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Insertion or Deletion: Rethinking an Old Morphophonological Issue*

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This study rethinks an old issue concerning the generation of the allomorphs of the English past tense suffix *-ed*. Based on historical and synchronic data, it is proposed that the underlying phonological representation of the suffix should better be /əd/ and the schwa gets deleted in the generation of the surface representation under phonological conditions. Given the proposal, the historical development of the suffix can be incorporated into the new account, and the spelling of the past tense suffix, which is highly connected with the phonological information of the suffix, is accounted for as well. This proposal thus implies that the English past tense suffix is generated through a different phonological process from the plural suffix and the third person singular present tense suffix.

Keywords: allomorph, English past tense, phonological derivation, doubling consonant rule

Introduction

A key concept in an introductory course of generative phonology can be the ordering of rules that are required to generate the target phonological output. A classic case that serves to introduce to students of phonology the importance of correct rule ordering is the generation of the three allophones of the English past tense morpheme *-ed*, namely, [d], [t], and [əd]. The typical and classic account goes that the generation of the three allophones involves the application of two phonological rules and one assumption that states the default form, i.e., [-d], is devoiced when preceded by a voiceless consonants and the other rule states that a schwa is inserted when the preceding consonant is either [-t] or [-d]. Such an account prevails in all the introductory books to phonology and linguistics (Fromkin et al., 2000; Fromkin, Rodman, & Hyams, 2010; O'Grady & Archibald, 2004). This account is considered the optimal analysis of the generation of the three alternative allophonic forms of the English past tense morpheme, as demonstrated in Fromkin et al. (2000). Interestingly, the reasons that Fromkin et al. use to argue for this account may instead make it thinner as it seems. Moreover, other linguists can alternatively argue for an alterative account that assumes /-t/ as the underlying representation of the *-ed* ending (Honda & O'Neil, 2008). Apparently, the seemingly widely accepted account for the generation of the three alternative allophones of the English past tense morpheme may not be entirely convincing after all.

This paper will thus argue that the underlying representation of the English past tense ending can optimally

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be [-əd]—one of the discarded assumptions and the least endorsed one, as in Fromkin et al. (2000)—and the schwa form is deleted, instead of inserted, in the generation of the target phonological forms of the past tense morpheme. The new account can not only respect the phonological development observed in historical data of English, but also better reflect and account for the phonic relation among the past tense ending, its spelling, and its phonetic forms. In addition, based on the argument, this paper would like to propose a possibility that the division between derivational and inflectional suffixes in English may not be a distinct dichotomy, but a continuum; the inflectional ones could have been the result of a grammaticizing process and the English past tense can be seen as an example, just as the English present participle ending *-ing*, as argued in Brinton and Traugott (2005) and Huddleston and Pullum (2002, p. 1644).

The structure of the present paper is as follows: Section 2 reviews Fromkin et al.'s (2000) and Honda and O'Neil's (2008) demonstration of the generation of the English past tense ending. Section 3 proposes the alternative account with historical and contemporary data. Sectional 4 concludes and indicates the potential influence this paper can make on generative phonology and morphology.

The Generation of the Past Tense Ending

The Classic Account

Introducing the significance of correct rule ordering, books of introductory generative phonology mostly illustrate the concept with the generation of the allophones of the English past tense suffix *-ed*. In the illustration, the generation is accounted for under the assumption that the phoneme /-d/ is the underlying representation of the suffix *-ed*. Together with the assumption, two phonological rules are involved in the generation: One is devoicing and the other is the insertion of schwa. The former states that the underlying representation /-d/ is turned voiceless when preceded by a voiceless sound right before the morpheme boundary, and the latter states that a schwa is inserted when the consonant before the past tense suffix is similar to the suffix itself (Fromkin et al., 2000). For the derivation to generate the target outputs, the two phonological rules should be ordered correctly with the schwa insertion rule applied before the devoicing rule so that the inserted schwa can block the devoicing rule to keep the underlying /d/ voiced after the schwa sound. The derivation of the past tense morpheme can thus be exemplified as follows (Fromkin et al., 2000, p. 611)[1] (see Example 1).

Example (1)

Underlying representation	/bʌg-d/	/lɪk-d/	/mɛnd-d/
Schwa insertion	*n/a*	*n/a*	mɛndəd
Devoicing	*n/a*	lɪkt	*n/a*
Surface representations	bʌgd	lɪkt	mɛndəd

(*n/a* = not applicable)

In their demonstration and explanation for the derivation, Fromkin et al. (2000) argued for the schwa-insertion account and argued against schwa-deletion account. For one thing, the deletion of schwa that is required in the alternative analysis with an underlying representation /-əd/ may turn out redundant, since it is acceptable in the English phonological system to have a schwa sound between two consonants, such as *barrack* [bærək], *skeleton* [skɛlətən], *Pamela* [pæmələ] (p. 614). However, the attachment of the past tense suffix is a

[1] The ordering of the two phonological rules are not in question here and will not be elaborated in the present paper. For further detail of the ordering, please refer to any books in this respect.

morphological process, the insertion of the schwa is a derivational process applied across word boundaries. It is problematic whether word-internal sequencing can be considered a good justification for cross-morphemic cases.

A second argument held by Fromkin et al. (2000) is that schwa insertion is called for because of the English phonological rule that two similar consonants are not allowed to be in a consecutive order,[2] just as *mended* [mɛndəd] and *hunted* [hʌntəd]. In addition, when arguing against the alternative schwa-deletion alternative, they reinforce the acceptance of the appearance of schwa between two consonants with possible new words converted from existing nouns, for example, "*rhumba* and *fantasia*" (Fromkin et al., 2000, p. 614). After converted into verbs and inflected with the past tense suffix, a schwa is thus found between two consonants, as in Example 2 below:

Example (2) *rhumbaed* [rʌmbəd] *fantasiaed* [fænteʒəd] (Fromkin et al., 2000, p. 614)

Nevertheless, this argument may not suffice to justify the need for the schwa to be inserted. The schwa is found between two consonants for one thing that the verbs inherently end in a schwa. For the other, the consonant before the schwa sound, namely /b/ or /ʒ/ in the above examples, is not at all similar to that in the suffix and yet a schwa appears. For another, such an argument also seems to ignore the morpheme boundary. The schwa sound in the examples belongs to the word stem, while the schwa sound in question in the derivation belongs to the past tense morpheme. Thus, these two examples may not be sufficient to justify the necessity of schwa insertion.

Moreover, Fromkin et al. (2000) argued for schwa insertion with such cases as "*crooked* and *aged*" (p. 614). However, the schwa insertion analysis seems ad hoc instead when such cases are taken into consideration, since in these two words, the surface representation of the past tense suffix is [krukəd] and [edʒəd] respectively, which turns out impossible outputs of the derivation illustrated in Example 1, since the schwa insertion should never be called for in such phonological environments, /kruk-d/ and /edʒ-d/, where the final consonants do not trigger the application of the schwa insertion rule. Thus, cases like *crooked* and *aged* appear to be counterexamples of the schwa insertion argument.

An Alternative Account

Interestingly, some linguists argue for the other alternative analysis, even though most linguists endorse the typical analysis (Fromkin et al., 2000; Kenstowicz, 1994; O'Grady & Archibald, 2004). Honda and O'Neil (2008) demonstrated that the generation of the three allophonic variations of the English past tense suffix should be based on the assumption that the voiceless alveolar stop /t/ should be the underlying representation. Under such an assumption, the corresponding phonological rules are thus different from the typical analysis. Instead of devoicing, this alternative analysis calls for a voicing rule with which the underlying representation /t/ is turned voiced in the surface representation, under the condition where the sound preceding /t/ is voiced. The schwa insertion rule remains unchanged so as to block the unacceptable sequences of phonemes, such as */tt/, */dd/, */td/, or */dt/. This account can be illustrated in Example 3 below (Honda & O'Neil, 2008, p. 45).

Example (3)

Underlying representation	/trit-t/	/flIp-t/	/rɑb-t/
Schwa insertion	tritət	*n/a*	*n/a*
Voicing	tritəd	*n/a*	rɑbd
Surface representations	tritəd	flIpt	rɑbd

(*n/a* = not applicable)

[2] Here similar consonants refer to those that are only different in voicing.

Hondan and O'Neil (2008) argued for this alternative account on the basis of the cross-linguistic application of the two phonological rules, namely, assimilation and epenthesis. They maintain that voicing assimilation is a phonological rule found in many human languages, such as Japanese and Brazilian Portuguese (pp. 47-48) (see Example 4).

Example (4) Japanese (taken from Honda & O'Neil, 2008, p. 48; boldfaces the author's)

maki + *sushi* becomes *makizushi* "vinegared rice and vegetables rolled in seeweed"
maze + *sushi* becomes *mazezushi* "vinegared rice mixed with vegetables and seafood"

Brazilian Portuguese

singular	plural
mes /més/ "month"	/mé.**z**is/ "months"
país /pa.í**s**/ "country"	/pa.í.**z**is/ "countries"
lus /lú**s**/ "light"	/lú.**z**is/ "lights"

As shown in Example 4, the initial consonant in the Japanese word *sushi* "seaweed" is turned voiced after it is compounded with another noun ending with a voiced sound. The same voicing assimilation can also be seen in Brazilian Portuguese where the final voiceless alveolar fricative /s/ is turned voiced when the nouns are inflected with the plural suffix /is/, since the suffix begins with a voiced sound and hence assimilates the final sound in the stem. These examples in Example 4 can thus show that voicing assimilation is a common phonological process.

In addition, Honda and O'Neil (2008) also argued for the commonality of vowel epenthesis with internal language evidence. In English, the suffixation of the possessive morpheme, the 3rd person singular present tense morpheme, and the contraction of *is*, *did*, *would*, and *had* also involves the insertion or epenthesis of schwa (see Example 5).

Example (5) (taken from Honda & O'Neil, 2008, p. 48)

(a) the possessive morpheme {poss} in English, as in:
horse's, dog's, and cat's tail —/ɪz/, /z/, and /s/, respectively
(b) the 3rd person singular present tense morpheme for regular verbs, as in:
He fusses, frets, and worries.—/ɪz/, /z/, and /s/, respectively
(c) the contraction of *is* /ɪz/ and has /hæz/, as in:
The horse's fast; the horse's won.—/ɪz/
The dog's angry; the dog's been chased.—/z/
The cat's furry; the cat's been fed.—/s/
(d) the contractions of *did, would,* and *had*, as in:
What'd he do?—/ɪd/
Jack'd've done it if we'd asked him to.—/t/, and /d/, respectively

As shown in Example 5, when the two consecutive consonants are too similar or even alike, a vowel is thus inserted to avoid any violation of the English phonotactics that state that two similar sounds cannot be in a consecutive order.

Summary

Based on the review above, it is obvious that two of the three alternative accounts for the generation of the

three allophones of the English past tense ending are equally reasonable, albeit some of the evidence provided by Fromkin et al. (2000) may not be robust enough to argue for their account. This may thus suggest that the third alternative account—assuming that /-əd/ is the underlying representation—can suffice to account for the generation of the three allophones of the English past tense ending. In other words, the surface representation [-əd] is not likely to be generated not because of the application of the schwa insertion rule, but otherwise. Therefore, this paper will propose that the underlying representation of the past tense suffix should be /-əd/ and instead of insertion, the schwa in the underlying form is deleted in the generative process. Such an argument will be supported with evidence of historical development of the past tense suffix, synchronic examples, and morphophonological examples. It will be shown that the new analysis will respect not only the historical development of the morpheme but also the interaction between morphology and phonology. Based on the new analysis, this paper will also propose a possible idea that considers the distinction between derivational suffixes and inflectional suffixes as a continuum, not a dichotomy, and the past tense suffix may be one of the medial cases in the continuum.

The Derivation of the Past Tense Ending: Rethinking

Instead of concurring with either one of the account reviewed in the previous section (Section 2), this study argues that the third alternative account can better respect the linguistic facts of the generation of the English past tense ending. It is assumed here that the underlying representation of the English past tense suffix *-ed* should better be /əd/ and the underlying representation gets deleted and/or devoiced in the generation of the surface representations of the suffix. Thus, the phonological rules that are involved in the generation include: (1) schwa-deletion—the schwa is deleted except for the cases where the final consonant of the stem is similar to /t/ or /d/; and (2) the devoicing rule: the /d/ in the underlying representation /əd/ is turned voiceless when its neighboring sound is voiceless. In addition, the ordering of the two rules is crucial so as to generate the intended surface representations; the schwa-deletion rule should apply first so that the output of this rule can then feed the second rule or leave it inapplicable, as illustrated in Example 6.

Example (6) (Examples taken directly from Fromkin et al., 2000, p. 611)

Underlying representation	/bʌg-əd/	/lɪk-əd/	/mɛnd-əd/
Schwa deletion	bʌg-d	lɪk-d	*n/a*
Devoicing	*n/a*	lɪkt	*n/a*
Surface representations	bʌgd	lɪkt	mɛndəd

(*n/a* = not applicable)

As seen in Example 6, the schwa in underlying representation of the suffix /əd/ is deleted in *bugged* and *liked*, since the final consonants in the stem is not similar to /t/ or /d/—both are [+alveolar, +stop]—and the remaining /d/ in the suffix in *liked* is further devoiced because of the voiceless consonant /k/. This alternative account may seem unacceptable or even odd and not better than the typical account, but it is nonetheless based on diachronic as well as synchronic evidence.

Diachronic Evidence

It is generally agreed upon that the English language has undergone many significant changes in its

phonology, morphology, syntax, semantics, and uses over centuries. The development of English can be divided into the following periods: the Old English Period (449-1100) (OE, henceforth), the Middle English Period (1100-1500) (ME, henceforth), the Early Modern English Period (1500-1800) (EME, henceforth), and the Late Modern English Period (1800- Present) (LME, henceforth) (Algeo, 2010; Barber, Beal, & Shaw, 2009; Culpeper, Katamba, Kerswill, Wodak, & McEnery, 2009). The development of English definitely involves the past tense ending, especially when the phonological system and spelling-pronunciation correspondence change. As documented in the *Online Etymology Dictionary* (Harper, 2012), the English past tense ending *-ed* used to be attached to weak verbs, or regular verbs in terms of current terminology. According to the etymology dictionary, the *-ed* ending emerged in ME, which is believed to be leveled from *-ed*, *-ad*, and *-od* in OE. In addition, Hallmann (2009) also pointed out a similar pattern of the development of the past tense ending and proposes that the past tense endings in OE, including *-ode*, *-ede*, were leveled to *-ed* in ME, for example (Hallmann, 2009):

Example (7)

	OE		ME		EME	
	Present	Past	Present	Past	Present	Past
1Sg indicative[3]	*Lufie*	*Lufode*	*Loue*	*louede*	*love*	*loved*

In addition to the formal development of the morpheme, its pronunciation is also documented in the dictionary. Harper (2010) noted that the past tense ending was originally fully pronounced as an independent syllable, namely [əd]. As the English phonology changed, the schwa became deleted and the past tense ending syllable thus became simplified, around the time when the final letter <*e*> in some words, such as *life*, *love*, and *name*, was turned into a silent letter—spelled but not pronounced. The simplification of the pronunciation of the *-ed* ending and the silence of the final letter <*e*>, according to Culpeper and Archer (2009), occurred around the time when the spelling of English words were becoming standardized whereas the phonology of English kept changing over time during the late ME period and the EME period (Culpeper et al., 2009).

Based on the documentation of the history of English, it is clear that among the three allophones of the past tense ending *-ed*, the [əd] one is documented to be the earliest form, while the other two, namely, [d] and [t], turn out to be later forms developed around the EME period. In other words, the historical data of the English language suggests that the schwa in the suffix should be deleted, but not otherwise.

Synchronic Evidence

Synchronic evidence indicates that the past tense ending remains fully pronounced in some words. As pointed out by Fromkin et al. (2000), the past tense ending is pronounced fully as a separate syllable only when it is attached to a verb stem ending in the [t] or [d] sounds, such as *hunted*, *intended*, and *wanted*. However, some words or verbs with the *-ed* ending is still pronounced as a separate syllable as the original pronunciation, for example, *beloved*, *blessed*, *accursed*, and *naked* (Wells, 2000). Other examples are listed below in Example 8 (Prator & Robinett, 1985; Wells, 2000).

Example (8) *two-legg**ed*** *ragg**ed*** *rugg**ed***
*wick**ed*** *wretch**ed*** *mark**ed**ness*
*mark**ed**ly* *suppos**ed**ly* *unreserv**ed**ly*

As shown in Example 8, all the *-ed* suffixes are pronounced as a separate syllable, namely, [əd]. One should, however, note that the past tense suffix *-ed* in such words as *marked*, *supposed*, and *unreserved* is pronounced

[3] According to Hallmann (2009), the term *indicative* is used in declarative and interrogative sentences.

according to the current principle—as [t] after voiceless consonants and as [d] after voiced consonants (Fromkin et al., 2000; Prator & Robinett, 1985; Wells, 2000). Interestingly, the past tense ending is pronounced as a separate syllable when another suffix, such as *-ly* and *-ness*, is attached after it, as seen in *markedly*, *unreservedly*, *markedness*, and *supposedly*. How should the cases be so? Should it be a case of automatic alternations or of morphophonological alternations (Haspelmath & Sims, 2010)? Should the schwa be inserted, as suggest by the currently known principle, or remained undeleted?

The schwa should be better considered undeleted but fairly unlikely inserted. As stated by the current principle, as discussed in Fromkin et al. (2000) and stated in most books mentioning the pronunciation of the English past tense ending (Gilbert, 2005; Lane, 2005; Prator & Robinett, 1985; Wells, 2000), the English past tense ending *-ed*:

> *has three regular pronunciations:*
> *1. After t or d it is pronounced Id or, less commonly in BrE but regularly in AmE, əd, …*
> *2. After the other VOICED consonants or a vowel sound, it is pronounced d …*
> *3. After the other VOICELESS consonants, it is pronounced t….* (Wells, 2000, pp. 249-250, italicized and capitalized as the original text)

According to the commonly known principles, the past tense ending *-ed* in the words listed in Example 8 above should never be pronounced as [əd], but should be [t] or [d] instead. In other words, such words in Example 8 can be regarded as exceptional cases where the schwa remains undeleted, given the three principles cited above.

In addition, one may also argue that the words where *-ed* is pronounced as a separate syllable are actually adjectives in contemporary English, and the adjectival cases may not suffice to argue against the defectiveness in the current morphophonological rules with regard to the English past tense ending that are usually applied to verbs.

Valid as the argument seems, however, not all the cases listed in Example 8 are purely adjectives. Obvious as they appear, cases like *supposedly*, *markedly*, and *unreservedly* are adverbs, but not adjectives. These adverbs are clearly derived from their adjective stems, namely, *supposed*, *marked*, and *unreserved* respectively, and the *-ed* endings in these words are pronounced according to the currently known principles, that is, as [d], [t], and [d] respectively. Then, what triggers the insertion of schwa when these words are attached to with the derivational morpheme *-ly*? It would however be ad hoc to stipulate that for these cases the derivational suffix *-ly* not only turns adjectives as such into adverbs, but also triggers a phonological process where schwa is inserted. Moreover, such contemporary adjectives as *blessed*, *beloved*, *wretched*, *aged*, and *rugged* are originally stemmed from their respective verb forms, as documented in *Merriam-Webster Dictionary* (Wight, 2011) as well as in Huddleston and Pullum (2002, p. 1644).

Some may nonetheless argue that most of the words listed in Example 8 are likely lexicalized into one integral word and thus the phonological form of the *-ed* endings may have been lexicalized as well. In other words, unlike most inflected verbs, whose verb roots or stems form a natural and apparent paradigm with the inflected verbs, these words appear not to have a paradigmatic counterpart. For example, *naked* can not be analyzed as an inflected or derived form stemmed from its verb stem or root **nake*. Nor can *wretched* and *wicked*.[4]

Although it may seem that such synchronic evidence does not suffice to argue for the alternative account of the morphophonological process involving the English past tense ending, historical evidence seems to show that

[4] There are such words as *wretch* and *wick* in English, but their grammatical categories and semantic properties are irrelevant to the inflection verbs with the past tense ending *-ed*. *Wretch*, according to *Merriam-Webster Dictionary*, is a noun and so is *wick*. Although *wick* can also be a verb, its meaning is irrelevant to the meaning of the word *wicked*.

the words in Example 8 were once inflected with *-ed*, according to *Merriam-Webster Dictionary*. In addition, the forms *markedness* and *markedly* are indeed inflected from the verb *mark*, but not *marked*, an adjective where the *-ed* ending is pronounced as a separate syllable. To accommodate these cases, the typical account, in which the underlying presentation is [d], may need to find a leeway, or in order not to complicate the generation, the typical account would then consider these cases exceptional such that they are morphologically-conditioned alternatives of *marked*. All in all, the alternative account, where the underlying representation of *-ed* is assumed to be /əd/ and the schwa is deleted in the generation of the surface representations, may be a better account at this point, compared to the typical account.

Orthography and Phonology of the English Past Tense Ending

The orthographical and phonological correspondences can also suggest that the underlying representation of the English past tense ending *-ed* should be [əd]. A common spelling rule that is involved when some verbs are inflected with the past tense ending is the doubling rule of the final consonant letters (see Example 9).

Example (9)

Base form	Past tense form
rebel	*rebel**l**ed*
control	*control**l**ed*
occur	*occur**r**ed*
refer	*refer**r**ed*
plan	*plan**n**ed*
jam	*jam**m**ed*
rob	*rob**b**ed*
top	*top**p**ed*
pat	*pat**t**ed*
lag	*lag**g**ed*

The verbs listed in Example 9 all require the doubling rule of the final consonant letters so as to generate a well-formed and legitimate past tense forms, as far as their orthographies are concerned. An English phonotactic rule states that geminates of consonants are not allowed in English phonology and this is why the typical account insists on the insertion of schwa (to break up potential geminate consonants). According to this phonotactic rule, all geminate consonant letters are pronounced only once, such as *letter*, *ladder*, *boss*, *immense*, *apple*, and *rubber*, where the geminate *-tt-*, *-dd-*, *-ss-*, *-mm-*, *-pp-*, and *-bb-* are realized as one sound only. Then why is it legitimately necessary to spell the final consonant letter twice when the past tense ending *-ed* is attached to such verbs as those listed above? What triggers the reduplicated spelling of the final consonant letter? Would it be redundant to do so? What can such reduplication suggest to us?

In fact, the need to double the final consonant letter as the illustrating verbs above can serve as evidential clues to the proposal that the underlying representation of the English past tense *-ed* should better be /əd/. The consonant doubling rule applies under two conditions where the first one has a priority over the second one; once the first one is not met, the second one is thus inapplicable or void. The first condition states that the final syllable in the word stem should carry the primary stress, and the second condition states that the orthography of the rhyme of the stressed syllable consists of a vowel letter and a consonant letter and the consonant letter is realized

in one consonant sound, which will correspond to a lax vowel sound and a consonant sound in the phonological structure of the rhyme (D. E. Freeman & Y. S. Freeman, 2004; Huddleston & Pullum, 2002). For example, in *permit*, the final syllable, namely, *-mit*, receives the primary stress, and the rhyme of the syllable is spelled in one vowel letter and one consonant letter and the phonological form of the rhyme consists of one lax vowel [ɪ] and a consonant [t]. Since the two conditions are met, the final consonant letter is thus reduplicated, when inflected with the past tense ending. On the other hand, in *retain* (*retained*, but not **retainned*), *pilot* (*piloted*, but not **pilotted*), and *mix* (*remixed*, but not **remixxed*), the conditions are not met, so reduplication of the final consonant letter is not required when inflected with the past tense suffix. For *retain*, although the stress is on the ultimate syllable (condition one met), this syllable contains two vowel letters and one consonant letter in the spelling of the rhyme (condition two not met). For *pilot*, the primary stressed in on the penultimate syllable, but not on the ultimate syllable (the first condition not met), and since the first condition takes a priority over the second one, the reduplication of the final consonant is void. For *remix*, the primary stress is on the ultimate syllable and the spelling of the rhyme of the syllable consists of a vowel letter and a consonant letter, but the consonant letter is realized as two sounds in its phonological form. Thus, reduplication of the final consonant letter is inapplicable.

Based on the discussion above, it seems that the reduplication of the final consonant letter may not entirely relevant to phonology or morphology. In fact, the phonology of the past tense suffix and the English morphology trigger the reduplication. In addition, the reduplication of the final consonant letter conforms not only to basic phonic principles but also to the English phonotactics, as well as morphology. As an inflectional morpheme, the English past tense suffix, like the other inflectional morphemes, are principally not allowed to alter any information of the stem, phonological information in particular (Katamba & Stonham, 2006). Since the underlying representation of the past tense suffix /əd/, beginning with a vowel, it is thus potential to change the syllable structure of the stem and hence the vowel quality of the stem will therefore be affected, as other suffixes beginning with vowel (such as, *-ic*, *-y*, and *-ity*). Take *-ity* for example. This derivational suffix not only creates a new word with a new semantic concept with a new grammatical function but also changes the stress of the stem, as in *creative* and *creativity.* In *creative*, the stress falls on the penultimate syllable, but after the suffixation of *-ity* the stress, although it remains on the penultimate syllable, is no longer on the same vowel, as it is in *creative*; it is moved to the vowel in the suffix. To account for the stress shift in the derivation of *creativity* from *creative*, one may need to consider that derivational suffixes of this kind have a weak morpheme boundary and lead to the resyllabification of the word and hence the metrical structure of the word is altered (Katamba & Stonham, 2006). On the other hand, inflectional suffixes are basically with a strong morpheme boundary and only create a paradigm of the stem, as in *bakes* and *baked* (in a paradigm with the base form *bake*). Because of this peculiar nature, *-ed* is thus morphologically and phonologically not allowed to create any new words (with a new semantic concept and/or a new syntactic function) and to alter the metrical structure of the stem. That is, it is less preferred for inflected counterparts to be phonologically distinct from their respective stems.

The new thinking of the generation of the English past tense seems to be majorly motivated by spelling, not purely by phonological and morphological factors or conditions. In fact, such spelling-relevant morphophonological changes are not uncommon in English; the alternative spellings of the article *a/an*, the

possessive suffix -*'s*, and the plural and third person singular suffix -*s/-es* all involve the same process. When the article *a* is preceding a vowel sound, the spelling *an* should be used instead, for example, *a book* and *an apple* (vs. **a apple*). In addition, the spelling of the English possessive suffix is also subject to the phonological information of the stem it is attached to (see Example 10).

Example (10) *child's* (but not **childs'*) vs. *children's*

girl's vs. *girls'* (but not *girls's*)

Charles's, Ross's vs. Bridges', Connors'

According to *Oxford Dictionaries* (Pearsall et al., 2012), the spelling of the possessive suffix is under the condition of phonological information in the stem. Generally speaking, when the stem does not end with the phoneme /s/, the suffix is spelled as -*'s*. When the stem, on the other hand, ends with the phoneme /s/, the suffix is spelled as -*(s)'* (the *s* belongs to the stem. However, when the stem ends with /s/ and the possessive suffix is spoken as a separate syllable, the spelling of the suffix should be -*'s*, as in *Charles's* and *Ross's*. Albeit the suffix in such cases as *Charles'* and *Ross's* is pronounced as a separate syllable, the spelling of suffix does not call for an additional vowel letter *e*, unlike another similar case the plural suffix in English -*s/-es*. The plural suffix for nouns is realized in two different spellings and the two spellings are phonologically conditioned as well: when the stem ends with a sibilant, the suffix is spelled as -*es*, as the way it is pronounced. These three morphological examples thus lend support to the idea that some morphemes are pronounced and spelled in more than one way and such variations are closely connected to phonology. Therefore, it is not unusual to consider that the doubling consonants are triggered by the phonology of the past tense morpheme -*ed*.

In contrast with the typical account, it is argued here that the underlying representation of the past tense suffix should be /əd/ and with the potential to alter the metric structure of the stem. Take the verb *rob* for example. When it is inflected with the past tense suffix, the final consonant letter, -*b*, should be reduplicated and is hence spelled as *robbed*. What if the final consonant were not reduplicated? Inflected with -*ed*, if the final consonant were not reduplicated, the inflected form would be spelled as *robed*, a whole another word. Since the underlying representation of the suffix is /əd/ with a weak morpheme boundary and hence the stem is resyllabified as /ro•bəd/. After the application of the schwa deletion rule, the output will thus be [robd], but not the target output [rɑbd], which thus yields an inflected form that is phonologically distinct from its stem. In order to attain the target output, the final consonant is reduplicated to eschew the resyllabification of the past tense suffix, so that the vowel in the inflected form remains the same. The typical account that treats the underlying representation form of the past tense suffix /d/, however, may not as well account for this aspect.

Moreover, the reduplication of the final consonant reinforces one of the English phonotactics. In English, lax vowels are not allowed to appear in stressed open syllables—those without coda, and can only appear in stressed closed syllables—those with coda (Ashby & Maidment, 2005; Ladefoged & Johnson, 2011; D. E. Freeman & Y. S. Freeman, 2004). The doubling consonant rule hence ensures that the lax vowel in the stem remains lax after the stem is inflected with the -*ed* suffix. Otherwise, the lax vowel in the stem may be turned into a tense one after the inflection of the -*ed* suffix, and this will in turn make the inflected form phonologically distinct from its stem because of resyllabificaiton. However, the currently accepted account may not reflect such phonotactics in English. The underlying /-d/ phonological form of the suffix would be fairly unlikely to trigger any resyllabification and the doubling consonant rule in spelling.

The account provided here is endorsed by other researchers. Huddleston and Pullum (2002) mentioned that "[t]he inflectional suffixes that trigger the doubling [of the final consonant]… are the preferite or irregular past participle *-ed*. … For historical reasons, … *-ed* counts as a vowel-initial suffix even when it corresponds to phonological /t/ or /d/…" (p. 1575). Agreeing with Huddleston and Pullum, this study further argues that the underlying representation should be /əd/ and that the schwa is deleted in the generation of the target output. This new account not only is better and simpler, but can also explain the generation of the English past tense inflection.

Conclusions

This study revisits an old issue of the underlying phonological representation of the English past tense suffix *-ed*. Based on historical data and synchronic data, the present study proposes that the underlying phonological representation of the *-ed* suffix should better be /əd/, and the schwa is deleted in the generation of the surface representations of the suffix rather than inserted as argued by the typical account. This proposal appears to respect the historical development of the suffix in phonology and in morphology. In addition, the proposal here also regards the synchronic English phonotactics and morphology. Above all, the proposal not only takes spelling into consideration but also connects phonology and orthography of the English past tense suffix. Furthermore, the new account can also imply that the English past tense suffix may not be a bound inflectional morpheme with a strong morpheme boundary (Katamba & Stonham, 2006), but a bound morpheme with a weak morpheme boundary that triggers resyllabification. Additionally, the generations of the English plural and third person singular present tense suffixes are typically considered to undergo the same derivational process as does the English past tense suffix. This study may thus suggest that the English past tense suffix is generated through a different phonological process from the plural and third person singular present tense suffixes.

The implication of the study can be multifold. First of all, the study suggests rethinking the generation of the plural suffix and the past tense suffix. Traditionally, the generation of these two suffixes is considered to undergo the same phonological processes; both involve devoicing and schwa insertion. Given the new account proposed here, the two suffixes are likely to undergo different phonological processes: The plural suffix undergoes devoicing and schwa insertion, while the past tense suffix undergoes schwa deletion and devoicing. Secondly, inflectional morphemes in English are typically considered to have a strong morpheme boundary, whereas only derivational morphemes are divided into those with a strong morpheme boundary and those with a weak one (Katamba & Stonham, 2006). Based on the account newly proposed here, it is likely that inflectional suffixes are also of two kinds as are derivational morphemes. The past tense suffix *-ed* is a morpheme with a weak morpheme boundary and thus leads to resyllabification. Other inflectional morphemes with a weak morpheme boundary may include the present participle suffix *-ing*, the comparative suffix *-er*, and the superlative suffix *-est*, since they all trigger the consonant doubling rule, although further study may be desirable to examine this respect.

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