Early Knowledge of the Interaction between Aspect and Quantification: Evidence from Child Cantonese

Margaret Ka-yan Lei and Thomas Hun-tak Lee

1. Introduction

As a type of A-quantifier (Partee 1995), verbal affixes are known to constrain the interpretation of nominal objects due to the intricate interaction between aspect and quantification (Krifka 1992; Filip 1999; Partee 1999). In Slavic languages such as Polish, there is a close affinity between perfectivity and universal quantification, aligning perfective verbs with the definite and totality interpretation on bare mass and bare plural noun phrases (Krifka 1992; Filip 1997, 2001), as in (1a). In the corresponding imperfective sentence (1b), the same object noun phrase can receive either an indefinite (partial) or a definite (universal) interpretation.

(1) a. On \texttt{z\textsubscript{a}d\textsubscript{l}p} kas\'z\'e.  
   he.NOM PREF.ate porridge.SG.ACC  
   ‘He ate (up) (all) the porridge.’

b. On \texttt{j\textsubscript{a}d\textsubscript{l}l} kas\'z\'e.  
   he.NOM ate porridge.SG.ACC  
   ‘He ate/was eating some/the porridge.’

(Polish; Example from Wierzbicka 1967, glosses from Filip 2005)

A similar interaction between verbal affixes and definiteness can be observed in Cantonese. In Cantonese, totality of an event involving an incremental theme object could be expressed by the perfective aspect marker \texttt{zo\textsubscript{2}} (2a) or by the universal quantifier affix \texttt{saai\textsubscript{3}} (2b). When perfective \texttt{zo\textsubscript{2}} is used, the indefinite (partial) reading is preferred; in the context of \texttt{saai\textsubscript{3}}, only the definite (universal) reading is available.

(2) a. On \texttt{z\textsubscript{a}d\textsubscript{l}p} kas\'z\'e.  
   he.NOM PREF.ate porridge.SG.ACC  
   ‘He ate (up) (all) the porridge.’

b. On \texttt{saai\textsubscript{3}d\textsubscript{l}l} kas\'z\'e.  
   he.NOM ate porridge.SG.ACC  
   ‘He ate (up) (all) the porridge.’

(Polish; Example from Wierzbicka 1967, glosses from Filip 2005)

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These cross-linguistic similarities invite us to examine the links between aspect, totality and definiteness, and how children acquire these links. The present study investigates Cantonese-speaking children’s sensitivity to the distinction between universal quantification (encoded by the postverbal quantifier suffix saai3) and perfective aspect (encoded by the perfective aspect marker zo2), addressing the following research questions:

(i) Are Cantonese-speaking children sensitive to the role of verbal suffix in the quantificational and referential interpretations of the associated nominal? Can they associate definiteness and exhaustivity with the universal quantifier suffix saai3 on one hand, and indefiniteness and partitivity with the perfective aspect marker zo2 on the other?

(ii) Are they capable of differentiating between perfective aspect and universal quantification, mapping the former to quantification of events (“totalities of events”) and the latter to quantification of individuals (“totalities of objects”)?

Our paper will be organized as follows: first, we discuss the quantificational and referential effects of verbal affixes observed in the Slavic languages, and how verb semantics and nominal structure play a role in the interaction between perfectivity, definiteness and universal quantification. Next, we highlight similar interactions in Cantonese, comparing the perfective aspect marker zo2 and the universal quantifier suffix saai3. This will provide the background for the design of our experiments, which make use of their differentiating contexts. In the third and main section of our paper, we report two experiments examining children’s sensitivity to the distinction between perfectivity and universal quantification.

2. The quantificational and referential effects of Slavic verbal affixes

The quantificational and referential effects of verbal affixes on object nominals in the Slavic languages depend on verb semantics and nominal structure. The effect of object totality is restricted to verbs taking incremental-theme arguments, such as verbs of consumption like eat in (1) (Filip 2005). For verbs that do not take incremental-theme arguments, such as carry in (3), the sentence

In this paper, Cantonese is transcribed using The Linguistic Society of Hong Kong Cantonese Romanization Scheme (Jyutping) (http://www.lshk.org/). The digits after the romanization indicate the tone category, which are only provided for morphemes under discussion. Abbreviations: CL = classifier; CLPL = plural fuzzy classifier di1; DEM = demonstrative; PERF = perfective aspect marker; N = noun; V = verb.
is compatible with either a partial or a universal reading even in the scope of a perfective verb.

(3) Jan przymiósł kaszę.  
John DIR.carried porridge.SG.ACC  
‘John brought some/the porridge.’  
(Polish; example from Filip 2005:128)

The definiteness effect exerted by perfective verbs is restricted to bare mass and bare plural nominals (Filip 2005). When the object nominal is a singular count noun or a modified plural count noun, no such effect would be observed. In (4), the singular count noun gruszkę “pear” could receive either an indefinite reading “a whole pear” or a definite reading “the whole pear”.

(4) On zjadł gruszkę.  
he.NOM PREF.ate pear.SG.ACC  
‘He ate (up) a/the whole pear.’  
(Polish; example from Filip 2005:128)

The crucial determinants for the interactions between aspect and quantification depend on verb semantics and nominal structure: (i) Perfectivity coupled with verbs taking incremental-theme arguments will induce totality on the object nominal, and (ii) Perfective verbs taking a bare mass or a bare plural nominal will result in definiteness.

3. The quantificational and referential effects of Cantonese verbal affixes

Similar totality and definiteness effects of verbal affixes can be observed in Cantonese. In Cantonese, definiteness can be expressed by noun phrases in the form of [demonstrative-classifier-noun] or [classifier-noun], with the classifier playing a role similar to the English definite article (Cheung 1989; Cheng and Sybesma 1999). The classifier denotes singularity in general, except for classifiers such as the plural classifier di1 which denotes a fuzzy quantity. When [di1-N] occurs post-verbally in the absence of any verbal affix, it can express an indefinite reading (“some N”) or a definite reading (“the several N”), as in (5). Although the [di1-N] structure does not encode definiteness and totality on its own, these interpretations may be induced by certain verbal affixes depending on the form of the nominal and verb semantics.2

(5) Koei seong maai di1 syu.  
s/he want buy CLPL book  
‘S/he wants to buy some/the books.’

2 The referential reading of the [CL-N] structure also depends on syntactic position. In Cantonese, [di1-N] nominals in subject position may receive a definite reading or a generic reading depending on the predicate (Au Yeung 1998).
3.1. The case of the perfective aspect marker zo2

In Cantonese, perfectivity can be expressed by the postverbal affix zo2, which denotes the realization of an event (Cheung [1972] 2007), as shown in (6). When zo2 appears after a stative verb or an adjective, it yields an inchoative reading (7).3

(6) Anna tai zo2 jat bun syu.
Anna read PERF one CL book
‘Anna read a book.’
(7) Anna beng zo2.
Anna sick PERF
‘Anna has fallen sick.’

In general, sentences with the perfective zo2 can denote either a partial (indefinite) or a universal (definite) reading. When the object nominal is in the form of [classifier-noun], the partial reading is preferred over the universal one. The perfective zo2-sentences with [classifier-noun] objects in (8-9) are compatible with continuations denoting event non-completions.

(8) Anna tai zo2 di1 syu, daanhai mei tai jyun.
Anna read PERF CLPL book but not read finish
‘Anna read some/the books, but (she) didn’t finish reading them.’
(9) Anna sik zo2 di1 daangou, daanhai mei sik jyun.
Anna eat PERF CLPL cake but not eat finish
‘Anna ate some/the cakes, but (she) didn’t finish eating them.’

The partial reading is also compatible with zo2-sentences taking definite [demonstrative-classifier-noun] noun phrases, as in (10). It should be noted that the partial reading is strongly dispreferred with verbs of consumption as in (11), indicating a visible effect of verb semantics.

(10) Anna tai zo2 go di1 syu,
Anna read PERF that CLPL book
daanhai mei tai jyun.
but not read finish
‘Anna read those books, but (she) didn’t finish reading them.’
(11) Anna sik zo2 go di1 daangou,
Anna eat PERF that CLPL cake
??daanhai mei sik jyun.
??but not eat finish
??‘Anna ate those cakes, but (she) didn’t finish eating them.’

3 The Cantonese zo2 is similar to the perfective aspect marker le in Mandarin Chinese.
3.2. The case of the universal quantifier affix saai3

The Cantonese postverbal affix saai3 achieves the effects of universal quantification. When regarded as a nominal quantifier, it exerts quantificational force on either NP1 or NP2 in a structure [NP1 V-saai3 NP2] (Lee 1994). Which nominal in a sentence is quantified by saai3 depends on whether the nominal can be interpreted as plural and definite: thus, it is the object nominal in (12) and the subject nominal in (13) that is selected by saai3.4

(12) Anna maai saai3 di1 daangou.
    Anna buy all CLPL cake
    ‘Anna bought all of the cakes.’

(13) Di1 hoksaang maai saai3 daangou.
    CLPL student buy all cake
    ‘All of the students bought cakes.’

Sentences with the affix saai3 must contain a nominal that is interpreted as definite and universally quantified. The saai3-sentences in (14-15) with [CL-N] object nominals are incompatible with continuations denoting event non-completions.

(14) Anna tai saai3 di1 syu, *daanhai mei tai jyun.
    Anna read all CLPL book *but not read finish
    *‘Anna read all of the books, but (she) didn’t finish reading them.’

(15) Anna sik saai3 di1 daangou, *daanhai mei sik jyun.
    Anna eat all CLPL cake *but not eat finish
    *‘Anna ate all of the cakes, but (she) didn’t finish eating them.’

The referential effects of the verbal affixes are linked to the quantification of the object nominal; perfective aspect favors indefiniteness and partitivity (16a), while universal quantification requires definiteness and exhaustivity (16b). This truth-conditional difference between the use of saai3 and zo2 will be explored in our experiments as a differentiating context between universal quantification and perfectivity.

(16) a. Anna jam zo2 zi caangzap.
    Anna drink PERF CL orange.juice
    ‘Anna drank a/the bottle of orange juice.’

b. Anna jam saai3 zi caangzap.
    Anna drink all CL orange.juice
    ‘Anna drank the whole bottle of orange juice.’

4 Bare nominals cannot denote definite reference in Cantonese (Cheung 1989).
4. Experiments on the differentiation between universal quantification and perfective aspect

Naturalistic corpus data have indicated that Cantonese-speaking children are sensitive to the referential effects of verbal affixes and the definiteness requirement of saai3 (Lei 2017), but it is unclear whether they assign different interpretations to the two affixes.

We conducted two experiments using the Truth Value Judgment (TVJ) task and the two-choice Picture Selection task to examine whether Cantonese-speaking children are sensitive to the semantic differences between universal quantification (marked by the affix saai3) and perfectivity (marked by the affix zo2) in sentences taking an incremental theme object modified by the plural fuzzy classifier di1 ([di1-N]), in which sentences containing the two affixes would be truth-conditionally distinct.

4.1. Participants

Fifty-three children aged 4;2-5;9 (mean = 5;0) and 68 college-age adults took part in the Truth Value Judgment task. Another 46 children aged 3;1-5;3 (mean = 4;2) and 37 college-age adults took part in the two-choice Picture Selection task.

4.2. Test materials and experiment design

Adopting a between-subject design, half of the participants in each experiment were tested on saai3-sentences with [di1-N] nominal in object position (quantification condition) (as in (17)), and the other half with the corresponding zo2-sentences (aspectual condition) (as in (18)).

(17) Hungzai sik saai di1 daangou.
    bear.little eat all CL PL cake
    ‘Little Bear ate all of the cakes.’

(18) Hungzai sik zo di1 daangou.
    bear.little eat PERF CL PL cake
    ‘Little Bear ate some/the cakes.’

In the TVJ task, there were four test sentences containing either saai3 or zo2 (depending on test condition), each paired with a partial event in which event completion involved some but not all members of the object set (indefinite reading)

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5 In the Truth Value Judgment task, 26 children (mean age = 5;0) and 34 adults were assigned to the quantification condition, and 27 children (mean age = 5;0) and 34 adults to the aspectual condition. In the Picture Selection task, 24 children (mean age = 4;3) and 22 adults were assigned to the quantification condition, and 22 children (mean age = 4;1) and 15 adults to the aspectual condition.
In the two-choice Picture Selection task, the four test sentences were each paired with simultaneous presentation of a partial event (Figure 1a) and a universal event (Figure 1b), the latter being one in which event completion involved all members of the object set (definite reading). In this study, the universal reading is taken to be definite, and the partial reading is taken to be indefinite specific (“some of the N”).

Figure 1 Sample pictures of an indefinite reading and a definite reading presented at the end of story paired with the test sentence (17) or (18)

A sample story for a partial event in the TVJ task is illustrated in (19):

(19) This is a story about Mama Bear and Little Bear. Today, Mama Bear goes to the bakery, and while she is there she remembers that Little Bear loves strawberry cakes. She buys five slices of strawberry cake and heads for home. When she arrives home, Little Bear is delighted to see the slices of cake. Mama Bear urges Little Bear to take a piece of strawberry cake. Little Bear thinks that the cake looks delicious, so he takes a slice and eats it. It tastes wonderful indeed! He takes another slice and eats it too. He then takes a third slice and eats it. After finishing the third slice of cake, Little Bear is full and asks Mama Bear whether she wants some cake too. Mama Bear then says that she will have the remaining two slices of cake with Papa Bear later on.

In addition, there were 12 training items, 4 filler items, and 4 control items of zo2-sentences with a singular object nominal. The test sentences were presented in a pseudo-randomized order at the end of each short story, together with a filler and/or control item.

4.3. Procedures

The child participants were tested individually in a classroom at the kindergarten they studied at. The task involved two experimenters: the first experimenter told the stories with the aid of sequences of pictures presented on a

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6 The universal reading was not tested in the TVJ task, as children’s early knowledge of the universal quantificational meaning of saai3 was attested in our earlier experiments (see Lei 2017).
tablet (for the Truth Value Judgment task) or a storybook (for the Picture Selection task) in front of the child, and the second experimenter played the role of a puppet Little Frog (for the Truth Value Judgment task) or a puppet Sister Giraffe (for the Picture Selection task) who listened to the stories with the child and was responsible for jotting down the responses of the child on an answer sheet and recording the whole experimental session.

In the Truth Value Judgment task, the child was told that the puppet Little Frog would utter something about what happened in the story at the end of each short story, and the child was then asked to judge the puppet’s description (i.e. the test sentences) as ‘right’ or ‘wrong’. If the child judged the puppet’s saying as ‘wrong’, he would be instructed by the first experimenter to explain to the puppet why it was wrong. The whole TVJ experiment for each child was split into two test sessions, with each lasting for around 15 to 20 minutes.

In the Picture Selection task, we adopted a modified version of the design used in van Hout (2008) such that the last picture in the picture sequence showed a big curtain, and the child was told that only the puppet Sister Giraffe was able to see what happened in the last scene of the story with its long neck. The child was then asked to select one of the two pictures that best matched with the puppet’s description of what happened at the end of the story, and put the selected picture back to the storybook. The whole Picture Selection experiment for each child lasted for around 15 minutes.

4.4. Predictions

Since the presence of saai3 forces the object nominal containing the plural fuzzy classifier di1 to denote a definite and exhaustive reading, children tested with the saai3-sentences in the quantification condition are expected to reject the partial events in the Truth Value Judgment task. They should choose pictures depicting partial events in the Picture Selection task.

On the other hand, as zo2 favors indefiniteness and partitivity, children tested with the zo2-sentences in the aspectual condition are expected to accept the partial events in the Truth Value Judgment task. Since zo2 does not rule out the possibility of a definite and exhaustive reading, children might be divided in choosing either the partial events or the universal events in the Picture Selection task.

4.5. Results
4.5.1. Results of the Truth Value Judgment task

In the Truth Value Judgment task, children behaved like the adults in showing a high group acceptance of the partial reading for the zo2-sentences over 90% of the time, but exhibited a very low acceptance of the same reading for the saai3-sentences (see Table 1). In terms of individual acceptance pattern, this partial reading was consistently accepted by over 90% of the children tested with the zo2-

7 In our analysis, the partial reading is taken to be equivalent to an indefinite specific reading, and the universal reading is taken to be equivalent to a definite reading.
sentences, but was consistently rejected by over 80% of the children tested with the saai3-sentences (see Table 2).⁸

### Table 1. Percentage of group who accepted the partial reading on the Truth Value Judgment task for the saai3-sentences or the zo2-sentences

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Partial reading (saai3-sentences)</th>
<th>Age Group</th>
<th>Partial reading (zo2-sentences)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-year-olds (N=13)</td>
<td>15.4%</td>
<td>4-year-olds (N=15)</td>
<td>93.3%</td>
</tr>
<tr>
<td>5-year-olds (N=13)</td>
<td>0%</td>
<td>5-year-olds (N=12)</td>
<td>91.7%</td>
</tr>
<tr>
<td>Adults (N=34)</td>
<td>0.7%</td>
<td>Adults (N=34)</td>
<td>85.3%</td>
</tr>
</tbody>
</table>

Significant effect on test condition (aspectsual vs. quantification) (independent-samples Mann-Whitney U Test, \(p<0.000\)). No effect on age group (\(p=0.307\)).

### Table 2. Number (percentage) of children who consistently accepted or rejected the partial reading on the Truth Value Judgment task for the saai3-sentences or the zo2-sentences

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Consistent acceptance (saai3-sentences)</th>
<th>Consistent rejection (saai3-sentences)</th>
<th>Age Group</th>
<th>Consistent acceptance (zo2-sentences)</th>
<th>Consistent rejection (zo2-sentences)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4y (N=13)</td>
<td>1 (7.7%)</td>
<td>11 (84.6%)</td>
<td>4y (N=15)</td>
<td>14 (93.3%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>5y (N=13)</td>
<td>0 (0%)</td>
<td>13 (100%)</td>
<td>5y (N=12)</td>
<td>11 (91.7%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Adults (N=34)</td>
<td>0 (0%)</td>
<td>34 (100%)</td>
<td>Adults (N=34)</td>
<td>29 (85.3%)</td>
<td>3 (8.8%)</td>
</tr>
</tbody>
</table>

### 4.5.2. Results of the Picture Selection task

In the Picture Selection task, children resembled the adults in overwhelmingly favoring the universal reading with the saai3-sentences, while their preference was divided between the partial reading and the universal reading with the zo2-sentences (see Table 3 for the group selection rates and Table 4 for the individual selection patterns).⁹

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⁸ A participant’s acceptance of the partial reading is considered to be consistent if s/he accepted it on at least 3 of the 4 test trials; a participant’s rejection of the partial reading is considered to be consistent if s/he rejected it on at least 3 of the 4 test trials.

⁹ A participant’s selection of the partial/universal reading is considered to be consistent if s/he selected it on at least 3 of the 4 test trials.
Table 3. Percentage of group who selected the partial reading or the universal reading on the Picture Selection task for the saai3 sentences or the zo2-sentences

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Partial reading (saai3-sentences)</th>
<th>Universal reading (saai3-sentences)</th>
<th>Age Group</th>
<th>Partial reading (zo2-sentences)</th>
<th>Universal reading (zo2-sentences)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Younger group (N=9)</td>
<td>13.9%</td>
<td>86.1%</td>
<td>Younger group (N=10)</td>
<td>50.0%</td>
<td>50.0%</td>
</tr>
<tr>
<td>Older group (N=15)</td>
<td>5.0%</td>
<td>95.0%</td>
<td>Older group (N=12)</td>
<td>33.3%</td>
<td>66.7%</td>
</tr>
<tr>
<td>Adults (N=22)</td>
<td>0%</td>
<td>100.0%</td>
<td>Adults (N=15)</td>
<td>71.7%</td>
<td>28.3%</td>
</tr>
</tbody>
</table>

Significant effect on test condition (aspectual vs. quantification) (independent-samples Mann-Whitney U Test, \( p < 0.000 \)). No effect on age group (\( p=0.326 \)).

Table 4. Number (percentage) of children who consistently selected the partial reading or the universal reading on the Picture Selection task for the saai3-sentences or the zo2-sentences

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Partial reading (saai3-sentences)</th>
<th>Universal reading (saai3-sentences)</th>
<th>Age Group</th>
<th>Partial reading (zo2-sentences)</th>
<th>Universal reading (zo2-sentences)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Younger group (N=9)</td>
<td>0 (0%)</td>
<td>7 (77.8%)</td>
<td>Younger group (N=10)</td>
<td>5 (50.3%)</td>
<td>3 (30.0%)</td>
</tr>
<tr>
<td>Older group (N=15)</td>
<td>0 (0%)</td>
<td>14 (93.3%)</td>
<td>Older group (N=12)</td>
<td>2 (16.7%)</td>
<td>1 (8.3%)</td>
</tr>
<tr>
<td>Adults (N=22)</td>
<td>0 (0%)</td>
<td>22 (100%)</td>
<td>Adults (N=15)</td>
<td>10 (66.7%)</td>
<td>3 (20.0%)</td>
</tr>
</tbody>
</table>

5. General discussion and conclusion

Our findings demonstrate that children are able to differentiate between perfectivity marked by zo2 and universal quantification marked by saai3 from the age of three. While children generally did not accept the partial reading with saai3, the same reading was allowed with zo2, showing that they are sensitive to the interaction between perfectivity and universal quantification.
Young children predominantly chose the definite reading of saai3 in the Picture Selection task and rejected the indefinite reading in the Truth Value Judgment task, demonstrating clearly that they are aware of the definiteness and totalizing effects imposed by saai3. The low acceptance of the indefinite reading indicates that children do not confuse saai3 with a perfective aspect marker, the latter denoting totalities of events rather than totalities of objects.

Unlike saai3, the indefinite (partial) reading of zo2 was overwhelmingly accepted by children in the Truth Value Judgment task, reflecting children’s understanding that zo2 does not induce totality or definiteness on the object. Children’s low consistency in their acceptance of the partial reading as well as in their acceptance of the universal reading in the Picture Selection task suggests that they find the [di1-N] structure ambiguous between the two readings under the scope of zo2.

To conclude, our findings demonstrate that Cantonese-speaking preschool children do not confuse universal quantification with perfective aspect, and are aware of the role of verbal suffix in affecting the quantificational and referential properties of the associated nominal. Children are able to associate definiteness and exhaustivity with the universal quantifier suffix saai3 on one hand, and indefiniteness and partitivity with the perfective aspect marker zo2 on the other. Put differently, children are capable of differentiating perfective aspect from universal quantification, mapping the former to quantification of events (“totalities of events”) and the latter to quantification of individuals (“totalities of objects”).

References


