Telicity and Objecthood in the Acquisition of Unaccusativity: Mandarin-Speaking Children’s Interpretation of Manner-of-Motion Verbs

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1. Introduction

It is well established that telicity as an aspectual notion plays a fundamental role in the syntax-semantics interface, with participants delimiting telic events typically projected onto the direct object position (e.g. Tenny 1987, 1994; Hoekstra and Mulder 1990; Dowty 1991; Levin and Rappaport Hovav 2005; van Hout 2000). Such a close affinity between telicity and objecthood is also manifested in the split between object-taking unaccusatives (Perlmutter 1978, Burzio 1986) and subject-taking unergatives (e.g. Hoekstra 1984; Tenny 1987, 1994; Zaenen 1988, 1993; Hoekstra and Mulder 1990; Van Valin 1990; van Hout 2000; Randall 2007). For example, in Italian, intransitive verbs denoting telic eventualities, as identified by their compatibility with the adverbial in un’ ora ‘in an hour’, co-occur with the auxiliary essere ‘be’ in a perfective sentence (1a), qualifying them as unaccusatives. In contrast, verbs denoting atelic agentive processes, compatible with the duration adverbial per un’ ora ‘for an hour’, co-occur with the auxiliary avere ‘have’, an indicator of their unergative status (1b).

(1) a. Angela è arrivata/annegata/morta *per/in un’ ora.
   Angela is arrived/drowned/died for/in an hour
   ‘Angela arrived/drowned/died *for/in an hour.’

   b. Angela ha parlato/pianto/ballato/camminato per/*in un’ ora.
   Angela has talked/cried/danced/walked for/*in an hour
   ‘Angela talked/cried/danced/walked for/*in an hour.’

   (Van Valin 1990: 232)
As another example of the close connection between telicity and objecthood, Mandarin Chinese projects mono-morphemic one-argument verbs denoting telic events as unaccusatives, and those denoting internally-caused atelic events as unergatives. Intransitive verbs denoting telic events can take a postverbal nominal and occur in the ‘\(V + le\) (perfective marker) + NP’ structure, a basic diagnostic for unaccusativity in the language (e.g. Huang 1987; Zhou 1990; Yu 1995). On the other hand, one-place verbs signaling atelic events are prohibited from such a context, as shown in the contrast between (2) and (3).

(2) Lai-le yi-ge xiaohai.¹
    come-Perf one-CL child
    ‘There came a child.’

(3) *You-le yi-ge xiaohai.
    swim-Perf one-CL child
    *‘There swam a child.’

Given the strong correlation between telicity and unaccusativity in various languages, the present study explores whether Mandarin-speaking children can appeal to the temporal properties of events encoded in intransitive verbs in their acquisition of the unaccusative vs. unergative distinction.

2. Telicity, objecthood and unaccusativity across languages
2.1. The link between telicity and objecthood

The intimate relationship between telicity and objecthood has been well noted in the literature (e.g. Tenny 1987, 1994; Hoekstra and Mulder 1990; Dowty 1991; Levin and Rappaport Hovav 2005; van Hout 2000). Evidence for such a linkage stems from the fact that alternation between transitive and intransitive structures for the same verb may result in a telic vs. atelic contrast, insofar as the verb in question takes an incremental theme, i.e. the activity expressed by the verb affects the entity denoted by the direct object in an incremental way (Dowty 1991, van Hout 2000). To illustrate with an example from Dutch, the verb drinken ‘drink’ in the intransitive frame yields an atelic process interpretation compatible with the duration phrase urenlang ‘for hours’, whereas the same verb delimited by a definite nominal gives rise to a telic accomplishment reading, as evidenced in its compatibility with the adverbial in 5 minuten ‘in five minutes’ (4). The connection between telicity and direct object is also manifested in the fact that obligatorily telic verbs such as those taking a particle must appear in a transitive frame, as shown in (5).

(4) a. Judy heeft urenlang/*in 5 minuten gedronken.
     Judy has hours-long/*in 5 minutes drunk
     ‘Judy drank for hours/*in five minutes.’

¹ Abbreviations: CL = classifier; NP = noun phrase; Perf = perfective aspect marker; V = verb.
b. Judy heeft *urenlang/in 5 minuten haar kopje koffie gedronken. Judy has hours-long/in 5 minutes her cup coffee drunk ‘Judy drank her cup of coffee *for hours/in five minutes.’ (5) a. Judy heeft *urenlang/in 5 minuten haar kopje koffie opgedronken. Judy has hours-long/in 5 minutes her cup coffee up-drunk ‘Judy drank up her cup of coffee *for hours/in five minutes.’ b. *Judy heeft opgedronken. Judy has up-drunk ‘Judy drank up.’ (van Hout 2000: 242-244)

Cross-linguistic evidence for the role of telicity in argument realizations has prompted scholars to propose a variety of accounts, linking the direct object position with measure-out (Tenny 1987, 1994), incremental theme (Dowty 1991), the telicity feature of events (e.g. van Hout 2000), or subject of quantity (Borer 2005). The linkage between telicity and direct objecthood has clear implications for our understanding of the semantic basis of the unaccusative vs. unergative distinction: one would be tempted to hypothesize that intransitive verbs denoting telic events must necessarily take an underlying object and thus qualify as unaccusatives.

2.2. The link between telicity and unaccusativity in Chinese and other languages

The fundamental role of telicity in differentiating unaccusative and unergative verbs has been attested in a wide array of languages, with the unaccusative vs. unergative alternation corresponding to the telic vs. atelic event type shift, as exemplified below.\(^2\)

(6) a. Hij heeft/*is gelopen. he has/is run ‘He has run.’

b. Hij heeft/is naar huis gelopen. he has/is to house run ‘He has run home.’ (Zaenen 1993: 136)

The manner-of-motion verb *lopen ‘run, walk’ behaves like an unergative or unaccusative verb depending on whether the event described by the verb is delimited by a boundary: the verb co-occurs with the auxiliary hebben ‘have’ when denoting an atelic activity, and with the auxiliary zijn ‘be’ in the presence

\(^2\) Although verbs or predicates denoting telic events always fall into the unaccusative class, telicity may not be a necessary criterion for unaccusative status, in view of the inconsistencies of auxiliary selection in various languages. For instance, manner-of-motion verbs denoting atelic locomotion events in German (e.g. *herumtanzen ‘dance around’) co-occur with the perfective auxiliary sein ‘be’, and thus behave like unaccusatives (Sorace 2000, Randall 2007).
of the Goal PP, which provides a culmination for the atelic event. As pointed out by van Hout (2000), this alternation pattern is productive for manner-of-motion verbs. It should be noted that as an Agent is involved in both the unaccusative and the unergative frames, the crucial semantic features determining the projection of the sole argument of intransitive verbs involve aspectual configurations of events rather than thematic role labels such as Agent or Patient.

The prominence of telicity in determining unaccusativity is also evidenced in Mandarin Chinese. All the one-argument telic verbs come under the unaccusative class, as reflected in their well-formedness in the perfective V + NP structure, irrespective of whether they denote an agentive event (7a), a non-agentive internally-caused event (7b), or an event that can be externally caused (7c).

(7)  
a. Lai-le san-wei keren.  
   come-Perf three-CL guest  
   ‘There came three guests.’

b. Kai-le san-duo yujinxiang.  
   bloom-Perf three-CL tulip  
   ‘Three tulips bloomed.’

c. Chen-le san-sou chuan.  
   sink-Perf three-CL ship  
   ‘There sank three ships.’

The above facts demonstrate that telicity plays a fundamental role in the projection of internal arguments at the syntax-semantics interface, and traditional theories that characterize the syntax-semantics interface in terms of indecomposable thematic roles are inadequate and miss an important regularity in argument realization.

3. The Semantic Bootstrapping Hypothesis and the poverty-of-stimulus problem in the acquisition of unaccusativity in Chinese

The crucial role of telicity in the unaccusative vs. unergative opposition in different languages naturally leads one to conjecture that such semantic features may guide young children to master the unaccusative vs. unergative distinction in their native language, in line with Pinker’s (1984, 1987) Semantic Bootstrapping Hypothesis. Under this account, pre-existing linking rules at the syntax-semantics interface, such as the Agent-subject and Theme/Patient-object mappings, help children bootstrap into the syntax of the target language and establish verb subcategorization frames. Following the spirit of the Semantic Bootstrapping Hypothesis, one can hypothesize that in addition to canonical mappings between thematic roles and syntactic positions, there also exist canonical mappings between temporal features of event structure and argument positions.

The acquisition of unaccusativity in Mandarin Chinese may shed light on the validity of the semantically-driven approach to the acquisition of argument structure, because the morphosyntactic cues for the unaccusative vs. unergative
distinction in Chinese are sparse and pose a typical poverty-of-stimulus problem. First, although the postverbal NP structure with the verb carrying the perfective aspect suffix le serves as a basic diagnostic for unaccusatives in Chinese, unergative verbs may also occur in this structure in contrastive discourse contexts (Sun and Pan 2012), overlapping with unaccusative verbs.

(8) Yihao changdi tiao zhe-zu yundongyuan, No.1 court jump this-CL athlete erhao changdi tiao na-zu yundongyuan. No.2 court jump that-CL athlete
‘This team of athletes jump in No. 1 court; that team of athletes jump in No. 2 court.’ (Sun and Pan 2012: 333)

Second, our analysis of the child-directed speech in the longitudinal corpus of two Mandarin-acquiring children growing up in Beijing has revealed considerable overlap in the distributions of unaccusative and unergative verbs in adult input, since both classes of intransitives occurred predominantly in the NP + V order (unaccusatives: 84%; unergatives: 100%) (see Lu 2019 for details).

A third factor that complicates the situation is that some manner-of-motion verbs have dual category membership, so that they may function either as unergatives, occurring in the perfective ‘NP + V + le (perfective aspect marker)’ structure and denoting a termination-of-activity reading, or as unaccusatives, appearing in the perfective ‘NP + V + le (perfective aspect marker)’ or ‘V + le (perfective aspect marker) + NP’ structure, signifying a telic change of location.

(9) Na-ge xuesheng pao le. that-CL student go away/run Perf
‘The student went away.’
‘The student ran (performed an action of running).’
(10) Pao-le liang-ge xuesheng. go away/run-Perf two-CL student
‘Two students went away.’ *‘Two students ran (performed an action of running).’

As revealed in the above analyses, young Mandarin-speaking children face a learnability problem due to the distributional overlap between the two subclasses of intransitives, and the subtle semantic differences between the dual-category manner-of-motion verbs in the preverbal and postverbal NP structures. To explore whether telicity as an aspectual trigger will enable Mandarin-acquiring children to overcome the poverty-of-stimulus problem, we conducted two experiments to investigate the role of telicity in Mandarin-speaking children’s acquisition of unaccusativity, following the spirit of the Semantic Bootstrapping Hypothesis.
4. Experiments on Mandarin-speaking children’s interpretation of manner-of-motion verbs in the perfective preverbal and postverbal NP structures

4.1. Research questions

The experiments tested Mandarin-speaking children’s understanding of manner-of-motion verbs in the preverbal and postverbal NP structures. One experiment included dual-category manner-of-motion verbs which can be either unaccusative on a telic change-of-location reading or unergative on an atelic agentive motion reading; the other experiment involved unambiguous unergative verbs denoting an atelic agentive motion. The research questions to be addressed are as follows.

I. Do Mandarin-speaking children accept both the change-of-location (telic) reading and the termination-of-activity (atelic) reading in the preverbal NP structure marked with the perfective aspect (‘NP + V + le’ structure)?

II. Do Mandarin-speaking children accept the change-of-location (telic) reading and reject the termination-of-activity (atelic) reading in the postverbal NP structure marked with the perfective aspect (‘V + le + NP’ structure)?

4.2. Participants

Sixty-one children in the age range of 4;0-5;0 and 5;0-6;0 (Mean age = 5;01;23) participated in Experiment 1, and another 61 children in the same age range (Mean age = 5;01;28) took part in Experiment 2. In addition, 59 native Mandarin speakers aged between 18 and 23 (Mean age = 20;05) served as adult controls in Experiment 1.

4.3. Experimental design and test materials

A between-subject design was adopted for both experiments, each conducted with two groups of subjects. One group was tested on the ‘NP + V + le (perfective aspect marker)’ structure and the other on the ‘V + le (perfective aspect marker) + NP’ structure. Experiment 1 included three dual-category manner-of-motion verbs (i.e. fei ‘fly away/fly’, pao ‘escape, go away/run’, zou ‘leave/walk’) in a perfective context, which can be unaccusative, denoting a change of location, or unergative, denoting termination of an agentive activity. Experiment 2 involved three manner-of-motion verbs which can only be unergative (i.e. pa ‘crawl’, you ‘swim’, tiao ‘jump’), denoting an atelic agentive motional process. A test sentence containing the dual-category verb pao ‘escape, go away/run’ and another one

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3 The test sentences in the preverbal NP structure and the postverbal NP structure are not fully equivalent. The preverbal NP sentences begin with a bare NP to observe the Subject Specificity Constraint in Chinese (Chao 1968). In contrast, the nominals in the postverbal NP structure appear as ‘one + CL + NP’, since bare NPs in this presentative structure do not convey sufficient individuation information for referent introduction. A temporal adverb is needed for the preverbal NP structure to provide temporal anchoring (e.g. Tsai 2008).
containing the single-category verb you ‘swim’ are given below. It should be noted that for single-category unergative verbs, adult grammar will exclude them from the postverbal NP structure, and only allow the termination-of-activity reading when they occur in the preverbal NP structure.

(11) A test sentence pair with a dual-category verb (unaccusative or unergative in preverbal NP structure and unaccusative in postverbal NP structure)
   a. Xiao zh u gangcai pao le.
      little pig just-now escape/run Perf
      ‘The little pig escaped just now.’
      ‘The little pig ran just now.’
   b. Pao-le yi-zhi xiao zhu.
      escape/run-Perf one-CL little pig
      ‘A little pig escaped.’
      # ‘A little pig ran.’

(12) A test sentence pair with a single-category unergative verb
   a. Longxia gangcai you le.
      lobster just-now swim Perf
      ‘The lobster swam just now (performed an action of swimming).’
      ‘The lobster swam away just now.’
   b. *You-le yi-zhi longxia.
      swim-Perf one-CL lobster
      ‘A lobster swam away.’
      # ‘A lobster swam (performed an action of swimming).’

The test items in the two experiments consisted of two trials per verb for each word order, with each item paired with a change-of-location (telic) scenario and a termination-of-activity (atelic) scenario, resulting in a total of 12 experimental items for each experiment. To illustrate with the dual-category verb pao ‘run/escape’, in the scenario for the change-of-location reading, a pig went out of the room and disappeared behind the door through a jumping act, resulting in a clear change of location of the actor. In the scenario for the termination-of-activity reading, the same protagonist ran about inside the room and finally returned to its starting point, resulting in no visible change of location. Scenes from the sample videos depicting the two scenarios paired with the dual-category verb pao ‘escape, go away/run’ in (11) are provided in Figures 1 and 2.
As for the single-category unergative verbs, as they do not have an abstract telic change-of-location reading like the dual-category verbs, the telic reading necessarily entails the atelic one for these verbs. Take the single-category verb *you* ‘swim’ as an example. The scenario for change-of-location involved a lobster swimming to an area behind a coral and then disappearing from the sight of the viewer, depicting a clear change of location; the video for the termination-of-activity reading involved the same animal swimming around and finally returning to the starting point.

In addition to the experimental items, four training items and 12 filler items were incorporated into each experiment. All the test items were presented in a pseudo-random order. The test battery in each experiment included 28 items for the ‘NP + V + le (perfective aspect marker)’ structure and ‘V + le (perfective aspect marker) + NP’ structure respectively.

### 4.4. Task and procedure

A video verification task was adopted for both experiments, with each experiment completed in one session lasting approximately 15 minutes. The children were tested individually in a quiet classroom or meeting room. During the experiment, the children were invited to watch videos together with Mickey Mouse. After each episode, Mickey Mouse uttered a sentence about what he had seen in the video clip, and the children were responsible for judging the truth of the utterance. When children judged Mickey Mouse’s statement as wrong, they were also asked to explain to Mickey Mouse what was wrong with his statement. The experiment conducted with adult subjects followed essentially the same procedure, except that the participants were tested in groups, and their judgments and reasons for rejection were jotted down on the answer sheets.

### 4.5. Predictions

For the dual-category verbs (such as *pao* ‘run/escape, go away’) in Experiment 1, children should accept the atelic termination-of-activity reading as well as the telic change-of-location reading for the perfective preverbal NP structure: if the verb maps its sole argument to the subject position, it is an unergative verb and an atelic interpretation should result; if the verb maps its sole argument to the object position, which then moves to the subject position in surface syntax, it is an unaccusative verb, and a telic interpretation should be
obtained. Further, since both interpretations are attested in adult usage in this word order, children should have positive evidence for both readings. For dual-category verbs occurring in the postverbal NP structure, children will understand them as unaccusative verbs with only a telic-change-of-location reading.

Turning to the single-category manner-of-motion verbs (such as you ‘swim’) in the preverbal NP structure (Experiment 2), children should accept the termination-of activity reading, since these verbs, being purely unergative, only occur with preverbal arguments to signal atelic motional processes. Although the change-of-location reading is not encoded in these verbs, children are likely to also accept this interpretation, since the telic reading entails the atelic reading: for an entity to have changed its location, it must have terminated a motional activity. For single-category unergative verbs occurring in the perfective postverbal NP structure, which are not attested in actual adult usage, one would expect children to make use of the correlation between telicity and unaccusativity to accept the telic reading and suppress the atelic reading.

4.6. Results
4.6.1. Results for the interpretation of dual-category verbs

Figure 3 shows the group acceptance of the telic change-of-location reading and atelic termination-of-activity reading for the dual-category verbs in the preverbal NP structure. All three groups of participants accepted both the telic reading (80%-94%) and the atelic reading (67%-78%) at high rates, suggesting that they could assign two semantic representations to dual-category verbs in the ‘NP + V + le (perfective aspect marker)’ structure. The greater acceptance of telic over atelic interpretations could be due to frequency and salience effects in the incidence of the telic versus atelic readings in this word order.

![Figure 3. Acceptance of the change-of-location reading (telic) [6 trials] and termination-of-activity reading (atelic) [6 trials] for dual-category (unaccusative/unergative) verbs in the ‘NP + V + le (perfective aspect marker)’ structure](image-url)
Figure 4 shows the group acceptance of the change-of-location and termination-of-activity readings for the dual-category verbs in the postverbal NP structure. A repeated-measures ANOVA revealed a significant main effect of verb interpretation ($F(1, 57) = 273.658, p < 0.001$). Further analyses show that for the two child groups and for the adults as well, the telic reading was accepted significantly more than the atelic reading ($p < 0.001$), with the acceptance rates for the former ranging from 88% in the five-year-olds to 96% in the adult group, and those for the latter varying between 9% in the adults and 47% among the four-year-olds. Our findings point to a natural mapping of a structure with a postverbal object NP to a telic rather than an atelic situation.

Apart from the main effect of interpretation, there was also a significant main effect of age ($F(2, 57) = 8.326, p = 0.001$) and a significant interaction between interpretation and age group ($F(2, 57) = 12.380, p < 0.001$), suggesting that different groups of participants discriminated the two interpretations of dual-category verbs in the postverbal NP structure to varying extents. While the acceptance rates of the telic change-of-location interpretation remained high for all age groups, the acceptance of the atelic termination-of-activity interpretation declined with age. The acceptance rates of the atelic reading between each of the two child groups and the adult participants were significantly different (4-year-olds vs. adults: 47% vs. 9%, $p < 0.001$; 5-year-olds vs. adults: 31% vs. 9%, $p = 0.008$), though the difference between the two child groups did not reach significance (4-year-olds vs. 5-year-olds: 47% vs. 31%, $p = 0.103$). The rejection of the atelic reading by the children was less determinate than its rejection by the adult participants.
4.6.2. Results for the interpretation of single-category verbs

Recall that Experiment 2 set out to test how children would interpret purely unergative verbs with their sole argument occurring in preverbal and postverbal positions. For an unergative verb (e.g. you ‘swim’) in the perfective preverbal NP structure, the typical reading to assign would be a termination-of-activity reading. Further, the change-of-location interpretation may also be acceptable, as this interpretation entails the atelic termination-of-activity reading, one made available by the grammar of the target language. For the same verb in the postverbal NP structure taking the perfective aspect marker, children may assign a telic change-of-location reading by virtue of the natural association of objecthood and telicity. Meanwhile, they are expected to reject or disfavor the termination-of-activity reading in the same structure, as unergative verbs are not permitted to take a postverbal argument in discourse contexts with no contrastive or restrictive focus, such as those for our test sentences.

Figure 5 provides the group acceptance rates of the telic change-of-location interpretation and the atelic termination-of-activity interpretation for the single-category verbs in the preverbal NP structure. A repeated-measures ANOVA revealed that the main effect of interpretation was not significant (F(1, 30) = 0.443, p = 0.511). On the one hand, the child participants as a whole readily accepted the lexicalized atelic reading (four-year-olds: 85%; five-year-olds: 91%); on the other, they also accepted at high rates the extended telic change-of-location reading (four-year-olds: 75%; five-year-olds: 94%), probably because this reading entails the telic activity reading, based on which the test sentences can be found acceptable. Neither the main effect of age (F(1, 30) = 2.363, p = 0.135) nor the interaction between age and interpretation (F(1, 30) = 1.714, p = 0.200) was significant, indicating that the four-year-olds behaved on a par with the five-year-olds in not differentiating the two readings in the preverbal NP structure.

![Figure 5. Acceptance of the change-of-location reading (telic) [6 trials] and termination-of-activity reading (atelic) [6 trials] for single-category (unergative) verbs in the ‘NP + V + le (perfective aspect marker)’ structure](image-url)
Figure 6 presents the acceptance rates of the change-of-location and termination-of-activity interpretations for the single-category verbs in the perfective postverbal NP structure. A repeated-measures ANOVA revealed a significant main effect of verb interpretation (F(1, 27) = 10.609, p = 0.003), indicating that the two child groups as a whole accepted the telic change-of-location reading significantly more than the atelic termination-of-activity reading (four-year-olds: 77% vs. 66%; five-year-olds: 88% vs. 57%).

Neither the main effect of age (F(1, 27) = 0.043, p = 0.838) nor the interaction between age and interpretation (F(1, 27) = 1.679, p = 0.206) reached statistical significance, implying that the four- and five-year-olds behaved similarly in generally accepting the coerced change-of-location reading and showing a clear tendency to reject or disfavor the termination-of-activity reading in the postverbal NP structure.

5. Discussion and conclusions

Overall, our experimental studies demonstrate that four- and five-year-old Mandarin-acquiring children resort to the aspectual notion of telicity and the link between telicity and direct objecthood to bootstrap into the unaccusative vs. unergative opposition in Chinese, though they are confronted with a typical poverty-of-stimulus problem in view of the sparse overt morphosyntactic markers for unaccusativity in Chinese.

Experiment 1 shows that Mandarin-speaking children aged four and five as well as the adult native speakers are able to access both the telic change-of-location reading and the atelic agentive activity reading for the dual-category manner-of-motion verbs in the perfective preverbal NP structure, whereas they rejected the atelic reading in the postverbal NP structure. Experiment 2 reveals that for the perfective postverbal NP structure, children exhibited a clear tendency
to accept the telic reading but disfavor the atelic reading for the single-category unergative verbs, demonstrating sensitivity to a distinction for which no positive evidence would be available, since these verbs are generally precluded by adult grammar from the postverbal NP structure. The children were able to coerce a telic reading onto an unergative verb in the context of a syntactic frame for unaccusative verbs.

In conclusion, our experimental findings demonstrate that Mandarin-speaking children by the age of four have become aware of the fundamental role of telicity in the mapping of internal arguments at the syntax-semantics interface. Our findings have substantiated and developed Pinker’s (1984, 1987) Semantic Bootstrapping Hypothesis by introducing features of event structure into the canonical mapping principles.

References


