Aspectual Asymmetries in the Mental Representation of Events: Significance of Lexical Aspect

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1. Introduction

Aspect contributes important temporal information for the construction of situation models in the human mind. Aspect refers to different ways of viewing the temporal properties of a situation (Comrie 1976). There are two major types of aspect: lexical aspect and grammatical aspect. Both types of aspect frequently interact to produce asymmetries in processing speeds. These asymmetries allow us to impose different temporal perspectives (e.g. foregrounding vs. backgrounding effects) on situations and events.

1.1 Lexical aspect:

Inherent properties of verbs/predicates that are distinguished on the basis of temporal properties such as dynamism, durativity, and telicity (Vendler 1967).

- States (*e.g. know*)
- Activities (*e.g. play*)
- Accomplishments (*e.g. bake a cake*)
- Achievements (*e.g. break*)

1.2 Grammatical aspect:

A grammatical encoding that allows us to view a situation as *bounded* or *unbounded*, *telic* or *atelic*, i.e. whether or not to include the initial or final endpoint within our temporal perspective of the situation (Comrie 1976; Smith 1991)

- Perfective aspect allows us to view an event as a whole.
- Imperfective aspect constrains us to focus on the internal stages of an event.

1.3 Perfective facilitation:

For English, Madden and Zwaan (2003) have shown that perfective aspect (e.g. *The man made a fire*) is processed faster than imperfective aspect (e.g. *The man was making a fire*). A similar perfective advantage was also found in East Asian languages including Cantonese (Chan et al., 2004), Mandarin (Yap et al., 2004) and Japanese (Yap et al., in press). This processing advantage was observed for accomplishment verbs.

2. Research Questions

The present study investigates whether different verb classes (e.g. accomplishment vs. activity) have different effects on processing speeds. This study focuses on Cantonese.

2.1 Accomplishment verbs (ACC)

(1) *sik6 go3 ping4gwo2* [+ dynamic] [+ durative] [+ telic]
eat CL apple
'eat an apple'

2.2 Activity verbs (ACT)

(2) *jau4seoi2* [+ dynamic] [+ durative] [- telic]
swim
'swim'

The effects of imperfective markers *gan2* and *hai2dou6* and of perfective markers *zo2* and *jyun4* were examined under the following conditions:
(i) accomplishment verbs only,
(ii) activity verbs only, and
(iii) a combination of accomplishment and activity verbs.

We predict that perfective sentences will be faster with accomplishment verbs, but imperfective sentences will be faster with activity verbs. Positive results would be consistent with a prototype explanation.

3. Methodology

- Participants: native Cantonese speakers in local secondary schools in Hong Kong (mean age = 18).
- Forced-choice utterance-picture matching tasks were used (see Figure 1).
- Reaction times were recorded using millisecond INQUISIT software.
- We compared the mean reaction time across matched perfectives and matched imperfectives.
- Significance was tested by a series of ANOVAs. The accuracy rate was also analyzed.

Figure 1: Utterance-picture matching task

A. Presentation of either a perfective or imperfective utterance:

go3 laam4jan2 diu3gan2 jyu2
CL man fish-ASP fish
'The man is fishing.'

B. Presentation of a pair of pictures depicting ongoing versus completed events

C. Decision of which picture matches the utterance by pressing corresponding key on keyboard

We conducted a series of 3 experiments using the same methodology, with some configurational variations related to number of verb classes and type of grammatical markers. Experiments 1a and 1b are pair-wise experiments involving one verb class only (Accomplishments). Likewise, Experiments 2a and 2b are also pair-wise experiments involving one verb class only (Activities). Experiment 3 is a more complex experiment involving two verb classes (Accomplishments and Activities).

Table1: Experimental setups

Experiment	Verb class	Aspect markers	No. of participants	No. of sentences*
1a	ACC	*zo2, gan2*	18	20
1b	ACC	*jyun4,hai2dou6*	18	20
2a	ACT	*zo2, gan2*	18	20
2b	ACT	*jyun4, hai2dou6*	18	20
3	ACT, ACC	*zo2, gan2*	32	24

ACC: Accomplishment; ACT: Activity *excluding trial sentences

4. Results

4.1 Perfective facilitation was found with accomplishment verbs (see Table 2).

Table 2: Results of experiments 1a and 1b

	Experiment 1a	Experiment 1b
Verb class	Accomplishment	Accomplishment
Aspect markers	*zo2* vs *gan2*	*jyun4* vs *hai2dou6*
Mean length of utterance	1.94 secs (SD=.12)	1.82 secs (SD=.19)
Perfective	Mean=941ms (SD=242)	Mean=964ms (SD=295)
Imperfective	Mean=1032ms (SD=289)	Mean=1113ms (SD=396)
Signifiance	$p < .05$	$p < .05$
	Perfective advantage	Perfective advantage

4.2 Imperfective facilitation was found with activity verbs (see Table 3).

Table 3: Results of experiments 2a and 2b

	Experiment 2a	Experiment 2b
Verb class	Activity	Activity
Aspect markers	*zo2* vs *gan2*	*jyun4* vs *hai2dou6*
Mean length of utterance	1.7 secs (SD=.15)	1.7 secs (SD=.15)
Perfective	Mean=1211ms (SD=379)	Mean=1171ms (SD=431)
Imperfective	Mean=1125ms (SD=367)	Mean=1064ms (SD=425)
Signifiance	$p < .05$	$p < .05$
	Imperfective advantage	Imperfective advantage

4.3 Imperfective facilitation but not perfective facilitation was found in more complex environments involving two verb classes, namely accomplishments and activities (see Table 4). The results suggest that imperfective facilitation with activity verbs is more robust than perfective facilitation with accomplishment verbs.

Table 4: Results of Experiment 3 (Accomplishments and Activities combined)

Lexical aspect	Grammatical aspect	
	Perfective *zo2*	Imperfective *gan2*
Accomplishment (N=168)	Mean = 1199ms (SD = 376)	Mean = 1193 ms (SD = 430)
Activity (N=168)	Mean = 1239 ms (SD=445)	Mean = 1096 ms (SD=326)

Mean length of utterance = 1.8 secs; SD = .19
Main effect of grammatical aspect: $p < .05$
Main effect of lexical aspect: $p > .05$
Lexical x grammatical interaction effect: $p < .05$

4.4 A paired-samples t-test was conducted to investigate the significant interaction in the more complex environment involving more than one verb class (Experiment 3). Imperfective facilitation with activity verbs remained robust. However, perfective facilitation with accomplishment verbs was not found, suggesting that the perfective advantage was more fragile and more vulnerable to neighborhood effects (see Table 5).

Table 5: Follow-up t-test on interaction effect of Experiment 3

	Perfective *zo2*	Imperfective *gan2*	Significance
Accomplishment (N=168)	Mean = 1199ms SD = 376	Mean = 1193 ms SD = 430	$p > .05$
Activity (N=179)	Mean = 1241ms SD = 435	Mean = 1091 ms SD = 321	$p < .05$

4.5 The accuracy rates for Experiments 1, 2 and 3 were very high (see Table 6).

Table 6: Accuracy rates in the present Cantonese study

Experiment	1a	1b	2a	2b	3	
Verb Class	ACC	ACC	ACT	ACT	ACC	ACT
Perfective	90%	95%	92%	93%	90%	93%
Imperfective	89%	92%	97%	96%	89%	95%
Overall Accuracy	89.5%	93.5%	94.5%	94.5%	89.5%	94%

5. Discussion

5.1 Aspectual asymmetries

Our findings indicate that inherent lexical aspect (accomplishment vs. activity) contributes to aspectual asymmetry in language processing. The evidence suggests that prototype effects are more general predictors of aspectual facilitations with respect to processing speed in sentence-picture matching tasks. More specifically, accomplishment verbs impose an inherent telic endpoint to an event, while activity verbs draw reference to an event without focusing on the endpoint(s). The completive features of perfective aspect markers *zo2* and *jyun4* nicely match the telic nature of accomplishment verbs. The durative features associated with imperfective aspect markers *gan2* and *hai2dou6* nicely match the intrinsic atelic nature of activity verbs. Compatibility has a reinforcing effect, and this induces an imperfective processing advantage among activity verbs.

5.2 Neighborhood effects

Neighborhood factors (such as the presence or absence of other verb types) also appear to be a contributing factor. In contexts such as Experiment 3, in which subjects are exposed to both activity and accomplishment verbs, the presence of activity verbs could lead subjects to pay more attention to the ongoing phase of accomplishment verbs. In a setup where activity verbs co-occur with accomplishment verbs, participants are exposed to a higher ratio of [+durative] features. This could then sometimes 'wipe out' the perfective advantage often associated with accomplishment verbs.

5.3 Pair-wise vs. complex designs

The pair-wise experiments (Experiments 1 & 2) and the complex experiment (Experiment 3) are conducted for different purposes. The 'accomplishment verbs only' and 'activity verbs only' pair-wise experiments provided clear baseline results for each verb type. Crucially, these baseline results are sufficiently robust even when the subject pool is minimal (N=18). These baseline results enable us to better analyze the results of complex designs with two or more verb classes, which more closely reflect authentic language use.

5.4 Accuracy rates

Accuracy rates in the present study are higher than those in the study by Madden and Zwaan (2003). Participants in the current study are sensitive to both perfective and imperfective cues.

6. Conclusion

Perfective facilitation is found with accomplishment verbs and imperfective facilitation is found with activity verbs. The prototype hypothesis accurately predicts that prototypical combinations of grammatical and lexical aspect are processed significantly faster than non-prototypical combinations.

7. References

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