Do syllables exist? Psycholinguistic evidence for the retrieval of syllabic units in speech production

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The question of whether or not the syllable constitutes a functionally relevant unit for speaking has been addressed by research on phonetic and phonological planning. Theories of speech production generally agree that syllables play a role in speech production planning (e.g., Dell, 1986, 1988; Levelt, Roelofs & Meyer, 1999; Shattuck-Hufnagel, 1979, 1983), however, there is disparity at what level syllables come into play. While some researchers (Dell, 1986, 1988; Shattuck-Hufnagel, 1979, 1983) assume that syllables are an inherent part of the lexicalized word forms, others (Cholin, Levelt, & Schiller, 2006; Levelt et al., 1999; Levelt & Wheeldon, 1994) argue that syllables emerge during context-dependent online syllabification processes and are separately stored and retrieved at a post-lexical level. Frequency effects are generally viewed as a characteristic of stored representations and effects of syllable frequency would therefore support the assumption of a separate storage of syllables.

A related question concerns the temporal coordination of the retrieval and integration of subsequent syllables in multisyllabic utterances. Subsequent syllables might be collected before articulation is initiated or the first syllable might already be executed while following syllables are still under construction. This flexibility is an inherent feature of the incremental account of speech production and depends on various factors. One factor might be the syllables' transparency in a given language. In languages with relatively clear syllable boundaries (e.g., Dutch) speakers might be able to start articulation as soon as the first syllable is available while in languages with less clear syllable boundaries (e.g., English) the speaker might plan larger prosodic units before articulation is initiated.

To test these hypotheses, the production of Dutch and English high- and low-frequency syllables was tested in mono-syllabic pseudo-words (Exp.1a/b) and in disyllabic pseudo-words that consisted of either high-and low-frequency first (Exp. 2 a/b) or second syllables (Exp. 3 a/b). The material selection in all experiments in both languages ensured that the syllable-frequency manipulation was unconfounded by any segmental or segment transition differences (see Table 1).

Syllable frequency effects were observed in both languages, supporting the existence of stored syllabic representations. However, disyllabic pseudo-words in Dutch and English exhibited different patterns of frequency effects. In English, frequency effects were found when the frequency manipulation was on the first syllable and when it was on the second syllable. In contrast, in Dutch, a frequency effect was only observed when the frequency manipulation was on the first syllable. Dutch speakers may be able to start articulation as soon as the first syllable is retrieved while English speakers must plan a larger prosodic unit to begin speaking.

Taken together, these results suggest that syllables are stored units, regardless of the transparency of the language's syllables. Transparency, however, may have an influence on the coordination of incremental planning and articulation units.

References

Cholin, J., Levelt, W. J. M., & Schiller, N. O. (2006). Effects of syllable frequency in speech production. *Cognition*, *99*, 205-235.

Dell, G. S. (1986). A spreading-activation theory of retrieval in sentence production. *Psychological Review, 93*, 283–321.

Dell, G. S. (1988). The retrieval of phonological forms in production: Tests of predictions from a connectionist model. *Journal of Memory and Language*, *27*, 124-42.

Levelt, W. J. M., Roelofs, A., & Meyer, A. S. (1999). A theory of lexical access in speech production. *Behavioral and Brain Sciences*, *22*, 1-75.

Levelt, W. J. M., & Wheeldon, L. (1994). Do speakers have access to a mental syllabary? *Cognition*, *50*, 239-269.

Shattuck-Hufnagel, S. (1979). Speech errors as evidence for a serial-ordering mechanism in sentence production. In: *Sentence processing: Psycholinguistic studies presented to Merrill Garrett,* ed. W. E. Cooper & E. C. T. Walker. Erlbaum.

Shattuck-Hufnagel, S. (1983). Sublexical units and suprasegmental structure in speech production planning. In: *The production of speech,* ed. P. F. MacNeilage. Springer.

Table 1. *Examples of the Dutch and English materials: High- and low-frequency monosyllabic pseudo-words and disyllabic pseudo-words with high- and low-frequency first and second syllables*

	Dutch high-frequency	*Dutch low-frequency*	*Dutch high-frequency*	*Dutch low-frequency*	*English high-frequency*	*English low-frequency*	*English high-frequency*	*English low-frequency*
monosyllabic pseudo-words	kɛm	kɛs	wɛs	wɛm	gɪn	gɪz	zɪz	zɪn
disyllabic pseudo-words with high- and low-frequency first syllables	kɛm.ra	kɛs.ra	wɛs.ra	wɛm.ra	gɪn.rə	gɪz.rə	zɪz.rə	zɪn.rə
disyllabic pseudo-words with high- and low-frequency second syllables	li.kɛm	li.kɛs	li.wɛs	li.wɛm	rɔɪ.gɪn	rɔɪ.gɪz	rɔɪ.zɪz	rɔɪ.zɪn