A Perfective-Imperfective Asymmetry in Language Processing: Evidence from Cantonese

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Previous work on English (Madden & Zwaan 2003) has shown that perfective sentences are processed faster than imperfective ones. Given that languages show variation in their tense-aspect systems, it is unclear whether the 'perfective advantage' observed in English reflects a universal tendency. This study examines the potential asymmetry between perfective marker *zo2* and imperfective marker *gan2* in Cantonese, a 'tenseless' but aspectually rich language. An utterance-and-picture matching task is used. Participants first hear a perfective or imperfective utterance, then choose between pictures depicting a completed or ongoing event. The results indicate that participants were slightly but significantly faster and more accurate in matching perfective marker *zo2* with pictures depicting *completed* events, than in matching imperfective marker *gan2* with pictures depicting *ongoing* events. These findings show that aspectual asymmetry favouring the perfective is also evident in Chinese, a tenseless language.

INTRODUCTION

We construct situation models to represent events as we listen to narratives. Previous studies suggest that verb aspect is a significant linguistic cue for narrative comprehension (Morrow 1985; Magliano & Schleich 2000). A recent study has shown that participants process sentences with the perfective aspect faster than those with the imperfective aspect (Madden & Zwaan 2003). However, most previous studies have been done in English, in which grammatical aspect interacts with tense. In this study on Cantonese, where tense is unmarked, we will examine if aspect markers still play the same role in the construction of situation models.

Research has been done on situation models for the past twenty years. These models have been treated as multidimensional mental representations, with different types of information such as time, space, causation and intentionality contributing to the formation of these models (Zwaan & Radvansky 1998). The effect of each factor has been examined through different studies. Morrow (1990) demonstrated the importance of linguistic elements such as prepositions and verb aspect markers on the construction of spatially organized situation models. By examining how readers locate a moving entity on a path specified by sentences with different prepositions and aspect markers, Morrow's study showed that different prepositions highlight different locations along a pathway within a narrative event, and that both present perfect and simple past tense emphasized completion.

While Morrow's study focused on the relationship between linguistic information and spatial representation of situations, another study by Magliano and Schleich (2000) focused on the understanding of *duration* of narrative events. More specifically, Magliano and Schleich examined the effect of perfective and imperfective aspect on the understanding of duration of activities in the subsequent context. It was found that in-progress activities, as marked with the imperfective aspect (i.e. progressive *be* + *V–ing*), had a higher probability of

being perceived as ongoing in the subsequent context compared to completed activities marked with the perfective aspect. It was also observed that memory for in-progress activities tagged with the imperfective aspect decayed at a slower rate than that of completed activities tagged with the perfective aspect.

In another study, Madden and Zwaan (2003) used a sentence-and-picture matching task to further investigate the nature of aspectual asymmetry between perfective and imperfective sentences. For each test item, participants read a sentence describing a telic action (i.e. an action with an endpoint, e.g. *He lit a fire*). Each sentence was either in simple past tense (perfective) or past progressive (imperfective). Results showed that participants responded faster to completed pictures than in-progress pictures after reading a perfective sentence. However, participants did not respond faster to in-progress pictures than completed pictures after reading an imperfective sentence. The presentation sequence was reversed in another task, i.e. participants were first shown the pictures before the sentences. A faster reaction time resulted when a perfective sentence was read after a completed picture was shown, relative to after an in-progress picture was shown. On the other hand, there was no facilitation in reaction time when participants read imperfective sentences after seeing ongoing pictures. This suggests that, for English, perfective (but not imperfective) cues facilitate the subsequent construction of situation models. In light of these findings, Madden and Zwaan suggested that readers construct mental models of completed events when the perfective aspect is used to describe an event. The effect of imperfective aspectual cues could not be captured in the study. Madden and Zwaan explained this by proposing that each reader represents an in-progress event at varying stages of completion, hence producing inconsistent responses in terms of processing speed.

The above studies were all conducted in English. Though mental representation of linguistic information is assumed to be robust across languages, there could be language specific features which affect the construction of situation models. Hence, it is worthwhile to test the robustness as well as identify the language specific constraints of the perfective advantage phenomenon across different languages. Cantonese, for instance, has a very different tense and aspect system from English. Cantonese speakers might map linguistic information onto their mental representations in a different way. We will begin by describing the differences between the tense-aspect systems of Cantonese and English.

Tense and aspect in Cantonese

Cantonese is a dialect of Chinese which belongs to the *Yue* family in southern China. It is spoken in Hong Kong, Macau, Guangzhou and other parts of the Guangdong province, and among overseas Chinese communities. Tense is not obligatory in Cantonese, nor in Mandarin Chinese or all other known Chinese dialects. There is no inflectional morpheme for past, present or future tense. Tense can be indicated by adverbs of time or temporal phrases. Temporal elements need not be specified if they are mutually understood.

Although Cantonese is 'tenseless', it has a rich aspectual system. In this paper, the term 'aspect' refers to grammatical aspect rather than lexical aspect, unless otherwise specified. Comrie (1976) classifies grammatical aspect into perfective and imperfective (Comrie 1976). Comrie notes that 'perfective indicates the view of a situation as a single whole, without distinction of the various separate phases that make up that situation; while the imperfective pays essential attention to the internal structure of the situation' (1976:16). In other words, perfectivity involves lack of explicit reference to the internal temporal constituency of a situation, while imperfectivity involves explicit reference to the internal temporal structure of a situation, viewing a situation from within (1976:21, 24). Imperfective aspect can be further

classified into habitual and continuous, and continuous can be classified into progressive and non-progressive (1976:25).

In Cantonese, grammatical aspect can be marked explicitly by attaching a morpheme to the verb, usually post-verbally, but in some cases pre-verbally. More than six different types of aspect have been identified in Cantonese, including 'progressive', 'continuous', 'habitual', 'perfective', 'experiential' and 'inchoative'. In this study, we test the aspectual morphemes *gan2* and *zo2*, as they typically represent the imperfective and perfective aspect respectively.[1] *Gan2* (緊) is identified as a progressive aspect marker (H. Zhang 1972; Gao 1980; Yuan 1989; Matthews & Yip 1994). It is attached post-verbally to the main verb to indicate ongoingness. *Gan2* can be translated as the English progressive *–ing* form. But unlike the English progressive aspect which can be used with perfect aspect (e.g. *He has been teaching for 25 years*) as well as the past or future tenses (e.g. *She was/will be staying with her parents*), the function of *gan2* is more limited. It is usually perceived to be referring to the present, unless the time is specified otherwise. Its usage in the past is restricted, and it can only apply to a specific short span of time within an activity. *Zo2* (咗) as a perfective aspect marker usually implies past time reference (H. Zhang 1972; Gao 1980; Yuan 1989; Matthews & Yip 1994). It can denote events that happen in the remote past or recent past in combination with certain temporal adverbs.

Despite the vast number of aspect markers, they are grammatically optional in Cantonese (Matthews & Yip 1994:197). If characteristics of language processing are universal, the same phenomenon that was found in English should be found in other languages, including Chinese. Yet, due to different tense and aspect systems in different languages, the effect of aspect markers on language processing might vary from language to language. In the case of Cantonese, since it is not obligatory to mark the tense of an event, we predict that *the effect of aspect markers should be more transparent.*

IN SEARCH OF A PERFECTIVE-IMPERFECTIVE ASYMMETRY: EMPIRICAL EVIDENCE

The aim of our study was to examine the sensitivity and processing speed of Cantonese native speakers to perfective and imperfective aspectual cues, *zo2* and *gan2* respectively. To maintain the linguistic effect purely from aspect markers, we employed an utterance-and-picture matching task. This involves a slight modification to the sentence-and-picture matching task used in Madden and Zwaan's (2003) reaction time study. That is, auditory stimuli were used in the present study, in place of visual stimuli.

As discussed above, Madden and Zwaan (2003) found that English speakers were only sensitive to perfective aspectual cues but not imperfective ones. We suggest that one possible explanation for this asymmetry is that prototypical perfective (simple past) was being compared to non-prototypical progressive (past progressive). More specifically, the effect of the imperfective (progressive) aspect may have been weakened by an interaction with tense. Progressive is prototypical in the present, but not in the past. With respect to English past progressive (*was + V–ing*), it is possible that the past tense feature is manipulating the effect of aspect. In Cantonese, however, the role of aspect is expected to be more transparent without the effect of tense. We therefore hypothesize that speakers would be sensitive to both perfective and imperfective aspect markers in Cantonese.

[1] Romanization of Cantonese in this paper follows the Linguistic Society of Hong Kong (LSHK) Cantonese Romanization Scheme.

Method

Our experiment was designed for two purposes. Firstly, to examine hearers' sensitivity to aspectual cues. Secondly, to compare participants' differential processing speed for perfective and imperfective utterances.

Participants

Twenty students from the upper forms of a secondary school in Hong Kong, aged 16, participated in the experiment. They signed up for the experiment voluntarily as an extra-curricular activity. All participants were native speakers of Cantonese.

Materials

Twenty-eight pairs of experimental sentences were constructed, each describing an accomplishment type event according to the classification of situation types by Vendler (1967) and Smith (1991). For each event, one sentence was marked with the perfective aspect marker *zo2*, and its counterpart was marked with the imperfective aspect marker *gan2*. Events were limited to the accomplishment type as only events of this type can be modified by both *zo2* and *gan2* in Cantonese and be depicted by pictures for both completive and ongoing interpretations. Activity verbs can also be modified by both *zo2* and *gan2*, yet it is difficult to draw clear pictures to depict a completed activity. The sentences were recorded onto sound wave files. The lengths of the recorded utterances were equalized pair by pair. The twenty-eight pairs of utterances were on average 1.79 seconds in length, with a standard deviation of 0.28.

A corresponding twenty-eight pairs of pictures were drawn by an artist. For each picture pair, one picture depicted an in-progress stage of the action while the other depicted its completed stage.

Consider the following sample utterances. (1a) illustrates an accomplishment event marked by progressive aspect marker *gan2*, while (1b) illustrates the same event marked by perfective aspect marker *zo2*:

(1a) *imperfective:*
婆婆織緊件冷衫。
Po4po2 zik1-gan2 gin6 laang1saam1.
maternal grandmother knit-PROG CL wool clothing
'Grandma is knitting a sweater.'

(1b) *perfective:*
婆婆織咗件冷衫。
Po4po2 zik1-zo2 gin6 laang1saam1.
maternal grandmother knit-PFV CL wool clothing
'Grandma has knitted a sweater.'

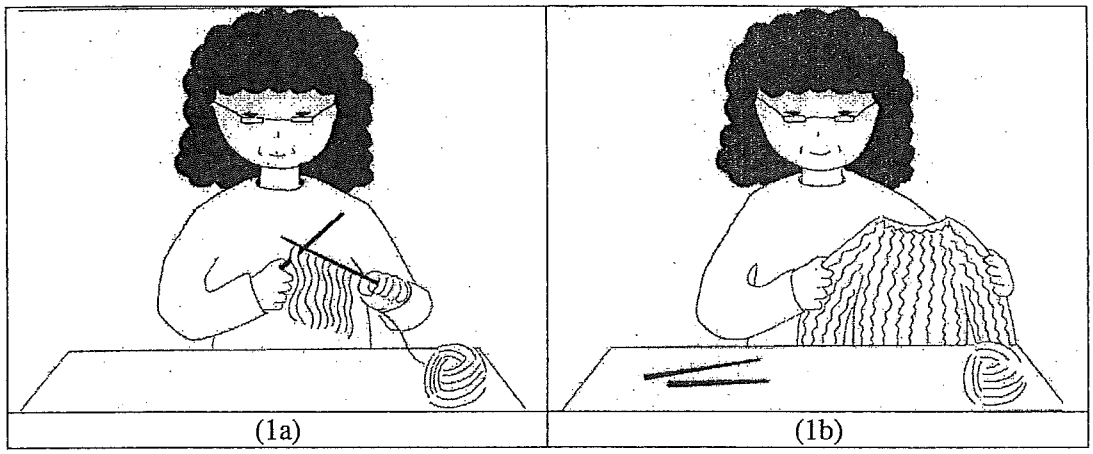
Upon hearing either (1a) or (1b), participants were immediately shown a pair of pictures (see Figure 1 below). One picture depicted an old woman knitting a sweater. The other picture depicted the old woman holding a newly completed sweater, with the needles and yarn still in front of her. The rest of the picture remained constant.

Each participant only heard either the perfective or the imperfective version of the utterance for each utterance pair. The materials (i.e. utterance-and-picture sequences) were counterbalanced across four lists. That is, each item was heard equally often as a perfective utterance as well as an imperfective utterance. Each picture had an equal chance to appear on

the left as well as on the right. Each participant came across an equal number of perfective utterances as well as imperfective utterances.

An additional seven pairs of utterances and pictures were prepared for a practice session before the trial.

Figure 1



Procedures

Instructions were displayed on the computer screen and reinforced verbally to the participants. Participants were told that they would hear an utterance and then see two pictures, one on the left, and one on the right. They were asked to decide which picture best depicts the content of the utterance they heard and then press the corresponding key labelled on the keyboard. Two labels were put on the keyboard, one with 左 *zo2* written on it, meaning 'left', the other one with 右 *jau6*, meaning 'right'. They were asked to press the 'left' key with the forefinger on the left hand, and the 'right' key with the forefinger on the right hand. Participants put on headphones to listen to the utterances. The pictures appeared for three seconds after the utterance was played through. Stimuli were presented and reaction times were recorded with Millisecond Software INQUISIT (De Clercq et al. 2003).

Before the twenty-eight valid trials, participants were given seven trials for practice to familiarize themselves with the experiment. The practice trials were conducted in the same manner as the valid trials, but with a different set of items. Accuracy and reaction time in the practice trials were not counted in the analyses.

Results and discussions

The independent variable of the experiment is the aspect marker (perfective vs. imperfective). Results were analyzed in terms of accuracy and reaction time. Paired sample *t*-tests were conducted. Analyses were carried out both in variance due to subjects and variance due to items, represented by subscripts 1 and 2, respectively. An alpha level of .05 was used in all statistical tests.

Responses were considered accurate if the participant chose the 'matching' picture. The picture was considered a 'match' if it depicted a completed action when a perfective utterance was heard, and if it depicted an in-progress action when an imperfective utterance was heard.

The results showed that participants performed slightly but significantly more accurately for perfective matches than imperfective matches (see Table 1 below).

Table 1

Means and standard deviations of response accuracy for the experiment

	Perfective	Imperfective	Overall
Mean	95%	91%	93%
SD_1	4%	7%	
SD_2	7%	8%	
SD_1= Standard deviation (variance due to subjects) SD_2= Standard deviation (variance due to items)			

Participants chose the matching picture in 93% of the trials. They chose the matching picture after listening to a perfective utterance in 95% of the perfective trials (SD_1 = 4%, SD_2 = 7%). A matching picture was chosen in 91% of the imperfective trials (SD_1 = 7%, SD_2 = 8%). A paired sample *t*-test revealed that participants were not choosing the matching picture by chance [t_1 (19) = 2.26, p<.05; t_2 (27) = 2.58, p<.05]. These results indicate that participants were sensitive to *both* perfective and imperfective aspectual cues, as they chose the matching picture for both types of utterances in over 90% of the trials.

It is worth noting that in Madden and Zwaan's (2003) study, participants chose matching pictures with a much lower percentage than in our study. In their forced choice experiment, participants chose the matching picture on 76% of the perfective trials, but only on 56% of the imperfective trials. The difference in accuracy between their perfective and imperfective trials (20%) is five times greater than that in our Cantonese study (4%). This outcome can be explained by differences in the tense-aspect systems of the two languages. That is, Madden and Zwaan compared *simple past* (perfective) against *progressive past* (imperfective). Simple past is prototypical perfective, while progressive past is non-prototypical progressive. Participants' sensitivity towards imperfective aspectual cues may have been masked by the past tense. However, in our study, no tense was indicated in the utterances. In Cantonese, a 'tenseless' language, there is no inflectional tense morpheme. Aspect markers dominate the temporal information in the situation when time is not specified by adverbials or context. Perfective aspect is usually associated with the past and imperfective with the non-past (Huang 1988:125). Without the manipulation of tense, we are comparing prototypical perfective and prototypical progressive. The effect of aspect is more transparent in our Cantonese study, hence producing a different result from Madden and Zwaan's study on English.

Let us now turn to the analysis of reaction time. The results showed that participants responded faster after hearing perfective utterances than imperfective ones (see Table 2).

Table 2

Means and standard deviations of response speed (in milliseconds) for the experiment

	Variance due to subjects			Variance due to items	
	Perfective	Imperfective		Perfective	Imperfective
Mean	1118	1253	Mean	1128	1268
SD	147	201	*SD*	186	198

The response speed of participants was analyzed as follows. Only matched responses were used in the reaction time analysis. Responses greater than plus or minus 3 standard deviations from the participant's mean condition were removed. These consisted of 1% of all responses. Participants reacted faster to perfective utterances in the subject analysis and item analysis (M_1 = 1118 ms, SD_1 = 147; M_2 = 1128 ms, SD_2 = 186) than to imperfective utterances (M_1 = 1253 ms, SD_1 = 201; M_2 = 1268 ms, SD_2 = 198). The faster response to perfective utterances is statistically significant [t_1 (19) = 4.37, p<.001; t_2 (27) = 4.46, p<.001]. Comparable to the favourable findings to perfective aspectual cues by Madden and Zwaan in their forced choice tasks, advantage was shown to perfective aspectual cues in terms of accuracy (by 4%) and processing speed (by 140ms) in our study. This suggests that participants, though sensitive to both perfective and imperfective aspect markers, are faster and more precise when processing situations marked by perfective aspect marker *zo2* than imperfective aspect marker *gan2*.

One possible explanation for the different results between the present study and Madden and Zwaan's study could be attributed to the nature of the stimuli. Auditory stimuli (utterances) were used in our Cantonese study, while visual stimuli (written sentences) were used in Madden and Zwaan's English study. Two reasons motivated our use of auditory stimuli. Cantonese is a spoken language which is seldom written down. Thus most Cantonese speakers are not used to reading Cantonese. At school in Hong Kong, Cantonese children are taught a written form of Cantonese known as Modern Standard Chinese (MSC), which is closer to Mandarin Chinese. Moreover, the written characters of Cantonese are not unified in a number of cases. Given these considerations, speech sounds were presented as stimuli in our experiment. It is worth noting here that the statistically significant results across items clearly indicate that different length of utterances did not contribute to notable difference in reaction time across items.[2]

Another point worth elaborating is Madden and Zwaan's (2003) suggestion that imperfective aspect showed no facilitation to participants' processing speed of ongoing situations in their studies because 'not all comprehenders represent the imperfective sentences at the same intermediate stage of completion' (2003:669). We would add, however, that the lack of sensitivity towards imperfective markers in Madden and Zwaan's experiments may also be partially due to the non-prototypicality of imperfective (i.e. past progressive) tested in their study. Simple past is a prototypical perfective (Dahl 1985), leading to sensitivity of participants towards perfective cues in Madden and Zwaan's experiments. Past progressive, on the other hand, is not a prototypical imperfective, as the perfective sense of 'past' dominates over the imperfective sense of progressive. In our Cantonese studies, without the manipulation of prototypicality of aspect by tense, aspects are prototypical of their type, so that participants perceive them with ease. The effect of aspectual cues in English could be examined again in another study. Prototypical perfective (simple past) and prototypical progressive (present progressive) should be compared. Participants might show sensitivity to both aspects when both are prototypical exemplars for their aspectual class.

Prototype theory may offer a possible explanation to the perfective advantage in comprehension of accomplishment situations.[3] L. Zhang (1995) addressed aspectuality through cognitive and prototype approaches. Based on the observation of Huang (1988), L.

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[2] Auditory presentation is also preferable for at least three other reasons. First, use of auditory stimuli provides more direct access to cognitive processing, without the intervention of writing. Secondly, we are better able to avoid extraneous problems arising from variation in reading strategies. Thirdly, use of auditory stimuli (speech utterances) in place of visual stimuli (written characters) would facilitate more valid cross-linguistic comparison.

[3] Prototype theory was largely proposed by Rosch (cf. Rosch 1973; Rosch et al. 1976). She has shown that people categorize objects around foci of 'natural prototypes'.

Zhang claimed that the perfective and the imperfective can be placed at the two ends on a continuum representing length of periodicity. Perfective is bounded in time, while imperfective is not. Achievements are prototypically perfective and should be placed at the perfective end, while states are prototypically imperfective. Activities are placed between them. As accomplishments share the properties of activities and achievements, they should lie in a position between the two. Accomplishments are activities with boundaries added. These boundaries could be quantitative or temporal, e.g. *'build a house'*, *'run for two hours'*. In that case, accomplishments lie nearer towards the perfective end of the continuum. A perfective aspect marker intensifies the boundedness of an accomplishment, making it more prototypically perfective. This accounts for the faster reaction time for perfective utterances in the experiment, as prototypes are activated faster than non-prototypical entities.

CONCLUSION

As tense is not grammatically marked in Cantonese, aspectual information dominates over the tense feature of the language. In the utterance-and-picture matching experiment, asymmetry was shown between utterances marked by the perfective aspect marker *zo2* and imperfective aspect marker *gan2*. Participants performed more accurately after hearing an utterance marked by a perfective aspect marker than an imperfective one. The asymmetry was further indicated when significantly faster processing speed was found for perfective situations. The advantage of the perfective marker over imperfective marker in speed and accuracy of task performance is explainable by the prototype account. That is, the prototypical perfective aspect marker *zo2* adds prototypicality to the accomplishment situations which are already inclined to the perfective side along an imperfective-perfective continuum.

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