



**Now you hear it, now you don't: Perception of English regular past *-ed* in naturalistic
input**

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Previous research has shown that English regular past tense forms are difficult to perceive, yet perception studies to date have used experimentally manipulated input, and none have investigated how contextual cues, beyond temporal adverbials, impact perception of the regular past. This study investigated whether second language (L2) learners and native (L1) speakers of English perceive regular past *-ed* in naturalistic input, whether phonological context (salient [əɪ] vs. nonsalient [t, d]) impacts perception, and whether language exposure and use are related to increased confidence or perceptual accuracy. Eleven L1 speakers and 28 L2 learners (14 intermediate, 14 advanced) watched 64 clips from television sitcoms (containing 32 regular past and 32 base forms), indicated whether they heard *-ed* or no ending, and rated their confidence on an 8-point Likert scale. Advanced L2 learners perceived *-ed* as accurately as L1 speakers, and both groups outperformed intermediate learners. All perceived [əɪ] more accurately than [t, d]. Confidence increased with proficiency and decreased with phonological difficulty. Learners' perception accuracy correlated with a measure of L2 exposure, and interviews revealed similarities in advanced learners' and L1 speakers' use of discourse cues to interpret tense. Results imply that *-ed* perception involves integration of multiple contextual cues.

Key words acquisition; morphology; salience; discourse; exposure

Difficulty with regular past tense *-ed* for second language (L2) English learners is well documented. Native-speaking (L1) children and L2 learners follow the “natural order of acquisition” of English grammatical morphemes, where the regular past tense is the second latest acquired morpheme (Goldschneider & DeKeyser, 2001). This order is also relatively immune to instruction (e.g., Perkins & Larsen-Freeman, 1975). The presence of similar morphemes in learners’ L1s has been shown to affect the order, yet the simple past remains stubbornly late acquired (Jia & Fuse, 2007; Jiang, Novokshanova, Masuda, & Wang, 2011). Within this context, the present study investigated L2 learners’ perception of simple past *-ed* in naturalistic input, on the assumption that at least one source of the persistent challenges faced by learners with acquiring English regular past relates to their ability to perceive *-ed*.

The Past Tense Challenge

English past tense is challenging for L1 and L2 speakers alike, and research with L1 users has pointed to perceptual explanations for this difficulty. For example, McDonald and Roussel (2010) compared past tense grammaticality judgements of L1 and L2 speakers under phonological processing stress (white noise) or lexical retrieval stress (time pressure), to determine the extent to which phonological or lexical processing affected past tense forms. For both speaker groups, regular past production was associated with phonological ability and irregular past production was related to lexical retrieval, suggesting that phonology, rather than lexical ability, is linked to difficulty in processing regular past. Dyslexic and language impaired L1 speakers are often nontarget in their perception and production of English past tense, implying that phonological processing (which is compromised in dyslexia and specific language impairment) is essential to acquisition of past tenses (Robertson, Joanisse, Desroches, & Terry, 2012). Moreover, studies of hearing-impaired L1 children show that phonological perception

training (Bow, Blamey, Paatsch, & Sarant, 2004) and cochlear implantation (Guo et al., 2013) facilitate hearing-impaired children's production of past tense. These findings make a strong case towards an "if you can't hear it, you can't learn it" connection when it comes to morphology such as the regular past.

Past tense difficulties of L2 learners mirror those of L1 speakers, with perceptual explanations often at the heart of these (Beck, 1997; Magen, 2014). For example, Bell, Trofimovich, and Collins (2015) investigated the perception of *-ed* by L2 learners of English as a function of the perceptual context in which *-ed* occurred, in utterances spoken at conversational and slowed speed and in the presence or absence of temporal adverbials (e.g., *yesterday*). Perceptually "easy" contexts included *-ed* spoken as a separate syllable and followed by a vowel (e.g., *corrected a paper*), and "hard" context involved *-ed* in a consonant cluster (e.g., *searched for gold* or *helped the lady*). Slowed speech helped learners perceive *-ed* as accurately in hard contexts as easy ones, and learners were also better at perceiving *-ed* in the presence of a congruent lexical adverb. However, L1 speakers did not reach ceiling performance in perception, confirming that in certain contexts, perception of *-ed* is a challenge even for nonimpaired native speakers.

Why Is the Past Tense Challenging?

Goldschneider and DeKeyser's (2001) meta-analysis targeting reasons behind the natural order of acquisition for morphology (Dulay & Burt, 1974) identified several factors that explain why certain morphemes are difficult to acquire. For the regular past, perceptual salience (which also encompasses input frequency), along with variables capturing learners' L2 exposure and use and the availability of discourse-level contextual cues, appear to be most relevant.

Perceptual Salience

Perceptual salience, which involves three subcategories (number of phones, syllabicity, and sonority), is an important contributor to morpheme learning difficulty (Goldschneider & DeKeyser, 2001). Past *-ed* has low perceptual salience. Only one of the three allomorphs ([əd]) contains more than one phone or forms a syllable, and the other two (i.e., stops /t/ and /d/) are the least sonorous English segments (e.g., Jespersen, 1904). L2 learners have more difficulty with [d] than [t], and with [t] than [əd], suggesting a hierarchy of perceptual difficulty (based on syllabicity and markedness) for the regular past allomorphs (Solt et al., 2004).

Input frequency is often considered a form of salience relevant to acquisition (e.g., Collins, Trofimovich, White, Cardoso, & Horst, 2009; Grause & Copen, 2015), on the assumption that the more available a form is in input, the easier it is to learn. Yet the regular past is infrequent. Collins et al. (2009) showed that only 2% of the verbs in their corpus of elementary school teachers' classroom input were regular past and that there was only one regular verb (*asked*) among the 15 most frequent verbs. Furthermore, only 22% of the regular verbs in the corpus included the most salient allomorph [əd], and of those that did, the majority were not followed by vowels, which would constitute some of the more perceptually salient contexts for regular past. If input frequency contributes to perceptual salience, then the regular past is not salient, at least not in the elementary classroom.

Language Exposure and Use

Apart from perceptual salience, a number of experiential variables might also compound the challenge of learning the regular past tense. The role of a learner's background has been relatively well researched in morphological learning, particularly in terms of age of acquisition (AOA) and amount of language exposure/use. For example, L1 children appear to learn some

morphemes at a faster pace (copula *be*), some more slowly (auxiliary *be*), and some simultaneously (auxiliary *do*, third person *-s*, and regular past *-ed*), suggesting that amount of exposure to the morpheme is a potential determinant of the sequencing and timing of learning (Rispoli, Hadley, & Holt, 2012). Typically developing children show increased accuracy in tense production in L2 English with increased exposure, but language impaired children do not (Blom & Paradis, 2015). In a five-year longitudinal study targeting the acquisition of six grammatical morphemes by Mandarin-speaking learners of English in New York, Jia and Fuse (2007) showed that all morphemes were mastered (produced at 80% accuracy) by at least some of the learners within the five years, except regular *-ed*. The best predictor of production of late-acquired morphemes (i.e., *-ed*) was not AOA but amount of exposure to English outside of class, suggesting that language exposure plays a role in L2 morphological learning.

Discourse-Level Cues

In addition, discourse-level factors, such as the immediate sentential context in which simple past occurs or the availability of lexical markers of tense, might also provide cues that can either facilitate or hinder how reliably simple past is heard. For instance, in the presence of time adverbials (e.g., *yesterday*), learners can ignore morphology and still understand the utterance, making it possible that they often do not perceive *-ed* (e.g., in *last night we danced*, *-ed* is redundant because *last night* encodes a time reference). Both L1 and L2 speakers are influenced by temporal adverbials in tense judgement (e.g., Solt et al., 2004; Wulff, Ellis, Römer, Bardovi-Harlig, & Leblanc, 2009), so adverbials such as *often* or *always* might prompt learners to perceive and produce present more often than past, though both tenses are grammatically possible (*I often walk to work*, *I often walked to work*). Thus, learners may overlook past tense

morphology in favor of meaning-based markers of tense. Yet such markers are not always present, so it is unlikely that learners rely on them exclusively to perceive the simple past.

Besides time adverbials, other discourse-level cues, such as the use of the regular past form in a conditional sentence or the use of a third person subject with a regular past verb, might cue listeners to the presence or absence of morphology. However, the role of these additional cues in the perception of *-ed* has not been explored. In a rare study targeting contextual cues in perception of simple past, Luke and Christianson (2015) showed that prediction of *-ed* was more accurate when the *-ed* form was a participle (as in *the potted tree grew tall*) instead of a verb (as in *we potted the tree last year*), implying that context may influence perception. Given that naturalistic input might confer some benefits to learners (e.g., contextual support aiding perception) while also presenting some challenges (e.g., rapid conversational speech), it is important to examine the potential role of contextual cues—in addition to time adverbials—in perception of simple past.

The Current Study

A growing body of research indicates that the difficulty of L2 learners and many populations of L1 users (i.e., learners with specific language impairment) with the regular past in English is linked to perceptual issues, so that low perceptual salience of *-ed*, its redundant nature, and insufficient exposure to language outside instruction make it difficult for learners to hear target forms in the input and, consequently, to acquire them (e.g., Bell et al., 2015; DeKeyser, 2005; Klein et al., 2004). One important shortcoming of prior research is that it has relied exclusively on experimentally manipulated input. For instance, Klein et al.'s (2004) perception study featured researcher-created input (two-sentence stories, as in *Yesterday the man went to the station. He waited at the station for a train*) to ensure that *-ed* was followed by a

vowel and presented in context, making it easier to perceive (see also Solt et al., 2004). In Bell et al. (2015), target sentences contained only short verb phrases recorded by a speaker in isolation (e.g., *searched for gold, waited in line*), subsequently slowed down using speech-editing software to carefully control for different phonological contexts as well as speed of delivery. To understand the perceptual challenge underlying the learning of English regular past, it is important to target the input that learners are likely to encounter in real life (classrooms or naturalistic interactions).

Therefore, the current study investigated the perception of past *-ed* in naturalistic input (TV sitcoms) by intermediate and advanced L2 learners and a comparison group of L1 speakers, focusing on one previously researched variable (perceptual salience), operationalized as occurrence of *-ed* in easy ([əd]) or hard ([t], [d]) perceptual contexts (Bell et al., 2015; Solt et al., 2004). Thus, the first objective was to investigate the perception of past *-ed* when researcher-created materials are replaced by naturalistic input. In light of previous research showing associations between L2 morphological learning and learners' language exposure/use (e.g., Jia & Fuse, 2007), this study's second objective was to explore the relationship between learners' perception of *-ed* and their background variables, such as amount of exposure to English, on the assumption that similar perception-exposure links should be evident with respect to learners' experience with naturalistic stimuli. As a final (exploratory) goal, this study also examined what discourse-level cues, besides temporal adverbials, listeners may use in their perception of *-ed*, and to what extent listeners may be aware of any such cues. The study addressed the following three research questions:

1. Does perceptual context (easy vs. hard) impact L2 learners' and L1 speakers' perception of *-ed* in naturalistic input?

2. Which background variables, specifically those related to language use, might be associated with L2 learners' perception of simple past, particularly in perceptually hard contexts?
3. What, if any, context cues do L2 learners and L1 speakers use in their perception of simple past *-ed* in naturalistic input, and to what extent are they aware of the cues that might help or hinder their perception of simple past?

Method

Participants

Participants included 28 L2 learners, recruited from two levels of ESL classes (intermediate and advanced) at a private language academy in Vancouver, Canada, and a comparison group of 11 L1 English speakers. At this language school, learner level is determined through mock Cambridge English Main Suite exams administered every two weeks. These exams—Cambridge Preliminary English Test (PET), First Certificate Exam (FCE), and Certificate of Advanced English (CAE)—evaluate general proficiency based on the Common European Framework of Reference (CEFR; Council of Europe, 2001). L2 learners were tested one day after completing the target tasks (see below). Based on these tests, there were 14 intermediate learners receiving passing or near-passing grades on the Cambridge PET ($M = 71.9\%$, $SD = 16.9$), which corresponded to CEFR B1 levels and IELTS bands 4–5. The remaining 14 learners were categorized as advanced, receiving passing or near-passing grades on the FCE ($M = 75.5\%$, $SD = 13.3$) or low to passing grades on the CAE ($M = 58.8\%$, $SD = 12.5$), which corresponded to CEFR B2 or low C1 levels and IELTS bands 5–7.

Intermediate learners (eight females, $M_{\text{age}} = 26.7$ years, $\text{range} = 17\text{--}29$) spoke L1 Spanish (5), Korean (2), French, Italian, Japanese, Portuguese, Russian, Thai, and Turkish (one

each). They had resided in Vancouver for an average of 70 days (16–226) and reported a mean of 8.6 years (0–16) studying English prior to arrival in Vancouver. Advanced learners (nine females, $M_{\text{age}} = 24.7$ years, $\text{range} = 18\text{--}51$) spoke L1 Portuguese (7), Spanish (2), Japanese (2), Czech, German, and Romanian (one each). They had resided in Vancouver for a mean of 57.3 days (10–162) and reported having studied English previously for a mean of 12 years (5–16). The comparison group of 11 L1 English speakers (four females, $M_{\text{age}} = 36.3$ years, $\text{range} = 27\text{--}58$) included residents of Vancouver (8), Montreal (2), and Chicago (1), born in Canada (5), the United States (3), Ireland (2), and New Zealand (1) in monolingual English families. They reported being fluent in L2 French (2), Spanish (2), Danish, Norwegian, and Swedish (one each). All had studied multiple languages. Eight were ESL instructors in the language school where the learners were recruited; thus, they likely had a greater level of metalinguistic knowledge and interest in language study compared to the rest of the L1 speakers.¹

Four L2 learners (two intermediate, two advanced) and four L1 speakers were randomly selected for debriefing interviews (see below). The two intermediate learners were an 18-year-old Colombian Spanish speaker (residence in Vancouver = 1.5 months, age of first exposure to English in Colombia = 10) and a 24-year-old Turkish speaker from Turkey (residence in Vancouver = 7 months; age of first exposure to English in Turkey = 22). The two advanced learners were a 21-year-old Portuguese speaker from Brazil (residence in Vancouver = 1 month; age of first exposure to English in Brazil = 5) and a 28-year-old Spanish speaker from Mexico (residence in Vancouver = 4 months; length of English study in Mexico = 3 years). Finally, the four interviewed L1 speakers were all ESL teachers: two Canadian males, 27 and 32 years old, a 48-year-old American male living in Canada for 9 years, and a 33-year-old male from New Zealand living in Canada for 7 years.

Materials

The target materials included 64 authentic video clips from popular TV shows (e.g., *The Big Bang Theory*, *Friends*). The video clips ($M_{\text{length}} = 3.2$ seconds, $\text{range} = 1.6\text{--}6.4$) featured one sentence with at least one regular verb form in present or past ($M_{\text{words}} = 8.7$, $\text{range} = 3\text{--}17$). Clips were edited to avoid the inclusion of time adverbials or other temporal references. However, the sentences themselves were unedited, such that the speech was presented just as it was on television. Of the 64 video clips, 32 featured simple past sentences as the target utterances, with 16 video clips targeting perceptually easy and 16 targeting perceptually hard past utterances. As in Bell et al. (2015) and Collins et al. (2009), perceptually easy contexts were defined as those instances of past tense marked by the separate-syllable allomorph [əd] (e.g., *I hated that, I needed to relax*) and perceptually hard contexts as those where the past tense was marked by either [t] or [d], which are syllabified with a preceding syllable (e.g., *They told me I looked too midwest for the part, After you turned thirty*). All past tense verbs, regardless of the context, were followed by a consonant. As a performance baseline, the remaining 32 video clips featured present tense utterances (excluding those marked by 3rd person singular *-s*), also extracted from popular sitcoms (e.g., *You realize what you are, I wish you all the best*). The status of the verb forms in the original clips was determined by the first researcher, who cross-checked the episode's transcript (publicly available online) with the audio, within the context of the show.

Due to the variability of content in naturalistic input, using identical verbs across present and past utterances proved impossible. Thus, present and past verb forms were roughly matched on corpus-based frequency of occurrence, based on the 51-million-word SUBTLEX_{US} corpus of spoken American English (Brysbaert & New, 2009). Table 1 shows descriptive statistics for target sentences across the 32 past (easy, hard) and 32 present utterances. The present and past

utterances were matched for word length and clip duration, $t(62) < 1.89, p > .06, d = .48$. The present verb forms were of higher frequency compared to past forms, $t(62) = 2.13, p = .037, d = .54$; nevertheless, corpus-based frequency of verbs in the easy and hard past contexts was comparable, $t(30) = .97, p = .340, d = .35$.

Table 1

Summary of Descriptive Statistics (Means, Standard Deviations) for Video Clips

Measure	Base ($n = 32$)	Past	
		Salient ($n = 16$)	Nonsalient ($n = 16$)
Sentence length (words)	7.88 (2.85)	8.88 (3.01)	10.13 (4.70)
Length (seconds)	3.26 (1.02)	3.18 (1.00)	3.14 (1.35)
Frequency (per million)	364.67 (713.01) ^a	72.26 (124.73)	112.42 (108.91)

Note. ^aOne present verb form (*like*) was much higher in frequency than the rest. The *M* and *SD* values that exclude this outlier verb were 243.76 and 266.90, respectively.

Each sentence was also separately coded for six discourse cues, based on their presence in the 32 target utterances, as summarized in Table 2. After the initial coding by the first researcher, the sentences were independently recoded by another trained coder (Cohen's $\kappa = .90$). The few cases of coder disagreement (9/75) were resolved through discussion. From the full set of 32 video clips featuring simple past, five were selected as prompts for in-depth debriefing interviews. These clips, which are discussed in detail below, were chosen based on whether they contained various discourse cues (listed in Table 2) that could aid listeners in, or distract them from, perceiving simple past, and ranged from offering less to more discourse context.

Table 2

Summary of Coded Context Cues

Cue	Example	Interpretation
Morphosyntactic		
Conditional	<i>Normally if someone <u>talked</u> to me that way, I'd fire 'em</i>	Cue for past
Clause	<i>What's insane is how you <u>refuse</u> to get with the program</i>	Additional context (including irregular past verb) may cue tense
3 rd person subject in the past	<i>And then he <u>seemed</u> kinda down</i>	Lack of -s may cue past
Phonological		
/t/ or /d/ following	<i>You <u>refused</u> to go out with Chaz</i>	Potential coarticulation, making past hard to hear
/θ/ or /ð/ following	<i>I <u>rented</u> the wrong movie</i>	Potential coarticulation, making past hard to hear
Verb ends in affricate	<i>I even <u>changed</u> my Facebook status</i>	Marked in coda position (Parker, 2003), making past hard to hear

Procedure

L2 learners were tested after regular classroom instruction at their language school. They first completed a language background questionnaire (5 minutes), then were given response booklets and performed the perception task (25 minutes), which included 64 sentences assembled into one video sequence in random order, with a prerecorded female voice

announcing the numbered position of each clip. Learners saw each clip twice with an interval of 3 seconds between the first and the second playback. The response booklet listed all 64 sentences. The base form of the verb was given next to the sentence (e.g., CHANGE: *Until you ED/X your mind*), and “ED” (ending) and “X” (no ending) represented the two response alternatives. For each sentence, learners indicated whether they heard the simple past *-ed* by circling “ED” (or “X”) and estimated their confidence using an 8-point Likert scale (1 = *not confident at all*, 8 = *very confident*). Before the 64 target clips, six additional practice clips were played to familiarize participants with the procedure. After the response booklets were collected for analysis, the four selected learners took part in individual debriefing interviews, which were recorded and subsequently transcribed. Interviews were semi-structured around open-ended questions about perception decisions (e.g., *Why did you chose the answer you did, why do you feel so confident?*), with interviewees allowed to listen to each of the five target clips again. The same procedure was followed with L1 speakers, except that they were tested at two different times in two locations (eight speakers in Vancouver, three in Montreal). Following the perception test, four L1 speakers (all in Vancouver) participated in debriefing interviews, conducted as with L2 learners.

Analysis

The ED/X decisions were tallied for each clip, separately for intermediate and advanced L2 learners and L1 speakers, by assigning the value of 1 to each decision matching the original coding of each sentence (i.e., present utterance marked X, past utterance marked ED) and the value of 0 to each mismatched decision (i.e., present utterance marked ED, past utterance marked X). Raw scores were then converted to proportion scores, based on the total number of items in each category (32 present, 32 past), with separate scores calculated for past in perceptually easy

(16) and hard (16) contexts. Confidence ratings were tallied similarly according to group. Missing data, where participants gave no answer, accounted for 8.2% of all ED/X decisions and 3.8% of all confidence ratings. Nearly all missing data were from L2 learners (205/206 of missing ED/X judgments, 91/94 of missing confidence ratings), suggesting increased task difficulty for L2 learners. Debriefing interviews were transcribed and coded using a top-down approach; broad a priori determined categories consistent with discourse-level cues (see Table 2) were identified (e.g., mention of grammar, phonology) and frequency of statements in each category tallied for each groups.

Results

Preliminary Analysis

The first analysis provided a baseline comparison for the perception of simple past, relative to simple present, for the three groups (see Table 3 for summary statistics). A two-way (group \times tense) mixed ANOVA targeting perception accuracy revealed a significant main effect of group, $F(2, 36) = 15.18, p < .0001, \eta_p^2 = .46$, no significant main effect of tense, $F(1, 36) = .28, p = .60, \eta_p^2 = .01$, and no significant two-way interaction, $F(2, 36) = 2.59, p = .09, \eta_p^2 = .13$. Follow-up (Bonferroni corrected) comparisons targeting the group factor showed that L1 speakers outperformed both intermediate ($p < .0001$) and advanced ($p < .0001$) learners, but that the two learner groups performed similarly ($p = .29$).

A similar ANOVA targeting confidence ratings revealed a significant main effect of group, $F(2, 35) = 47.19, p < .0001, \eta_p^2 = .73$, a significant main effect of tense, $F(1, 35) = 5.77, p = .022, \eta_p^2 = .14$, and a significant two-way interaction, $F(2, 35) = 5.40, p = .009, \eta_p^2 = .24$. Follow-up (Bonferroni corrected) comparisons exploring the significant interaction showed that L1 speakers were significantly more confident than both advanced and intermediate learners (p

=.036), and that advanced learners were significantly more confident than intermediate learners ($p < .0001$) in their perception of both present and past. However, only advanced learners were significantly more confident in their perception accuracy of past over present ($p < .0001$).

Table 3

Descriptive Statistics (Means, Standard Deviations) for Overall Perception of Base form and Regular Past

Group	Base form		Regular past	
	Accuracy	Confidence	Accuracy	Confidence
Intermediate ($n = 14$)	0.65 (0.23)	5.27 (0.82)	0.59 (0.28)	5.33 (0.83)
Advanced ($n = 14$)	0.59 (0.24)	6.61 (0.69)	0.78 (0.09)	7.00 (0.55)
L1 speakers ($n = 11$)	0.87 (0.09)	7.71 (0.28)	0.83 (0.08)	7.60 (0.34)

Thus, L1 speakers (83–87% correct) were overall more accurate than both learner groups (59–78% correct), who did not differ between each other. While accuracy rates did not differ between the two learner groups, confidence ratings were associated with proficiency. L1 speakers were significantly more confident, followed by advanced and then intermediate learners. Only advanced learners reported more confidence in their perception of past compared to present, but this increased confidence was not reflected in accuracy rates.

Perceptual Context

The first research question asked whether perceptual saliency, as defined through perceptually easy versus hard contexts, impacted perception of simple past (see Table 4). A two-way (group \times context) mixed ANOVA exploring accuracy rates revealed significant main effects of group, $F(2, 33) = 8.22, p < .001, \eta_p^2 = .33$, and context, $F(1, 33) = 23.54, p < .0001, \eta_p^2 = .42$, but no significant two-way interaction, $F(2, 33) = 1.08, p = .35, \eta_p^2 = .06$. For the group factor,

Bonferroni corrected comparisons showed no difference between L1 speakers and advanced learners ($p = .068$), but both these groups outperformed intermediate learners ($p < .019$). For context, all groups were more accurate in easy than in hard contexts ($p < .0001$).

A similar ANOVA targeting confidence ratings revealed significant main effects of group, $F(2, 35) = 46.27, p < .0001, \eta_p^2 = .73$, and context, $F(1, 35) = 21.19, p < .0001, \eta_p^2 = .38$, but no significant two-way interaction, $F(2, 35) = .48, p = .63, \eta_p^2 = .03$. For the group factor, Bonferroni corrected comparisons showed that L1 speakers were significantly more confident than both learner groups ($p < .037$), and that advanced learners were significantly more confident than intermediate ones ($p < .0001$). All groups were more confident in their responses in easy over hard contexts ($p < .0001$).

Table 4

Descriptive Statistics (Means, Standard Deviations) for Perception of Regular Past in Salient and Nonsalient Contexts

Group	Perceptually salient		Perceptually nonsalient	
	Accuracy	Confidence	Accuracy	Confidence
Intermediate ($n = 14$)	0.70 (0.10)	5.52 (0.89)	0.63 (0.19)	5.14 (0.85)
Advanced ($n = 14$)	0.86 (0.10)	7.12 (0.56)	0.71 (0.13)	6.89 (0.61)
L1 speakers ($n = 11$)	0.93 (0.05)	7.83 (0.23)	0.75 (0.18)	7.50 (0.23)

In sum, L1 speakers and advanced learners (71–93% correct) perceived simple past with comparable accuracy, both outperforming intermediate learners (63–70% correct). All groups were influenced by the verb’s context, detecting past more accurately when the verb occurred in easy (e.g., *I hated that*) than in hard contexts (e.g., *I booked the restaurant*). While accuracy rates

did not distinguish the groups, confidence ratings did. L1 speakers were significantly more confident, followed by advanced learners, then intermediate learners, and all groups were more confident in easy than hard contexts.

Language Exposure and Use

The second research question asked which learner background variables related to language use might be associated with perception of past, particularly in hard contexts. Pearson correlations (two-tailed) were carried out using the entire learner sample ($n = 28$) to determine possible relationships between learner perception accuracy or confidence and several background variables, including age variables (age at test, age of arrival, age when English instruction began), amount of time studying English, proficiency self-ratings (speaking, reading, writing, listening), amount of time speaking English in different contexts (at home, work, school), and overall percentage of time spent in English in Vancouver (speaking, reading, writing, listening).

Accuracy for past in easy contexts correlated with age at which learners started studying English ($r = -.46, p = .02$) and with amount of time studying English ($r = .46, p = .04$), so that an earlier age at the time when instruction began and greater lengths of instruction were associated with higher perception accuracy. Accuracy for past in a hard context was associated only with self-reported listening proficiency ($r = .42, p = .04$), such that higher listening proficiency was linked to greater accuracy. Confidence judgments for past in easy ($r = .52, p = .01$) and hard ($r = .50, p = .02$) contexts correlated with amount of time studying English. Confidence for past in a hard context was additionally associated with self-reported amount of English spoken at school ($r = .41, p = .04$). In all cases, more extensive language study and use were linked with greater confidence in perception of past, and all associations were of medium strength ($.40 < r < .60$), according to Plonsky and Oswald's (2014) guidelines.

Discourse Cues

The final (exploratory) research question targeted debriefing interviews to determine potential discourse cues used by listeners to aid in perception of past in naturalistic input and to document listeners' awareness of such cues. Generally, interviewees seemed to rely on context in their perception of *-ed*, with advanced learners (10 statements by two interviewees) and L1 speakers (30 statements by four interviewees) mentioning context more often than intermediate learners (two statements by two interviewees). L1 speakers mentioned phonology more often (23 statements) than advanced (five statements) and intermediate (five statements) learners.

I hated that. This clip contained virtually no context cues, and presented difficulty for all interviewees, despite the past tense morpheme being perceptually easy (separate-syllable allomorph [əd]). Intermediate learners indicated that there was no ending, and appeared to rely entirely on their perception skills. In contrast, advanced learners and most L1 speakers mentioned lack of context as a reason they were struggling to hear the ending.

But then we ditch those two. Here the potential cue (*but then*) did not indicate tense but instead signaled a continuation of narrative; it was not much help to the interviewees, as seven of the eight interviewees thought the sentence contained a past marker. All L1 speakers, except one who correctly thought the past tense marker was absent, mentioned *but then* as a reason they chose past, thus misinterpreting this sentence. An affricate is also present in the verb coda, and it is followed by /ð/, which may have caused confusion phonologically.

Until you change your mind. Again, this clip provided a cue (*until*), but not necessarily one that helped interpret tense, as this cue can be meaningfully used in both present and past. Yet this clip was not as challenging for the interviewees as the previous one. Only one intermediate learner of the eight interviewees incorrectly heard *-ed*. While two L1 speakers noted past tense

was possible, both advanced learners and all L1 speakers mentioned that *until* indicated future for them. Like the verb in the previous clip, *change* contains an affricate in the verb coda, this time followed by palatal [j], likely aiding perception. Only one interviewee reported relying solely on perception, without using any other cues, in determining verb tense.

Normally if someone talked to me that way, I'd fire 'em. There was more context provided in this clip compared to previous sentences. It contains a hypothetical conditional, with a (reduced) *would* in the second clause. All interviewees, with varying confidence, correctly perceived the past tense marker. Confidence increased with proficiency, with L1 speakers being the most confident. All L1 speakers labeled the sentence as a hypothetical conditional (reflecting their metalinguistic knowledge), and both advanced learners mentioned that the presence of *if* or *would* influenced their decision.

Yeah, Joey said I needed to relax, so he gave me an antihistamine. This sentence arguably provided the most context compared to the four previous clips, although some confusion could arise because this is reported speech and L1 speakers are often inconsistent with tense in reported speech. All but one interviewee correctly heard the past tense ending. The intermediate learners had the lowest confidence, and showed uncertainty about the clip. The advanced learners and L1 speakers were not as confident with this clip as with the previous; most talked through the context of the clip before confirming the target verb was past, and one L1 speaker indeed changed his mind when given the option, reporting that he heard no *-ed* after all.

Discussion

The current study examined L2 learners' and L1 speakers' perception of simple past *-ed* in naturalistic input, investigating the effect of perceptual difficulty, operationalized as the occurrence of *-ed* in easy or hard perceptual contexts. The study further explored which learner

background variables linked to perception and what contextual cues (besides time adverbials) listeners attend to when interpreting tense in naturalistic input.

Perception of Simple Past

With respect to detecting the presence or absence of *-ed*, results were identical for past and present forms. There was no difference between L2 learner groups, but L1 speakers overall were more accurate than L2 learners. This study is likely among the first to compare L1 and L2 perception of present and past verb forms. Neither Solt et al. (2004) nor Klein et al. (2004) reported perception accuracy for present, and Bell et al. (2015) combined present and past perception rates into a single score, based on the assumption that perception of *-ed* also involved the ability to detect its absence. The current results suggest that detecting the presence of a low-salience morpheme is just as demanding as detecting its absence in naturalistic input, although L1 speakers (83–87% accuracy) outperformed L2 learners (59–78% accuracy).

L1 speakers were far from ceiling performance in their perception of present or past (83–87% correct), indicating that detection of *-ed* in brief video clips is difficult for native and nonnative speakers alike. This result for L1 speakers is consistent with Bell et al.'s (2015) findings, where L1 speakers outperformed learners in perception accuracy without reaching 100% accuracy but contrasts with Klein et al.'s (2004) and Solt et al.'s (2004) results, where L1 users perceived *-ed* at ceiling. This difference may be due to the sentential context where *-ed* occurred. In the latter two studies, past verbs were followed by a vowel, with additional discourse cues present (irregular past verbs, temporal adverbials), likely making the ending salient. In contrast, Bell et al. used a conversational speech rate to present sentences varying in perceptual difficulty, and the current materials included authentic video clips, which ostensibly increased task difficulty.

In terms of rated confidence, L1 speakers outperformed both learner groups. Yet only advanced learners were more confident in perception of present than past forms, and advanced learners were overall more confident than intermediate learners, implying that higher-level learners are aware of the perceptual difficulty associated with *-ed*. Rodríguez Silva and Roehr-Brackin (2016) recently compared difficulty ratings for 13 grammar targets by applied linguists, university English teachers, and L2 learners, showing that the best predictor of functor difficulty for learners was their own difficulty ratings. The confidence ratings in this study thus likely revealed learners' proficiency-linked awareness of the *-ed* perceptual challenge, although this awareness was dissociated from (and most likely preceded) learners' actual perception accuracy.

Perceptual Context

For all participant groups, perception of *-ed* was facilitated in easy compared to hard contexts, and all groups were also more confident when *-ed* occurred in easy than in hard contexts. A similar difference in perception of *-ed* in easy and hard contexts—defined in perceptual (i.e., presence of a vowel making *-ed* easier to hear) or phonological (i.e., difference in sonority between [əɪ] and [t]/[d] allomorphs) terms—was found in Bell et al. (2015) for all listeners, and in Klein et al. (2004) and Solt et al. (2004) for L2 learners. Unlike the overall comparison of present versus past forms, *-ed* perception accuracy in easy versus hard contexts did not differ across L1 speakers and advanced learners, yet both were more accurate than intermediate learners (see also Solt et al.). Klein et al. found that the syllabicity of *-ed* was a better predictor of past tense accuracy than the verb's aspect (telic vs. atelic), and current findings showed that [əɪ] is easier to perceive than [t] and [d], adding support to Goldschneider and DeKeyser's (2001) definition of morpheme salience (number of phones, syllabicity, sonority). However, the more salient allomorph [əɪ] is lacking in learner input, at least in

classroom environments (Collins et al., 2009), which likely contributes to its late acquisition. Moreover, learners do not always accurately perceive *-ed* even in perceptually easy contexts (70–86% accuracy), and L1 speakers do not appear to perform at ceiling either (at 75–93%). Regular past, then, may be even less perceptible in everyday input than originally thought.

Language Exposure and Use

There was a relationship between L2 learners' perception of easy *-ed*, the age they had begun studying English, and their amount of time learning English. Increased confidence in perceiving easy *-ed* was also related to the length of time learners spent studying English. Together, these associations point to overall amount of study and use of English as beneficial to learners' ability to perceive regular past, and may add support to Jia and Fuse's (2007) finding that amount of exposure day-to-day predicts the acquisition of difficult L2 morphemes (see also Blom & Paradis, 2015; Rispoli et al., 2012). Increased L2 exposure (through time devoted to study or earlier and thus longer exposure) might enable learners to accrue sufficient evidence to reliably identify *-ed* in naturalistic input, in agreement with emergentist views of language learning (Ellis, 2007).

The only variable associated with learners' perception of hard *-ed*, which is particularly problematic, was self-reported listening proficiency, confirming prior claims that listeners' challenges with English past morphology are confined to the perceptual/listening domain (e.g., McDonald & Roussel, 2010). Moreover, Fracasso, Bangs, and Binder (2016) recently revealed an association between morphological awareness and listening comprehension for a group of adult L1 students working on their basic literacy skills, with morphological awareness defined as the ability to identify, reflect on, and manipulate the morphological structure of words. This link between awareness of morphology and comprehension skills points to a morphological basis of

listening comprehension. Listeners' ability to interpret spoken discourse is tied to their ability to detect morphology, with the consequence that the past challenge may be as much (if not more) about accurate listening comprehension of discourse as it is about perception of auditory forms.

Discourse Cues

Debriefing interviews with eight participants revealed that perception of *-ed* in naturalistic input was associated with many discourse cues (grammatical, lexical, phonological). L1 speakers and advanced learners mentioned such cues more frequently than intermediate learners. For instance, all interviewees were cued to past by conditionals (e.g., *Normally if someone talked to me that way, I'd fire 'em*), and they struggled to hear *-ed* in *Joey said I needed to relax so he gave me an antihistamine* (which arguably contained substantial context and featured a perceptually easy single-syllable allomorph), showing sensitivity to reported speech as being an unreliable cue for past (Parrott, 2000). Interviewees also had difficulty perceiving *-ed* when there was no context provided (e.g., *I hated that*). Thus, even a perceptually easy ending is unreliable in the absence of any further discourse context. In fact, it has been argued that English simple past relies nearly exclusively on context for interpretation (Ehrlich, 1990) and that it may not have meaning other than a speaker's subjective relationship to content (Pennington, 1988). Reported speech and context-poor utterances are examples of when listeners likely determine the temporal frame of an utterance based on subjective interpretation of discourse rather than on prescriptive grammar rules or presence or absence of morphological markers.

In this study, some clips created an "incongruent adverb" context for listeners (e.g., *But then we ditch those two*, with *but then* interpreted as a past, not a future tense marker). One L1 speaker noted that "the only reason to use the present simple would be to... talk about habit or repeated action," and two others mentioned present just not "making sense" to them in this

context. In fact, all but one L1 speaker misinterpreted the context, which for them was a more reliable temporal cue than morphology. In essence, listeners do rely on contextual cues, perhaps extensively, to interpret ambiguous utterances, especially when morphology is perceptually difficult. Thus, the simple past challenge is not restricted to perception, but likely involves an integration of various contextual cues as part of sense-making in speech comprehension.

Limitations and Future Directions

Because the targeted input was authentic language from TV shows, it lacked controls for pronunciation and fluency properties of verb forms. For instance, some forms may have been spoken more quickly or slowly, and some may have been more or less clearly articulated. These findings cannot be generalized beyond the current definition of easy/hard perceptual contexts (i.e., [əd] vs. [t] and [d] allomorphs, all followed by a consonant). Future studies might use more nuanced operationalizations of perceptual difficulty (e.g., in terms of palatalization, flapping, and other assimilatory or dissimilatory phonetic processes that affect alveolar stops) to understand phonetic influences on perception of *-ed*. Further, the target utterances were derived exclusively from American TV shows, with all but two speakers having American accents, so it would be important to see how past is perceived in different dialects of English.

In terms of listener-specific variables, the language background questionnaires did not reveal how much and when learners used English before and after their arrival in Canada. This study also did not address the relationship between adult L2 learners' perception and production; therefore, a more detailed look at learners' perception and production (and the interaction between them) across several proficiency levels would be needed to fully understand the learning challenges associated with L2 morphology. Finally, while the content of the debriefing interviews was revealing, the interviews themselves were brief, exploratory, and lacked

qualitative rigor. To understand how listeners interpret morphology in context, research using think-aloud procedures or more detailed interview protocols is warranted.

Conclusion

The current study contributed to clarifying the past tense challenge by showing that *-ed* is frequently hard to perceive for L1 speakers and L2 learners in rapid, conversational naturalistic input. The current findings also supported emergentist views of language development by revealing a link between learners' use/exposure to the L2 and success in perception of L2 morphology. Overall, this study added to a growing body of research that shows that English regular past is not just infrequent in learner input (Collins et al., 2009) but that it is also difficult to perceive (e.g., Bell et al., 2015), and that the perception challenge likely encompasses both finegrained phonetic perception and higher-order comprehension of spoken discourse.

Notes

1. Despite this difference in metalinguistic knowledge, the non-teacher participants did not perform any differently on the perception test or report a different level of confidence in their responses.

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Appendix A: Target Materials

Past Tense Stimuli

Past /əd/	Past /t, d/
1. But I hated getting dirty.	1. I even changed my facebook status.
2. Yeah, Joey said I uh, needed to relax so he gave me an anti-histamine.	2. Huh. Normally if someone talked to me that way, I'd fire him.
3. Maybe I just wanted to make myself feel better.	3. They told me I looked too Midwest for the part.
4. I attempted to cajole her.	4. Played to perfection, Charles!
5. I invented the game of cups as a way to give Joey money.	5. And then he seemed kinda down.
6. I rented the wrong movie.	6. You called me.
7. No one invited me.	7. Well first of all, I would like to say that you both performed very well.
8. We're really glad you decided to meet our guy.	8. You refused to go out with Chaz.
9. I trusted you with my email address and you...	9. I know, but you know what, it would make me feel better if Louis apologized to me.
10. Her grandson Judd reported she went out for bagels and never came back.	10. If you got married after you turned 30 you'd pay for it yourself.
11. The "mrow", that sounded to me like an African civet cat.	11. Oh good, I used that right.
12. Wait, I just decided to just ditch my plans.	12. I'm sorry, you tried to build your own CAT scanner.

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| 13. I just expected so much more out of you. | 13. Mitchell and I agreed that I would be in charge of the wedding. |
| 14. He started playing the most amazing game and I... | 14. Not everybody. No, as a matter of fact one of the guys in break room asked me to lunch. |
| 15. I don't care that you rejected my advances. | 15. I booked the restaurant from our first date. |
| 16. He responded to a riot at a gym without backup. | 16. Sorry, sorry! Once I changed the earrings I had to change the shoes. |
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Base Form Stimuli

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| 1. In India we just call them Untouchables. | 17. You seem to know a lot about fashion. |
| 2. Good people, you know, they start playing these games. | 18. You sound like a little girl. |
| 3. What's insane is how you refuse to get with the program. | 19. Dad, you seem to forget that I raised three children. |
| 4. I wish you all the best. | 20. Well, I hope you find something to do. |
| 5. Until you change your mind. | 21. Casey, I miss you! |
| 6. Yeah, well, just apologize to him ok? | 22. Now, I assume the saucer card came up when you played last. |
| 7. And we in return, agree not to violate the integrity of the internal hardware. | 23. OK, so now after you receive the doubling bonus. |
| 8. We remind you that this is a non-smoking flight so... | 24. Because I really believe that you have good judgement. |
| 9. But then we ditch those two. | 25. Oh, I remember laughing. |

10. You **open** the best bottle of wine.
11. **Try** less teeth.
12. It's like uh, in a way you-you **complete** me.
13. And I **correspond** with people like a grown-up.
14. We **call** him the vulture.
15. We **crack** the case.
16. If I **scream** right up until you say "action."
26. What do you say we **play** a little uh, foosball for money.
27. Ok, just **promise** me that you won't do anything stupid.
28. I really **appreciate** your offer to let me move in and everything, but...
29. Because he knows that we **enjoy** the silliness.
30. I **like** the old sheriff.
31. Soldiers **talk** about that moment when they shut off.
32. You **realize** what you are.
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