Interaction of Lexical and Grammatical Aspect in Language Processing

Foong Ha YAP,[*] Stella Wing Man KWAN,[*] Patrick Chun Kau CHU,[*]
Emily Sze Man YIU,[*] Stella Fat WONG,[*]
Seongha RHEE[†] and Yasuhiro SHIRAI[††]

[*]*Chinese University of Hong Kong*
[†] *Hankuk University of Foreign Studies*
[††]*University of Pittsburgh*

Temporal cues such as lexical and grammatical aspect contribute to the construction of situation models in the human mind (Zwaan & Radvansky 1998). Previous studies on English, Cantonese, Mandarin and Japanese show that, with accomplishment verbs, perfective sentences are processed faster than imperfective sentences (Madden & Zwaan, 2003; Chan et al., 2004; Yap et al., 2004, in press). However, subsequent studies on Cantonese show that, with activity verbs, imperfective sentences are processed faster than perfective sentences (Yap et al., 2006). In complex environments involving both accomplishment and activity verbs, results from the Cantonese studies show that the imperfective advantage with activity verbs remains robust, but the perfective advantage with accomplishment verbs disappear. The present study on Korean, a tensed language, shows similar results to Cantonese, a tenseless language. Our findings suggest that lexical aspect interacts with grammatical aspect to influence language processing. In this paper the observed aspectual asymmetries are explained in terms of a prototype account.

INTRODUCTION

Temporal information, including tense and aspect, is known to play a very important role in language processing (Carreiras, Carriedo, Alonso & Fernández, 1997; Magliano & Schleich, 2000; Morrow, 1985, 1990). Aspect refers to different ways of viewing the temporal properties of a situation (Comrie, 1976), and is typically classified into two major types—namely, lexical aspect and grammatical aspect. Lexical aspect refers to verb phrase(s) that are distinguished on the basis of temporal properties such as dynamism, durativity, and telicity. Vendler (1967) distinguishes four basic situation types: states (e.g. *love*), activities (e.g. *swim*), accomplishments (e.g. *type a letter*), and achievements (e.g. *begin*). Smith (1991) identified a fifth category, i.e. semelfactives (e.g. *jump*, interpreted iteratively).

Table 1 distinguishes each verb class based on their temporal characteristics.

Table 1. Different verb classes and their temporal properties (Smith 1991)

	+Dynamic	Durative	Telic	Examples
State	-	+	-	*love*
Activity	+	+	-	*swim*
Accomplishment	+	+	+	*type a letter*
Achievement	+	-	+	*begin*
Semelfactive	+	+	+	*jump*

Grammatical aspect, also referred to as viewpoint aspect, signals whether a speaker views a situation as *bounded* or *unbounded*—that is, whether or not the speaker's temporal focus includes an initial or final endpoint (Comrie, 1976; Smith, 1991). This yields a two-way perfective vs. imperfective distinction. As defined in Comrie (1976), perfective aspect allows us to view an event as a whole (hence a 'bounded' or 'external' perspective), while imperfective aspect constrains us to focus on the internal stages of an event (hence an 'unbounded' or 'internal' perspective). For example, in English, progressive aspect *be* + V-*ing* is an imperfective aspect marker, while past tense morphology -*ed* (along with the irregular past forms) is aspectually perfective.

Processing asymmetries

Using a series of sentence-and-picture matching tasks, Madden and Zwaan (2003) showed that

perfective sentences in English (e.g. *He wrote a letter*) were processed faster than imperfective sentences (e.g. *He was writing a letter*). Madden and Zwaan suggested that a perfective advantage emerges because it is much easier for participants to converge on a mental representation of events with a clear endpoint focus.

Perfective facilitation was also found in other languages. In Cantonese, sentences with perfective *zo2* were processed significantly faster than sentences with imperfective progressive *gan2* (Chan et al., 2004). Likewise, Mandarin sentences with perfective *le* were processed significantly faster than those with imperfective progressive *zai* (Yap et al., 2004); Japanese sentences with perfective *–ta* were processed faster than those with imperfective *–teiru* (Yap et al., in press).

These studies only involved one verb type, namely *accomplishment verbs*. Yap et al. (2006) examined the processing speed of perfective vs. imperfective sentences (i.e. grammatical aspect) in a more complex environment that included both accomplishment verbs and activity verbs. They found significant interaction between verb type (i.e. lexical aspect) and grammatical aspect. More specifically, perfective facilitation was found with accomplishment verbs, while imperfective facilitation was found with activity verbs. The present study extends this investigation to Korean.

Aims of the present study

The present paper examines two Korean aspect markers: perfective (completive) *–ess*, as in (1), and imperfective (progressive) *–ko iss*, as in (2). We also include sentences without grammatical aspect markers, which we termed 'null' sentences. An example of a null sentence is shown in (3).

(1) Perfective sentence with *–ess*
ku namca-nun swuyenghay-ss-ta.
the-man-TOP swim- Perf -DEC
'The man has swum.'

(2) Imperfective sentence with *–ko iss*
ku namca-nun   swuyengha-ko iss-ta.
the-man-TOP   swim- Prog -DEC
'The man is swimming.'

(3) 'Null' sentence without grammatical aspect marker
ku namca-nun   swuyengha- ta.
the-man-TOP   swim -DEC
'The man swims.'

We examine the above three types of sentences in the context of accomplishment verbs as well as activity verbs, as illustrated in (4) and (5) respectively.

(4) Accomplishment (ACC): [+dynamic][+durative][+telic]
sakwa-lul mekta.
apple-ACC eat
'eat an apple'

(5) Activity (ACT): [+dynamic][+durative][-telic]
swuyenghata
swim
'swim'

CURRENT STUDY

We examine the effects of grammatical aspect and lexical aspect on sentence processing in a more complex environment which better simulates the real world situation. More specifically, we examine participants' reaction times for three types of sentences (i.e. perfective, imperfective and null sentences) across two verb types (i.e. accomplishment and activity). We also include fillers in the stimuli set.

Method

Participants. The participants in this experiment were native Korean speakers at Hankuk University of Foreign Studies in Seoul. There were 30 participants in this experiment. Their ages varied between twenty-one and thirty-seven years with a mean of twenty-five.
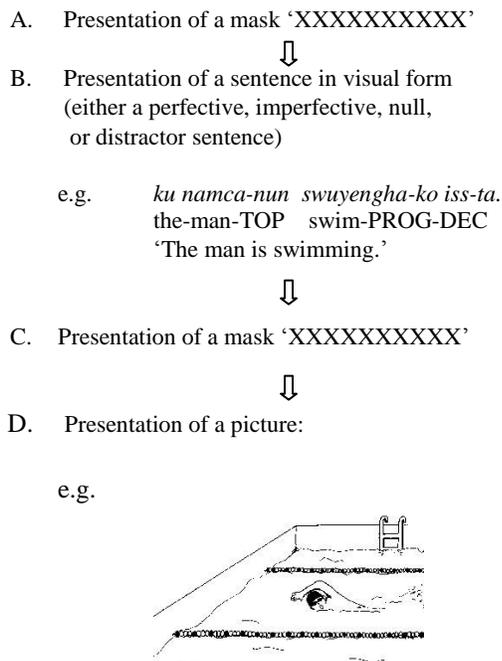
Materials. There were 96 prime sentences, 48 of them were target sentences while the other 48 sentences were used as distractors. (See Appendix A for a full list of the Korean sentences used, along with their English gloss and translation.) Each target sentence was matched with a picture depicting the action described in the sentence. Filler sentences were matched with unrelated pictures. All the pictures were drawn by professional artists. (See Appendix B for sample pictures.) In addition, there were eight sentence-picture practice items for the trial session.

Design. The experimental design included two within-subject factors (lexical aspect and grammatical aspect) in the target sentences. There were two levels in the factor of lexical aspect: activity verbs and accomplishment verbs. There were three levels in the factor of grammatical aspect: imperfective (*-ko iss*) sentences, perfective (*-ess*) sentences and the 'null' sentences (without any aspect marker). Each participant was exposed to all the above conditions. All the combinations were counterbalanced so that each participant was exposed to each condition with equal frequency.

Procedure. A forced-choice sentence-picture matching task was used in this experiment. During the practice session and the experiment proper, written instructions were first displayed on the computer screen in Korean. In the matching task, a Korean sentence was shown, preceded and followed by a mask which was used as a fixation point. After the disappearance of the second mask, participants were shown a picture. They were to judge whether the

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picture matched the sentence they had just read. If the picture matched the sentence, the participants had to press the **L** key on the keyboard with the left index finger. If the picture did not match the sentence, the participants had to press the **R** key with the right index finger. Figure 1 highlights the sequence of sentence-picture presentation.

Figure 1: Sentence-picture matching task

A. Presentation of a mask 'XXXXXXXXXX'

⇩

B. Presentation of a sentence in visual form (either a perfective, imperfective, null, or distractor sentence)

e.g. *ku namca-nun swuyengha-ko iss-ta.*
the-man-TOP swim-PROG-DEC
'The man is swimming.'

⇩

C. Presentation of a mask 'XXXXXXXXXX'

⇩

D. Presentation of a picture:

e.g.

The pictures remained on the computer screen for a maximum of 3 seconds. Failure to respond within 3 seconds was regarded as an incorrect response. We compared both the accuracy rates and the mean reaction times of the perfective, imperfective and 'null' sentences. Reaction times were recorded using INQUISIT Millisecond software (De Clerq et al., 2003). Mean reaction times were compared across matched perfectives, matched imperfectives, and null sentences, and significance was tested using ANOVA.

Results

A two-way repeated-measures ANOVA was conducted to identify the effects of grammatical aspect and lexical aspect on processing time. The within-subjects factors were lexical aspect with 2 levels (accomplishments and activities) and grammatical aspect with 3 levels (imperfective marker –*ko iss*, perfective marker –*ess*, and null sentences without aspect marker). The main effect of grammatical aspect was significant, $F(2,364) = 15.42$, $p < .000$. The main effect of lexical aspect was significant, $F(1,182) = 8.40$, $p < .05$. The interaction between lexical aspect and

grammatical aspect also reached significance, $F(2,364) = 13.58$, $p < .000$.

Paired-samples *t*-tests were conducted to further identify the specific lexical aspect plus grammatical aspect combination(s) responsible for the significant interaction. With Type I error controlled across the tests at the .05 level using the Holm's sequential Bonferroni procedure, the reaction time of imperfective marker –*ko iss* (M=993ms; SD=400) was significantly faster than perfective marker –*ess* (M=1201ms; SD=425) within activity verbs, $t(182) = -4.733$, $p < .000$. The difference of reaction times between –*ko iss* and –*ess* within accomplishment verbs was *not* significant, $t(201) = -2 .487$, $p = .014$.

The mean reaction time of null sentences was compared with imperfective and perfective sentences respectively in each verb class. The mean reaction time of null sentences was *not* significantly faster than that of imperfective sentences, $t(216) = 1.786$, $p = .075$, but the mean reaction time was significantly faster than that for perfective sentences within activities, $t(182) = 7.009$, $p < .000$. For accomplishment verbs, no significance was found between the mean reaction time of null sentences and imperfective sentences, $t(208) = -2.644$, $p = .009$, and perfective sentences, $t(201) = .462$, $p = .645$.

In order to observe the effect of lexical aspect alone, the mean reaction times of null sentences were compared across activities and accomplishments. The result was significant, $t(216) = -5.921$, $p < .000$. This suggests that different verb classes (e.g. accomplishments vs. activities) contribute distinctive effects on temporal processing (see **Table 2**).

Table 2. Mean reaction time (M) and standard deviation (SD) of imperfective, perfective and null sentences across activity and accomplishment verb types (N=183)

	Imperfective –*ko iss*	Perfective -*ess*	Null
Activity	M = 993ms SD = 399	M = 1201ms SD = 425	M = 916ms SD = 371
Accomplishment	M = 1050ms SD = 402	M = 1134ms SD = 400	M =1133ms SD = 429

Thus in terms of processing speed, imperfective facilitation was found in the context of two verb classes (accomplishments and activities). However, no perfective facilitation was observed. Interestingly, in terms of accuracy rates, participants performed significantly better with null sentences (i.e. those without aspect markers) than with perfective sentences, whether across activity or accomplishment verb types. They also performed better with null sentences than with

imperfective sentences within accomplishment verbs. There was no significant difference between null sentences and imperfective sentences within activity verbs, suggesting that imperfective sentences and activity verbs share many temporal features in common.

The accuracy rates for both matched perfectives and matched imperfectives were also analyzed using two-way repeated measures ANOVA. The main effect of lexical aspect was *not* significant, $F(1,239) = 3.61$, $p = .059$, while the effect of grammatical aspect was significant, $F(2,478) = 36.855$, $p < .000$. The interaction effect of lexical aspect and grammatical aspect also yielded significance, $F(2,478) = 21.12$, $p < .000$. Paired samples *t*-tests were conducted to follow up the significant interaction. We controlled for familywise error rate across these tests by using Holm's sequential Bonferroni procedure. For activity verbs, the difference in accuracy rate of imperfective sentences and perfective sentences was significant, $t(239) = 6.81$, $p < .000$. The difference between perfective sentences and null sentences was also significant, $t(239) = -6.281$, $p < .000$. No significance was found between imperfective sentences and null sentences, $t(239) = 2.255$, $p > .01$. For accomplishment verbs, all three paired-samples *t*-tests obtained significant level: $t(239) = 2.871$, $p < .01$ for imperfective sentences and perfective sentences; $t(239) = -3.224$, $p < .001$ for imperfective sentences and null sentences; $t(239) = -4.402$, $p < .000$ for perfective sentences and null sentences. Note that in terms of accuracy rate, the difference between the null sentences of activities and accomplishments was not significant, $t(239) = -1.739$, $p > .01$. The results are summarized in Table 3.

Table 3. Accuracy rates for imperfective, perfective and null sentences across activity and accomplishment verb types (N=240)

	Imperfective *-ko iss*	Perfective *-ess*	Null
Activity	93%	76%	90%
Accomplishment	88%	84%	92%

For activity verbs, the non-significant difference in accuracy rates between null and imperfective sentences indicate that ongoing pictures match with the intrinsic temporal properties of activity verbs and imperfective aspect, but not perfective aspect. For accomplishment verbs, significant difference in accuracy rates among perfective, imperfective and null sentences indicate that completed pictures are more ambiguous than ongoing pictures.

DISCUSSION

The present study on Korean supports findings from Cantonese studies (Yap et al., 2006) which suggest that the perfective advantage observed in Madden and Zwaan (2003) may not be robust across all verb types. In complex environments with more than one verb type, no perfective advantage was observed for accomplishment verbs. On the other hand, imperfective facilitation was found with activity verbs. These results can be explained in terms of prototype effects.

Recall that no significance was found between null sentences and imperfective sentences for activity verbs. This suggests that imperfective aspect is more compatible with the atelic features of activity verbs. In the case of accomplishment verbs, no significance was found between null sentences and perfective sentences, as well as imperfective sentences. This suggests that both perfective and imperfective aspect are compatible with the temporal features of accomplishment verbs, that is, whereas imperfective aspect perfectly matches the atelicity of activity verbs, both perfective aspect and imperfective aspect matches only part of the temporal features of accomplishment verbs, given that accomplishment verbs comprise of both ongoing (atelic) and completed (telic) phases.

In other words, since accomplishment verbs (e.g. *cip-ul cis-ta* 'build a house') comprise of an ongoing phase (building a house) *plus* an endpoint phase (completion of the house), use of imperfective marker *–ko iss* highlights the ongoing phase, while use of perfective marker *–ess* highlights the endpoint phase. Each marker is compatible with one of the phases of the accomplishment verb phrase. This explains why no significant difference was found in the mean reaction times for perfective vs. imperfective sentences with accomplishment verbs.

Activity verbs, on the other hand, comprise primarily of a homogeneous ongoing phase (e.g. *swuyengha-ta* 'swim'). Use of imperfective marker *–ko iss* is compatible with the ongoing phase, but use of perfective marker *–ess* imposes an arbitrary endpoint reading, in opposition to its inherent ongoing interpretation, and this arguably slows the processing time. This results in significant difference in the mean reaction times between perfective and imperfective sentences for activity verbs. The former (activity verb + *-ko iss*) constitutes prototypical combinations between lexical and grammatical aspect, while the latter (activity verb + *-ess*) constitutes non-prototypical combinations.

We thus see that a comprehensive theory of aspectual processing needs to take into account

that facilitation is dependent on the processing ease of particular combinations of lexical aspect (verb type) and grammatical aspect. In other words, the prototypes for each verb type are easier to process than the non-prototypes.

CONCLUSION

The present study shows that imperfective facilitation is observed with activity verbs, but perfective facilitation was not found for accomplishment verbs. This finding suggests that a perfective advantage in processing speed is not robust across all verb types. We propose instead a prototype account, which accurately predicts that, all things being equal, more prototypical combinations of grammatical and lexical aspect are processed significantly faster than less prototypical combinations.

Abbreviations used

ACC   Accusative case marker
DEC   Declarative mood
NOM   Nominative case marker
PERF   Perfective aspect marker
PN   Proper noun (name of person, etc.)
POL   Politeness marker
PROG   Progressive aspect marker
TOP   Topic marker

Appendix A:
Visual stimuli used in the Experiment

Activity verbs
1i)   *ku namca-nun   swuyengha-ko iss-ta.*
    the-man-TOP   swim- Prog –DEC
    'The man is swimming'
1p)   *ku namca-nun   swuyenghay-ss-ta.*
    the-man-TOP   swim- Perf –DEC
    'The man has swum'

2i)   *ku yeca-nun   umak-ul   tut-ko iss-ta.*
    the-woman-TOP   music-ACC   listen- Prog –DEC
    'The woman is listening to music.'
2p)   *ku yeca-nun   umak-ul   tul-ess-ta.*
    the-woman-TOP   music-ACC   listen- Perf –DEC
    'The woman has listened to music.'

3i)   *ku yeca-nun   ppallay-lul   ha-ko iss-ta.*
    the-woman-TOP   laundry-ACC   do- Prog –DEC
    'The woman is doing the laundry.'
3p)   *ku yeca-nun   ppallay-lul   hay-ss-ta.*
    the-woman-TOP   laundry-ACC   do- Perf -DEC
    'The woman has done the laundry.'

4i)   *ku yeca-nun   chwum-ul   chwu-ko iss-ta.*
    the-woman-TOP   dance-ACC   dance- Prog -DEC
    'The woman is dancing.'
4p)   *ku yeca-nun   chwum-ul   chu-ess-ta.*
    the-woman-TOP   dance-ACC   dance - Perf -DEC
    'The woman has danced.'

5i)   ku *namca-nun   ttwi-ko iss-ta.*
    the-man-TOP   run- Prog -DEC
    'The man is running.'
5p)   *ku namca-nun   ttwi-ess-ta.*
    the-man-TOP   run- Perf –DEC
    'The man has run'

6i)   *ku namca.ai-nun   khola-lul   mashi-ko iss-ta.*
    the-boy-TOP   coke-ACC   drink- Prog –DEC
    'The boy is drinking coke.'
6p)   *ku namca.ai-nun   khola-lul   mashi-ess-ta.*
    the-boy-TOP   coke-ACC   drink- Perf -DEC
    'The boy has drunk coke.'

7i)   *ku yeca-nun   yoli-lul   ha-ko iss-ta.*
    the-woman-TOP   cook-ACC   do-Prog -DEC
    'The woman is cooking.'
7p)   *ku yeca-nun   yoli-lul   hay-ss-ta.*
    the-woman-TOP   cook-ACC   do- Perf -DEC
    'The woman has cooked.'

8i)   *ku namca-nun   sungma-ul   ha-ko iss-ta.*
    the-man-TOP   ride-horse-ACC   do- Prog –DEC
    'The man is riding a horse.'
8p)   *ku namca-nun   sungma-ul   hay-ss-ta.*
    the-man-TOP   ride-horse-ACC   do- Perf –DEC
    'The man has ridden a horse.'

9i)   *ku yeca-nun   TV-lul   po-ko iss-ta.*
    the-woman-TOP   TV-ACC   watch- Prog –DEC
    'The woman is watching a TV program.'
9p)   *ku yeca-nun   TV-lul   po-ass-ta.*
    the-woman-TOP   TV-ACC   watch- Perf –DEC
    'The woman has watched a TV program.'

10i)   *ku namca-nun   thenisu-lul   chi-ko iss-ta.*
    the-man-TOP   tennis-ACC   play- Prog -DEC
    'The man is playing tennis.'
10p)   *ku namca-nun   thenisu-lul   chi-ess-ta.*
    the-man-TOP   tennis-ACC   play- Perf -DEC
    'The man has played tennis.'

11i)   *ku namca-nun   skate-lul   tha-ko iss-ta.*
    the-man-TOP   skate-ACC   ride- Prog -DEC
    'The man is skating.'
11p)   *ku namca-nun   skate-lul   tha-ss-ta.*
    the-man-TOP   skate-ACC   ride- Perf -DEC
    'The man has skated.'

'The man has skied (come) down the slope.'

12i)   *ku yeca-nun   padak-ul   ssul-ko iss-ta.*
the-woman-TOP floor-ACC sweep- Prog –DEC
'The woman is sweeping the floor.'

12p)   *ku yeca-nun   padak-ul   ssul-ess-ta.*
the-woman-TOP floor-ACC sweep- Perf –DEC
'The woman has swept the floor.'

13i)   *ku namca-nun   yen-ul   nalli-ko iss-ta.*
the-man-TOP   kite-ACC fly- Prog -DEC
'The man is flying a kite.'

13p)   *ku namca-nun   yen-ul   nalli-ess-ta.*
the-man-TOP   kite-ACC fly- Perf –DEC
'The man has flown a kite.'

14i)   *ku yeca.ai-nun umak-ul   nokumha-ko iss-ta.*
the-girl-TOP   music-ACC record- Prog -DEC
'The girl is recording music.'

14p)   *ku yeca.ai-nun umak-ul   nokumhay-ss-ta.*
the-girl-TOP   music-ACC record- Perf –DEC
'The girl has recorded music.'

15i)   *ku yeca-nun   nolay-lul pwulu-ko iss-ta.*
the-woman-TOP song-ACC sing- Prog -DEC
'The woman is singing a song.'

15p)   *ku yeca-nun   nolay-lul pwul-ess-ta.*
the-woman-TOP song-ACC sing- Perf –DEC
'The woman has sung a song.'

16i)   *ku yeca-nun   cenhwa-lo   yaykiha -ko iss-ta.*
the-woman-TOP telephone-by   talk- Prog -DEC
'The woman is talking on the phone.'

16p)   *ku yeca-nun   cenhwa-lo   yaykihay-ss-ta.*
the-woman-TOP telephone-by talk- Perf –DEC
'The woman has talked on the phone.'

17i)   *ku namca-nun phiano-lul   chi-ko iss-ta.*
the-man-TOP   piano-ACC play- Prog –DEC
'The man is playing the piano.'

17p)   *ku namca-nun phiano-lul   chi-ess-ta.*
the-man-TOP   piano-ACC play- Perf –DEC
'The man has played the piano.'

18i)   *ku namca-nun naksi-lul   ha-ko iss-ta.*
the-man-TOP   fishing-ACC do- Prog –DEC
'The man is fishing'

18p)   *ku namca-nun naksi-lul   hay-ss-ta.*
the-man-TOP   fishing-ACC do- Perf –DEC
'The man has fished.'

19i)   *ku namca-nun pithalkil-ul   naylyeo-ko iss-ta.*
the-man-TOP   slope-ACC come down- Prog -DEC
'The man is skiing (coming) down the slope.'

19p)   *ku namca-nun pithalkil-ul   naylyeo-ass-ta.*
the-man-TOP slope-ACC   come down- Perf -DEC

20i)   *ku namca.ai-nun san-ul olu-ko iss-ta.*
the-boy-TOP mountain/hill-ACC climb-Prog -DEC
'The boy is hiking in the hills.'

20p)   *ku namca.ai-nun san-ul oll-ass-ta.*
the-boy-TOP mountain/hill-ACC climb- Perf -DEC
'The boy has hiked in the hills.'

21i)   *ku aki-nun   wul-ko iss-ta.*
the-baby-TOP cry- Prog -DEC
'The baby is crying.'

21p)   *ku aki-nun   wul-ess-ta.*
the-baby-TOP cry- Perf –DEC
'The baby has cried.'

22i)   *ku yeca.ai-nun kitoha-ko iss-ta.*
the-girl-TOP   pray- Prog –DEC
'The girl is praying.'

22p)   *ku yeca.ai-nun kitohay-ss-ta.*
the-girl-TOP   pray- Perf –DEC
'The girl has prayed.'

23i)   *ku sensayngnim-un swuep-ul   ha- ko kyesi-ta.*
the-teacher-TOP   lesson-ACC do- Prog –DEC
'The teacher is teaching a class.'

23p)   *ku sensayngnim-un swuep-ul   hasi-ess-ta.*
the-teacher-TOP lesson-ACC do:POL- Perf -DEC
'The teacher has taught a class.'

24i)   *ku aki-nun   wuyu-lul   masi-ko iss-ta.*
the-baby-TOP milk-ACC drink- Prog -DEC
'The baby is drinking milk.'

24p)   *ku aki-nun   wuyu-lul masi-ess-ta.*
the-baby-TOP milk-ACC drink- Perf –DEC
'The baby has drunk milk.'

Accomplishment verbs

1i)   *ku namca-nun cip-ul   cis-ko iss-ta.*
the-man-TOP   house-ACC build- Prog –DEC
'The man is building a house.'

1p)   *ku namca-nun cip-ul   ci-ess-ta.*
the-man-TOP   house-ACC build- Perf –DEC
'The man has built a house.'

2i)   *ku yeca.ai-nun kulca-lul olyenay-ko iss-ta.*
the-girl-TOP   letter-ACC cut out- Prog -DEC
'The girl is cutting out the letter.'

2p)   *ku yeca.ai-nun kulca-lul olyenay-ess-ta.*
the-girl-TOP   letter-ACC cut out- Perf –DEC
'The girl has cut out the letter.'

3i)   *ku namca-nun sangcem-ulo tuleka-ko iss-ta.*
the-man-TOP   shop-into enter- Prog –DEC
'The man is walking to the store.'

3p) *ku namca-nun sangcem-ulo tuleka-ss-ta.*
the-man-TOP shop-into enter- Perf –DEC
'The man has walked to the store.'

4i) *ku yeca-nun kheik-ul kwup-ko iss-ta.*
the-woman-TOP cake-ACC bake- Prog –DEC
'The woman is baking a cake.'

4p) *ku yeca-nun kheik-ul kwuwo-ess-ta.*
the-woman-TOP cake-ACC bake- Perf –DEC
'The woman has baked a cake.'

5i) *ku namca.ai-nun pwul-ul piwu-ko iss-ta.*
the-boy-TOP fire-ACC burn- Prog -DEC
'The boy is lighting a fire.'

5p) *ku namca.ai-nun pwul-ul piwu-ess-ta.*
the-boy-TOP fire-ACC burn- Perf -DEC
'The boy has lighted a fire.'

6i) *ku namca-nun namwu-ul sim-ko iss-ta.*
the-man-TOP tree-ACC plant- Prog –DEC
'The man is planting a tree.'

6p) *ku namca-nun namwu-ul sim-ess-ta.*
the-man-TOP tree-ACC plant- Perf –DEC
'The man has planted a tree.'

7i) *ku namca.ai-nun nwunsalam-ul mandul-ko iss-ta.*
the-boy-TOP snowman-ACC make- Prog –DEC
'The boy is making a snowman.'

7p) *ku namca.ai-nun nwunsalam-ul mandul-ess-ta.*
the-boy-TOP snowman-ACC make- Perf –DEC
'The boy has made a snowman.'

8i) *ku yeca-nun tari-lul kenne-ko iss-ta.*
the-woman-TOP bridge-ACC cross- Prog –DEC
'The woman is crossing the bridge.'

8p) *ku yeca-nun tari-lul kenne-ss-ta.*
the-woman-TOP bridge-ACC cross- Perf -DEC
'The woman has crossed the bridge.'

9i) *ku yeca-nun kkokkoci-lul ha-ko iss-ta.*
the-woman-TOP flower arrangement-ACC do- Prog –DEC
'The woman is arranging the flowers.'

9p) *ku yeca-nun kkokkoci-lul mantul-ess-ta.*
the-woman-TOP flower arrangement-ACC make-Perf–DEC
'The woman has arranged the flowers.'

10i) *ku yeca-nun sweythe-lul ttu-ko iss-ta.*
the-woman-TOP sweater-ACC knit- Prog –DEC
'The woman is knitting a sweater.'

10p) *ku yeca-nun sweythe-lul ttu-ess-ta.*
the-woman-TOP sweater-ACC knit- Perf –DEC
'The woman has knitted a sweater.'

11i) *ku namca-nun umlyoswu khayn-ul tta-ko iss-ta.*
the-man-TOP drink can-ACC open- Prog -DEC
'The man is opening a can.'

11p) *ku namca-nun umlyoswu khayn-ul tta-ss-ta.*
the-man-TOP drink can-ACC open- Perf –DEC
'The man has opened a can.'

12i) *ku namca-nun kulim-ul kuri-ko iss-ta.*
the-man-TOP picture-ACC draw- Prog-DEC
'The man is drawing a picture.'

12p) *ku namca-nun kulim-ul kuri-ess-ta.*
the-man-TOP picture-ACC draw- Perf –DEC
'The man has drawn a picture.'

13i) *ku namca.ai-nun sinpal kkun-ul may-ko iss-ta.*
the-boy-TOP shoelace-ACC tie- Prog -DEC
'The boy is tying his shoelaces.'

13p) *ku namca.ai-nun sinpal kkun-ul may-ss-ta.*
the-boy-TOP shoelace-ACC tie- Perf-DEC
'The boy has tied his shoelaces.'

14i) *ku namca.ai-nun sakwa-lul mek-ko iss-ta.*
the-boy-TOP apple-ACC eat- Prog -DEC
'The boy is eating an apple.'

14p) *ku namca.ai-nun sakwa-lul mek-ess-ta.*
the-boy-TOP apple-ACC eat- Perf -DEC
'The boy has eaten an apple.'

15i) *ku halmeni-kkeyse hwacho-ey mwul-ul cwu-ko iss-ta.*
the-grandma-NOM:POL plant-in water-ACC give-Prog-DEC
'The old woman is watering the plant.'

15p) *ku halmeni-kkeyse hwacho-ey mwul-ul cwu.sye-ess-ta.*
the-grandma-NOM:POL plant-in water-ACC give-Perf -DEC
'The old woman has watered the plant.'

16i) *ku yeca-nun senmwul-ul phocangha-ko iss-ta.*
the-woman-TOP gift-ACC wrap- Prog –DEC
'The woman is wrapping a present.'

16p) *ku yeca-nun senmwul-ul phocanghay-ss-ta.*
the-woman-TOP gift-ACC wrap- Perf –DEC
'The woman has wrapped a present.'

17i) *ku namca.ai-nun kil-ul kenne-ko iss-ta.*
the-boy-TOP road-ACC cross- Prog -DEC
'The boy is crossing the road.'

17i) *ku namca.ai-nun kil-ul kenne-ss-ta.*
the-boy-TOP road-ACC cross- Perf –DEC
'The boy has crossed the road.'

18i) *ku namca.ai-nun puzzle-ul matchwu-ko iss-ta.*
the-boy-TOP puzzle-ACC fix up- Prog –DEC
'The boy is doing a jigsaw puzzle.'

18p) *ku namca.ai-nun puzzle-ul matchwu-ess-ta.*
the-boy-TOP puzzle-ACC fix up- Perf –DEC
'The boy has done a jigsaw puzzle.'

19i) *ku namca.ai-nun chilphan-ul ciwu-ko iss-ta.*
the-boy-TOP blackboard-ACC erase-Prog -DEC
'The boy is cleaning the board.'

19p) *ku namca.ai-nun chilphan-ul   ciwu-ess-ta.*
      the-boy-TOP   blackboard-ACC erase- Perf -DEC
      'The boy has cleaned the board.'

20i) *ku yeca-nun   pyenci-lul ssu-ko iss-ta.*
      the-woman-TOP letter-ACC write- Prog –DEC
      'The woman is writing a letter.'

20p) *ku yeca-nun   pyenci-lul ssu-ess-ta.*
      the-woman-TOP letter-ACC write- Perf –DEC
      'The woman has written a letter.'

21i) *ku namca.ai-nun sosel-ul   ilk-ko iss-ta.*
      the-boy-TOP   novel-ACC read- Prog –DEC
      'The boy is reading a novel.'

21p) *ku namca.ai-nun sosel-ul   ilk-ess-ta.*
      the-boy-TOP   novel-ACC read- Perf –DEC
      'The boy has read a novel.'

22i) *ku yeca-nun   phyenci-lul thaiphingha-ko iss-ta.*
      the-woman-TOP letter-ACC type- Prog –DEC
      'The woman is typing a letter.'

22p) *ku yeca-nun   phyenci-lul thaiphinghay-ss-ta.*
      the-woman-TOP letter-ACC type- Perf –DEC
      'The woman has typed a letter.'

23i) *ku namca-nun neykthai-lul   may-ko iss-ta.*
      the-man-TOP   necktie-ACC tie- Prog –DEC
      'The man is tying a necktie.'

23p) *ku namca-nun neykthai-lul   may-ss-ta.*
      the-man-TOP   necktie-ACC tie- Perf –DEC
      'The man has tied a necktie.'

24i) *ku namca.ai-nun mohyeng pihayngki-lul cholipha-ko iss-ta.*
      the-boy-TOP model airplane-ACC assemble-Prog-DEC
      'The boy is assembling a model airplane.'

24p) *ku namca.ai-nun mohyeng pihayngki-lul choliphay-ss-ta.*
      the-boy-TOP   model airplane-ACC assemble- Perf -DEC
      'The boy has assembled a model airplane.'

Appendix B:
A pair of pictures used in the Experiment
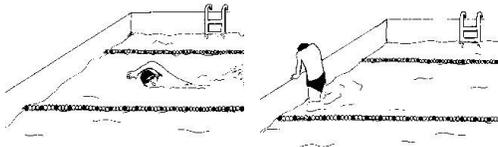
1i) *ku namca-nun swuyengha-ko iss-ta.* 1p) *ku namca-nun swuyenghay-ss-ta.*
   the-man-TOP swim- Prog –DEC   the-man-TOP swim- Perf –DEC
   'The man is swimming'   'The man has swum'

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