head with the <*mov*> feature in *v*. Consisting of the main ingredients of a quantity Path, the complex head [<*mov*>V-Reach] undergoes further head movement to the head position of Asp$_Q$P and assign range to it, as illustrated in (21) below:

(21) Range Assignment via Head Movement



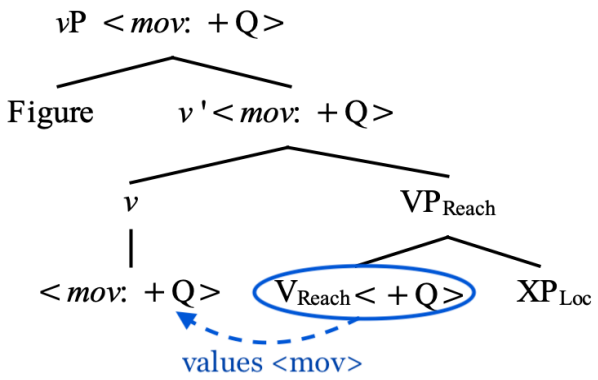
Before we proceed, let us pause to consider how a Path may be rendered quantity by a V-Reach. Specifically, we propose that the feature <*mov*> needs to be specified with two possible values: either <+Q> or <-Q>. These two values roughly correspond, respectively, to *closed scale* and *open scale* in the four-way classification of motion verbs proposed by Rappaport Hovav and Levin (2010). According to this classification, a closed scale is bounded whereas an open scale is not. Since a V-Reach denotes the reaching of an endpoint, it clearly should be classified as a closed scale morpheme and therefore should be able to give <*mov*> a <+Q> value[17]. The specific formalization of this process is in (22) below: <*mov*:___> assigns range to the empty head of the Figure little *v*P, giving rise to a Path Component and thereby giving the predicate a translational motion interpretation. The feature <*mov*:___> by itself is unspecified in terms of boundedness, namely, +Q or -Q. Thus, the feature probes into its c-command domain to find a morpheme with a Q specification. A V-Reach, which has a +Q value, is found and values <*mov*:___> through an AGREE or a head movement operation, depending on the language[18]. The now valued <*mov*: +Q>

[17] Motion morphemes in Mandarin have been analyzed by Lin (2015, 2019) based on Rappaport Hovav and Levin's (2010) classification. The Mandarin V-Reach *dao* 'arrive' is classified as a *two-point closed scale motion morpheme* in Lin (2015).

[18] Of course, there are other morphemes that can also give <*mov*> a +Q value. These morphemes denote events of entering, exiting, crossing, etc. For a comprehensive list of closed scale motion morphemes in Mandarin, see Lin (2019).

feature projects to the *v*P level and may assign range to [Asp$_Q$<e>] via specifier-head agreement (as in (20)); alternatively, the feature at the head level may undergo head movement to [Asp$_Q$<e>] and assign range there directly (as in (21)).

(22)



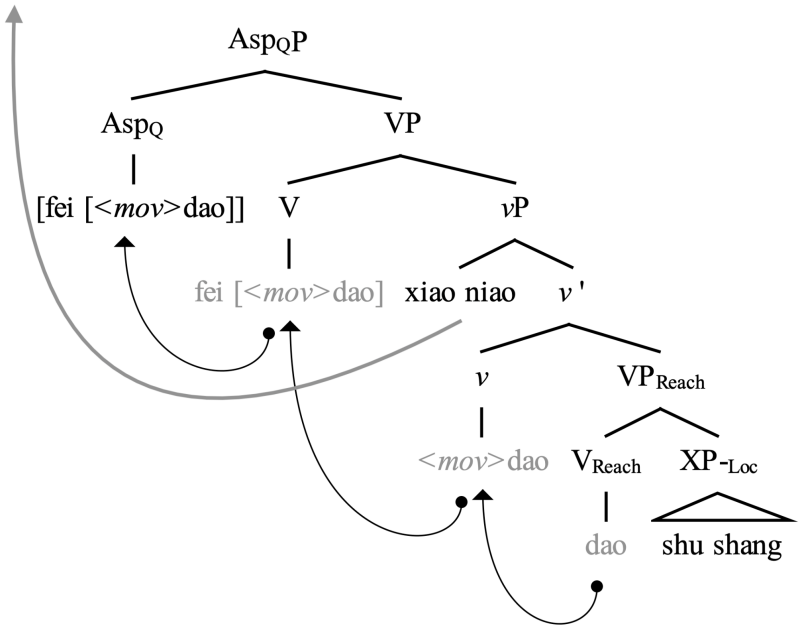
With these two possibilities in mind, we will now turn to the three languages and see which of these options each of them uses. We first examine how motion telicity is obtained in Mandarin. One thing we found in the data is that the Mandarin V-Reach *dao* 'arrive' was only used in response to prompts depicting telic motion events. Based on this finding, it stands to reason that *dao* can give rise to a quantity Path, which in turn can give rise to telicity. Example (23) reveals how a motion predicate with *dao* is quantity/telic: if one were to divide the event of (23) into sub-events along a timeline, at least one sub-event should be described as the bird flying **toward** the treetop (see (24)) rather than it flying **to** the tree top. The fact that (23) cannot be used to describe such a sub-event means that it is non-divisive, hence telic.

(23) Xiao niao fei **dao** shu shang.
Little bird fly arrive tree top
'The birdie flew to the treetop.'

(24) Xiao niao wang shu shang fei.
Little bird toward tree top fly
'The birdie flew in the direction of the treetop.'

What needs to be explained now is how exactly the quantity Path in (23) assigns range to the empty head of Asp$_Q$P, which must be present in telic predicates according to the hypothesis. We propose that in Mandarin, the V-Reach *dao* undergoes head movement as shown below in (25):

(25)



The derivation proceeds as follows: The V-Reach *dao* 'arrive' first undergoes head movement to the little *v* that introduces the Figure *xiao niao* 'the birdie'. Recall that in the present system, this little *v*P is the core of the Path Component, without which the predicate would not be interpreted as a motion event. The V-Reach forms a complex head with the abstract feature <*mov*> in the *v* position, giving <*mov*> a <+Q> value and thereby yielding a quantity Path. The complex head then proceeds to move to the V position, where the Manner V *fei* 'fly' is located. The complex head [<*mov*>dao] forms an even bigger complex head with *fei* and finally moves to [AspQ<e>], where [<*mov*>dao] assigns the necessary range for the telic interpretation to arise. By common assumption, the Figure DP *xiao niao* 'birdie' moves to Spec TP to check the EPP feature, resulting in the surface word order observed in (23).

Based on this derivation, one can make a prediction about the position of the Mandarin perfective suffix *-le* relative to that of a V-Reach. Specifically, taking into account Wang's (2018) analysis of *-le* as a marker occupying the head of Asp_Q[19], we predict that *-le*, when present, must linearly follow *dao* 'arrive' rather than precede it. This is because, based on what is being proposed in (25), *dao* moves to Asp_Q (where *-le* is base-generated) as part of the complex head

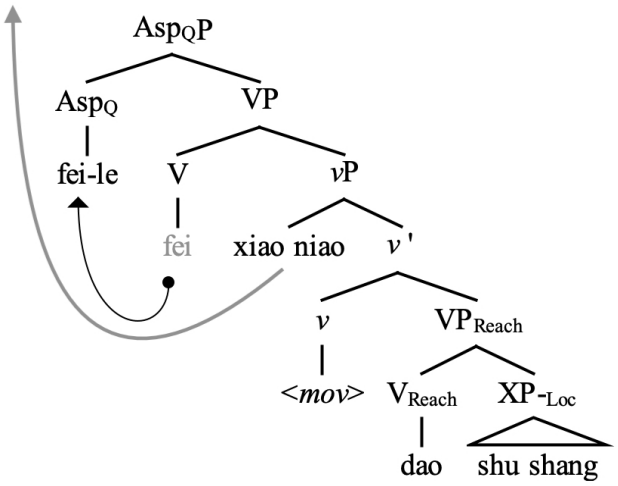
[19] Wang's (2018) analysis of *-le* is done within the framework of XSM. He argues that the primary function of *-le* is in fact a range assigner to [Asp_Q<e>], while the perfective reading is secondary and only arises when an outer aspect projection (i.e., AspP) is present in the structure. (If AspP projects, *-le* will assign range to its empty head through AGREE, resulting in a perfective reading.) While agreeing with most of his proposal, we treat *-le* as a phonological spell-out of an Asp_Q head that has already been properly assigned range, rather than as a range assigner in and of itself. The reason for this thinking is that quantity internal arguments, according to Wang, are also able to assign range to [Asp_Q<e>] from Spec Asp_QP through specifier-head agreement (recall the discussion in section 2.1 and, in particular, tree diagram (7)). If *-le* is a range assigner to [Asp_Q<e>], it is not entirely clear how double marking can be avoided when *-le* and a quantity internal argument co-exist in the structure, which they certainly can. However, this minor departure from Wang's analysis does not invalidate the arguments being made in this work.

[fei[<*mov*>dao]], to which the perfective -*le* is suffixed. This prediction is borne out. When -*le* is added to sentence (23), the marker must appear immediately after *dao*:

(26) Xiao niao fei dao-**le** shu shang.
Little bird fly arrive-LE tree top
'The birdie flew to the treetop.'

Crucially, we further predict that a telic motion predicate in which -*le* is suffixed to the Manner V instead of *dao* will be ungrammatical. Put in structural terms, the Manner V cannot move to Asp_Q without *dao* also undergoing head movement to the same position (see the derivation below). This is because *dao* is the morpheme responsible for rendering a Path quantity, which in turn is responsible for assigning range to [Asp_Q<e>] and yielding a telic interpretation. Without proper range assignment to [Asp_Q<e>], the structure in (27) is predicted to crash—a prediction borne out by sentence (28)[20].

(27) Illicit derivation where [Asp_Q<e>] fails to receive range from [<*mov*>dao]



(28) *Xiao niao fei-**le** dao shu shang.
Little bird fly-LE arrive tree top
'The birdie flew to the treetop.'

[20] There is no rule in Mandarin that requires -*le* to take a verb series in its scope as a whole. That is, -*le* need not always suffix to the last verb in a verb series. Therefore, the ungrammaticality of sentence (28) should not be attributed to the fact that -*le* breaks up the verb series *fei dao* 'fly arrive' by taking *fei* alone. There are plenty of examples in motion predicates where -*le* takes only part of a verb series as its stem. See sentence (19), reproduced below, where -*le* is suffixed to the first verb *zou* instead of the last verb *qu*:

i) E zou-le shang qu.
Goose walk-LE go-up go
'The goose walked up and away.'

This pattern holds not only for Manner V's that typically appear in the unergative structure, such as *fei* 'fly', but also for those often found in the unaccusative structure, such as *diao* 'fall'. In (29) below, the suffix *-le* must follow the V-Reach and is barred from the position immediately after *diao*. Again, from the derivation shown in (30), this pattern is entirely expected based on a head movement account.

(29) Qiu diao(*-le) dao(-le) di shang.
Ball fall(*-LE) arrive(-LE) floor top
'The ball fell on the floor.'

(30) [$_{AspQP}$ diao-<*mov*>dao-le [$_{VP}$ diao-<*mov*>dao [$_{vP}$ <*mov*>dao [$_{VP\text{-}Reach}$ dao di shang]]]]

Moreover, since range is assigned through head movement, the Head Movement Constraint (Travis 1984, Roberts 2011) should hold. Therefore, the following derivation is expected to be ruled out because the V-Reach moves directly to [Asp$_Q$<e>] by skipping intermediate heads. This illicit derivation and the sentence derived from it are in (31) and (32), respectively. As predicted, the sentence is not acceptable:

(31) *[$_{AspQP}$ dao-le [$_{VP}$ diao [$_{vP}$ <*mov*> [$_{VP\text{-}Reach}$ dao di shang]]]]

(32) *Qiu dao-**le** diao di shang.
Ball arrive-LE fall floor top
'The ball fell on the floor.'

From a theory-internal perspective, even if the Head Movement Constraint is to be relaxed somehow, the derivation in (31) still suffers another problem, which is that we only have a V-Reach rather than a quantity Path in [Asp$_Q$<e>]. This is because the core of the Path Component—the feature <*mov*> in the Figure little *v* position—is left out. Again, recall that the account put forward here states that a V-Reach can make a Path quantity, and that a quantity Path in turn gives rise to motion telicity. This means that a V-Reach by itself does not have the necessary semantic value for [Asp$_Q$<e>]. This point is a major departure from some earlier accounts (most notably, Chen et al. 2019, Osei-Tutu 2019a, and Taherkhani 2019) that suggest a V(P)-Reach by itself is necessary and sufficient for motion telicity. A more accurate account, we believe, is that a V(P)-Reach is necessary but not sufficient. Sentences like the ones below, while having the V-Reach *dao* in them, do not denote motion events in the sense adopted here. And while one can argue that (34) has a telic reading (albeit not motion telic), it is difficult to say the same for (33), which cannot be modified with an *in x time* temporal phrase without sounding like the Mississippi River is not in contact with the Gulf of Mexico at the beginning of the event. Notice that even if, in order for *zai yi tian nei* 'in one day' to be an acceptable modifier of (33), we adopt this fanciful scenario in which the river gradually comes into contact with the gulf, the subject will now have to be

interpreted as going through some kind of change in its spatial configuration, rather than just a state holder[21]. These suggest that a V-Reach like *dao* 'arrive' must be embedded in some larger structure to have an effect on telicity, and that its ability to induce telicity, at the same time, has an effect on the way certain arguments in the structure must be interpreted. The present account, which links the V-Reach with the Figure DP via the Figure little *v*P (recall the diagram in (22)), can capture this correlation, while in earlier accounts it was not formalized explicitly.

(33) Mixixibi He (#zai yi tian nei) cong Aitasika Hu
Mississippi River (#be-at one day inside) from Itasca Lake

liu **dao** Moxige Wan.
flow arrive Mexico Gulf
'The Mississippi River flows from Lake Itasca to the Gulf of Mexico (#in one day).'

(34) Wo kan **dao** jiaotang le.[22]
1SG see arrive church CRS
'I saw the church.'

Incidentally, it may be tempting to attribute the lack of motion readings in the cases above to the semantic content of the Manner V's *liu* 'flow' and *kan* 'see'. However, one of the main theoretical motivations behind the root-based approach to syntax is the observation that a verb's semantic content can often be "coerced" by the functional syntactic environment in which the verb is embedded. Examples of coercion abound in the literature, and we will only point out three that are related to motion events. In (35), the word *siren*, typically recognized by native speakers as a noun associated with a type of sound, is now not only coerced into a verb (presumably by the functional morpheme *-ed*) but also forced to take on the role of a Manner V, describing the manner in which the police car moved to the accident site. The coercion effect in (36) is even more striking. The Mandarin verb *chi* 'eat' is undoubtedly not a typical Manner V, and its semantic content has very little, if any, to do with translational motion. Yet, native Mandarin speakers not only

[21] While Borer (2005a, b, 2013) does not provide a detailed account of how XSM handles stative events such as (33), Wang's (2018) analysis suggests that, at least in Mandarin, the notion of quantity is compatible with stative event structure. According to this analysis, Asp$_Q$P returns a quantity reading of an event, regardless of whether the event is stative or non-stative. It is just that the term *telic* is usually for non-stative events. If true, we must conclude that whatever it is that makes (33) fail the *in x time* test for telicity, it is not necessarily the absence of Asp$_Q$P. In fact, some participants report that they are okay with suffixing *-le* to *dao* in (33) while maintaining a stative reading, suggesting that Asp$_Q$P can still project. These facts point to the existence of some structure other than Asp$_Q$P that not only dominates VP-Reach but also enables it to yield a telic—i.e., quantity **and** non-stative—interpretation.

[22] It should be noted that the *le* in this example is not the same as the *le* associated with Asp$_Q$. In the literature, the former is often called sentential *-le* because of its sentence-final position, whereas the latter is called verbal *-le* for its post-verbal position. For the syntactic and semantic differences between these two types of *-le*, see Wang (2018) and Soh (2014). Since sentential *-le* occupies a position higher than TP (Soh 2014) and functions as a focus marker (Wang 2018), it should not be confused with verbal *-le*, which occupies Asp$_Q$ and functions as a quantity marker. To avoid confusion, we follow Lin (2019) by glossing sentential *-le* as CRS, which stands for currently relevant state.

understand what (36) means without any trouble but also accept it as a possible sentence. Finally, notice that even though the Mandarin verb *kan* 'see' is hardly associated with motion, it could still—given the proper context—assume the role of a Manner V in (37), which is felicitous for a scenario in which the speaker and their friends looked at the exhibitions at the National Gallery of Art and worked their way from the East to the West Building, undergoing translational motion throughout the event. For the present study, the most important point is that whether a predicate has a motion reading or not is not contingent on the lexical semantics of the Manner V. [23]

(35) The police car sirened up to the accident site. (Clark and Clark, 1979)

(36) Cong Shengli Hao yi lu chi guo qu.
From Victory Shop one way eat cross go.
'Eat our way up (the street), starting from Victory (a restaurant's name).'
(From https://echo978.pixnet.net/blog/post/62706758, accessed on December 16, 2021)

(37) Women (zai yi ge xiawu nei) cong dong xiang
1PL (be-at one CLF afternoon inside) from east building

kan dao xi xiang.
see arrive west building
'We looked (at the exhibitions) from the East Building to the West Building (in one afternoon).'

Turning our attention to GSP, the data suggests that telicity is achieved by means of the first strategy discussed in (20). Specifically, we propose that a quantity Path covertly moves to Spec Asp_QP and assigns range to $[Asp_Q<e>]$ from there. In GSP, telic motion predicates are characterized by a V-Reach, which usually has the phonological output *catch* but can also be phonologically null in certain contexts. This is illustrated by sentence (38) below:

[23] A comprehensive review of the literature regarding coercion cannot be attempted here due to space limitations. We refer the reader to the first chapter of Borer (2005a) for a detailed discussion on this phenomenon, and to the second chapter of Chen (2021) for further information on its relevance to motion predicates. Notice that the alternative to treating (35), (36), and (37) as instances of coercion would be claiming that the words *siren*, *chi* 'eat,' and *kan* 'look, see' have in their lexical entries the meanings of 'to move while emitting a loud, prolonged sound,' 'to move while eating,' and 'to move while looking (at exhibitions),' respectively. Given how rare instances like these occur in our daily linguistic input, it is questionable whether most people's mental lexicons really have these entries. Indeed, the New Oxford American Dictionary does not even have the word *siren* as a verb. Taking the rarity into account, such an alternative fails to explain why, for example, sentence (35) can be so readily acceptable by native English speakers as a well-formed, interpretable sentence and, as one of the authors can attest, even by non-native speakers who presumably have had no prior exposure to the use of *siren* as a verb, let alone as a Manner V. Furthermore, a model that encodes motion readings in the lexical entries of verbs like *chi* 'eat' must also do the same to many, if not all, other verbs. This would result in a bloated lexicon with a lot of redundancy and very little psychological plausibility.

(38) The bird fly go **catch** the tree top
DET bird fly go reach DET tree top
"The bird flew to the treetop."

As argued in Section 4.1 (specifically, structure (20)), telicity is achieved in a sentence like (38) when [Asp$_Q$<e>] sends out a probe within its c-command domain and finds a constituent (in this case, *v*P) that has a quantity semantic value, which is possible here because of V-Reach. This quantity Path is then able to assign range to [Asp$_Q$<e>] and, thus, yield a telic interpretation. Here, it may be worthwhile to go through the derivation process step-by-step as an illustration. First, we have the Merge of the V-Reach *catch* 'reach' and the XP-Loc *tree top*. This semi-grammaticalized verb has a <+Q> value:

(39) [$_{\text{VP-Reach}}$ catch$_{<+Q>}$ [$_{\text{XP-Loc}}$ the tree top]]

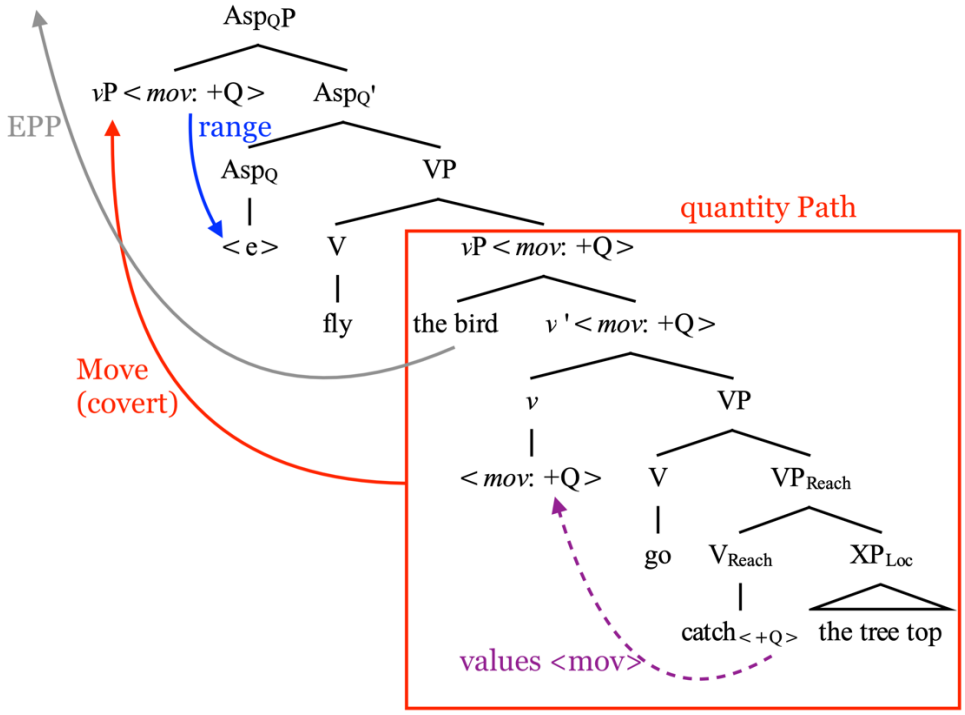
The constituent that results from this Merge, i.e., the VP-Reach, is not able to yield a telic interpretation yet. At this point, what we have is a piece of structure that represents a direction, not a Path. A motion reading emerges only after the VP-Reach (or the constituent it is embedded in) merges with a Figure little *v*. At this stage, *catch* values <*mov*:> with its <+Q> feature.

(40) [$_{v'}$ <*mov*: +Q> [$_{\text{VP}}$ go [$_{\text{VP-Reach}}$ catch$_{<+Q>}$ the tree top]]]

Finally, the little *v*P introduces an argument that is interpreted as the Figure. The <*mov*: +Q> feature projects to the *v*P level and is found by the probe sent down by [Asp$_Q$<e>]. The *v*P, now representing a quantity Path, moves to Spec Asp$_Q$P covertly and assigns range to [Asp$_Q$<e>], resulting in a telic motion reading[24]. The entire derivation is illustrated below:

[24] We propose that the movement is covert based on the evidence we currently have. Specifically, the Manner V *fly* must linearly precede the Path Component. This may change, however, if we find out that *fly* has reasons to move somewhere higher than Asp$_Q$. At any rate, the most important cross-linguistic contrast we wish to show in this work is not between covert and overt movement, but between overt head movement and anything else.

(41) Derivation of sentence (38)



It is important to note, as alluded to above, that V-Reach in GSP is not always spelled out—in other words, it can be a phonologically null <+Q> feature in the head of VP-Reach. This, however, does not affect the derivation, as the sentence is still understood as being telic (as is shown by the application of the *in x time*/*for x time* test in (43) and (44), respectively).

(42) The bird fly go (catch) the tree top
DET bird fly go (reach) DET tree top
'The bird flew to the treetop.'

(43) The bird take two minutes fly go (catch) the tree top
DET bird take two minute.PL fly go (reach) DET tree top
'The bird flew to the treetop in two minutes.'

(44) *For two minutes, the bird fly go (catch) the tree top
For two minute.PL DET bird fly go (reach) DET tree top
'*The bird flew to the treetop for two minutes.'

Note that the diagram in (41) reveals a theoretical advantage of the present analysis over earlier ones. It has been argued that the AGREE operation is subject to the constraint of Locality, or sometimes known as Minimality (Adger 2003, Chomsky 2000). The constraint states that X can AGREE with an element Y that it c-commands only if there is not a third matching element that is c-commanded by X and c-commands Y. Given how similar AGREE is to the relation between an

empty head and its potential range assigner, it stands to reason that Minimality should also hold in the case of range assignment. Therefore, any analysis that assumes a V(P)-Reach by itself can assign range to [Asp$_Q$<e>] must explain why assignment can happen despite the intervening quantity argument in Spec *v*P (e.g., *the bird* in (41)). (Range assignment to [Asp$_Q$<e>] by quantity arguments will be discussed in the next section.) Put differently, if *v*P in (41) did not have the right semantic value for [Asp$_Q$<e>], then the structurally closest quantity element to [Asp$_Q$<e>] would be *the bird*, rather than the V(P)-Reach c-commanded by it. This problem disappears if it is the quantity Path rather than V(P)-Reach that is responsible for assigning range to [Asp$_Q$<e>]. The present account, therefore, maintains the overall structure proposed by earlier studies while respecting Minimality.[25]

At this point, it is important to show that telicity in GSP cannot be achieved via the other strategy mentioned in Section 4.1, above; that is, Head Movement. Consider sentences (45) and (46), below, both with an adjunct modifier:

(45) The bird fly quickly go catch the tree top
DET bird fly quickly go reach DET tree top
'The bird flew quickly to the treetop.'

(46) The boy carry the duck slowly go the coop inside.
DET boy carry DET duck slowly go DET coop inside
'The boy slowly carried the duck into the coop.' (Osei-Tutu 2019a, p. 190)

As was shown with the Mandarin example, for range assignment to occur via Head Movement, V-Reach must form a complex head with the feature <*mov*>, move to combine with the Manner V and then form a bigger complex head before finally moving to [Asp$_Q$<e>] to assign range. What this means for GSP, as exemplified by the sentences above is that, were Head Movement responsible for range assignment, a complex head [fly[<*mov*>[go[catch]]]] would have been formed and it would not, therefore, have been possible for the adverb to be inserted into that head. This, therefore, eliminates Head Movement as an option for achieving telicity in GSP[26]. Below is an illicit derivation involving head movement. Taking (46) into account, we assume adverbs adjoin

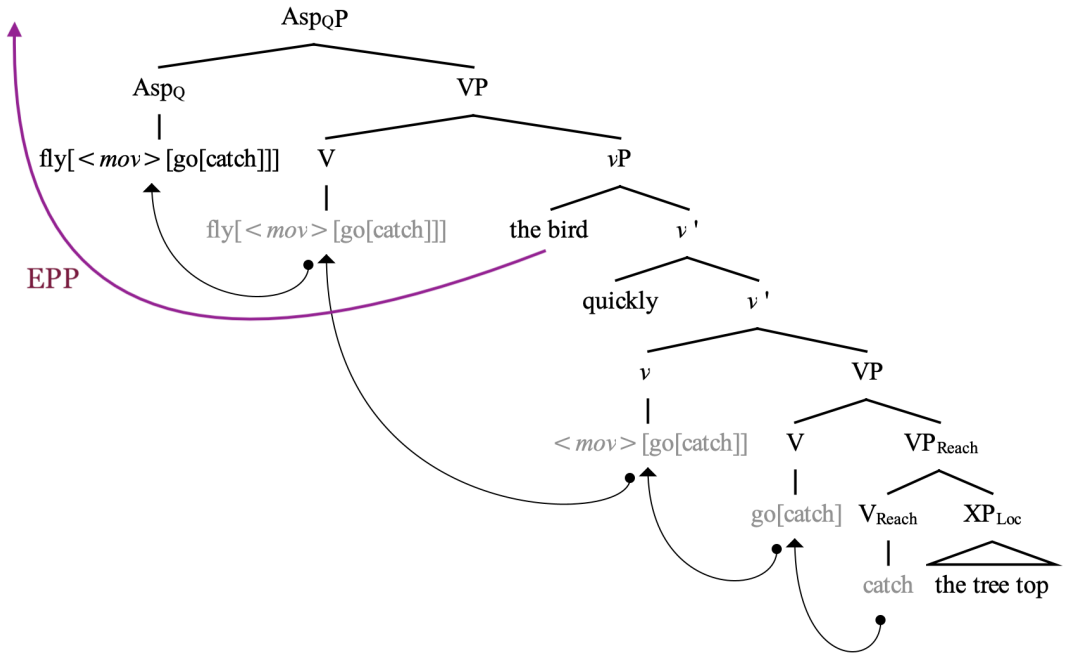
[25] If range assignment really has to respect Minimality, then we should strongly disfavor an account of GSP that involves head movement—covert or overt—from V-Reach to [Asp$_Q$<e>]. Even though one can safely assume that *catch* in (41) covertly moves to the *v* head to give it a <+Q> value, the probe sent down by [Asp$_Q$<e>] should still find *the bird* first rather than the head [*v* <*mov*: +Q>] since the former asymmetrically c-commands the latter. Thus, taking computational economy into consideration, it would be difficult to argue that [*v* <*mov*: +Q>] should raise to [Asp$_Q$<e>] via head movement. We will discuss possible motivations behind overt head movement in Mandarin in section 6.2.

[26] Unsurprisingly, Mandarin does not allow adverbs to appear as freely as in GSP. This is expected if there is head movement to [Asp$_Q$<e>]:

i) Laoying (man-man de) fei (*man-man de) jin-le senlin li.
Eagle (slow-slow DE) fly (*slow-slow DE) enter-LE forest inside
'The eagle slowly flew into the forest.'

with Figure little *v*'.[27] This derivation predicts that *quickly* cannot appear between verbs in a series, contrary to fact. However, if there is no head movement, the surface word order follows straightforwardly.

(47) Illicit derivation for (45) involving head movement



The same operation appears to be at work in Tati as well. In this language, V-reach is realized as *be-ras-* 'reach', as shown in the examples below.

(48) ferɛtitijɛ-ʃ o-ɢord be-bard tønd
boy girl-3SG.M PV-pick PV-carry quickly

be-ras-den-ast madrɛsɛ
PV-reach-CAUS-PST school
'The boy picked up the girl, carried her away to quickly (reach) the school.'

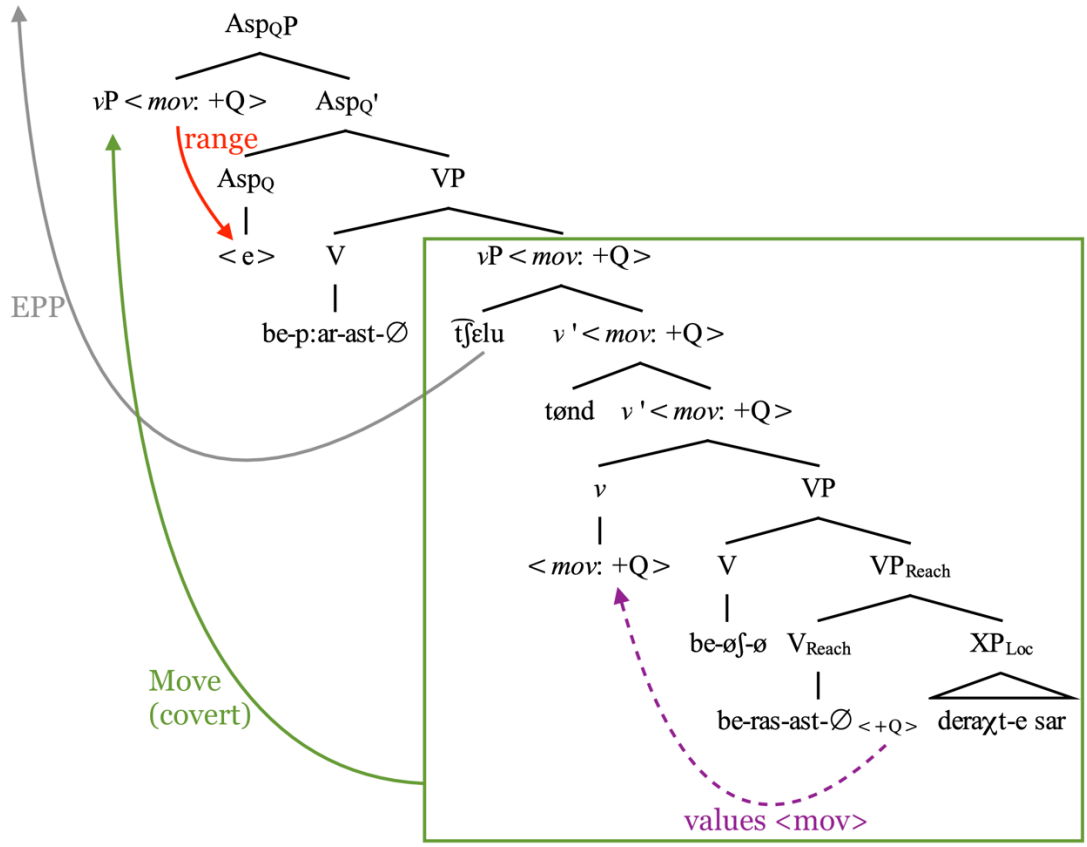
(49) t͡ʃɛlu be-p:ar-ast-Ø tønd be-øʃ-ø
sparrow PV-fly-PST-3SG.M ADV.quickly PV-go.PST-3SG.M

be-ras-ast-Ø deraχt-e sar
PV-reach-PST-3SG.M tree-OBL top
'The sparrow flew, quickly went, (and) reached the treetop.'

[27] Some GSP speakers find it acceptable to place *quickly* between *go* and *catch* in (45), suggesting that *quickly* can be even lower structurally.

As can be seen from the data, adverbs are free to intervene between two verbs in a series, which would be impossible if the verbs formed a complex head. Thus, the same argument against head movement in GSP also holds true for Tati. Below is the tree for (49).

(50)



In conclusion, while a V-Reach is crucial to motion telicity in all three languages, Tati and GSP contrast with Mandarin in that they do not employ head movement to assign range to [Asp$_Q$<e>]. We tentatively attribute this contrast to the morphophonological properties of the Mandarin *-le* suffix. This point will be revisited in section 6.2.

4.2. Seemingly Contradictory Cases: Quantity Argument as Range Assigner for [Asp$_Q$<e>]

In the last section, we argued that Mandarin employs head movement to satisfy the range requirement of [Asp$_Q$<e>]. Specifically, a V-Reach forms a complex with a <*mov*> feature, and the complex, which denotes a quantity Path, moves to the head of Asp$_Q$P and assigns range there. However, one may find telic sentences like the one below in Mandarin, where the *-le* suffix takes the Agentive Manner V *zai* 'drive' rather than *dao* as its stem. This appears to contradict our earlier argument.

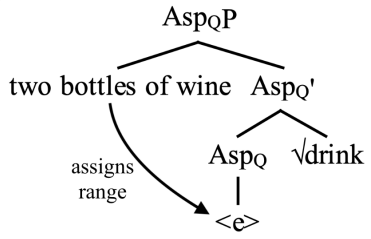
(51) Wo (zai yi xiaoshi nei) zai-**le** wu wei laoshi dao xuexiao.
1SG (be-at one hour inside) drive-LE five CLF teacher arrive school
'I drove five teachers to (the) school (in an hour)'

To understand why, consider the well-known observation—first attributed to Verkuyl (1972, 1989, 1996)—that a certain semantic property of internal arguments plays a crucial role in determining the telicity of a predicate. For Borer (2005b), that semantic property is quantity. In (52a), the internal argument *two bottles of wine* is both non-divisive and non-cumulative, thus quantity. That internal argument, according to Borer's analysis, is introduced in the specifier of Asp_QP and assigned accusative case. By virtue of being quantity, *two bottles of wine* assigns range to [Asp_Q<e>] from Spec Asp_QP, thereby turning the event denoted by (52a) into a quantity/telic one (see (53a)). On the other hand, the internal argument in (52b) is both divisive and cumulative, hence homogeneous. Therefore, it does not have the right semantic value to assign to [Asp_Q<e>], and as a result, Asp_QP cannot project. What projects instead is a functional shell that introduces the homogeneous internal argument and assigns it partitive case (see (53b))[28].

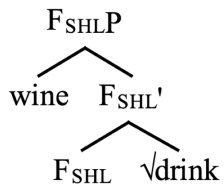
(52) a. He drank two bottles of wine (in ten minutes/*for ten minutes).
b. He drank wine (*in ten minutes/for ten minutes).

(53)

(a)



(b)



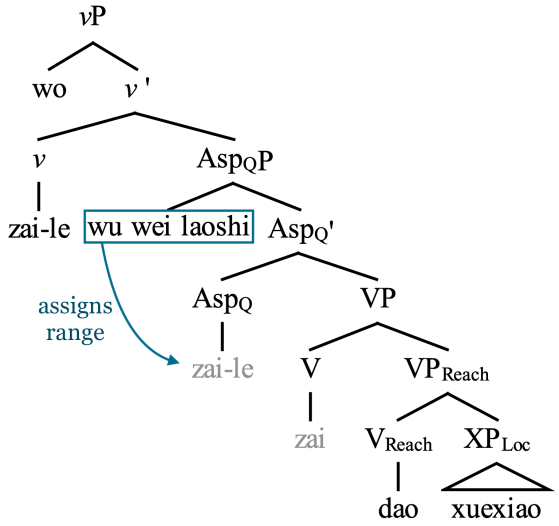
Returning to (51), we can account for it by proposing the structure in (54) below. Instead of being in the Specifier of the Figure little *v*P, the quantity DP *wu wei laoshi* 'five teachers' is introduced in the Specifier of Asp_QP, from which it assigns range to [Asp_Q<e>] in exactly the same way as illustrated in (53a). The Agentive Manner V *zai* 'drive' undergoes head movement to Asp_Q and becomes the stem for the suffix *-le* (which is base-generated in Asp_Q, as mentioned earlier). Subsequently, *zai-le* undergoes further head movement to the Agentive little *v*, as has been proposed by Huang et al. (2009).

[28] In languages such as Finnish, partitive and accusative case markings are morphologically distinct. A pair of examples are given below. Notice the interpretational difference between the two.

i) Anne rakensi talon.
Anne built house-ACC
'Anne built a/the house.'

ii) Anne rakensi taloa.
Anne built house-PRT
'Anne was building a/the house.'

(54) Derivation of (51)



According to Borer's (2005b) account, the DP *wu wei laoshi* receives a *Subject-of-Quantity* interpretation by assigning range to [Asp$_Q$<e>]. It "measures out" the event in Tenny's (1987) sense. That is, the quantity and progression of the event are measured by or mapped onto the number of teachers driven to school—with zero marking the beginning of the event and five marking its culmination. As expected, the most salient interpretation of (51) is that the number of teachers that I drove to school reached five in one hour—most likely in more than one trip—not that I reached the school in one hour with five teachers in my car.

Another point worth mentioning is that the most natural interpretation of *wu wei laoshi* in the context of (51) is five **non-specific** teachers. That is, even if there is a specific set of teachers that need to be driven to school, the sentence will be felicitous regardless of which five from the set are picked. Now, recall that in section 2.3 we made a distinction between Path and direction and pointed out that a Figure must be specific in order for its location to be tracked in space. According to this criterion, *wu wei laoshi* is not qualified to be interpreted as a Figure. Thus, in a telic structure like (54), with the Agent interpretation already assigned to *wo* 'I', *wu wei laoshi* has no choice but to receive a Subject-of-Quantity interpretation instead. Furthermore, the absence of a Figure means there is in fact no Figure little *v*P in (54), which in turn means the absence of a Path. (One cannot track the location of a Figure when there is no Figure.) Strictly speaking, then, this also means cases such as (51) are in fact not motion predicates at all, and they do not denote motion events in the sense adopted in this work (recall the discussion in section 2.3). The V-Reach *dao* in (54), therefore, is not able to have any effect on motion telicity because it is not embedded in a Path structure (a point already emphasized in section 4.1), and it is no surprise that *dao* does not move to the position of [Asp$_Q$<e>], as evidenced by the fact that it is not the stem for *-le*. Based on this analysis, we predict that a telic structure can no longer be sustained if the internal argument is both *non-specific* and *homogeneous* (i.e., *non-quantity*). That is, once an internal argument cannot function as a Figure or a Subject of Quantity, Asp$_Q$P can no longer project without crashing, and the structure will have to be interpreted as atelic, as the following English sentence shows:

(55) I drove teachers to school (for several hours/*in several hours).[29]

Similarly, the Mandarin sentence below also bears out this prediction. The bare noun *laoshi* can mean a specific teacher or an indefinite number of non-specific teachers, but the latter reading in the context of (56) results in atelicity, despite the presence of a V-Reach.

(56) Wo (*zai yi xiaoshi nei) zai laoshi dao xuexiao.
1st (*be-at one hour inside) drive teacher arrive school
Intended reading: 'I drove teachers to (the) school (*in one hour).'

The same pattern can also be found in the minimal pair in Tati below. In (57a), *zʌron* 'kids' is stressed as nouns are stressed by default in Tati: on the last syllable. In (57b), *zʌron* is not stressed; instead, the agreement suffix *-em* is stressed. The interpretations related to these examples are different: In (57a) *zʌron* has a non-specific sense, but in (57b) it is interpreted as specific. The former one has an atelic interpretation whereas the latter one is telic.[30]

(57) a. zʌˈron-em be-barˈd-i : be-ras-den-asˈt-i madrɛˈsɛ (Atelic)
kids-1SG.NOM PV-take.PST-PRF PV-reach-CAUS-PST-PRF school
'I have taken such kids to school.'

b. zʌroˈn-em be-barˈd-i : be-ras-den-asˈt-i madrɛˈsɛ
kids-1S.NOM PV.take.PST-PRF PV-reach-CAUS-PST-PRF school (Telic)
'I have taken the kids to school.'

Data from GSP provides further corroboration for this analysis. All four sentences below have the V-Reach *catch*, but they differ in the readings of their internal arguments. Sentence (58a) has *the patients* as its internal argument. With a definite article, this internal argument is both specific and quantity. Therefore, it can receive a Figure interpretation or a Subject-of-Quantity one without any problem. If it is the former, it will entail the presence of a Path structure, which will be rendered quantity by *catch*. If it is the latter, it will entail the absence of Path, and the argument will be introduced in Spec Asp_QP. Either way, [Asp_Q<e>] can be assigned range properly, and telicity will emerge. With a telic reading, the predicate is semantically compatible with the phrase *take two hours* (see (58a)), but not with *for two hours* (see (58b)). In sentences (58c) and (58d), the internal arguments are bare plurals and therefore are neither specific nor quantity. This means that they cannot be interpreted as Figures or Subjects of Quantity. The absence of a Figure means there is

[29] The example is intended to be interpreted as a single event. The temporal modifier *in several hours* is felicitous if the sentence is interpreted as a routine or habit. That is, I drove teachers to school routinely, and whenever I drove a teacher there, I did so in several hours. Such a reading is **not** what we are interested in here.
[30] Changes in intonations, which are mostly reflected on the verb, have been disregarded between these two sentences.

not a Path, let alone a quantity Path. Since there is no quantity Path or Subject of Quantity, [Asp$_Q$<e>] has no way to be assigned range, and atelicity is bound to emerge. Thus, the atelic event denoted by these two sentences is compatible with the phrase *for two hours* (see (58c)), but not with *take two hours* (see (58d)).

(58) a. I take two hours drive the patients go catch the hospital (Telic)
1SGSUB take two hour.PL drive DET patient.PL go reach DET hospital
'I drove the patients to the hospital in two hours'

b. *For two hours I drive the patients go catch the hospital (*Telic)
For two hour.PL 1SGSUB drive DET patient.PL go reach DET hospital
'For two hours, I drove the patients to the hospital'

c. For two hours, I drive patients go catch the hospital (Atelic)
For two hour.PL 1SGSUB drive patient.PL go reach DET hospital
'I drove patients to the hospital for two hours'

d. *I take two hours drive patients go catch the hospital(*Atelic)
1SGSUB take two hour.PL drive patient.PL go reach DET hospital
'I drove patients to the hospital in two hours'

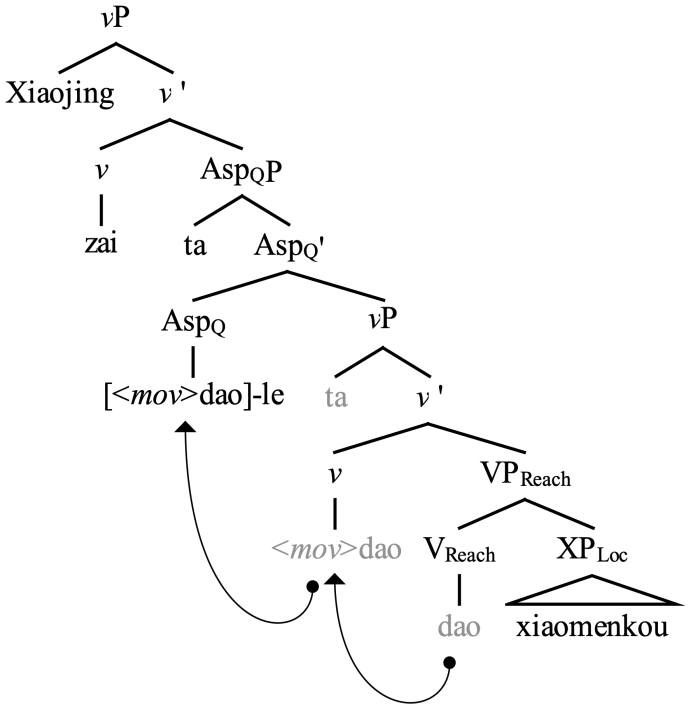
Let us return to sentence (51), reproduced below as (59). Contrast it with sentences (60) and (61), which have unambiguously specific internal arguments that take the form of personal pronouns. Being specific, these arguments qualify for receiving a Figure interpretation, which means the Figure little *v*P projects and a Path exists. The V-Reach *dao*, then, is able to undergo head movement, value <*mov*:___> with its <+Q> feature, and form a complex with it, which then assigns range to [Asp$_Q$<e>] in the way already described earlier. (See (62) for the derivation.)

(59) Wo (zai yi xiaoshi nei) zai-**le** wu wei laoshi dao xuexiao.
1SG (be-at one hour inside) drive-LE five CLF teacher arrive school
'I drove five teachers to (the) school (in an hour).'

(60) Xiaojing (zai wu fenzhong nei) zai ta dao-**le** xiaomenkou.
Campus police (be-at five minute inside) drive 3SG arrive-LE campus entrance
'The campus police drove him to the campus entrance (in five minutes).'

(61) Baba (zai ban xiaoshi nei) song wo dao-**le** jichang.
Father (bet-at half hour inside) send 1SG arrive-LE airport
'Father drove me to the airport (in half an hour).'

(62) Derivation of (60)[31]



[31] The derivation requires some elaboration. First, the third person pronoun *ta* appears to move to Spec AspQP even though it is not responsible for assigning range to [AspQ<e>]. Pending future investigation, we tentatively attribute it to the internal argument's need for accusative case, as Spec AspQP is hypothesized by Borer (2005b) to be a case-assigning position. Alternatively, it is also plausible that the internal argument is not introduced until [<*mov*>dao] has moved to [AspQ<e>]. When it is finally introduced, it is introduced in Spec AspQP and receives a Figure interpretation in agreement with the semantics of <*mov*> (recall the close connection we hypothesized between Figure and Path in section 2.3). Notice that in XSM, functional projections are completely void of semantic content prior to range assignment. Following this logic, the interpretations of AspQP and the argument it introduces are entirely dependent on the range assigned to its empty head. It is, therefore, quite natural and logical for AspQ to introduce a Figure when the range assigned to [AspQ<e>] denotes a quantity Path. Second, based on trees (54) and (62) as well as the word order in (60), the verb *zai* 'drive' appears to undergo head movement in (54) but not in (62). This discrepancy is related to the point we brought up in footnote 10 and can be explained as follows. Adopting Folli and Harley's (2020) analysis of the Agentive *v*P structure and Matushansky's (2006) account of head movement, we may say that in Mandarin, a verb—or more accurately, a root—that denotes Agentive manner may undergo external Merge with an Agentive *v*'. Afterwards, the root undergoes morphological Merge (m-Merge) with the Agentive little *v* head, ending up in the position of the verb *zai* in (62). (For details, see Folli and Harley (2020).) According to this analysis, there is in principle no rule requiring an Agentive Manner V to merge below AspQ as in (54). The reason that *zai* merges in a lower position in (54) than in (62), we propose, is because the suffix *-le* needs morphological support from a root. In other words, *-le* needs a verb to be its host. Since *dao* 'arrive' does not move up in (54), *-le* in AspQ would remain without a host if *zai* merged above AspQP. Therefore, *zai* must appear in AspQ before moving up to the Agentive *v*. In contrast, *-le* in (62) has morphological support as a result of *dao* undergoing head movement. Thus, there is no need for *zai* to merge below AspQ before moving up to the Agentive *v*. Indeed, the fact that sentence (i) below is not acceptable under the intended reading suggests it never does. It is likely because merging below AspQ would inevitably result in more steps in the derivation of (62) than merging above AspQP. The grammar, therefore, opts for the latter in accordance with some sort of economy principle.

i) *Wo zai dao-le ta xuexiao.
1SG drive arrive-LE 3SG school
Intended reading: 'I drove him to (the) school.'

It should be noted that although our Mandarin-speaking participants strongly prefer (60) to an alternative like (63), where *-le* is suffixed to the Agentive Manner V rather than *dao*, they do not outright reject (63) as ungrammatical. This is not unexpected, since the internal argument *ta* is technically quantity and therefore should still be able to function as a range assigner to [Asp$_Q$<e>]. For some reason, however, it seems more natural to our participants to measure out the progression of the event using the quantity Path, with the culmination being the reaching of the campus entrance. Perhaps a personal pronoun is not preferred as a Subject of Quantity in this case because its quantity is not as explicitly expressed as in the case of (59), where the numeral *wu* 'five' is used. This may have some psychological effect on how easy it is for a speaker to construe a DP as a Subject of Quantity. We leave this issue for future research[32].

(63) ??Xiaojing zai-**le** ta dao xiaomenkou.
Campus police drive-LE 3SG arrive campus entrance
'The campus police drove him to the campus entrance.'

Interestingly, we observe the opposite preference for (59) over (64). ((59) is reproduced as (65) below.) We interpret this preference as a result of the participants tending to interpret the DP *wu wei laoshi* as non-specific and therefore a Subject of Quantity. The reason they do not completely reject (64) is presumably because Mandarin does not prohibit a specific reading of *wu wei laoshi* even though it does not appear to be as salient as the non-specific reading to our participants. When *chaoguo* 'more than' or *zhishao* 'at least' is added to the internal argument, making it unambiguously non-specific (but still quantity), the contrast becomes sharper (see (66) and (67))[33].

(64) ?Wo (zai yi xiaoshi nei) zai wu wei laoshi dao-**le** xuexiao.
1SG (be-at one hour inside) drive five CLF teacher arrive-LE school
'I drove five teachers to (the) school (in an hour).'

(65) Wo (zai yi xiaoshi nei) zai-**le** wu wei laoshi dao xuexiao.
1SG (be-at one hour inside) drive-LE five CLF teacher arrive school
'I drove five teachers to (the) school (in an hour).'

[32] A quick Google search with the string *zai ta dao le* in Chinese characters returned more than ten pages of results, with each page displaying ten results. With the string *zai le ta dao* (also in Chinese characters), the search returned only one page displaying nine results. (The searches were conducted on December 12, 2021.) Similarly, the string *song wo dao le* returned ten pages of results, whereas *song le wo dao* returned only one page (search conducted on January 27th, 2022). While not a rigorous corpus study, these results indicate a pattern consistent with our participants' judgments.

[33] One participant found (66) more acceptable with *-le* appearing after *dao* than after *zai*, but she added that she would put *-le* in both places at the same time because that would be even more natural for her. It thus appears that the participant parsed (66) as containing two conjoined predicates rather than a single one and based her acceptability judgment on that parse.

(66) Wo (zai yi xiaoshi nei) zai-(le) chaoguo wu wei laoshi
1SG (be-at one hour inside) drive-(LE) exceed five CLF teacher

dao-(??le) xuexiao.
arrive-(??LE) school
'I drove more than five teachers to (the) school (in an hour).'

(67) Wo (zai yi tian nei) song-(le) zhishao san wei lüke
1SG (be-at one day inside) send-(LE) at least three CLF tourist

dao-(??le) jichang.
arrive-(??LE) airport
'I drove at least three tourists to the airport (in one day).'

Furthermore, when a demonstrative is added to the internal argument and specificity is therefore unambiguously expressed, our participants report a better acceptability with *-le* appearing immediately after *dao* (see (68)). We interpret this observation as a result of the internal argument being unambiguously qualified to be a Figure. And if the argument is indeed interpreted as such, a quantity Path will be available to assign range. It thus appears that in the case of Mandarin, how readily an internal argument is interpreted as specific or merely quantity affects how acceptable it can be for *dao* to raise to Asp_Q. Some of the contrasts shown here may be subtle, but insofar as they exist, they are in line with our hypothesis.

(68) Wo zai ?(**na**) wu wei laoshi dao-le xuexiao.
1SG drive ?(that) five CLF teacher arrive-LE school
'I drove (**those**) five teachers to (the) school.'

We now have seen that homogeneous internal arguments can yield atelicity even when there is a V-Reach. The opposite are cases where quantity internal arguments can give rise to telicity despite the absence of a V-Reach. In GSP, a sentence like (69), below, which does not have *catch* but is nonetheless interpreted as telic may appear to contradict the argument made in section 4.1:

(69) Kwame push six boxes go the garage in direction
Kwame push six box.PL go DET garage PD direction
'Kwame pushed 6 boxes in the direction of/towards the garage.'

In the first place, we can establish the telic interpretation of the sentence by using the *in x time* test. In other words, if the sentence is felicitous with the temporal limitation such as *in 1 hour* then the sentence can be said to have a telic interpretation. Thus, let us consider (70) below:

(70) Kwame take one hour push six boxes go the garage in direction
Kwame take one hour push six box.PL go DET garage PD direction
'Kwame pushed six boxes towards the garage in one hour.'

The fact that adding *take one hour* to the sentence does not render it infelicitous confirms that it has a telic interpretation. The source of telicity, of course, is the DP *six boxes*, which assigns range to [Asp_Q<e>] and receives a Subject-of-Quantity interpretation in return. As with many previous examples above that obtain telicity this way, the DP *six boxes* "measures out" the progression of the event of (70). That is, the culmination of the event is not the arrival at the garage, as nothing in the sentence tells us the six pushed boxes actually reached there. Instead, the culmination that accompanies the telic reading of this event comes from the interpretation that the number of boxes pushed toward the garage reached six by the end of one hour. In other words, it is a quantity rather than a destination that was reached. On the other hand, if, instead of a quantity object (i.e., six boxes), one uses a homogeneous object (i.e., boxes) as the internal argument, the sentence cannot be interpreted as telic because nothing in the predicate can assign range to [Asp_Q<e>]. For example,

(71) Kwame (*take one hour) push boxes go the garage in direction
Kwame (*take one hour) push box.PL go DET garage PD direction
'Kwame pushed boxes towards the garage (*in one hour).'

In this case, the sentence fares better when the *for x time* temporal modifier (which is used to determine atelicity) is used, as in (72) below:

(72) For one hour, Kwame push boxes go the garage in direction
For one hour Kwame push box.PL go DET garage PD direction
'Kwame pushed boxes towards the garage for one hour.'

To summarize, a quantity internal argument—whether it is specific or not—can assign range to [Asp_Q<e>] and receive a Subject-of-Quantity interpretation as a result. When this happens, the event has no Figure and cannot be interpreted as a motion event, and the resulting predicate is not a motion predicate. Unlike motion telicity, the culmination of which comes from spatial transitions such as the reaching of a physical destination, telic interpretations that result from Subjects of Quantity are a far more abstract kind of transitions—namely, the reaching of a quantity. When telicity is obtained this way, whether the predicate has a V-Reach or not plays absolutely no role in determining telicity because there is simply no Path, let alone a quantity Path that [Asp_Q<e>] could receive its range from. A homogeneous internal argument, on the other hand, is eligible for neither the Subject-of-Quantity role nor the Figure role. Hence, whenever it appears, the predicate must be atelic.

For better understanding, see the table below, which shows various derivations and their outcomes discussed in this section. *DP* in this table stands for the internal argument of a predicate. The term *VP-Reach* here encompasses any phrase that contains a verb, preposition, particle, etc. that can render a Path quantity if embedded in one, e.g., the English preposition *to*.

(73) Possible Derivations and Outcomes

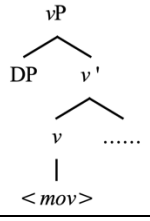
Scenario	Step 1	Step 2	Step 3	Step 4	Step 5
1	Build up a VP-Reach.	VP-Reach merges with Figure *v*. Introduce a specific DP in Spec *v*P.	**Motion reading emerges** due to Step 2. *v*P represents a Path, which is quantity due to Step 1. **DP is interpreted as Figure.**	*v*P merges with Asp_Q, which uses the quantity Path from Step 3 as source of range.	Asp_Q receives range. **Telic reading emerges.**
	E.g., sentence (61)				
2	Build up a VP-Reach.	VP-Reach merges with a Figure *v*. Introduce a non-specific DP in Spec *v*P.	**Derivation fails**. C-I system is unable to track the location of a non-specific entity.		
	E.g., sentence (67) with *-le* suffixed to *dao*				
3	Build up a VP-Reach	VP-Reach merges with Asp_Q. Introduce a quantity DP in Spec Asp_QP.	Asp_Q uses quantity DP from Step 2 as source of range. **Telic reading emerges. DP is interpreted as Subject of Quantity.**		
	E.g., sentence (59)				
4	Build up a VP-Reach	VP-Reach merges with Asp_Q. Introduce a homogeneous DP in Spec Asp_QP.	Asp_Q cannot use homogeneous DP from Step 2 as source of range. Search elsewhere.	Asp_Q cannot find a quantity Path as source of range because there is no Figure *v*P at all, which would represent a Path.	Asp_Q cannot receive any range. **Telic reading fails to emerge.**
	E.g., sentence (58c)				
5	Build up a constituent without VP-Reach.	Merge the constituent from Step 1 with Figure *v*. Introduce a specific DP in Spec *v*P.	**Motion reading emerges** due to Step 2. *v*P represents a Path, which is homogeneous due to lack of VP-Reach	*v*P merges with Asp_Q, which cannot use the homogeneous Path from Step 3 as source of range.	Asp_Q cannot receive any range. **Telic reading fails to emerge.**[34]

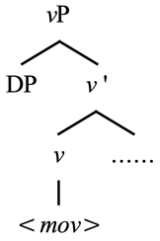
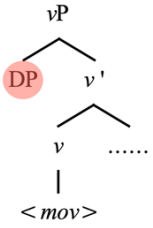
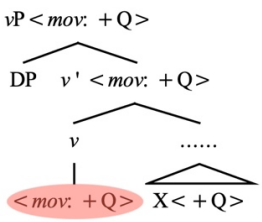
[34] Of course, if Asp_QP introduces a quantity expression at Step 4, a telic reading can still emerge. In scenario 5, such an expression could be a frequentative phrase, such as *three times*, *twice*, etc.

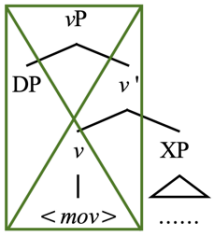
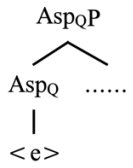
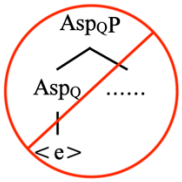
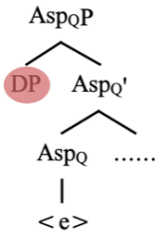
			from Step 1. **DP is interpreted as Figure.**	No quantity DP can be found in Spec Asp_QP, either.	
	E.g., "I pushed the cart toward the lamppost for ten minutes."				
6	Build up a constituent without VP-Reach.	Merge the constituent from Step 1 with Figure *v*. Introduce a non-specific DP in Spec *v*P.	**Derivation fails**. C-I system is unable to track the location of a non-specific entity.		
7	Build up a constituent without VP-Reach.	Merge the constituent from Step 1 with Asp_Q. Introduce a quantity DP in Spec Asp_QP.	Asp_Q uses quantity DP from Step 2 as source of range. **Telic reading emerges. DP is interpreted as Subject of Quantity.**		
	E.g., sentence (70)				
8	Build up a constituent without VP-Reach.	Merge the constituent from Step 1 with Asp_Q. Introduce a homogeneous DP in Spec Asp_QP.	Asp_Q cannot use homogeneous DP from Step 2 as source of range. Search elsewhere.	Asp_Q cannot find a quantity Path as source of range because there is no Figure *v*P at all, which would represent a Path.	Asp_Q cannot receive any range. **Telic reading fails to emerge.**
	E.g., sentence (72)				

Finally, let us summarize all the key concepts that have been covered so far and the relations between them:

(74)

Key concept	How this concept is interpreted by the C-I system	How this concept is represented by the language module	Properties of this concept that are crucial for the C-I system	How those crucial properties manifest in language via interface with the C-I system
(translational) motion	An entity changes its location in space in a given time frame.	The feature <*mov*> and the Figure *v*P it assigns range to. This piece of structure turns a predicate into a motion predicate. 	To know whether an entity changes its location, one must be able to track it. Thus, a motion event is a tracking event.	Not relevant to this study, but see section 6.1 for future research suggestions

Path	The trajectory drawn based on the entity's earlier location and its later location. If there is no motion, there is no Path, and vice versa.	The feature <*mov*> and the Figure *v*P it assigns range to. Path includes the constituents dominated by *v*P. 	Path cannot exist without tracking the location of an entity. Therefore, if there is nothing to track, there is no Path or motion.	If the Figure *v*P exists, it turns the event into a motion event. It also turns whatever constituent it dominates into part of the Path Component. Moreover, it makes sure there is an entity to track by introducing a DP in its specifier.
Figure	The entity which changes its location in a motion event and whose location is being tracked. If there is no Figure to track, there is no motion or Path, and vice versa.	The DP that is introduced by the Figure *v*P in the specifier position 	Must be specific because one cannot track the location of an entity without specifying which entity to track, and the ability to track a figure by distinguishing a specific individual from other members of its kind is highly likely to be an innate cognitive capacity and present in other species. See Marcus (2001, p. 153).	The use of definite articles, demonstratives, pronouns, or whatever grammatical elements that can yield a specific reading of the DP introduced in Spec *v*P, depending on the language.
Quantity Path	A Path that is a closed scale in the sense of Rappaport Hovav and Levin (2010)	A <*mov*> feature with a <+Q> value from an element in its c-command domain, typically from a V-Reach. <*mov*: +Q> can be a source of range for [Asp$_Q$P]. 	No crucial properties relevant to this study, but see section 6.1 for future research suggestions	Not relevant to this study, but see section 6.1 for future research suggestions

Direction	The trajectory drawn from one location to another	It can be thought of as the constituent left out by taking away the Figure *v*P from a Path Component. 	Direction can be mentally constructed without a Figure. All it needs is two (or more) locations.	Because a direction can exist without a Figure, there is no need to have *v*P in the structure to introduce a DP.
Quantity/ Telic Event	An event that is non-divisive, non-cumulative, or both.	A functional projection called Asp_QP. When its empty head is properly assigned range, a telic reading emerges. May receive range from a quantity Path. 	The opposite of a quantity/telic event is a homogeneous/atelic event.	A structure without Asp_QP denotes an atelic/homogeneous event. This may be due to a lack of range assigners for [Asp_Q<e>]. 
Subject of Quantity	An entity whose quantity is used to measure the progression of an event. E.g., 0 is the beginning and 5 is the end of an event of *eating 5 apples.*	A DP that is introduced in the specifier of Asp_QP and responsible for assigning range to [Asp_Q<e>] 	A Subject of Quantity must be quantity. Otherwise, it cannot be used to measure the progression of an event. Being specific entails being quantity, but not vice versa. Thus, Subjects of Quantity are not always specific.	The use of quantity expressions on the DP, such as *five*, *a*, *several*, *more than ten*, *many*, etc. Since being specific entails being quantity, the use of definite articles, pronouns, demonstratives, etc. is possible, too.

5. Theoretical Contributions and Implications

In section 4.2, a number of cases were presented to show that telicity may arise from the presence of a quantity internal argument rather than a quantity Path. Those cases had internal arguments that assigned range to [Asp_Q<e>] and received a Subject-of-Quantity interpretation rather than a Figure interpretation. Due to the lack of a Figure, those cases did not have a Path and—strictly speaking—were not motion predicates according to the definition adopted in this work.

Importantly, a DP needs to be quantity to receive a Subject-of-Quantity interpretation, and specific to receive a Figure interpretation.

It should be noted that Borer (2005b, pp. 209-213) made a similar observation when examining the following cases:

(75) a. Kim pushed carts to New York (for several hours/*in several hours).
b. Kim pushed the carts to New York in several hours.

She pointed out that for (75), "in spite of the presence of a delimiting expression, the quantity nature of the direct object continues to play a crucial role in determining the nature of the event" (p. 210), and that "[d]elimiters such as *to New York* would have to be viewed as (optional) Asp_Q modifiers in such contexts, allowing, but not requiring, the projection of Asp_Q" (p. 211). What was problematic, as she noted, was that for intransitive cases, such a delimiter "*is* a range assigner to [Asp_Q<e>], thereby allowing quantity interpretation without a quantity DP in [Spec, Asp_Q]" (p. 211). However, she did not identify the factors that determine whether a "delimiter" is a modifier or a range assigner for Asp_Q and left it for future research. The present work is an attempt to fill this gap. Again, according to our account, a V-Reach (i.e., what Borer calls a delimiter in the quotes above) is never really able to assign range to [Asp_Q<e>] directly. It must first be embedded in a Path structure—represented by the *v*P that introduces a Figure—and render that structure quantity. Only then can [Asp_Q<e>] be assigned range by the quantity Path. Furthermore, the present account requires an argument to be *specific* in order to receive a Figure interpretation, based on the reasonable assumption that in order to track the location of an entity in a space, one must first specify what that something is. While *carts* in (75a) is clearly existential, it is not specific and thus not eligible for a Figure interpretation. Without the projection of a Figure *v*P, there is no Path to speak of, and the delimiting expression *to New York* has no effect on telicity. Having essentially the same grammatical function as *to the valley* in (76), *to New York* in (75a) denotes the **direction** in which carts were pushed. It does not denote a Path, and the predicate does not denote a motion event in the sense adopted here. Thus, while Borer (2005b) correctly concluded that delimiting expressions such as the one in (75a) do not contribute to telicity, we have taken one step further by proposing an account that explains **why** they do not do so.

(76) For years, the river flowed from the mountaintop to the valley.

We propose a test that can determine whether a sentence denotes an event that involves a Path or one that involves a direction. It can be formulated as follows:

(77) Let α be a sentence whose denotation involves a trajectory *T*. Let β be the DP in α that denotes the undergoer(s) of *T*. The sentence α denotes an event where *T* is a direction if one of the following is true:

(i) A scenario can be constructed where α is felicitous and the entity (or entities) denoted by β do(es) not change its(their) location on *T*.
(ii) A scenario can be constructed where α is felicitous and the entity (or entities) denoted by β is(are) found in more than one location on *T* simultaneously.

α denotes an event where *T* is a Path (i.e., a motion event) if neither (i) nor (ii) can be met.[35]

To illustrate, *the river* in (76), though a specific DP, refers to something that did not change its location throughout the event. Under the normal interpretation, the river did not shift its existence from the mountaintop to the valley. According to (77i), therefore, the event is not a motion event, and no Path is involved. As for (75a), its most salient reading is one in which there were entities called *carts* in New York and somewhere not in New York simultaneously, and Kim was coming back and forth between the two locations to do the pushing. Based on (77ii), it is not a motion event, either. Even with (78) below, as long as *six rocks* is not interpreted as specific, it is quite easy to imagine that six rocks could be found both inside and outside the forest at any point during the event. In fact, it would be hard to imagine otherwise, given common knowledge about the natural world.

(78) I threw six rocks into the forest.

In contrast, under the normal interpretation of (75b), the entities denoted by *the carts* did change their location—from outside of New York to inside of New York. By the end of the event, we would not have found any of the carts outside the state. Condition (77i) is thus not met. Furthermore, at no point during the event would we have found in more than one location entities that could be referred to as *the carts*. What we would have found both inside and outside of New York simultaneously would have been entities that could only be properly referred to as *some of the carts*. Thus, (77ii) is not met, either, and (75b) does denote a motion event.

Let us now consider an alternative analysis of the patterns discussed thus far. According to this analysis, the distinction between Path and direction is purely a conceptual difference and has no effect on the grammar. A delimiting expression, such as *to New York*, is all it needs to yield motion telicity. Sentences like (75a) will be treated as telic in the *core event* (however it is defined), and the atelic reading only emerges when the core event is understood to repeat indefinitely. Based on

[35] The test being proposed here is based on the definition of motion events given in section 2.3. To repeat, a motion event is an event in which an entity changes its location in the time period under consideration. It should be clear without any explanation that this definition is incompatible with (77i). As for (77ii), it is based on the premise that if something changes its location, it cannot be in its current and previous locations simultaneously. Thus, if something can be in two places at once, it is most definitely not a Figure. Like most tests, however, this one is not foolproof. It works well on quantity trajectories but not so well on homogeneous trajectories. It also tends to run into trouble with cases that involve multiple destinations, such as *driving the cars to those parking lots.* The issue, we believe, lies in the need for a well-defined notion of **location**, which, in turn, requires a well-developed account of how the human mind perceives and carves out space.

this view, (75a) **is** telic in its core due to the presence of *to New York*, but the direct object *carts* gives it an indefinitely iterative reading, thereby turning the core event atelic.

A view similar to this one can be found in Ramchand (2008). When discussing cases like (75a), she notes that "the unboundedness emerges not because of the homogeneity of the core event, but because the core event is being indefinitely repeated/iterated once each for every individual within the plural set" (p. 31). Furthermore, she treats these cases as cases "of external aspect, which needs to be excluded when analysing the phenomenon of aktionsart or event building that will be the job of the lowest portion of the clause" (p. 31).

Now, if such a view is to be adopted, one must ask what constitutes a *core event*. Based on the quotes from Ramchand (2008) above, one could analyze (75a) as having a core event of *Kim pushing a cart to New York*, which was telic but became atelic when iterated indefinitely. But (75a) is also felicitous for a scenario where every time Kim did a pushing, she pushed more than just one cart. Moreover, it could be that Kim never pushed the same number of carts twice. For instance, perhaps the first time she pushed two carts, the second time three carts, the third time four carts, so on and so forth for several hours. What, then, is the core of the atelic event denoted by (75a)? One answer could be that the core event is an event that can be denoted by (75a). However, since the PP *to New York* should be sufficient for a telic reading of the core event according to this alternative view, (75a) cannot be the core because it is atelic. Another answer, perhaps more in line with the spirit of Ramchand (2008), is that the core is an abstract structure like the following:

(79) [*Initiator X* **push** [*Undergoer Y* <push> [**to** *Destination Z*]]]. (single iteration)

In this abstract structure, the quantity of the initiator, undergoer, and destination does not matter. It only becomes relevant to telicity when an aspectual head—perhaps something akin to Asp_Q—appears **outside** the structure of the core event and the arguments somehow interact with that head, yielding telic or (iterative) atelic readings based on their quantity semantics. The core event, again, is telic simply by virtue of having a PP headed by *to*.

But, if this answer is to be accepted, then we are no better off than when we started. Specifically, there is still a need for an account of **when** and **how** the argument(s) can interact with this aspectual head sitting outside the core event structure. Returning to the most basic contrast illustrated by the pair in (80) as an example, since the initiators, undergoers, and destinations are exactly the same, why should (80a) be telic and (80b) be atelic? One may reply that the arguments simply do not interact with the aspectual head at all in (80a) or (80b), and that the nature of the PP's in the core event structures makes all the difference.

(80) a. I pushed the cart to the lamppost in ten minutes.
b. I pushed the cart toward the lamppost for ten minutes.

Such a reply is fine until the pair in (81) is encountered. If none of the arguments in (81a) (same with (80a)) interacts with the aspectual head above the core event structure, why must *carts*

in (81b) interact with it and yield an iterative, atelic interpretation? Under what conditions does the quantity property of arguments or the lack thereof matter? Under what conditions does the quantity property of a Path or the lack thereof matter? Such an alternative analysis would lead us back to where we started, with the same questions that have been answered by this paper.

(81) a. I pushed the cart to the lamppost in ten minutes.
b. I pushed carts to the lamppost for ten minutes.

Moreover, any alternative analysis must address the same linguistic patterns found in the data presented here. For instance, why does the Mandarin suffix *-le* not always appear immediately after a V-Reach? What kind of interpretation arises when it does not? How do we explain speakers' preferences for one of its syntactic positions over the other? We believe the present work has sufficiently addressed them.

From the discussion above, it should be clear now why the distinction between Path and direction is an important one to make, and why we should clearly define what a motion event is and what specific properties each of its components holds. Without the distinction and relevant definitions, we would be tempted to lump various cases, such as (81a) and (81b), into one single ill-defined category labeled as "motion predicates," and consequently, we would be forced to concede that "motion predicates" sometimes obtain a telic reading from a V-Reach (as (80a) and (80b) show) but other times do not (as (81a) and (81b) show). What is worse is that we would not have a **principled** way to predict **when** telicity obtains because we would not know **what determining factors** come into play under **what conditions** and—most importantly—**why** they come into play under those conditions. It is precisely these issues that this paper addresses.

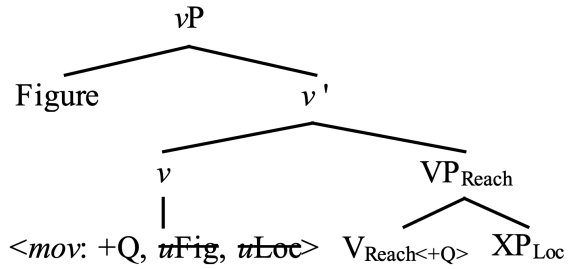
6. Remaining Questions for Future Research

There are some remaining issues that cannot be fully addressed in this paper. We offer some speculative comments here, but well-developed accounts of these issues must require further research.

6.1. XP-Loc and Feature Checking

Recall we hypothesized in section 2.3 that a Path is calculated based on the Figure's earlier and later locations in space. Following this intuition, it seems reasonable to suggest that the Ground in a motion event, denoted by an XP-Loc, must be specific, too. Let us pursue this line of reasoning a little further and postulate that the feature <*mov*> always comes with two uninterpretable features <*u*Loc> and <*u*Fig>, the former checking with a locative phrase denoting a specific location, the latter a specific Figure (see (82)). Essentially, <*mov*> ties together a specific entity and a specific location in space. This formalization captures the intuition that a motion event is basically an event of tracking the location of a Figure.

(82)



The relation outlined above has some interesting implications. First, the argument introduced by this Figure *v*P must be specific, or the uninterpretable feature <*u*Fig> would not be checked. Second, it requires that there be a specific locative expression in the c-command domain of *v*. This could be a locative adverb (e.g., *there*), a dectic morpheme (e.g., *come*), or simply a DP denoting a specific Ground (e.g., *this airport*). Of course, the languages under discussion here allow well-formed sentences like the one below, in which the goal DP is quantity but non-specific:

(83) Wo (zai san fenzhong nei) jinru-le zhishao liang jian fangjian.
1SG (be-at three minute inside) enter-LE at least two CLF room
"I entered at least two rooms in three minutes."

In this case, however, we predict that no Figure little *v*P can project because *zhishao liang jian fangjian* 'at least two rooms' does not denote a specific location and therefore cannot check the <*u*Loc> feature that comes with <*mov*>. The telic reading of (83), then, stems from the quantity semantics of *zhishao liang jian fangjian*, not from a quantity Path. Unsurprisingly, when a goal DP is homogeneous (i.e., neither specific nor quantity), no telic interpretation can emerge even if there is a (phonologically null) V-Reach:

(84) For hours, she push the cart go customers dema cars
For hour.PL 3SGSUB push DET cart go customer.PL 3PD car.PL
'For hours, she pushed the cart to customers' cars.'

Examples like this, once again, show that a V-Reach by itself is not enough to yield motion telicity. A lot depends on its syntactic environment. We leave a detailed analysis of predicates with quantity and homogeneous goal DP's for future research.

6.2. Why Overt Head Movement?

We have shown that Mandarin, GSP, and Tati use different syntactic operations to express motion telicity. The next question is why this should be the case. Put differently, why does Mandarin seem to be the odd one out in using overt head movement as a range assignment method whereas the other two languages resort to a different strategy? We think answering this question from a

synchronic perspective is just as difficult as explaining, say, why *wh*-words move to Spec CP in English but stay in-situ in Mandarin, or why there is overt *v*-to-T movement in French but not in English. Nevertheless, we offer a tentative explanation below, while keeping in mind that a truly satisfying solution may not be available without serious diachronic research into the three languages.

To begin, let us assume that the range assignment strategy employed by GSP and Tati is the more "economic" one in that it respects Minimality (see footnote 25) and generally requires fewer instances of movement. (Remember that head movement cannot be done in one fell swoop without violating the Head Movement Constraint.) The question now becomes: Why does Mandarin adopt the seemingly less economic option of overt head movement?

Suppose that the Mandarin suffix *-le* is the spell-out of an Asp_Q head that has been properly assigned range.[36] In line with the common treatment of *-le* as a suffix to verbs (e.g., Huang et al. 2009, p. 102), suppose further that when spelled out, it needs to attach to a root because of its morphological properties. If so, the reason why *dao* 'arrive' has to raise to [Asp_Q<e>] overtly becomes transparent. If the movement were covert, it would mean that the Asp_Q head would never get spelled out, and *-le* would never be phonologically realized. Furthermore, if Mandarin did not employ head movement but instead overtly moved a quantity Path—i.e., a Figure little *v*P with the feature <*mov*: +Q>—to the specifier of Asp_QP, there would be no way to ensure that *-le* will be spelled out with a verbal stem. To see why, consider the example below, which does not have a Manner V:

(85) Wo zhongyu dao-le ni jia.
1st finally arrive-LE 2nd home
"I have finally arrived at your home."

Assuming Mandarin employs phrasal movement. Right before the sentence above is spelled out, it should have the structure below. The *v*P<*mov*: +Q> assigns range to [Asp_Q<e>] from Spec Asp_QP, but because *dao* did not undergo head movement and therefore is not in Asp_Q, it is impossible for *-le* to spell out where it appears in (85). Even more troubling is the fact that *-le* is now completely without a verbal stem—a result that is difficult to reconcile with its suffixal status.

(86) [$_{TP}$ wo [$_{AspQP}$ [$_{vP<mov: +Q>}$ dao$_{<+Q>}$ ni jia] [$_{AspQ'}$ <e> [$_{vP<mov: +Q>}$ wo dao$_{<+Q>}$ ni jia]]]]

[36] Things are actually much more complicated than that. Due to the limitation of space, we are setting aside the thorny issue of where the perfective reading of *-le* comes from. Suffice to say, we propose that above Asp_QP, there is a functional projection for viewpoint aspect. This projection takes in a quantity event as input and returns an interpretation that focuses on the culmination of that event. *-Le* is the spell-out of Asp_Q in combination of the head of that viewpoint aspect projection. This proposal would correctly rule out any occurrence of *-le* in a progressive predicate whose inner aspect is telic, assuming that progressive blocks culmination in Mandarin just as it does in English. See Borer (2005b, p. 240) on progressive *-ing* and telicity in English.

In short, it seems that Mandarin uses overt head movement for range assignment because it has a unique morphological realization of Asp_Q. In contrast, there is no evidence that GSP and Tati have any overt realization of this head, which is why they may default to a more economic option.

6.3. Syntactic Behaviors of Other Path Elements in Mandarin

In the last section we explained why the V-Reach in Mandarin is different from those in GSP and Tati in terms of movement. However, within Mandarin, is V-Reach also different from other elements in the Path Component? In other words, are other Path elements subject to the same head movement operation? In this section, we lay out the reason why we think the V-Reach *dao* is not much different from other elements that can yield motion telicity in Mandarin. At the same time, we also point out a sentence pattern that is related to the present topic but cannot be fully addressed here due to space limitations.

To start off, given the discussion in section 6.2, it seems a reasonable prediction that other Mandarin elements that can render a Path quantity will undergo head movement to [Asp_Q<e>] just as *dao* 'arrive'. This prediction appears to be correct. Consider the following pattern with *jin* 'enter' and *chu* 'exit', two verbs that are classified by Lin (2015) as *two-point closed scale motion morphemes* and therefore should give the <*mov*> feature a <+Q> value in our system:

(87) Xiaoniao (zai san miao ne) fei(*-le) jin(-le) niaochao.
Small bird (be-at three second inside) fly(*-LE) enter(-LE) bird nest
'The birdie flew into the nest (in three seconds).'

(88) Xiaoniao (zai san miao ne) fei(*-le) chu(-le) niaochao.
Small bird (be-at three second inside) fly(*-LE) exit(-LE) bird nest
'The birdie flew out of the nest (in three seconds).'

It clearly resembles the pattern with *dao* 'arrive' that we showed in section 4.1. That is, *-le* does not suffix to the Manner V, suggesting that the V-Enter and V-Exit, just like V-Reach, must undergo head movement to [Asp_Q<e>] and form a complex head with the Manner V on their way. In this respect, the Mandarin V-Reach does not seem to be all that different from other elements that can render a Path quantity.

Let us turn to a sentence pattern that shows a different syntactic behavior of certain Path elements. Consider the following video prompt we used in this study and a sentence it elicited in (89):

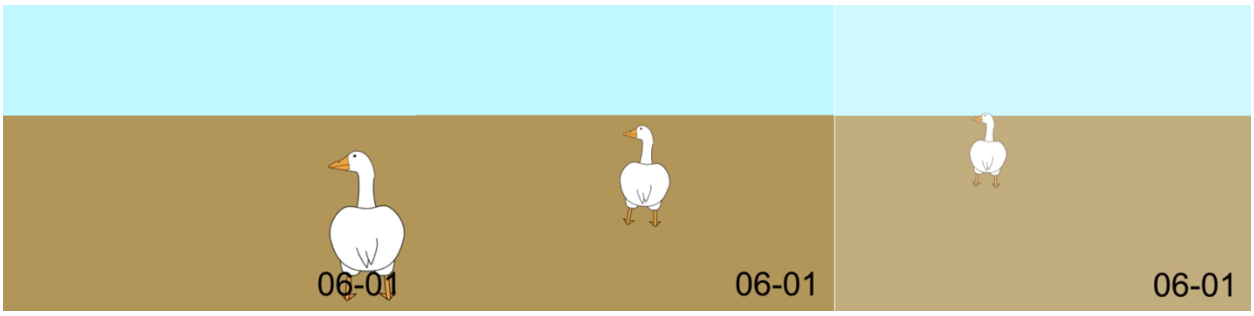


Figure 4. clip 06-01 (beginning, middle and end)

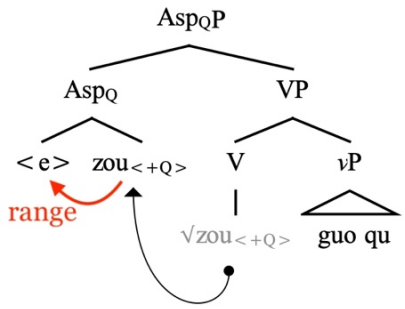
(89) Yi zhi e wang zuo qian fang zou-le guo qu.
One CLF goose toward left front side walk-LE cross go
'A goose walked over toward the area that was on the left and in front of it.' (Chen 2022)

In this prompt, the goose starts out in the bottom right corner of the screen and moves toward the top left corner, but the prompt ends while it is still in motion. Without a reached destination, the Path Component of the elicited sentence—namely, *guo qu* 'cross go'—should denote a homogeneous rather than quantity Path. Interestingly, the sentence contains the suffix *-le*, suggesting Asp_QP still projects, and the whole event should be interpreted as telic. How do we make sense of all this?

First off, the fact that there is an Asp_Q head in the structure but no Path elements move to it is a very promising sign that our analysis of motion telicity is on the right track. If the Path elements in (89) do not render the Path quantity, there should be no reason for them to undergo head movement in the same way as *dao* 'arrive'. Thus, the absence of movement in (89) nicely complements our other examples where movement is present.

But how is the presence of Asp_QP accounted for if the Path is homogeneous? We suggest that the event depicted by Figure 4 is telic in some special sense that is arguably different from motion telicity. Specifically, the prompt begins with the goose standing still, and only after a short while does it start moving. This transition from not moving to moving at a single moment in time seems to fit in Vendler's (1957) category of achievements. If this instantaneous transition is indeed what our participant picked out, then perhaps the Manner V *zou* 'walk', to which *-le* is suffixed in (89), is best analyzed the way Borer (2005b, p. 333) analyzes achievement verbs, namely, treating it as a root in combination with some abstract feature that can assign range to [Asp_Q<e>]. If so, sentence (89) may be analyzed as in (90), where we use <+Q> as a label for the abstract feature. Once range is properly assigned to [Asp_Q<e>], the head is spelled out as *zou-le*. While there are still some details to work out, this account receives support from the fact that there is only one visual feature in the entire prompt that could possibly be perceived as quantity, namely, the instantaneous transition from one state to another—specifically, from not walking to walking.

(90)



To sum up, different Path elements seem to behave differently in Mandarin. Some elements raise all the way up to Asp_Q, while some other elements do not. We tried to show in this section that the different syntactic behaviors hinge on whether [Asp_Q<e>] receives its range from a quantity Path, and whether the element in question can render a Path quantity. Aside from this general difference, the Mandarin V-Reach *dao*, though having received most of our attention in earlier sections, does not seem to possess any peculiar property that other Path elements do not, at least not in the aspect under discussion here.

7. Conclusion

In this paper, we presented a hypothesized structure of motion predicates and an account of how motion telicity emerges out of it. Specifically, we proposed that a Path Component that is rendered quantity by the presence of a V-Reach can assign range to the empty head of Asp_QP, which is a functional projection that returns a telic reading. However, since not every sentence that has a V-Reach has a telic or even a motion reading, there clearly are constraints on whether or not a constituent containing a VP-Reach qualifies as a Path. We postulated a little *v*P that introduces a Figure argument, which must be interpreted as specific based on the assumption that in order to track the location of an entity in space, one must first specify what that entity is. We thereby drew a link between the conceptual Path/direction distinction and the presence/absence of the Figure little *v*P. With regard to how range is assigned to [Asp_Q<e>] by a quantity Path, our data suggested that different languages employ different strategies. In the case of Mandarin, evidence from the syntactic behavior of *-le* suggests that head movement is involved. In the case of GSP and Tati, evidence indicates otherwise. We then discussed cases that appeared to contradict our hypothesis. Upon closer examination, the internal arguments in those cases were best analyzed as Subjects of Quantity rather than Figures, and the predicates contained no Paths. In the case of Mandarin, different syntactic positions of *-le* correspond to different interpretations of the event and, in particular, to the specificity of the internal argument. When a predicate has neither a specific nor a quantity DP as the internal argument, telicity fails to emerge even if the predicate has a V-Reach, and this failure receives a straightforward explanation in the present account.

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List of Abbreviations

1	first person
3	third person
ACC	accusative
CAUS	causative
CLF	classifier
CRS	currently relevant state
DE	the Mandarin particle *de*
DET	determiner
F	feminine
LE	the Mandarin suffix *-le* (treated as a quantity and perfective marker in this study)
M	masculine
NOM	nominative
OBL	oblique
PD	possessive determiner
POST	postposition
PRF	perfect
PST	past tense
PV	preverb
SG	singular

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