**A reduced form advantage in spoken-word recognition: The case of German -en**

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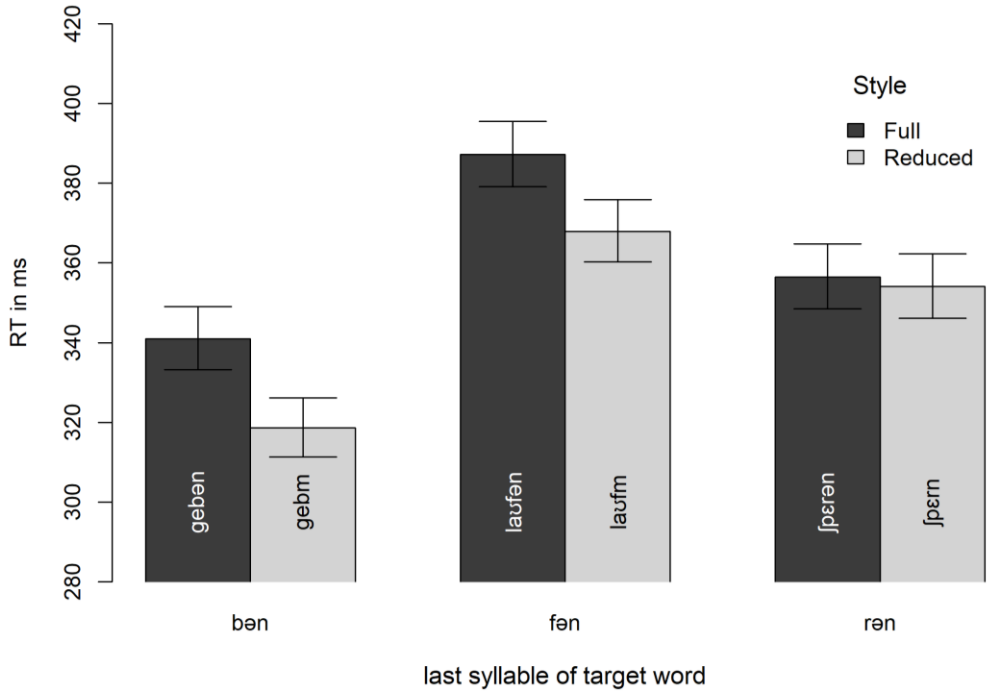
Usually, practice makes perfect in most domains of language processing so that frequent structures and words are recognized more easily. For instance, Trueswell et al. (1993) found that a minimal-attachment garden-path in sentence processing can be counteracted by verb-specific statistical patterns that favor the more complex sentence-complement structure. However, studies of spoken-word recognition have repeatedly revealed a surprising pattern that contrasts with this frequency bias. Words are recognized more *slowly* if they are heard in their most common form if that form is a phonetic reduction (e.g., *cenner* for center in American English, see Pitt et al., 2011). That is, there seems to be an inherent advantage for the canonical—but not frequent—form (*center*), which is recognized faster than the most common—but reduced—form (*cenner*). It has also been argued that this canonical-form advantage supports the idea that spoken-word recognition is influenced by orthography (Ranbom & Connine, 2007; Ziegler & Ferrand, 1998), since the canonical form is consistent with the orthographic form. However, the canonical-form advantage is not as ubiquitous as initial claimed (Bürki et al., 2018) and the role of orthography for spoken-word recognition remains controversial (Mitterer & Reinisch, 2015).

One of the problems in this controversy is the mismatch in context for production and perception studies. Reduction likelihoods are calculated from corpora of connected, spontaneous speech, while perception studies make use of single-word utterances or short phrases purposefully and usually carfully recorded for the experiments. Therefore, this study makes use of a reduction that is appropriate even in careful speech: Schwa reduction in German words ending on *-en* (e.g., *reden* → [redn], Engl. ‘to speak’). To substantiate that the reduced form is preferred in careful speech, a corpus study investigated the production of final *-en* in read and spontaneous speech. The results showed that, even in read speech, the reduced form is preferred, though to a lesser degree that in spontaneous speech.

Five perception experiments were then conducted using full and reduced forms of German words ending on *-en*. Stimuli were generated with a diphone synthesizer, making this the first study to fully control for any confounds in phonetic quality that may arise by asking speakers to purposefully produced reduced forms. Experiment 1 and 2 used words ending on *ben*, in which not only the schwa is deleted but also the final /n/ assimilats to the preceding /b/ (e.g., *geben*, → [gebm], Engl. ‘to give’). These words were presented in a short phrase (Exp 1) or a single-word utterance (Exp 2). Results showed a processing advantage for reduced forms over canonical forms. Experiment 3 and 4 investigated the importance of the nasal assimilation, by using words ending on *-fen* (e.g., *laufen* → [laufm] or [laufn]), in which the schwa deletion is likely, but the nasal assimilation is not likely. Results still showed a preference for the reduced form with and without the assimilation applied, suggesting that assimilation may be compensated for pre-lexically (Mitterer & Blomert, 2003). Experiment 5 used forms in which reduced and full form are roughly balanced in careful speech (e.g., *spüren* Engl. ‘to feel’) and found no preference for either form (though a power analysis indicated that a typical canonical-form advantage of about 50ms was highly likely to be found, with a power > 0.99, see Figure 1 for an overview).

These results combined indicate that previously reported canonical-form advantages may be attributed to the oddness of the specific reduced forms in careful speech. The result also show that a form that is inconsistent with the orthographic form of a word (e.g., [gebm] for *geben*) can be recognized faster than the orthographically consistent full form. This also indicates that an online orthographic involvement in spoken-word recognition is unlikely.

Figure 1.
Mean predicted latency for full and reduced items (converted into raw ms from the predicted log(RT) values). Error bars are based on the standard error of the regression weight for Style. The text in the bars provides an example of the stimuli in the respective condition.




References:


Bürki, A., Viebahn, M. C., Racine, I., Mabut, C., & Spinelli, E. (2018). Intrinsic advantage for canonical forms in spoken word recognition: Myth or reality? *Language, Cognition and Neuroscience*, *33*(4), 494–511. https://doi.org/10.1080/23273798.2017.1388412

Mitterer, H., & Blomert, L. (2003). Coping with phonological assimilation in speech perception: Evidence for early compensation. *Perception & Psychophysics*, *65*(6), 956–969. https://doi.org/10.3758/BF03194826

Mitterer, H., & Reinisch, E. (2015). Letters don't matter: No effect of orthography on the perception of conversational speech. *Journal of Memory and Language*, *85*, 116–134. https://doi.org/10.1016/j.jml.2015.08.005

Pitt, M. A., Dilley, L., & Tat, M. (2011). Exploring the role of exposure frequency in recognizing pronunciation variants. *Journal of Phonetics*, *39*(3), 304–311. https://doi.org/10.1016/j.wocn.2010.07.004

Ranbom, L. J., & Connine, C. M. (2007). Lexical representation of phonological variation in spoken word recognition. *Journal of Memory and Language*, *57*, 273–298.

Trueswell, J. C., Tanenhaus, M. K., & Kello, C. (1993). Verb-Specific Constraints in Sentence Processing: Separating Effects of Lexical Preference From Garden-Paths. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *19*(3), 528–553. Scopus. https://doi.org/10.1037/0278-7393.19.3.528

Ziegler, J. C., & Ferrand, L. (1998). Orthography shapes the perception of speech: The consistency effect in auditory word recognition. *Psychonomic Bulletin & Review*, *5*, 683–689. https://doi.org/10.3758/BF03208845