

L2 Perception and Production of the English Regular Past: Evidence of Phonological Effects

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1. Introduction

1.1 Variable Use of Inflectional Morphology

The inconsistent use of inflectional morphology in the speech of second language (L2) learners is well attested across many L2s. For example, second language learners of English often produce verbs without the required inflections, such as in (1) below, while at other times they produce correctly inflected verbs, as in (2):

- (1) My friend *call* me yesterday
- (2) My friend *called* me yesterday

The English regular past tense morpheme *-ed* is a classic example of this phenomenon. It appears late in the acquisition process, and L2 learners – even fairly advanced ones – use this morpheme inconsistently, and sometimes not at all. Moreover, the regular past tense has been shown to be used less consistently than the irregular past (Wolfram, 1985; Bayley, 1994). The difficulty L2 learners have with the use of the English regular past remains a puzzle for L2 researchers, prompting Hawkins (2001: 65) to comment: “second language learners [...] seem to have difficulty establishing the regular pattern at all. Given the current stage of our knowledge, it is not clear how to explain this difficulty.”

Various attempts have been made to explain this phenomenon. Within the generative framework, there are two major accounts of non-target-like use of L2 morphology: Some researchers propose that these errors reflect an underlying

* Our thanks to the audience at BUCLD 28, and especially to Lydia White, Donna Lardiere and Katherine Demuth, for helpful comments and suggestions. Thanks also to Olga Belomestnova, Ronit Webman and Megumi Yoshida for their invaluable participation in this research, and to Marcel den Dikken, Michele de Goeas-Malone, Eva Fernández, Frank Leone, Gita Martohardjono, Peter Slomanson, Winifred Strange and Robert Vago for ideas and assistance at various stages of the process. Finally, our appreciation to the staff and students of the Long Island Business Institute and the LIU English Language Institute for making this study possible.

syntactic impairment in the domain of functional categories or features (e.g., Vainikka & Young-Scholten, 1996; Eubank et al., 1997; Hawkins & Liszka, 2003). Others propose that the L2 syntactic representation is unimpaired, and that learners' problems are extra-syntactic (e.g., Epstein et al., 1996; Prévost & White, 2000; Lardiere, 1998, 2000, 2003, Klein, in press). Basing our assumptions on the latter line of research, we seek to understand the extra-syntactic factors that contribute to the variable use of the regular past in L2 English.

In an important series of studies, Lardiere (1998, 2000, 2003) provides evidence from a Chinese learner of English who exhibits a low rate of past tense marking, but whose grammar shows other evidence of a fully specified Tense node (for example, correct use of pronominal case marking), implying that the absence of overt inflectional morphology does not necessarily entail the absence of the underlying syntactic representation. Lardiere (1998) has proposed instead that her subject's inconsistent use of the past tense represents a problem of "mapping" between the abstract feature of +PAST and its surface form.

Prévost & White (2000) similarly found that the use of inflectional morphology by four L2 learners of French and German was not random, but rather exhibited constraints indicative of an unimpaired syntactic representation. These authors, following earlier work by Epstein et al. (1996) and Haznedar & Schwartz (1997), proposed the Missing Surface Inflection Hypothesis, which (like Lardiere's "mapping" hypothesis) posits that underlying representations of tense morphology are present even while inflections may be absent on the surface.

In our research, we draw on this concept of "mapping problems," which we understand to mean the following: The relevant syntactic node (TP) is present in the learner's L2 representation, its relevant abstract features are fully specified, and errors in production are related to the difficulties learners have in mapping abstract syntactic features to their surface morphological realizations.

1.2 The Role of Phonology

In investigating the factors that inhibit target-like mapping by L2 learners, Lardiere (1998, 2003), following Bayley (1996), proposes that phonological factors, such as L1 transfer or variable L2 input, might be a barrier to production or even perception of the English regular past. Although relatively few studies have explicitly investigated the impact of phonological factors on L2 morphosyntactic performance, there is some evidence that phonology does in fact play a role. We build on this work in the present research.

Wolfram (1985) and Bayley (1994, 1996) found that both the phonetic form of the past tense and the phonetic environment impact the rate of past tense marking by L2 learners of English. Thus a more salient difference between past and present forms favors past tense marking (e.g., the past tense is more likely to be marked in the case of *bring/brought* than *talk/talked*). Additionally, use of the regular past is favored by a sonorous preceding segment (as in *cried*, where

[d] is preceded by a glide) as well as by a sonorous following segment (as in *moved in*, where [d] is followed by a vowel).

Goad, White & Steele (2003) propose that constraints imposed by learners' L1 prosodic representations also may impact their production of L2 inflectional morphology. They argue that the absence of English past tense inflections in the oral production of Mandarin-speaking L2 learners of English is due to differences in Mandarin and English prosodic adjunction structures.

Finally, Lardiere (2003) proposes that her subject's low use of the past tense is partially due to a phonological process of consonant cluster reduction. Evidence for this position includes a higher rate of past tense marking for irregular versus regular forms, a higher rate of past tense marking in written versus oral production, and similarities in the rate of deletion of final *-t/-d* in regular past tense contexts and monomorphemic clusters (e.g., *packed* vs. *pact*).

While these studies have shown the role of phonological factors in L2 production of the English regular past, few studies have taken into consideration the problems inherent in learners' perception of the input (cf. Man, 1990). The perception of the English regular past could be a challenge to L2 learners for several reasons. First, the regular past morpheme is not always phonetically realized in the same way: There are 2 non-syllabic allomorphs, [t] (as in *stopped*) and [d] (as in *closed*), and one syllabic allomorph, [ɪd] (as in *waited*). Not all of these allomorphs are equally salient. Syllabics (e.g., [ɪd]) are considered to be more perceptually salient than stops (e.g., [t], [d]); moreover, it is an accepted fact in phonetics that stops – especially final stops – are among the least sonorous phonetic segments (Pickett, 1999).

The perceptual challenge is further deepened by the fact that many languages do not allow codas consisting of final *-t* or *-d* (the phonetic segments by which the English regular past is realized). Additionally, the formation of the English regular past tense often creates complex codas, or consonant clusters, which are rare in the world's languages and are considered to be marked (Kager, 1999).

More generally, numerous cross-language perceptual studies have shown that L2 learners' perception of second language phonetic segments often does not match that of native speakers, particularly when it comes to segments or contrasts not found in the learners' L1 (Strange, 1995). Furthermore, this difficulty persists even when learners are fairly advanced. For example, Nabelek & Donahue (1984) showed that perception by advanced L2 learners was comparable to that of native speakers in quiet conditions, but not in an inferior listening environment (reverberant speech). This supports the view that speech perception is a serious problem for L2 learners; yet the possible impact of perceptual limitations on grammatical acquisition has received little attention.

2. The Study

The link between phonology and acquisition of grammatical morphemes has rarely been made, as can be seen from the relatively few studies cited above.

Even fewer researchers have studied this link in controlled investigation of perception. To contribute to a better understanding of variability in L2 past tense performance, we examine the impact of phonological factors on L2 learners' ability to correctly perceive, as well as produce, the English regular past tense morpheme.

We also investigate whether perception and production are aided by cues in the context, such as lexical adverbs and common irregular verbs in the past tense (Hinkel, 1997; Klein, in press). Such contextualized lexical cues are assumed to help access a learner's underlying grammatical knowledge of regular past tense morphology for use in performance.

In addition, some studies have shown that L2 learners exhibit a higher rate of suppliance of grammatical morphemes in writing than in spoken production (Ellis, 1987; Lardiere, 2003), suggesting that written performance enables learners to more accurately and consistently use their grammatical knowledge. In our research, we therefore chose to include a written task to test learners' performance on past tense morphology.

2.1 Research Questions and Hypotheses

In this study we address the following research questions: To what extent do L2 learners of English perceive the regular past *-ed* morpheme across its 3 allomorphs? To what extent do they produce the regular past *-ed* morpheme across its 3 allomorphs when given a written task that is prompted by contextual cues in the oral input? We propose the following hypotheses:

Hypothesis 1: L2 learners of English will not perceive the regular past tense form in a target-like manner. This will be seen at both the beginning and more advanced levels.

Hypothesis 2: The syllabic allomorph [ɪd] will be better perceived than the non-syllabic allomorphs [t]/[d]. This will also be seen at both the beginning and more advanced levels.

Hypothesis 3: In a written task that allows learners to draw on grammatical knowledge in addition to perception, more advanced learners will be able to use contextual cues to aid in correctly producing the regular past tense morpheme.

2.2 Participants

We tested 68 adult instructed learners of L2 English in a classroom setting in New York City. A wide range of native languages was represented, including Mandarin, Cantonese, Russian, Spanish, Turkish, Arabic, Ukrainian and French Creole. We divided our informants into 2 levels, according to their scores on the

short form of the Michigan Test of English Language Proficiency: High (n=33; MTELP 26-43/50, mean 33.7) and Low (n=35; MTELP 15-25/50, mean 20.5).

A control group of 19 native speakers of English was also tested.

2.3 Materials and Procedures

Stimuli: 18 highly frequent monosyllabic English regular verbs were selected, divided evenly by phonetic form of the past tense morpheme: 6 [t] verbs, 6 [d] verbs and 6 [ɪd] verbs (see Appendix for the list of test verbs). Verbs within each group were balanced by lexical aspect and by syllable structure (i.e., each allomorph group included 4 verbs ending in a single consonant and 2 ending in a consonant cluster). For consistency, verbs ending in a vowel or glide (e.g., *play*), all of which take the [d] form of the regular past, were not included.

To further control the phonological environment and maximize the salience of the past tense morpheme, each test verb was followed by a non-stressed word beginning with a vowel (see examples 3, 4 and 5 below), following Wolfram (1985).

Filler sentences were also developed, each of which included one of the following grammatical morphemes: plural *-s*, third person singular *-s*, progressive *-ing*, comparative *-er*, and the negator *not*.

Procedure: Participants filled out a short questionnaire relating to their language background and received training on vocabulary that appeared in the study. Then they participated in the tasks described below.

2.4 Perception Task

The perception task was designed to measure L2 learners' ability to perceive the three allomorphs of the regular past morpheme in spoken language.

Stimuli for the perception task consisted of short (6-7 syllable) sentences, each of which included one test or filler item. The task was administered by three native speakers of English: a narrator and two investigators who were introduced to participants as an English teacher and a student. The "teacher" read each sentence, and the "student" repeated it. In some cases the "student" repeated the sentence correctly, as in (3) below; in other cases the "student" omitted the relevant grammatical morpheme, as in (4):

- | "Teacher" | "Student" |
|--|------------------------------------|
| (3) The girl <i>walked</i> in the park | The girl <i>walked</i> in the park |
| (4) The girl <i>walked</i> in the park | The girl <i>walk</i> in the park |

Participants were instructed to mark on an answer sheet whether the sentence spoken by the "student" was the same or different from that spoken by the "teacher."

Each test verb appeared twice in the task, once in a correct and once in an incorrect pairing. This resulted in 36 test items (18 test verbs × 2). An additional 36 filler items were included, for a total of 72 sentence pairs. Due to length, the perception task was split into two sections, the first of which was administered before the perception/production task, the second after that task.

2.5 Perception/Production Task

The perception/production task was designed to measure learners' ability to produce the regular past tense morpheme on a written task when prompted orally by a sentence containing a lexical adverb or phrase denoting past time (e.g., *last year*) and a common irregular verb in the past tense (e.g., *had*).

The stimuli for this task consisted of short "stories" two sentences in length. The first sentence contained the lexical adverb and irregular verb to establish the time frame. The second sentence contained one test or filler item.

- (5) a. Last year the young man had a good job. He *worked* in a big store.
 b. He _____ in a big store.

An investigator read each story. The second sentence was read twice. Participants' answer sheets included only the second sentence, with a blank in place of the relevant test or filler word (as in (5b)). Participants were instructed to listen closely to both sentences, and fill in the word they heard in the blank.

Note that in scoring this task, participants' spelling of the test words was not taken into consideration; a response was considered correct if it showed evidence of the target grammatical morpheme.

The production task included 18 test items (1 per test verb) and an additional 22 filler items, for a total of 40 items.

3. Results

3.1 Perception Task

Table 1 presents the overall results of the Perception Task, showing the mean percentage of correct responses on test items among the second language learners and native speaker controls.

Table 1. Perception Task Results – Mean % Correct

	Native Speaker	L2 High Proficiency	L2 Low Proficiency
Total test items (N=36)	99.1	74.5	68.2

As seen here, the native speaker control group performed at ceiling on this task. However, among second language learners, accuracy on this task was much lower. Results of a one-way ANOVA show a significant difference between groups ($F(2,84)=61.92$, $p<.001$), with post hoc testing (Tukey)

indicating that both the High and Low Proficiency groups performed significantly below the native speakers ($p < .001$ in both cases). The difference between High and Low proficiency groups is also significant ($p < .05$).

Table 2 shows these results among the second language learners, broken down by the three allomorphs of the regular past tense morpheme.

Table 2. Perception Task Results by Allomorph among L2 Learners – Mean % Correct

	L2 High Proficiency	L2 Low Proficiency
[ɪd] verbs (N=12)	90.9	85.3
[t] verbs (N=12)	70.5	61.3
[d] verbs (N=12)	62.1	58.1

Results of ANOVAs show that among both High and Low Proficiency groups, there are significant differences in the perception of the three allomorphs (High: $F(2,64)=52.91$, $p < .001$; Low: $F(2,68)=55.52$, $p < .001$). Paired t-tests show that, as predicted, both groups exhibited a significantly higher rate of accuracy on the syllabic allomorph [ɪd] than on the non-syllabic allomorphs [d] and [t] ($p < .001$ in each case). Additionally, among the High Proficiency group only, a significant difference is also found between [t] and [d], favoring [t] ($p < .05$).

To better understand L2 learners' performance on this task, the results were further broken down by "same" sentence pairs (where the repeated sentence was the same as the first sentence) versus "different" sentence pairs (where the repeated sentence was different from the first sentence, in that the *-ed* morpheme was omitted). Results of this analysis are presented in Table 3.

Table 3. Perception Task Results by Allomorph (Same vs. Different Sentence Pairs) among L2 Learners – Mean % Correct

	L2 High Proficiency		L2 Low Proficiency	
	"Same"	"Different"	"Same"	"Different"
[ɪd] verbs (N=12)	97.0	84.8	89.5	81.0
[t] verbs (N=12)	82.3	58.6	83.3	39.3
[d] verbs (N=12)	77.3	47.0	81.0	35.2

Same: Repeated sentence same as first sentence

Different: Repeated sentence different from first sentence (*-ed* omitted).

As is seen here, on test items featuring the syllabic allomorph [ɪd], participants at both proficiency levels were quite accurate (>80% correct) both when the two sentences were the same and when they were different. In the case of the non-syllabic allomorphs [d] and [t], however, the picture is different. Specifically, learners at both proficiency levels were relatively accurate on "same" sentence pairs, but performed poorly on "different" pairs. This indicates

that participants were unable to consistently detect the absence of the non-syllabic allomorphs; this contrasts with the syllabic allomorph [ɪd], whose absence was more accurately detected.

3.2 Perception/Production Task

Table 4 shows the overall results of the Perception/Production Task, specifically the rate of supplying a correctly inflected regular past tense form when required.

Table 4. Perception/Production Task Results – Mean % Correct

	Native Speaker	L2 High Proficiency	L2 Low Proficiency
Total test items (N=18)	100.0	90.6	52.6

As was the case in the perception task, a one-way ANOVA shows a significant difference between groups ($F(2,83)=33.37, p<.001$). However, post hoc tests (Tukey) identify a different pattern of performance among the three groups. Recall that on the perception task, the High Proficiency group performed significantly below the native speaker control group. But on this contextualized task, the High Proficiency group's performance improved to near target-like levels; in fact, there is no significant difference between this group and the control group. By contrast, the Low Proficiency group found this task quite challenging, performing significantly below both the High Proficiency group and the native speaker controls ($p<.001$ in both cases).

Finally, Table 5 presents results of the Perception/Production Task broken down by past tense allomorph.

Table 5. Perception/Production Task Results by Allomorph among L2 Learners – Mean % Correct

	L2 High Proficiency	L2 Low Proficiency
[ɪd] verbs (N=6)	91.9	60.3
[t] verbs (N=6)	93.4	50.9
[d] verbs (N=6)	86.4	46.6

Once again, ANOVAs show that there are significant differences by allomorph for both groups (High: $F(2,64)=4.05, p<.05$; Low: $F(2,66)=4.80, p<.05$). Paired t-tests show that among the Low Proficiency group, the regular past morpheme is produced at a significantly higher rate on verbs taking the syllabic allomorph [ɪd] than on those taking [d] ($p<.05$), with a trend also for [ɪd] vs. [t] ($p=.068$). Among the High Proficiency group, a significant difference is found between [t] and [d] ($p<.05$).

4. Discussion

Relating these results to the research questions and hypotheses outlined above, we note first that Hypothesis 1 is confirmed. As predicted, second language learners of English do not perceive the regular past tense morpheme *-ed* in a target-like manner, and this is true both for beginning and more advanced learners.

Hypothesis 2 is also confirmed. While both beginners and more advanced learners are able to perceive the syllabic allomorph [ɪd] quite accurately, they are significantly less able to perceive the non-syllabic allomorphs [t] and [d]. Additionally, between the two non-syllabic allomorphs, sensitivity to [t] appears to develop before [d], since the High Proficiency learners (though not the Low Proficiency group) performed more accurately on perception of [t] than [d]. While a conclusive account for this cannot be provided, we hypothesize that this pattern may relate to the unmarked nature of the voiceless stop [t] compared to the more marked nature of its voiced counterpart [d] (Paradis & Prunet, 1991).

Finally, Hypothesis 3 is also confirmed. The High Proficiency group performed significantly below the native speaker controls in their perception of the regular past tense morpheme. However, on a written, contextualized task that drew on grammatical knowledge as well as perception, these more advanced learners were able to use these cues to produce this morpheme nearly as accurately as native speakers.

The Low Proficiency group, by contrast, performed poorly on this task. One might initially hypothesize that their performance reflected a lack of grammatical knowledge; that is, this group did not know the rule for English past tense formation. However, evidence to the contrary is provided by the results of a “tense test” (a written cloze test) administered to a subset of participants. On this untimed, decontextualized task, the Low Proficiency group provided 88% correct suppliance of the regular past tense morpheme in contexts where it was required, implying clear knowledge of the past tense rule. We therefore hypothesize that this group’s low accuracy on the perception/production task was related to performance factors or issues of “processing load” (Valian & Eisenberg, 1996; Martohardjono et al., 2000; Klein, in press).

5. Conclusions and Questions for Future Research

Our results show that with regard to the regular past tense, English phonology creates a perceptual challenge for second language learners. The regular past tense morpheme is not consistently perceived by adult learners – even in the clear speech of native speakers. Rather, we observe a pattern of perceptual difficulties relating systematically to the phonetic realization of the past tense morpheme, with errors confined primarily to the non-syllabic allomorphs [t] and [d]. Furthermore, these perceptual problems remain even as learners advance (at least within the range of proficiency levels studied in this

research). While these findings are perhaps not surprising in light of the perceptual phonetic research cited above, the possible implications of non-target-like perceptual patterns for the acquisition of second language grammatical morphology have received little attention until now.

We propose based on these findings that L2 learners' inability to perceive the past tense *-ed* morpheme consistently across its allomorphic variants – a *systematic perceptual deficit* – is a barrier to producing this morpheme in a target-like manner. Perceptual limitations appear to particularly constrain the performance of beginning learners. By contrast, on at least one type of task, more advanced learners are able to compensate for their imperfect perception by drawing on contextualized lexical cues to access their grammatical knowledge.

We further inquire as to the mechanism by which this perceptual deficit contributes to variable use of the regular past in the spontaneous oral production of L2 learners. While the present research does not address this question directly, we propose two possible analyses, drawing on the previously mentioned concept of “mapping problems” as the source of L2 morphosyntactic errors.

The first possibility is that learners' difficulty perceiving the regular past morpheme causes them to interpret some inflected verbs as uninflected. If that is the case, then L2 learners would be establishing a mapping from the past tense feature to its surface form that does not match that of native speakers. Learners' lexical representations of this non-native-like mapping might then include an uninflected default form (Prévost & White, 2000) or a null morpheme as an optional realization of the feature +PAST. However, it must be noted that some research casts doubt on the proposal that missing inflections in performance are due to a non-target-like lexical representation (e.g., Martohardjono et al., 2000)

An alternative, and perhaps simpler explanation is that the perceptual deficit impacts production at a purely phonological level. In other words, learners simply do not consistently produce what they do not consistently perceive. This would imply that an apparent problem with the regular past morpheme is really a problem with a particular phonetic sequence (final *-t/-d*, particularly in clusters). Support for this hypothesis is mixed (Lardiere, 2003; cf. Hawkins & Liszka, 2003).

To more fully understand the link between perceptual limitations and variability in production, several questions require investigation. First, what is the exact nature of the L2 perceptual deficit (in particular, is it limited to regular past tense contexts, or would similar perceptual issues be found in monomorphemic clusters ending in *-t/-d*)? Second, how direct is the link between perception and production? For example, would a controlled study show that those allomorphs that are better perceived are used more consistently in oral production?

More broadly, several further questions arise relating to the role of perception in the acquisition of inflectional morphology by L2 learners:

- 1) Is the variable perception of the English regular past tense allomorphs L1-related or more universal?
- 2) Do other English grammatical morphemes create perceptual challenges for L2 learners, and if so, does this correlate with variability in production?
- 3) Is there a phonological basis for missing inflections in other L2s?

In summary, while questions remain as to the exact nature and impact of the perceptual deficit, our research contributes to the growing body of research (e.g., Goad et al., 2003, Lardiere, 2003) showing that phonological factors play a role in apparent syntactic errors by second language learners. As is well known, acquiring a second language phonology is a challenge – one that many learners (particularly adults) never fully master. The possibility that lack of full attainment in the domain of phonology may impact other grammatical domains is an important topic for further research in second language acquisition.

Appendix

Test Verbs

[t]:	jump, kiss, stop, walk, watch, work
[d]:	burn, close, learn, live, plan, rain
[ɪd]:	add, paint, shout, start, vote, wait

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