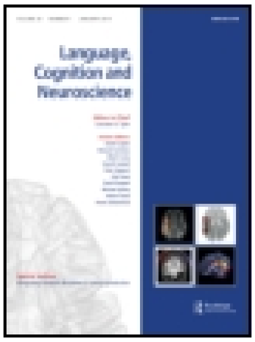

Language, Cognition and Neuroscience

ISSN: 2327-3798 (Print) 2327-3801 (Online) Journal homepage: https://www.tandfonline.com/loi/plcp21

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To cite this article: Amy Goodwin Davies & David Embick (2019): The representation of plural inflectional affixes in English: evidence from priming in an auditory lexical decision task, Language, Cognition and Neuroscience, DOI: 10.1080/23273798.2019.1684528

To link to this article: https://doi.org/10.1080/23273798.2019.1684528

LANGUAGE, COGNITION AND NEUROSCIENCE
https://doi.org/10.1080/23273798.2019.1684528

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REGULAR ARTICLE

The representation of plural inflectional affixes in English: evidence from priming in an auditory lexical decision task

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ABSTRACT

The representation of inflection is controversial: theories of morphological processing range from those that treat all inflectional morphemes as independently represented in memory to those that deny independent representation for any inflectional morphemes. Whereas identity priming for stems and derivational affixes is regularly reported, priming of inflectional affixes is understudied and has produced no clear consensus. This paper reports results from a continuous auditory lexical decision task investigating priming of plural inflectional affixes in English, in plural prime-target pairs such as *crimes→trees*. Our results show statistically significant priming facilitation for plural primes relative to phonological (*cleanse→trees*) and singular (*crime→trees*) controls. This finding indicates that inflectional affixes, like lexical stems, exhibit identity priming effects. We discuss implications for morphological theory and point to questions for further work addressing which representation(s) produce the priming effect.

ARTICLE HISTORY
Received 21 November 2018
Accepted 27 September 2019

KEYWORDS
Morphology; inflection; identity priming; lexical decision; auditory morphological processing

1. Introduction

An active controversy in the study of the mental lexicon concerns the representation of inflectional morphology. Even in the wake of a vast literature comparing different approaches to the representation of regular versus irregular inflection in the "past tense debate", there is little consensus concerning how inflectional morphology is represented. Approaches that admit independent morphological representation range from those that posit activation of morphemes as objects in memory, without whole-word representations ("decompositional accounts" e.g., Taft & Forster, 1975 and much subsequent work) to those that posit morphological representations in addition to or following activation of whole-word representations ("supra-lexical accounts" e.g., Giraudo & Grainger, 2001). At another extreme are approaches denying independent morphological representation across the board. For Plaut and Gonnerman (2000), for example, all putatively morphological effects are derivative of phonological and semantic representations and their interactions (cf. Baayen, Milin, Đurđević, Hendrix, & Marelli, 2011).

Here, we investigate the representation of the English plural inflectional suffix. A direct way of examining how inflectional morphology is represented is to see whether inflectional affixes show priming effects in the way that stems and derivational affixes do. The main contribution paper of this paper is a demonstration of inflectional affix priming: In a continuous auditory lexical decision task, we find evidence that processing of a plural word is facilitated by a plural prime, relative to phonological and singular controls. The implications are examined in the discussion, where we outline how this project can be developed in ways that disentangle the relative contribution of syntactic, semantic, and phonological similarities.[1]

1.1. Background

Identity priming effects, i.e., facilitation of the target when primes and targets are identical in some way, are well-established in the lexical processing literature. Examples include whole word repetition (e.g., Forster & Davis, 1984; Scarborough, Cortese, & Scarborough, 1977), syllable rhyme repetition (e.g., Norris, McQueen, & Cutler, 2002; Slowiaczek, McQueen, Soltano, & Lynch, 2000), or lexical stem repetition (discussed below). Under abstractionist accounts (Bowers, 2000; Morton, 1969), these priming effects are attributed to shared representations (though see the exchange between Amenta & Crepaldi, 2012 and Giraudo & Dal Maso, 2016). Residual activation of the shared representation from processing the prime facilitates subsequent access in the target. The idea that priming effects diagnose shared

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Supplemental material for this article can be accessed at https://doi.org/10.1080/23273798.2019.1684528.

representations has been used extensively. Most relevant here are (i) previous positive findings with stems and derivational morphemes and (ii) the *absence* of such results for inflection. There is much evidence that lexical stems exhibit identity priming in both simplex and complex words, in visual, cross-modal, and auditory presentation (see Amenta & Crepaldi, 2012; Marslen-Wilson, 2007). Derivational affixes have also been shown to display identity priming in a range of modalities (e.g., Duñabeitia, Perea, & Carreiras, 2008; Marslen-Wilson, Ford, Older, & Zhou, 1996; VanWagenen, 2005). However, similar findings have not been established for inflectional affixes (reviewed in Table 1).

There are several reasons why inflectional affix priming effects, if they exist, might be small relative to lexical stem priming effects (and thus difficult to detect). Here we review four.[2]

First, inflectional affixes can be high frequency. Identity priming effects have been shown to be smaller for high-frequency items than lower-frequency items (see Kinoshita, 2006). This is also consistent with inverse-frequency and surprisal effects found in structural priming studies (e.g., Bernolet & Hartsuiker, 2010; Bock, 1986; Ferreira, 2003; Jaeger & Snider, 2013).

Second, inflectional affixes are *functional* rather than *lexical* items. As such, they are neutral in valence, low in arousal, and low in concreteness. Valence and arousal (e.g., Kuperman, Estes, Brysbaert, & Warriner, 2014) and concreteness (e.g., Yap, Pexman, Wellsby, Hargreaves, & Huff, 2012) contribute to word recognition speed. Work investigating priming effects for functional items is limited (cf. Schmauder, Morris, & Poynor, 2000), and it is possible that functional items have a different profile with regards to identity priming due their grammatical rather than lexical nature. Correspondingly, theories of syntax and morphology often treat functional and lexical morphemes as different in kind (e.g., Embick, 2015).

Third, inflectional affixes, especially suffixes, are often prosodically weak (not bearing stress; shorter in duration than full words). Phonological weakness leads to a general lack of salience; furthermore, as the items are short in duration, potential speed-up from priming facilitation is limited.

Fourth, there can be extensive homophony among inflectional affixes. This is the case for plural affixes in English, which are homophonous with third person agreement, the possessive clitic, and contractions of the copula.[3] It is conceivable that even temporary uncertainty about which morpheme is present in a word can attenuate activation, particularly in tasks with single word presentation.

Perhaps due to these methodological challenges, there are few attempts to investigate inflectional affix priming in the literature. One contributing factor to this apparent gap may be the "file-drawer problem" (Rosenthal, 1979); previous work on inflectional affix priming was not published because it yielded null results. The available studies, briefly overviewed in Table 1, are varied in methodology (e.g., modality, affix properties) and taken together, the results are difficult to interpret.

1.2. The current study

In this study, we examine inflectional affix priming effects for English plural inflectional suffixes (restricted to the voiced allomorph, /z/) in an immediate auditory continuous lexical decision task (see Bacovcin, Goodwin Davies, Wilder, & Embick, 2017; Wilder, Goodwin Davies, & Embick, 2019 for similar methodology). Although we do not have specific predictions concerning modality, it is important to consider that suffixes, in particular, may be processed differently in auditory versus visual presentation. Suffixes are encountered late in auditory presentation, as the signal unfolds incrementally. Even if subphonemic co-articulatory cues are present in the stem prior to the actual suffix, it is necessary for the speech signal to unfold before these become apparent to the listener, unlike in visual presentation where suffixes are perceptible from the beginning of a word being displayed (see Wilder et al., 2019 for discussion).

Care was taken to ensure that the study was appropriately powered. A power curve analysis was conducted in R with the package `simr` (Green & MacLeod, 2016).[4] Using data from a separate pilot, new data was simulated with increasing numbers of participants. With an effect size of 15 ms,[5] the study was determined to reach power of >80% with approximately 200 participants.

2. Experiment

The procedure and the analyses were preregistered.[6] Three changes were made to the preregistered plan: Firstly, following Milin, Feldman, Ramscar, Hendrix, and Baayen (2017), prime was added as a random effect. This is more conservative as it reduces the extent to which random variation among the prime words is attributed to the experimental conditions. Secondly, due to a technical issue, there was unwanted variation in the inter-stimulus interval (ISI). To address this, trials where the ISI was longer than 900 ms were removed. Thirdly, rather than z-scoring trial number in our analyses, we centre it.

2.1. Stimuli

3 prime conditions were constructed to compare facilitation due to shared morphological structure to

Table 1. Overview of previous inflectional affix priming studies.

	Emmorey (1989, Experiment 2)	Reid and Marslen-Wilson (2000, Experiment 1)	Smolík (2010)	VanWagenen and Pertsova (2014)
Language	English	Polish	Czech	Russian
Affixes	Verbal: *-ing*, *-ed*, Nominal: *-es*	Verbal: *s-*, *na-* (perfective), Nominal: *-ek* (diminutive), *-arz* (agentive)[a]	Nominal: *-a* (feminine nominative), Verbal: *-ete* (2p. pl.)	22 affixes[b]
Task	Paired lexical decision	Paired lexical decision	Paired lexical decision at 50 ms and 150 ms inter-stimulus intervals (ISIs)	Paired lexical decision
N Subjects	20	40	39	36
N Targets per Subject	18(12 *-ing*, 5 *-ed*, 1 *-es*)	88(24 *s-*, 22 *na-*, 18 *-ek* 24 *-arz*)	52(26 *-a*, 26 *-ete*)	16(affix breakdown unavailable)
Modality	Auditory	Cross-modal (auditory prime, visual target)	Visual	Visual
Effect	Not sig. vs. unrelated control prime	**18 ms** (sig.) for all affixes treated as a group vs. unrelated control prime	Nominal: Not sig.	Nominal: Not sig.,
			Verbal: **14 ms** (marginal, *p*=.08) at 150 ms ISI vs. phonological control prime	Verbal: **59 ms** (sig.) vs. phonological control prime

[a] These affixes are mixed: *s-* (perfective) appears to be inflectional. Reid and Marslen-Wilson (2000) label *na-* (perfective) as "aspectual-derivational" indicating it has some derivational and inflectional properties. *-ek* (diminuitive) and *-arz* (agentive) would typically be analysed as derivational.
[b] See full list in the Appendices (included in the supplemental material).

phonological and singular controls (Table 2). Targets are plural nouns ending with /z/. There are several reasons motivating this choice. /z/ is productive, applying to novel nouns (e.g., Berko, 1958). It has syntactic reflexes, i.e., triggering agreement on verbs, which demonstrates it has processing consequences in sentence production. By using only the voiced allomorph, we keep phonological realisation consistent, which removes any effects that might arise from morpho-phonological alternations.

The plural primes share this morphological and phonological structure. Per target, the singular control prime is the singular version of the plural prime, thus controlling for semantic relatedness among prime and target stems and providing an unrelated baseline condition. The phonological control primes share the phonological structure of the target but not the morphological structure, i.e., non-plural words which end with /z/ which are not homophonous with a plural word, and for which the phonological string prior to /z/ is not a reduced syllable.

The presentation of stimuli was counterbalanced such that every participant encountered each of the 36 targets once and encountered 12 primes in each condition. To achieve this, there were 3 lists. Plural primes and singular control primes were varied per list to avoid stem repetition, whereas the phonological control primes remained constant. As such, across all lists there were 36 plural primes, 36 singular control primes and 12 phonological control primes. Words of English that meet our criteria for phonological control primes are limited, so we opted for a design in which 12 rather than 36 were required. Per experimental list, no prime or target was repeated.

Latent Semantic Analysis (LSA; Dennis, 2007) was used in stimuli selection to restrict semantic relatedness below a threshold of .3 between critical primes and targets to minimise semantic priming (where a value of 1 indicates maximum relatedness). To avoid phonological inhibition, no critical primes and targets shared an onset. Across the 3 conditions, primes were matched for frequency using the Lg10CD[7] frequency from SUBTLEX-US (Brysbaert & New, 2009). Table 3 provides an overview of mean LSA and frequency in each prime condition.

The critical stimuli made up 16.1% of the experiment. 152 filler words and 224 phonotactically licit nonwords were included, resulting in an equal number of words and nonwords. All stimuli were monosyllabic. Each participant encountered 448 stimuli arranged into pairs which were balanced for all four lexicality combinations.[8] Pairings were not made explicit to participants.

Due to the high proportion of /z/ final and plural words in the critical stimuli, plurality and whether a stimulus ended with /s/ or /z/ was carefully controlled within the fillers. No word filler ended with /z/. 28 word fillers ended with /s/, 50% of which were plural. Aside from these plural words, all other fillers were monomorphemic. Of the nonword fillers, 28 ended with /z/ and 28 ended with /s/. 54 nonword fillers were constructed to be "foils" which encouraged participants to attend to the final segments of stimuli prior to making a lexical decision: 28 phonologically embedded a real word

Table 2. Prime and target design.

	Prime	Target
Plural prime	crimes	
Phonological control prime	cleanse	trees
Singular control prime	crime	

Table 3. Mean LSA and frequencies in each prime condition.

	Mean LSA (SD)	Mean frequency (SD)
Inflectional plural prime	.065 (.067)	2.04 (.48)
Phonological control prime	.070 (.059)	2.05 (.50)
Singular control prime	.062 (.076)	2.62 (.53)

Table 4. Composition of the stimuli across the experiment, per participant (columns do not sum to 448 because a single stimulus can be a member of multiple categories).

	Count	Percentage
Critical stimuli	72	16.1
Word	224	50
/z/ final word	100	22.3
/s/ final word	56	12.5
Plural word	76	17.0
/z/ final nonword	28	6.25
/s/ final nonword	28	6.25
Embedded word nonword	28	6.25
Shared (C)VC nonword	28	6.25

(e.g., /kɪs/ of *kiss* embedded in the nonword *kisp* /kɪsp/) and 28 shared an initial (C)VC sequence with a real word (e.g., /trʌs/ in nonword *trusk* shared with the word *trust*). Composition of the stimuli is summarised in Table 4. See Appendices (included in the supplemental material) for complete stimuli lists.

Stimuli were recorded in a soundproof booth using a Blue Snowball microphone by a male speaker of General American English and segmented in Praat.

2.2. Procedure

228 native speakers of North American English took part in the study in the fall semester of 2017. Informed consent was obtained from each participant, and the experimental protocol was approved by the IRB. Participants were financially compensated for their participation, managed through the research crowdsourcing platform "Prolific" (Damer and Colleagues, 2018).

The experiment was run online using the experimental presentation software "Ibex" (Drummond, 2017). The task was continuous lexical decision: participants responded to both primes and targets (Figure 1).

Participants were instructed to indicate (as quickly and as accurately as possible) whether each sound they heard was a word of English. Participants first responded to 16 practice trials (50% nonwords) before being randomly assigned to one of the three experimental lists. This resulted in the following distribution: 89 in List 1, 73 in List 2, and 68 in List 3. The order of stimulus presentation

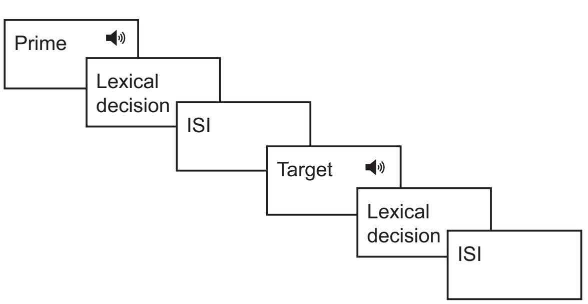

Figure 1. Continuous lexical decision task.

Table 5. Data removal.

	Datapoints	Percentage
Experimental trials	7200	100
Inaccurate trials	1200	16.67
Initial trimming (300>*RT*<3000)	89	1.24
ISI trimming (*ISI*<900)	165	2.29
Participant trimming	79	1.1
Item trimming	45	.62
Residual trimming	126	1.75
Total removed	1704	23.67
Total remaining	5496	76.33

was randomised within a template to ensure that critical pairs were never adjacent, a block never began with a critical pair, and that, aside from the critical pairs, no stimuli ending with /z/ were adjacent. The ISI was 600–800 ms, randomised to discourage participants from responding at regular intervals. The ISI was measured from the end of the soundfile or participant response, whichever was later. The experimental procedure had 4 blocks with a break between blocks. Response time was measured from the onset of stimulus presentation.

2.3. Results

Participants with overall accuracy below 70% were excluded from the study (n=28). After subsetting the data to include only critical trials, inaccurate trials (inaccurate responses to prime or target) were removed. Response time outliers were removed following procedures in Baayen and Milin (2010) which involve examining RTs for each participant and target separately, and removing outliers which fall outside a normal distribution (see Table 5 for a summary). As mentioned,

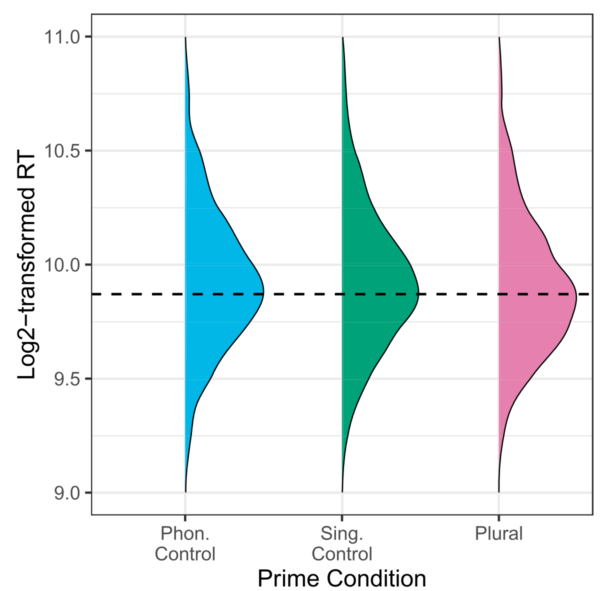

Figure 2. Density plot of trimmed response time data for targets preceded by primes in the three experimental conditions.

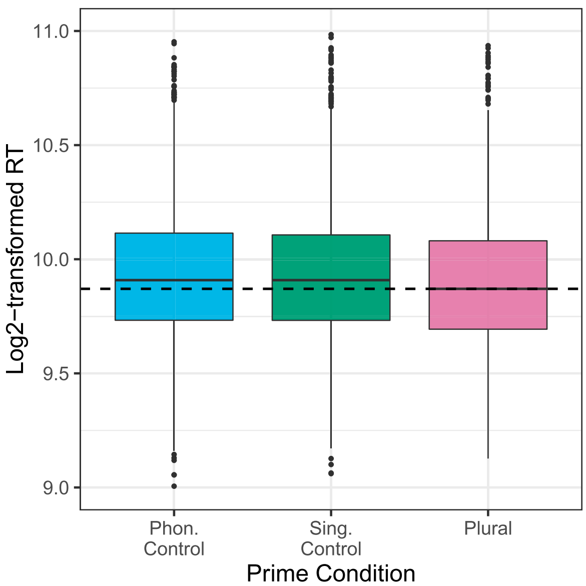

Figure 3. Box plot of trimmed response time data for targets preceded by primes in the three experimental conditions.

trials with ISIs greater than 900ms between prime and target were also removed.

A linear mixed effects model was fitted to log-transformed (binary logarithm) response time to targets in R, using the package `lmerTest` (Kuznetsova, Bruun Brockhoff, & Haubo Bojesen Christensen, 2018). Residuals greater than 2.5 standard deviations from the mean were trimmed following Baayen & Milin, 2010. Prime condition was coded with plural as the reference level so that separate comparisons were made between (i) the plural prime and the singular prime and (ii) the plural prime and the phonological control prime. The following z-scored control fixed effects were included: LSA value corresponding to semantic relatedness between prime and target; ISI between prime and target; duration of target soundfile; and target frequency. Trial number (centered), was also included. The fixed effects which were predicted to co-vary with prime condition were z-scored and centred by prime condition: Mel-frequency Cepstral Coefficient (MFCC) value corresponding to phonetic relatedness between prime and target; phonological Levenshtein distance value corresponding to phonological relatedness between prime and target; prime frequency; and prime response-time. Random effects for participants and targets were optimised following

Table 6. Mean RT (trimmed data) and percent accuracy across conditions.

	Mean (SD) accurate RT	Percent accuracy
Plural prime	989.5 (243.3)	91
Phonological control prime	1013.4 (251.4)	89
Singular control prime	1018.1 (266.4)	90

Table 7. Response time model summary.

	Log-transformed RT		
Fixed Effects	Estimates	95% CI	*p*-values
Intercept	9.911	9.868, 9.954	<**.001**
Prime condition			
Phon. cntrl vs. Plural	.037	.010, .063	**.015**
Sing. cntrl vs. Plural	.027	.006, .048	**.020**
Trial number	.000	.000, .000	<**.001**
Prime-target LSA	−.014	−.026, −.002	**.024**
ISI	.006	.000, .013	**.050**
Target duration	.064	.025, .104	**.004**
Target frequency	−.069	−.109, −.030	**.002**
Prime-target MFCC	.011	−.001, .022	.078
Prime-target Levenshtein distance	−.012	−.025, .104	.085
Prime frequency	.001	−.012, .014	.906
Prime response time	.074	.066, .081	<**.001**
Random Effects	N	Variance	Standard deviation
Participants	200	.0149	.122
Primes	84	.0013	.036
Targets	36	.0129	.113
Residual		.0480	.219
N Datapoints	5496		
Marginal R^2	.144		
Conditional R^2	.467		

Bates, Kliegl, Vasishth, & Baayen, 2015 which resulted in random intercepts for participants, primes, and targets. The model's fixed effect estimates are summarised in Table 7. The Satterthwaite (1946) method for denominator degrees of freedom was used for computing the p-values. Marginal and Conditional R^2 was calculated using the Nakagawa & Schielzeth, 2013 method implemented in the package `MuMIn` (Bartoń, 2018). Table 6 provides a summary of the model. Figure 4 plots model fixed effect estimates and 95% confidence intervals.

Responses to targets following plural primes were significantly faster than responses following phonological control primes ($\beta = .037$, p=.015). Responses to targets following plural primes were significantly faster than responses following singular control primes ($\beta = .027$, p=.02).[9] The model indicates that, for an average target word, the speed-up for a plural prime compared to a phonological control prime was 24.9 ms, whereas the speed-up compared to a singular control prime was 18.3 ms. Figures 2 and 3 plot log-transformed response time data for targets preceded by primes in the three experimental conditions.

As anticipated for lexical decision tasks, the control variables of trial number, target duration, target frequency, and prime response time were significant predictors of response time. LSA was a significant predictor of response time, indicating that, despite restricting relatedness between primes and targets to be below a threshold (.3), semantic relatedness influenced response time.

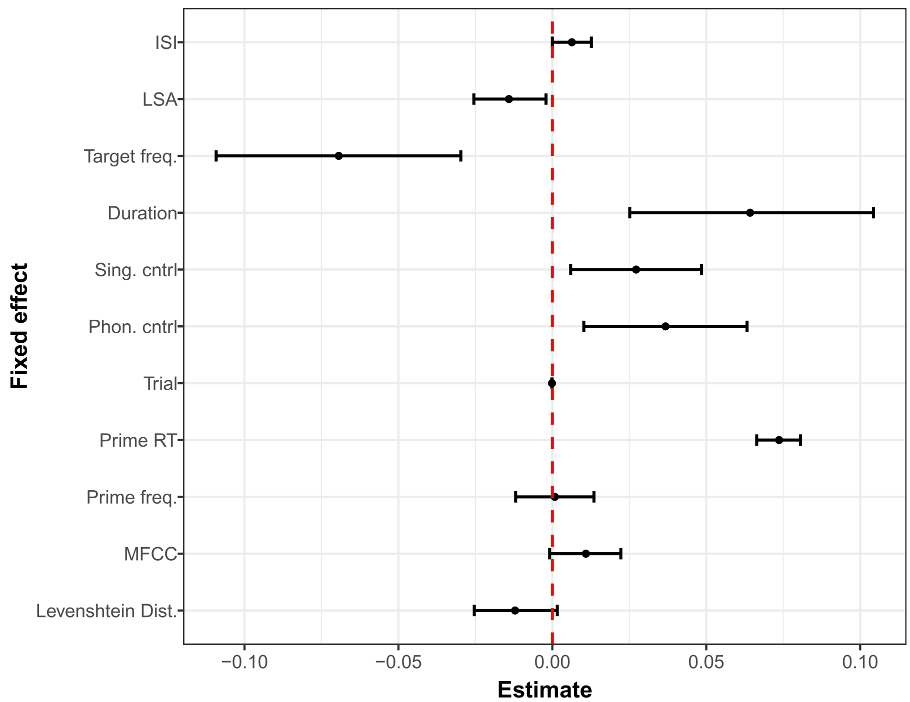

Figure 4. Plot of model fixed effect estimates and 95% confidence intervals.

3. Discussion

In this paper, we find priming effects for plural primes and targets relative to both singular and phonological controls. This result should be replicated for English plural suffixes and examined for additional affixes and additional languages in both visual and auditory modalities.

As anticipated, the size of the effect is small relative to identity priming for stems, which were in the 150–200 ms RT speedup range in a similar study (Wilder et al., 2019).[10] It is possible that stem versus affix priming facilitation magnitude differences are due to representational differences between stems and affixes; most morphological theories treat these as distinct types of objects. It is also possible that differences in other factors, such as frequency, semantic contribution, prosodic strength, and extent of homophony among stems versus affixes contribute to these magnitude differences, as discussed in the Background section.[11]

The importance of an affix priming facilitation result is that it provides a foundation for a further set of questions that are central to morphological processing and representation. A first point of interest involves identifying the loci of inflectional priming effects. The second involves questions about whether morphology merely involves features that are associated with plural words in some way, or whether there are *discrete* inflectional affix morphemes, represented as pieces in memory.

Concerning the loci of priming, critical primes and targets shared (i) semantic interpretation (i.e., a notion of multiple units), (ii) morpho-syntactic feature [+PL] (plurality, as diagnosed through agreement), (iii) phonological realisation (/z/), and (iv) syntactic structure (NOUN-AFFIX). Future research can elucidate which of shared representations (i)–(iv) (or some combination) are responsible for the effect, perhaps starting with the following questions:

(1) *Is shared semantic interpretation required?* (a) Do plural words without the semantic interpretation of plurality (such as *scissors/pants*) produce the same facilitation as typical plurals? (For an analogous question concerning the effects of transparency/opacity on the processing of stems see e.g., Smolka, Gondan, & Rösler, 2015 and Creemers, Goodwin Davies, Wilder, Tamminga, & Embick, 2020). (b) If semantic overlap is required for the effect, a next step would investigate whether non-plural words associated with a similar semantic interpretation (e.g., countable mass nouns such as *furniture*) produce equivalent facilitation to plural words.

(2) *Is shared phonological realisation required?* Do words with different inflectional allomorphs produce the same amount of facilitation as plural words with the same allomorph? Stimuli in which allomorphs are typically analysed as derived from a single underlying form (e.g., voicing allomorphy in voiceless *cats*

versus voiced *trees*) could be compared with suppletive allomorphy, where there is no hypothesised underlying phonological form (such as *oxen/geese*). Again, there is an analogous literature which examines the role of stem allomorphy in morphological processing (see e.g., Morris & Stockall, 2012; Pastizzo & Feldman, 2002).

It is important to point out that questions about the loci of priming arise for derivational affixes as well. Prior reports of facilitation for derivational affixes (e.g., *darkness*→*happiness*), have been taken as evidence for their independent representation (e.g., Duñabeitia et al., 2008). However, the locus of the effect could be probed further. For example, for the *darkness*→*happiness* example, it could be investigated whether representations associated with the semantic interpretation of abstract nominals or a morpho-syntactic feature are responsible for the effect.

Another question concerns whether the representation shared in inflectional priming is an isolable unit or a feature of an indivisible whole. Linguistic theories are sharply divided on this question. The "word and paradigm" (Matthews, 1972) and related approaches (such as Anderson, 1992) deny discrete morpheme status for inflection but have features like [+PL] bundled with plural nouns. Opposed to this, approaches like Distributed Morphology (Embick, 2015; Halle & Marantz, 1993) hypothesise that inflectional morphology involves discrete morphemes. A theory without discrete morphemes would represent a plural noun like *crimes* as [CRIME +PL], i.e., as a single word with a plural feature. In morpheme-based theories, on the other hand, the [+PL] is a piece on a par with the stem: [CRIME]-[+PL]. Since both of these theories employ a [+PL] feature, both are in principle able to account for the type of inflectional priming that we report here.

In our view, identifying the loci of affix priming effects is an essential next step towards a fuller understanding of the fine-grained details of morphological representation.

Notes

1. This study is also discussed in Goodwin Davies (2018).
2. Some of these reasons are specific to inflectional affixes; others also apply to derivational affixes in comparison to lexical stems.
3. For example, /wɔks/ in *"these walks are…"*, *"she walks…"*, *"this walk's highlight is…"*, and *"this walk's fun…"*.
4. Data and analyses available here: GITHUB.COM/AMYGOOD/INFL-PRIME
5. We specified a 15 ms average speed-up for targets in the plural condition compared to the singular control condition. This was selected as a lower bound because in the means per condition of the pilot data, the plural condition was 17.4 ms faster than the phonological control condition and 15.9 ms faster than the singular control condition.
6. https://aspredicted.org/c3dw4.pdf.
7. This is the base 10 log of the number of films in which a word appears in a database of 8388 films, +1.
8. Word-word, word-nonword, nonword-nonword, and nonword-word.
9. The reference level was the plural prime. For this reason, the β values are positive, indicating that the controls are slower.
10. These studies, although similar, have some important differences. For example, in the current study, the critical prime→target structure is [STEM$_1$][**affix**$_1$]→[STEM$_2$][**affix**$_1$] (e.g., *crimes*→*trees*) with the repeated unit occurring with different non-repeated units in both prime and target. In contrast, in the relevant stimuli from Wilder et al. (2019), the structure is [**stem**$_1$][AFFIX$_1$]→[**stem**$_1$] (e.g., *frogs*→*frog*) with the repeated unit occurring in isolation in the target. A more directly comparable stem priming prime→target structure would be [**stem**$_1$][AFFIX$_1$]→[**stem**$_1$][AFFIX$_2$] (e.g., *walks*→*walked*). Still greater comparability would be achieved if the linear order of repeated versus non-repeated unit was controlled across stem priming and affix priming stimuli, e.g., [AFFIX$_1$][**stem**$_1$]→[AFFIX$_2$][**stem**$_1$] and [STEM$_1$][**affix**$_1$]→[STEM$_2$][**affix**$_1$].
11. For example, focussing on duration (one aspect of prosodic strength): If we were to consider a priming effect as percentage speed-up across the duration of a stem/affix, we find similar effect sizes for affix priming in the current study and stem priming in Wilder et al. (2019). For the 36 plural targets in this study, the mean duration of the affix was approximately 200 ms. As such, a 29 ms increase indicates an approximately 15% facilitation across the duration of the affix. This is similar to the percentage speed-up observed across the duration of the stem for plural→singular (e.g., *frogs*→*frog*) priming at an immediate distance in Wilder et al. 2019, where speed-up was 11% and 15% in Experiments 1 and 2 respectively.

Acknowledgments

Special thanks to Hezekiah Akiva Bacovcin, Ava Creemers, Florian Schwarz, Linnaea Stockall, Meredith Tamminga, Robert J. Wilder, Jérémy Zehr, and the FMART/XMORPH reading groups at Penn for their input to this project. We also acknowledge helpful feedback from several anonymous reviewers.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the National Institutes of Health Grant No. R01HD073258.

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