

Now You Hear It, Now You Don't: Perception of English Regular Past *-ed* in Naturalistic Input

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Résumé : De précédentes recherches ont démontré que les formes régulières du passé des verbes anglais sont difficiles à percevoir. Or les chercheurs qui se sont intéressés à cette perception ont jusqu'à maintenant soumis leurs intrants à un traitement expérimental, la façon dont les indices contextuels, au-delà des adverbes de temps, influent sur la perception du passé régulier n'ayant pas retenu leur attention. Les auteurs se demandent si les apprenants de l'anglais langue seconde (L2) et les locuteurs natifs de l'anglais (L1) perçoivent le passé régulier *-ed* lorsque l'intrant s'inscrit dans un contexte naturaliste, si le rendu phonologique (marqué [əd] ou non marqué [t, d]) influe sur leur perception et si leur exposition à la langue et l'usage qu'ils en font sont liés à une confiance ou une justesse perceptuelle accrue. Dans le cadre de l'expérience menée par les auteurs, 11 locuteurs de la L1 et 28 apprenants de la L2 (14 de niveau intermédiaire et 14 de niveau avancé) ayant visionné 64 vidéoclips de comédies de situation télévisées (contenant 32 formes régulières du passé et 32 formes de base) ont indiqué s'ils entendaient ou non la terminaison *-ed* et ont noté leur degré de confiance sur une échelle de Likert à 8 points. Les apprenants de la L2 de niveau avancé ont perçu la terminaison *-ed* avec autant de justesse que les locuteurs de la L1, la performance de ces deux groupes s'étant révélée supérieure à celle des apprenants de niveau intermédiaire. Tous les participants ont perçu la terminaison [əd] avec plus de justesse que les terminaisons [t, d]. La confiance augmentait avec la maîtrise de la langue et diminuait avec la difficulté phonologique. La justesse de perception des apprenants en corrélation avec une mesure de l'exposition à la L2, ainsi que des entrevues, ont révélé des similitudes dans l'usage des indices du discours pour interpréter le temps chez les apprenants de niveau avancé de la L2 et les locuteurs de la L1. Les résultats de l'étude confirment que la perception de la terminaison *-ed* suppose l'interprétation de multiples indices contextuels.

Mots clés : acquisition, discours, exposition, morphologie, prépondérance

Abstract: 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 has investigated how contextual cues, beyond temporal adverbials, affect the 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 [əd] vs. non-salient [t, d]) affects 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 [əd] 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

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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.

Keywords: acquisition, discourse, exposure, morphology, salience

The regular past is late acquired by native (L1) and second language (L2) English learners according to the “natural order of acquisition” and studies of L2 morpheme acquisition (Dulay & Burt, 1974; Goldschneider & DeKeyser, 2001; Jia & Fuse, 2007; Jiang, Novokshanova, Masuda, & Wang, 2011). The present study investigated L2 learners' perception of regular past *-ed* in naturalistic input, on the assumption that one source of this persistent challenge is learners' (in)ability to perceive *-ed*.

The past-tense challenge

Research with L1 users has pointed to perceptual explanations for regular past difficulty. For example, McDonald and Roussel (2010) compared past-tense grammaticality judgments of L1 and L2 speakers with added phonological processing workload (white noise) or lexical retrieval workload (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. Robertson, Joanisse, Desroches, and Terry (2012) found that dyslexic and language-impaired L1 speakers were non-target in their perception and production of English past tense, implying that phonological processing (which is compromised in these speakers) is essential to the acquisition of the regular past. Moreover, studies of hearing-impaired L1 children show that phonological perception training (Bow, Blamey, Paatsch, & Sarant, 2004) and cochlear implantation (Guo, Spencer, & Tomblin, 2013) facilitate the production of the regular past. These findings make a strong case toward an “if you can't hear it, you can't learn it” element of regular past morphological learning.

The past-tense difficulties of L2 learners mirror those of L1 speakers, with perceptual explanations often at the heart (Beck, 1997; Magen, 2014). Bell, Trofimovich, and Collins (2015) investigated the perception of *-ed* by L2 learners of English based on the phonological context in which *-ed* occurred in utterances spoken at conversational and slowed speed and in the presence or absence of congruent or incongruent temporal adverbials (e.g., *yesterday I walk[ed]*). Phonologically salient (easy) contexts included *-ed* spoken as a separate syllable and followed by a vowel (e.g., *corrected a paper*), and non-salient (hard) contexts involved *-ed* in a consonant cluster (e.g., *searched for gold, helped the lady*). Slowed speech helped learners perceive *-ed* as accurately in non-salient contexts as in salient ones. 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 non-impaired 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 contribute to certain morphemes being difficult to acquire. For the regular past, perceptual salience (including input frequency), variables capturing learners' L2 exposure and use, and the availability of discourse-level contextual cues seem most relevant.

Perceptual salience

Perceptual salience (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., the stops [t] and [d]) are among the least sonorous least sonorous English segments (e.g., Jespersen, 1904). L2 learners have more difficulty producing and perceiving [d, t] than [əd] (e.g., Wolfram, 1989; Wolfram & Hatfield, 1986), suggesting that perceptual salience affects learners' processing of 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 & Coppen, 2015), on the assumption that the more frequent a form is in input, the easier it is to learn. Yet the regular past is infrequent. For L2 speakers, Wolfram and Hatfield (1986) and Wolfram (1989) noted the role of frequency in the production of irregular verbs; however, they made no mention of its importance for regular forms. More recently, Collins et al. (2009) showed that only 2% of the verbs in their corpus of elementary school students' classroom input was 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, the most salient context for regular past. Therefore, if input frequency contributes to perceptual salience, as Wolfram and Hatfield suggest for the irregular past, the regular past is not salient, at least not in elementary classroom input.

Language exposure and use

Apart from perceptual salience, a number of experiential variables might also compound the challenge of learning the regular past. The role of language background in morphological learning has been relatively well researched, particularly regarding 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*, 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 the production of late-acquired morphemes (such as *-ed*) was not AOA but amount of exposure to English outside of class, suggesting that language exposure plays a role in L2 morphological learning. The above findings are in line with emergentist perspectives on language acquisition (e.g., Beckner et al., 2009; Ellis, 1998, 2007), which posit that language systems (e.g., morphology) emerge over time from patterns extracted from repeated exposure to complex input. Thus, exposure may be key to morphological perception and subsequent acquisition.

Sentence-level cues

The sentential context in which the regular past occurs, which includes the availability of lexical markers of tense, might also provide cues that facilitate or hinder how reliably it is

heard. For instance, in the presence of time adverbials (e.g., *yesterday*), learners can ignore morphology and still understand the utterance (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., Bell et al., 2015; 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*).

Research conducted within the framework of input processing (VanPatten, 1996) has provided ample evidence for the importance of lexical cues in learners' interpretation of L2 morphology. For example, Musumeci (1989) compared the ability of L2 learners of French, Spanish, and Italian to identify tense in video clips of speakers producing sentences across several conditions, notably, those that included or excluded lexical markers of tense. She found that L2 learners performed more accurately in situations where lexical markers were present, compared with contexts where learners had to rely on verbal morphology only. In another study, Lee, Cadierno, Glass, and VanPatten (1997) investigated the impact of morphological and lexical cues on listening comprehension in L2 Spanish. For university-level learners, comprehension was greater in the lexical cue condition, where morphological markers were accompanied by lexical markers, compared with the morphology-only condition, which again supported the primacy of lexical meaning over morphological form in comprehension (see also Lee, 1998, 1999). Nevertheless, at least in English, temporal adverbials are not always present, so it is unlikely that native speakers or learners rely on them exclusively to perceive the regular past.

Besides temporal 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 the perception of the regular past, Luke and Christianson (2015) showed that syntactic context (the presence of a noun phrase) was used by readers to predict inflection in upcoming verbs. Thus, contextual cues in naturalistic input might confer some benefits to learners (e.g., contextual support aiding perception), yet the input might also present some challenges (e.g., rapid conversational speech). It is important to examine naturalistic input to determine the potential role of contextual cues other than time adverbials in the perception of regular past.

The current study

A growing body of research indicates that L2 learners and many populations of L1 users (e.g., the hearing impaired) have difficulty with English regular past *-ed* linked to perceptual issues, such that the low perceptual salience of *-ed*, its redundant nature, and its insufficient frequency in input make it difficult for learners to hear and, consequently, to acquire (e.g., Bell et al., 2015; DeKeyser, 2005; Klein et al., 2004). One shortcoming of prior perception research is that it has relied exclusively on experimentally manipulated input. For instance, Klein et al.'s (2004) 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 and speed of delivery. To fully 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 everyday 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 (salience), operationalized as occurrence of *-ed* in phonologically salient ([æd]) or non-salient ([t], [d]) contexts (Bell et al., 2015; Solt et al., 2004). Therefore, our first objective was to investigate the perception of past *-ed* when researcher-created materials are replaced by naturalistic input. Our second objective, in light of previous research showing associations between L2 morphological learning and learners' language exposure/use (e.g., Jia & Fuse, 2007), was to explore the relationship between learners' perception of *-ed* and their background variables, such as amount of exposure to English. It is assumed that perception–exposure links similar to those found in Jia and Fuse (2007) should exist with respect to learners' experience with naturalistic stimuli. As a final goal, we 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. However, the occurrence of discourse cues in the target materials was not experimentally controlled or manipulated, which meant that this goal was strictly exploratory. The study addressed the following research questions:

1. Does perceptual context (salient vs. non-salient) affect 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 the regular past, particularly in salient and non-salient contexts?
3. What, if any, sentential context cues do L2 learners and L1 speakers use in their perception of regular past *-ed* in naturalistic input, and to what extent are they aware of the cues that might help or hinder its perception?

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 – the 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), which has six levels in total (A1, A2, B1, B2, C1, C2; Council of Europe, 2001). L2 learners were tested one day after completing the target tasks. Fourteen intermediate learners received passing or near-passing grades on the Cambridge PET ($M = 71.9\%$, $SD = 16.9$), corresponding to CEFR B1 levels, or International English Language Testing System (IELTS) bands 4–5 (on a nine-band scale), and 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 ($M = 58.8\%$, $SD = 12.5$), corresponding to CEFR B2 or low C1 levels, or IELTS bands 5–7.

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

(1 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, range = 18–51) spoke L1 Portuguese (7), Spanish (2), Japanese (2), Czech, German, and Romanian (1 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, range = 27–58) included residents of Vancouver (8), Montreal (2), and Chicago (1), born in Canada (5), the United States (3), Ireland (2), and New Zealand (1) to monolingual English parents.¹ They reported being fluent in L2 French (2), Spanish (2), Danish, Norwegian, and Swedish (1 each). All had studied multiple languages. Eight were ESL instructors in the learners' language school; therefore, they probably had a greater level of metalinguistic knowledge and interest in language study compared with the rest of the L1 speakers.²

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 = 10 years) and a 24-year-old Turkish speaker from Turkey (residence in Vancouver = 7 months; age of first exposure to English = 22 years). The two advanced learners were a 21-year-old Portuguese speaker from Brazil (residence in Vancouver = 1 month; age of first exposure to English = 5 years) 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 ESL teachers: two Canadian males, 27 and 32 years old, a 48-year-old American male living in Canada for nine years, and a 33-year-old male from New Zealand living in Canada for seven years.

Materials

The target materials included 64 authentic video clips from popular TV shows (e.g., *The Big Bang Theory*, *Friends*; see Appendix). The video clips ($M_{\text{length}} = 3.2$ seconds, range = 1.6–6.4) featured one phrase with at least one regular verb form in base or past forms ($M_{\text{words}} = 8.7$, range = 3–17). 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 targeted regular past sentences, with 16 targeting salient and 16 targeting non-salient past utterances. Similar to both Bell et al. (2015) and Collins et al. (2009), salient contexts were defined as instances of past tense marked by the separate-syllable allomorph [əd] (e.g., *I hated that, I needed to relax*) and non-salient 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*). While both Bell et al. and Collins et al. defined phonologically salient contexts as those that involved the separate-syllable allomorph [əd] followed by a vowel (as in *I wanted out*), in this study all past-tense verbs, regardless of the context, were followed by a consonant because we had been unable to identify sufficient numbers of naturalistic stimuli containing [əd] followed by a vowel.

As a performance baseline, the remaining 32 video clips, also extracted from popular sitcoms, featured base-form (*walk* as opposed to infinitive, *to walk*) utterances (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 episodes' transcripts (publicly available online) with the audio within the context of the show. Due to the variability of naturalistic input, using identical verbs across base-form and past utterances

proved impossible. Consequently, base 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 (Brybaert & New, 2009). Table 1 shows descriptive statistics for target sentences across the 32 past (salient, non-salient) and 32 base-form utterances. The base and past utterances were matched for word length and clip duration, $t(62) < 1.89$, $p > 0.06$, $d = 0.48$. The base form verbs were of higher frequency compared with past forms, $t(62) = 2.13$, $p = 0.037$, $d = 0.54$; nevertheless, the corpus-based frequency of verbs in the salient and non-salient past contexts was comparable, $t(30) = 0.97$, $p = 0.340$, $d = 0.35$.

In order to answer the third exploratory research question about the influence of sentence-level cues on perception, each sentence was 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 $\kappa = 0.90$). The few cases of coder disagreement (9/75) were resolved through discussion. From the full set of 32 video clips featuring regular past, five (discussed in detail below) were selected as prompts for in-depth debriefing interviews, based on whether they contained various discourse cues (Table 2) that could aid listeners in, or distract them from, perceiving the regular past, and ranged from offering less to more discourse context.

Procedure

L2 learners were tested after school. They first completed a language background questionnaire (five minutes) and 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 pre-recorded female voice announcing the numbered position of each clip. Learners saw each clip twice with an interval of three seconds between the first and 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 *-ed* by circling “ED” (or “X”).

Because this study's chief objective was to document participants' ability to detect past-tense and base forms in naturalistic input, the expectation was that participants would

Table 1: Summary of descriptive statistics for video clips

Measure	Past		
	Base ($n = 32$)	Salient ($n = 16$)	Non-salient ($n = 16$)
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)

^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.

Table 2: Summary of coded context cues

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

rely on multiple sources of information available in each utterance, not just the specific cues associated with the articulation of the past-tense allophones or base forms. Because the response options were binary and therefore susceptible to guessing effects, all participants were also asked to estimate the confidence they had in their response on an 8-point Likert scale (1 = *not confident at all*, 8 = *very confident*). The assumption here was that performance accuracy and confidence can be dissociated, for example, in the sense that participants could be guessing (demonstrating low confidence in their decision) while performing accurately (e.g., Dienes, Altmann, Kwan, & Goode, 1995). Thus, confidence ratings were considered to be the measure that could supplement accuracy rates in providing a nuanced picture of listeners' performance. Therefore, upon watching each clip, participants first selected "ED" or "X" as their response alternative and then estimated how confident they were in their decision using an 8-point scale.

Before the 64 target clips, six 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. The purpose of the interviews was to examine participants' awareness of cues that might have influenced their decisions in the perception task. Interviews were semi-structured around open-ended questions (e.g., *Why did you choose the answer you did, Why do you feel so confident?*), and interviewees could 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 a value of 1 to each decision matching the original coding of each sentence (i.e., base-form utterance marked X, past utterance marked ED) and the value of 0 to each mismatched decision (i.e., base-form utterance marked ED, past utterance marked X). Raw scores were then converted to proportion scores, first for base-form and past sentences, based on the total number of items in each category (32 base, 32 past), and then with separate scores calculated for past in salient (16) and non-salient (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 (Table 2) were identified (e.g., mention of grammar, phonology), and frequency of statements in each category tallied for each group.

Results

Perception of regular past

The first analysis provided a baseline comparison for the perception of regular past, relative to base form 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, $F(2, 36) = 15.18, p < 0.0001, \eta_p^2 = 0.46$, no significant main effect of tense, $F(1, 36) = 0.28, p = 0.60, \eta_p^2 = 0.01$, and no significant two-way interaction, $F(2, 36) = 2.59, p = 0.09, \eta_p^2 = 0.13$. Follow-up (Bonferroni-corrected) comparisons targeting the group factor showed that L1 speakers outperformed both intermediate ($p < 0.0001$) and advanced ($p < 0.0001$) learners, but that the two learner groups performed similarly ($p = 0.29$).

A similar ANOVA targeting confidence ratings revealed a significant main effect of group, $F(2, 35) = 47.19, p < 0.0001, \eta_p^2 = 0.73$, a significant main effect of tense, $F(1, 35) = 5.77, p = 0.022, \eta_p^2 = 0.14$, and a significant two-way interaction, $F(2, 35) = 5.40, p = 0.009, \eta_p^2 = 0.24$. Follow-up (Bonferroni-corrected) comparisons exploring the significant interaction showed that L1 speakers were significantly more confident than both

Table 3: Descriptive statistics for overall perception of base form and regular past

Group	<i>M (SD)</i>			
	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)

advanced and intermediate learners ($p = 0.036$), and that advanced learners were significantly more confident than intermediate learners ($p < 0.0001$) in their perception of both base form and past. However, only advanced learners were significantly more confident in their perception accuracy of past over base form ($p < 0.0001$).

As can be seen, 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 did. 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 with base forms, but this increased confidence was not reflected in accuracy.

Perceptual context

The first research question asked whether perceptual salience, as defined through salient versus non-salient contexts, affected the perception of the regular past (see Table 4). A two-way (group \times context) mixed ANOVA exploring accuracy rates revealed significant main effects of group, $F(2, 33) = 8.22$, $p < 0.001$, $\eta_p^2 = 0.33$, and context, $F(1, 33) = 23.54$, $p < 0.0001$, $\eta_p^2 = 0.42$, but no significant two-way interaction, $F(2, 33) = 1.08$, $p = 0.35$, $\eta_p^2 = 0.06$. For the group factor, Bonferroni-corrected comparisons showed no difference between L1 speakers and advanced learners ($p = 0.068$), but both these groups outperformed intermediate learners ($p < 0.019$). All groups were more accurate in salient than non-salient contexts ($p < 0.0001$).

A similar ANOVA targeting confidence ratings revealed significant main effects of group, $F(2, 35) = 46.27$, $p < 0.0001$, $\eta_p^2 = 0.73$, and context, $F(1, 35) = 21.19$, $p < 0.0001$, $\eta_p^2 = 0.38$, but no significant two-way interaction, $F(2, 35) = .48$, $p = 0.63$, $\eta_p^2 = 0.03$. For the group factor, Bonferroni-corrected comparisons showed that L1 speakers were significantly more confident than both learner groups ($p < 0.037$), and that advanced learners were significantly more confident than intermediate learners ($p < 0.0001$). All groups were more confident in their responses in salient over non-salient contexts ($p < 0.0001$).

In sum, L1 speakers and advanced learners (71–93% correct) perceived the regular past with comparable accuracy, both outperforming intermediate learners (63–70% correct). All groups were influenced by the verb's phonological context, detecting the past more accurately when the verb occurred in salient (e.g., *I hated that*) than in non-salient (e.g., *I booked the restaurant*) contexts. While accuracy rates did not distinguish the L1 and

Table 4: Descriptive statistics for perception of regular past in salient and non-salient contexts

Group	M (SD)			
	Perceptually salient		Perceptually non-salient	
	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)

advanced learner groups, confidence ratings did. L1 speakers were significantly more confident, followed by advanced learners, and then intermediate learners, and all groups were more confident in salient than in non-salient contexts.

Language exposure and use

The second research question asked which learner background variables related to language use might be associated with the perception of the past, particularly in non-salient 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 the past in salient contexts correlated with the age at which learners started studying English ($r = -0.46, p = 0.02$) and with the amount of time studying English ($r = 0.46, p = 0.04$), so that an earlier age when instruction began and greater lengths of instruction were associated with higher perception accuracy. Accuracy for the past in non-salient contexts was associated only with self-reported listening proficiency ($r = 0.42, p = 0.04$), such that higher listening proficiency was linked to greater accuracy. Confidence judgments for the past in salient ($r = 0.52, p = 0.01$) and non-salient ($r = 0.50, p = 0.02$) contexts correlated with amount of time studying English. Confidence for the past in a non-salient context was additionally associated with self-reported amount of English spoken at school ($r = 0.41, p = 0.04$). In all cases, more extensive language study and use were linked with greater confidence in perception of the past, and all associations were of medium strength ($0.40 < r < 0.60$), according to Plonsky and Oswald's (2014) guidelines.

Sentential cues

The final (exploratory) research question targeted debriefing interviews to determine learners' use and/or awareness of potential sentential (discourse) cues in the perception of the past in naturalistic input. Interviewees were played five clips again, chosen because they were thought to represent interesting phonological or contextual cases. 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 morpheme being salient (separate-syllable allomorph [əd]). Intermediate learners heard 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 that they struggled to hear the ending.

But then we ditch_ those two.

Here the potential cue (*but then*) did not indicate tense but instead signalled a continuation of narrative; it was not much help to the interviewees, as seven of eight thought the sentence

contained a past marker, likely influenced by the expectation that *but then* cues narrative past. All L1 speakers except one (who correctly indicated that *-ed* was absent) mentioned *but then* as a reason that 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 that 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 tense.

Normally if someone talked to me that way, I'd fire 'em.

There was more context provided in this clip compared with 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 labelled the sentence a hypothetical conditional (reflecting their metalinguistic knowledge), and both advanced learners mentioned that the presence of *if* or *would'd* influenced their decision.

Yeah, Joey said I needed to relax, so he gave me an antihistamine.

This sentence arguably provided the most context compared with 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 (Parrott, 2000). In addition, the clip was delivered in a slow voice, because the speaker was affected by the antihistamine (which was the joke). Therefore, it is perhaps unsurprising that all but one L1 interviewee correctly heard the past tense ending. The intermediate learners 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 that 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 regular past *-ed* in naturalistic input, investigating the effect of perceptual difficulty, operationalized as the occurrence of *-ed* in salient or non-salient contexts. The study further explored which learner background variables were linked to perception and what contextual cues (besides temporal adverbials) listeners attend to when interpreting tense in naturalistic input.

Perception of regular past

With respect to detecting the presence or absence of *-ed*, results were identical. 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 base

and past verb forms. Neither [Solt et al. \(2004\)](#) nor [Klein et al. \(2004\)](#) reported perception accuracy for base forms, and [Bell et al. \(2015\)](#) combined base and past perception rates into a single score, 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 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 base or past forms (83–87% correct), indicating that detection of *-ed* in brief video clips is difficult for native and non-native 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 (e.g., temporal adverbials), likely making the ending salient (see [VanPatten, 1996](#)). 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 confidence, L1 speakers self-rated higher than both learner groups. Advanced learners were more confident than intermediate learners overall. Only advanced learners were more confident in perception of past than base forms, indicating that when they did not hear an ending, they were unsure if they *should* be hearing an ending. This implies that higher-level learners are aware of the perceptual difficulty associated with *-ed*. [Rodríguez Silva and Roehr-Brackin \(2016\)](#) 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 somewhat dissociated from (and most likely preceded) learners' actual perception accuracy.

Perceptual context

For all participant groups, perception of *-ed* was facilitated in phonologically salient compared with non-salient contexts, and all groups were more confident when *-ed* occurred in salient contexts. A similar difference in perception of *-ed* in salient and non-salient 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 base versus past forms, *-ed* perception accuracy in salient versus non-salient contexts did not differ across L1 speakers and advanced learners, yet both were more accurate than intermediate learners (see also [Solt et al., 2004](#)). 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 saliency (number of phones, syllabicity, sonority). That the non-salient allomorph was harder to hear may also lend support to the notion that consonant clusters, particularly in coda position, are difficult to perceive (e.g., [Cardoso, 2011](#)). However, the more salient

allomorph [əd] is lacking in learner input, at least in classroom environments (Collins et al., 2009), which probably contributes to its late acquisition. Moreover, learners do not always accurately perceive *-ed* even in salient contexts (70–86% accuracy), and L1 speakers do not appear to perform at ceiling either (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 phonologically salient *-ed*, the age they had begun studying English, and their amount of time learning English. Increased confidence in perceiving salient *-ed* was also related to the length of time learners spent studying English. Together, these associations point to the overall amount of study and use of English as beneficial to learners' ability to perceive the regular past, and they may add support to Jia and Fuse's (2007) finding that amount of daily exposure 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 phonologically non-salient *-ed* (which is particularly problematic) was self-reported listening proficiency. This confirms 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) revealed an association between morphological awareness and listening comprehension for a group of adult L1 speakers working on their basic literacy skills. In that study, morphological awareness was 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 comprehension of discourse (top-down) as it is about perception of auditory forms (bottom-up).

Sentential cues to regular past

Debriefing interviews with eight participants revealed that the perception of *-ed* in naturalistic input was associated with many sentential 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 the 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, was spoken slowly, and featured a salient single-syllable allomorph), showing sensitivity to reported speech as an unreliable cue for past (Parrott, 2000). Interviewees also had difficulty perceiving *-ed* when there was no context provided (e.g., *I hated that*). Clearly, even a salient ending is unreliable in the absence of any further discourse context. It has been argued that the English regular 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 the subjective interpretation of discourse rather than on prescriptive grammar rules or the presence or absence of morphological markers.

In this study, at least one clip 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 said, “the only reason to use the present simple would be to . . . talk about habit or repeated action,” and two others mentioned base form 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 regular past challenge is not restricted to perception but probably 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 or more or less clearly articulated. These findings cannot be generalized beyond the current definition of phonologically salient versus non-salient contexts (i.e., [əd] vs. [t] and [d] allomorphs, all followed by a consonant). Future studies might use more nuanced operationalizations of difficulty (e.g., in terms of palatalization, flapping, and other assimilatory or dissimilatory phonetic processes that affect alveolar stops) to understand finer-grained phonetic influences on the 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 the 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. We further did not have a sufficiently balanced sample of participants across L1 background to investigate any cross-linguistic effects on perception. We also have not addressed 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 rigour. They were also conducted in participants’ L2, so proficiency, especially for the intermediate-level interviewees, may have prohibited participants from elaborating on their perception strategies. 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 difficult to perceive for L1 speakers and L2 learners in rapid, conversational, naturalistic input. The current findings also support 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

the English regular past is not just infrequent in learner input (Collins et al., 2009) but also difficult to perceive (e.g., Bell et al., 2015), and that the perception challenge is likely to encompass both fine-grained phonetic perception and higher-order comprehension of spoken discourse.

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Notes

1. Participants who did not speak North American dialects of English did not differ in accuracy or confidence scores from speakers of North American English.
2. 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: Target materials

Table A.1: 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.
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.

Table A.2: Base-form stimuli

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| 1. In India we just call them Untouchables. | 1. You seem to know a lot about fashion. |
| 2. Good people, you know, they start playing these games. | 2. You sound like a little girl. |
| 3. What's insane is how you refuse to get with the program. | 3. Dad, you seem to forget that I raised three children. |
| 4. I wish you all the best. | 4. Well, I hope you find something to do. |
| 5. Until you change your mind. | 5. Casey, I miss you! |
| 6. Yeah, well, just apologize to him ok? | 6. 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. | 7. OK, so now after you receive the doubling bonus. |
| 8. We remind you that this is a non-smoking flight so . . . | 8. Because I really believe that you have good judgement. |
| 9. But then we ditch those two. | 9. Oh, I remember laughing. |
| 10. You open the best bottle of wine. | 10. What do you say we play a little uh, foosball for money. |
| 11. Try less teeth. | 11. Ok, just promise me that you won't do anything stupid. |
| 12. It's like uh, in a way you-you complete me. | 12. I really appreciate your offer to let me move in and everything, but . . . |
| 13. And I correspond with people like a grown-up. | 13. Because he knows that we enjoy the silliness. |
| 14. We call him the vulture. | 14. I like the old sheriff. |
| 15. We crack the case. | 15. Soldiers talk about that moment when they shut off. |
| 16. If I scream right up until you say "action." | 16. You realize what you are. |
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