Past Tense Affixation in L2 English: The Effects of Lexical Aspect and Perceptual Salience*

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1. Introduction

It is well known that accuracy in verbal morphology is very variable in second language (L2) production. For example, English learners often show evidence of the following verb forms at a single stage in their developing L2 grammars:

(1) She (is) wait/waiting at the station right now.
(2) She wait/waited at the station yesterday.

Numerous explanations have been proposed to account for such variability. Here we will focus on two, exploring a potential relationship between them: the Aspect Hypothesis (AH) (e.g. Andersen 1989; Andersen & Shirai 1994, 1996) and the Perceptual Salience Hypothesis (PSH) following work, for example, by Shirai & Kurono (1998) and Man (1990). While drawing important parallels between the examples in (1) and (2) with regard to the grammatical morphemes required, we focus our study on those in (2), the -ed past tense affix in English. In particular, we investigate the degree to which the lexical aspect of a verb and/or the salience of its affix contribute to -ed variability in L2 performance, and whether or not there is an interaction between the semantics of a verb (i.e. its aspect) and the phonology of its affix (i.e. its salience).

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1.1 The Aspect Hypothesis

Based on Vendler's (1957) aspectual classifications, the Aspect Hypothesis predicts that the lexical aspect of a verb influences the appearance of grammatical morphology in the course of a learner's language development (e.g. Andersen 1989, 1991; Andersen & Shirai 1994, 1996; Li & Shirai 2000). Some of these predictions for an L2 English learner's morphology are illustrated in the chart below.

Aspectual Classifications as Predictors of Development of L2 English Verbal Morphology

Verb Type		**Example**	**Prediction**
Telic			
(Achievement/ Accomplishment)			
	-ing	(a) She is closing a window.	Late
	-ed	(b) She closed a window.	Early
Atelic			
(Activity)			
	-ing	(c) She is waiting at the station.	Early
	-ed	(d) She waited at the station.	Late
(Stative)			
	-ing	(e) She is loving it.	Not predicted
	-ed	(f) She loved it.	Late

The AH illustrated above specifically makes predictions for *early* L2 development of grammatical morphemes. Regarding the progressive suffix -ing in L2 English, this morpheme should initially appear on activities (e.g. *wait*), as seen in example (c); further, -ing should not be over-applied to stative verbs (e.g. *love*), as example (e) suggests. Support for these predictions is found in Bardovi-Harlig & Bergström(1996) and Bardovi-Harlig (1998). In addition, -ing should appear on telics (e.g. *close*) relatively late in development, as shown in example (a). Support for this prediction has been shown in Robison (1995a), Bardovi-Harlig & Reynolds (1995), Bardovi-Harlig & Bergström(1996) and Bardovi-Harlig (1998). Regarding past tense -ed in L2 English, the regular past tense morpheme should be applied to telics before atelics (compare (b) and (d)). Support for this prediction appears in Bayley (1991), Robison (1990, 1995a, 1995b), Bardovi-Harlig & Reynolds (1995) Bardovi-Harlig & Bergström (1996), and Bardovi-Harlig (1992, 1998).

There are studies, however, in which the AH predictions are not borne out in L2 English, especially regarding -ing. For example, Robison (1990) reports an untutored learner overusing -ing on statives; Rohde (1996) reports German child learners who produce -ing on both telics and atelics. Finger (2000, 2001), in what we believe to be the only highly controlled AH study to date, did not

find that her Brazilian learners preferred -ing on activities significantly more than they did on accomplishments; they were also quite willing to apply -ing to stative verbs.[1] With regard to -ed, Finger reports that her low proficiency level participants accepted -ed on atelics as much as on telics, contrary to the AH.[2] There was, however, a non-significant tendency for the high-proficiency level learners in Finger's study to accept -ed on telics more than atelics, but this finding is also contrary to the AH since only beginners are predicted to be affected. Finally, Kumpf (1984) reports that the low proficiency level Japanese learner in her study used past tense marking on stative verbs more than on non-statives in L2 English.

It is an open question as to why the AH is not consistently supported in L2 studies, especially regarding the unexpected applications of -ing. There are at least three possibilities. First, it may be that AH studies have simply not been sufficiently controlled (cf. Finger 2000, 2001), so inconsistent findings across studies are not surprising. Further, Shirai & Kurono (1998), following earlier proposals by Hatch (1974) and Wagner-Gough (1978), posit two phonological explanations to account for the over-application of -ing reported in Robison (1990): a) its phonological "stability" (i.e. -ing is a consistent form, lacking conditioned allomorphic variants); b) its phonological salience (i.e. -ing is syllabic, easily recognizable in the input).[3] Relatedly, Man (1990) and Solt et al. (2003) posit the influence of "perceptual salience" on L2 learners' performance of the past tense morpheme in English. In the present paper,[4] we also suggest that strong effects of perceptual salience account for variation in the past tense -ed morpheme in English L2, and that such effects may override predicted AH effects.

1.2 The Perceptual Salience Hypothesis

Considering proposals in the literature described above, we state the Perceptual Salience Hypothesis (PSH) as follows:

A second language learner will perceive and produce a syllabic grammatical suffix more accurately than a non-syllabic grammatical suffix because a syllable is more perceptually salient than a consonant (or cluster of consonants).

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1. Finger claims that the over-application of -ing to statives is a first language (L1) effect.
2. Like Finger, Slabakova (1997, 2001, 2002) found L1 effects. Her work shows that early learners transfer their L1 parameter setting for aspect, resulting in past tense on atelics before telics in L2 English.
3. It has also been argued that the -ing form is particularly frequent in the English input of L1 learners (Slobin 1973) as well as L2 learners (Wagner-Gough 1978; Shirai & Kurono 1998), a factor which could help account for its high frequency in L2 performance.
4. The analysis presented here is a subset of the larger study reported as Solt et al. (2003).

While various phonological factors have been proposed to influence -ed affixation (e.g. Bayley 1994, 1996; Wolfram 1985; Lardiere 2003; Goad, White & Steele 2003), the relative salience of syllabic affixes invites strong parallels between -ing and the syllabic allomorph of past tense -ed. That is, English -ed has three allomorphic variants, only one of which is syllabic, like -ing:

syllabic:	[ɪd] as in *waited*
nonsyllabic:	[d] as in *closed*
	[t] as in *walked*

The PSH, then, predicts that the syllabic [ɪd] should be the easiest of the three allomorphs for L2 learners to perceive and produce as it is perceptually salient in the same sense that -ing is.[5]

In a controlled study of adult learners of different native language (L1) backgrounds learning L2 English, Solt et al. (2003) report that syllabic [ɪd] was perceived to a significantly higher degree than was either of the non-syllabic allomorphs. The researchers conclude that L2 learners of English have a "perceptual deficit" as reflected in their difficulty perceiving (and producing) the non-syllabic allomorphs of past tense -ed, regardless of level of proficiency. This account suggests that differences in the salience of the allomorphs of -ed help explain variability in L2 performance of regular past tense.[6]

In the analyses reported here (see footnote 4), we suggest that perceptual salience should weaken any putative effects of aspect when -ed is realized as [ɪd] but not when it is realized as [d].[7] That is, the strong syllabic form [ɪd] should appear equally on telics and atelics. However, effects of aspect should not be weakened when past tense affixes lack perceptual salience. That is, among low-level learners we should see AH-predicted effects of telicity with verb stems that require the non-syllabic past form [d], since this affix lacks the salience that aids L2 performance.

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5. Note, however, that -ing and -ed clearly differ in that only the latter has morphological variants; thus, the relative "stability" of -ing over -ed may partially account for differences between -ing and -ed in L2 development, as evidenced in the so-called "early morpheme studies" (e.g. Dulay & Burt 1974; Makino 1980). Krashen (1977), reviewing over a dozen of these studies, concludes that -ing appears very early and -ed relatively late in development.

6. Solt et al. also report a developmental pattern distinguishing the two non-syllabics: Among higher proficiency level learners (though not low-level learners), [t] is perceived and produced at a higher mean rate of accuracy than is [d]. They attribute this to the universally unmarked nature of [t].

7. The findings of a perception task reported in Solt et al. (2003) suggest that learners perceive the -ed allomorphs in the following order of accuracy: [ɪd] > [t] > [d]. For purposes of this paper, we will only be reporting on the two ends of the hierarchy: the most salient [ɪd] and the least salient [d].

2. The Study

2.1 Hypotheses

(1) When the phonological form is salient (syllabic [ɪd]), lexical aspect has no effect on regular past tense marking. We predict this effect across proficiency levels.

(2) When the phonological form is not salient (non-syllabic [d]), performance will be better on telics than on atelics, as predicted by the Aspect Hypothesis. Following the AH, we predict this for low-levels only.

2.2 Participants

The findings reported here describe the results of 66 participants[8] who, at the time of the study, were classroom learners of English as a second language. All were adult L2 learners of English whose L1 backgrounds included Russian, Mandarin, Cantonese, Spanish, Turkish, and Arabic. Participants were divided into two proficiency levels, based on their scores on the short form of the Michigan Test of English Language Proficiency (MTELP): a "high" level group (N=33) and a "low" level group (N=33). A control group consisted of 19 native English speakers. Thus, the total number of participants was 85.

2.3 Materials and Procedures

Participants were given a perception task that involved producing written responses.[9] For each test item, a two sentence "story" was read aloud by a native English speaker. The first sentence contained a temporal adverb (e.g. *yesterday*) and an irregular verb (e.g. *went*) to set the time frame. The second sentence, which was repeated, contained the target item. Participants were given an answer sheet on which was printed only the second sentence, containing a blank for the target item. They were asked to fill in the blank on the answer sheet. For example:

The participant hears:	"Yesterday the man went to the station. He waited at the station for a train. He waited at the station for a train."
The participant sees:	He _____ at the station for a train.

8. In the larger study there were 67 participants. For the results reported in this paper, we removed one participant at random to have equal numbers in each level for our statistical analysis.

9. This experiment is one of two, reported in the larger study noted in footnote 4.

The participant fills in: He *waited* at the station for a train.

2.3.1 Stimuli

The target items analyzed here are 12 frequent, monosyllabic regular verbs, balanced for lexical aspect: 6 telic and 6 atelic; none are stative verbs. Verbs were also balanced for phonological variation in past tense morphology: 6 ending in [ɪd] as in "waited," and 6 ending in [d] as in "closed." Following Bayley (1994), we controlled the phonological environment of the target items by ensuring that the verb was always followed by an unstressed vowel as in *He waited at the station*, to aid in perception of the affix. (See appendix for target sentences.) The test also included fillers for a total of 40 items.

Before the test, vocabulary items were reviewed to ensure that participants understood them. Each target and filler item was scored for accuracy and the total mean percentage scores were obtained across and within groups. An item was considered correct as long as the past tense ending was indicated in some recognizable form (e.g. "kist" was acceptable for "kissed"; "clouse" was not acceptable for "closed").

3. Results

Table 1. Overall performance on regular past tense morphology: Mean % correct by lexical aspect and perceptual salience

	Lexical Aspect		Perceptual Salience	
	Telic	Atelic	Syllabic	Non-syllabic
Controls (N=19)	100.0	100.0	100.0	100.0
L2 learners (N=66)	70.4	70.9	75.5	65.9

As can be seen from Table 1, the control group performs 100% accurately on the task, regardless of the aspectual class of the verb or the perceptual salience of the past tense morpheme. The results of the L2 learners are significantly different from those of the native speakers on verbs that are telic: $F(1,83)=81.95$, $p<.01$ and atelic: $F(1,83)=41.66$, $p<.01$. Similarly, the two groups differ significantly when compared on verbs that require the syllabic allomorph $F(1,83)=42.91$, $p<.01$ and verbs that require the non-syllabic allomorph [d]: $F(1,83)=59.02$, $p<.01$.

However, the performance of the L2 learners is not affected by the aspectual class of the verb: 70.4 on telics and 70.9 on atelics; this difference is not significant. Regarding perceptual salience, on the other hand, performance of the L2 learners is more accurate on verbs that require the syllabic allomorph of the past tense morpheme [ɪd], with a mean percentage of 75.5, than on verbs that

require the non-syllabic allomorph [d], with a mean percentage of 65.9; this difference is statistically significant: F (1,65)=10.41, p<.01.

Table 2. Performance by L2 participants on syllabic [ɪd]:
Mean % correct by lexical aspect

	Telic	Atelic
High L2 group (N=33)	89.9	93.9
Low L2 group (N=33)	56.6	61.6

Table 2 shows that when the syllabic allomorph [ɪd] is required, the mean percent correct for the high L2 group is 89.9 on telics and 93.9 on atelics. This difference is not significant[10] but, inexplicably, performance on atelics is slightly better than on telics. The low L2 group shows a mean percent correct of 56.6 for telics and 61.6 for atelics; this difference is also not significant.

Table 3. Performance by L2 participants on non-syllabic [d]:
Mean % correct by lexical aspect

	Telic	Atelic
High L2 group (N=33)	87.9	84.8
Low L2 group (N=33)	47.5	43.4

Table 3 shows that when the non-syllabic allomorph [d] is required, both learner groups also perform equally on telic and atelic verbs: the high group at a mean of 87.9 on telics and 84.8 on atelics; the low group at a mean of 47.5 on telics and 43.4 on atelics. Repeated measures show that performance on telics is not significantly different from performance on atelic verbs for either group, although both groups appear to perform slightly better on telics than atelics with verbs requiring the non-syllabic allomorph [d].

10. There are also no significant differences between the control group and the high L2 group on [ɪd].

Fig. 1. Performance by total L2 participants: Interactions of two aspectual verb classes by syllabic [ɪd] vs. non-syllabic [d].

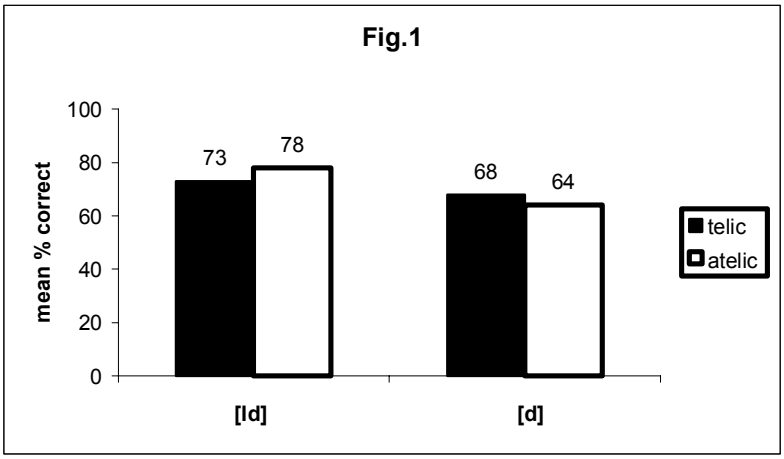

Fig. 1 above summarizes the data for L2 learners' performance on this task by lexical aspect and past tense allomorphs, syllabic [ɪd] vs. non-syllabic [d].
A 3-way Omnibus ANOVA shows a main effect of proficiency level: $F(1,64)=34.09$, $p<.001$, and a main effect of phonology: $F(1,64)=12.93$, $p<.001$, but no main effect of lexical aspect. While there is no 3-way interaction, there is an interaction of aspect x phonology: $F(1,64)=5.34$, $p<.05$, and a marginal effect of level x phonology. The latter tendency prompted sub-analyses by level:

For the high L2 group, a 2-way ANOVA (aspect x phonology) shows no main effect of lexical aspect, a very marginal effect of phonology: $F(1,32)=2.98$, $p=.094$, and a marginal interaction: $F(1,32)=3.52$, $p=.069$. For the low L2 group, by contrast, a 2-way ANOVA (aspect x phonology) shows a main effect of phonology: $F(1,32)=10.06$, $p<.001$, but no main effect of aspect, and no interaction between the two.

4. Discussion

The control group performed 100% accurately in this experiment, showing that the task clearly requires participants to produce past tense on the verbs presented. By contrast, performance by the L2 participants was not at ceiling, showing that the task appropriately captures distinctions between the performance of native and non-native participants, while not necessarily comparing them directly.

Our results show that L2 learners' overall performance is much better on verbs requiring the syllabic allomorph [ɪd] than on the verbs requiring the non-syllabic allomorph [d], supporting the Perceptual Salience Hypothesis. Like the progressive marker -ing, as discussed in the introduction, the syllabic allomorph is comparatively easy for learners to perceive and produce. Our results also

show that L2 learners' overall performance on telic verbs is no different than on atelic verbs, whether or not the stimulus contains the syllabic allomorph.

Hypothesis 1 predicted that when the phonological form of the English past tense is salient, i.e. the syllabic allomorph [ɪd], lexical aspect would have no effect on regular past tense affixation. The hypothesis also predicted that this result would hold across proficiency levels. Our results confirm both these predictions: The salient syllabic form [ɪd] is produced consistently on both telic and atelic verb stems by low-proficiency as well as high-proficiency learners.

Hypothesis 2 predicted that when the phonological form is not salient, i.e. the non-syllabic allomorph [d], performance by low-level learners on telics would be better than on atelics. This hypothesis, following from the Aspect Hypothesis, presumes that early learners will rely on lexical aspect when verb endings are not salient enough to aid them. Our data do not support this hypothesis. That is, production of the non-syllabic form of the past tense morpheme is not affected by telicity, with no significant difference between suppliance of [d] on telics and on atelics by low-proficiency L2 learners.

Overall, our results provide support for the PSH, but no support for the AH. Contrary to the AH, low-level L2 learners' production of past tense is not influenced by the aspectual class of the verb. In fact, the main factor at play for the low learners is the phonological salience of the allomorph alone. Among the high-level L2 learners, there is a weak interaction between lexical aspect and phonological form. Curiously, this interaction is largely due to high-level learners performing marginally better on atelics requiring [ɪd] than telics requiring [ɪd].[11] The Aspect Hypothesis predicts differences, but in the opposite direction, and it does not predict effects for high-level learners.

5. Summary and Conclusions

Motivation for this study came from well-attested variability of past tense verbal inflections in the performance of L2 learners of English. In some cases, learners provide the required -ed affix correctly, and in other cases they omit the inflection. In the first section of this paper, we compared this variability to the variable presence of the -ing affix in L2 English, suggesting that there are important parallels between the two.

For both -ing and -ed, at least two hypotheses have been proposed: The Aspect Hypothesis (e.g. Andersen 1989; Andersen & Shirai 1994, 1996) predicts that the lexical aspectual category of verbs helps to account for the variability of -ing, which should appear on atelic verbs before telics. Past tense -ed, on the other hand, is predicted to appear first on telics and later on atelics.

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11. We suspect that this result might be an artifact of the particular stimuli in this experiment. That is, particular telic items requiring [ɪd] might have been harder to perceive and /or produce than atelic items requiring [ɪd]. A subsequent item analysis will determine whether this is the case.

Hatch (1974), Wagner-Gough (1978) and, more recently, Shirai & Kurono (1998) propose that the phonological salience of -ing, among other factors, helps explain its over-suppliance by some L2 learners, particularly on stative verbs. In this paper, following Man (1990) and Solt et al. (2003), we refine and extend this notion in the Perceptual Salience Hypothesis, which helps account for -ed variation. That is, the PSH holds that variation in salience among the three allomorphs of -ed can predict differences among them in L2 learner performance, with learners performing more accurately on verbs ending in syllabic [ɪd] than on those ending in non-syllabic [d].

In this experiment, we formulated and tested two related hypotheses that developed from the predictions of both the AH and the PSH, investigating main effects of lexical aspect and salience, and any relationship between the two. Our general findings show strong effects of perceptual salience and no main effects of lexical aspect.

Investigating the strength of the PSH to see whether salience of the syllabic [ɪd] overrides any lexical aspect effects, we found no aspect effects, confirming our hypothesis. That is, when learners encountered verbs ending in the syllabic allomorph, they did not perform any better on telics than on atelics. However, when we investigated the strength of the AH to see whether predicted aspect effects would show up when learners were *not* aided by the syllabicity of the allomorph, we *still* found no aspect effects.

While this study lends further support to phonological influences on past tense affixation in L2 English, it would be very difficult to reconcile its results with any form of the AH. Finger (2000, 2001) also found no support for the AH, as reported in the introduction to this paper. Importantly, like Finger's study, ours was rigorously controlled, suggesting that data from such experiments do not uphold the AH. In fact, most support for the AH in L2 comes from studies analyzing spontaneous data (e.g. Robison 1990, 1995a, 1995b; Rohde 1996). It would be important, then, to re-examine the data from these studies to see if purported AH effects are, at least in part, artifacts of phonological influences.

Appendix

TELICS:

[Id]: The young man voted in the morning.
He added eleven and twelve.
The test started at 8:30.

[d]: She closed a window in her room.
She planned a trip to Mexico.
In class she learned a new word.

ATELICS:

[Id]: She shouted at her children a lot.
He waited at the station for the train.
She painted a lot in her garden.

[d]: It rained a lot in Florida.

It burned a long time.
He lived in a small apartment in Paris.

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