

**If segments are real,
 what are they?**

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Three kinds of ‘real’

Physically real:
 identifiable in motor production or in *segments* of the acoustic speech signal

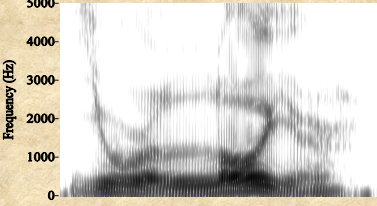
Theoretically real:
 needed to adequately model observable grammatical patterns (e.g., reduplication).

Cognitively real:
 discoverable in an experimental setting, language processing, language acquisition, etc.

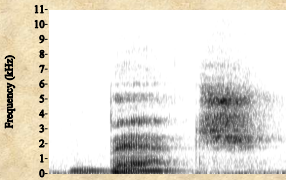
Can we find a physical speech segment?

- The answer has been “no” for over 100 years.

you were a lawyer

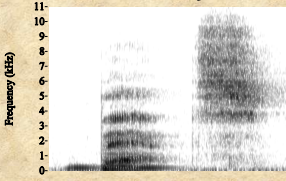


j u w ə ə l ɪ ɹ j ə



b æ tʃ


‘batch’
 Why is this coda one segment?



b æ t s

‘bats’
 and this one is two segments?

German rhymes an affricate [tʃ] with derived [t+s]



Hops and malt,
 God save it!

Are segments theoretically important?

No – all linguistic facts derived using segments can be derived without them, by relying solely on distinctive features and prosodic structure. (We think.)

An affricate is definable as a particular sequencing of distinctive features within a syllable onset or coda.

On this account, the codas of *batch* and *bats* would be described identically, modulo place.

Oowekyala (Wakashan, Pacific NW) does have the propensity to contrast affricates with corresponding stop + fricative sequences (Howe 2000, Lincoln and Rath 1980)

[tsəla] 'to cut through water'

[tʰsəla] 'pushing'

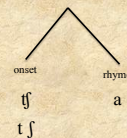
But Oowekyala also disallows most obstruent clusters within syllable components, generally giving each obstruent its own piece of a syllable or even its own syllable entirely (Howe 2000):

[tsə.la] 'to cut through water'

[tʰ.sə.la] 'pushing'

This is not coincidental, but is because segments aren't real in Oowekyala, though they may seem to be at first glance.

- No language contrasts an affricate vs. a cluster in a particular syllable position



- When such things are reported (eg, Polish), they differ in some other way (Ela Thurgood, p.c.)

tʃ alveopalatal all the way through

tʃ alveolar, then alveopalatal

Are segments cognitively real?

Literature on child development, adult psycholinguistics, and speech errors suggests 'probably not'.

Jusczyk (1992) summarizes the earlier literature on infant speech perception; numerous studies found little evidence that infants organize speech into segments.

'Currently, there are no data that demonstrate that infants actually do perceive similarities between segments occurring in different positions' within syllables.

'Children may not make such associations much before they learn to read.'

Cheung et al. (2001) cite literature on children doing onset deletion tasks: it was easier to delete an entire onset than part of one, even when the two deletion targets were the same.

Easier to delete

[s] from [sæp] (ie, delete an onset), than

[s] from [slæp] (ie, delete a 'segment')

Experiments in adults suggest that different languages may have different basic perceptual units.

The syllable is most important in French
(Cutler et al. 1986)

A stress-based foot is most important in English
(Cutler and Norris 1988)

No language has been definitively shown to have the segment as a perceptual unit.

When literature can be found that argues for the cognitive reality of segments, closer analysis generally reveals that the 'evidence for segments' is equally 'evidence for prosody'.

E.g. Werker and Pegg (1992) state that if a child can discriminate *bog* from *dog*, we have evidence that they represent the difference between a bilabial and an alveolar consonant.

Of course this only demonstrates the ability to distinguish bilabial from alveolar *place of articulation*. It does not show whether there are distinct *segments*, distinct *onsets*, distinct *syllables*, etc.

O'Seaghdha et al. (2010) claim that English and Dutch speech perception benefits from preparation with 'the first segment of the syllable.'

They purport to argue the importance of *segments* in those languages; but all segments tested were also onsets. The findings are equivocal.

A.5. Monosyllable Pairs in English Experiment 5

| | | Homogeneous | | | |
|---------------|---|-------------|------------|------------|-----------|
| | | /d/ | /p/ | /t/ | /s/ |
| Heterogeneous | 1 | Night-day | Snap-pea | Grain-rye | Pig-sow |
| | 2 | Tint-dye | Church-pew | Light-ray | Boat-sea |
| | 3 | Bread-dough | Cash-pay | Sauce-roux | Gasp-sigh |
| | 4 | Wet-dew | Fruit-pie | Line-row | Talk-say |

Widely cited speech error findings are supposed to show that errors usually affect *segments*. (Shattuck-Hufnagel & Klatt 1979)

But much of this is sub-segmental:

'[E]rrors which have been consigned to the phonemic, segmental, or feature levels could be reinterpreted as errors at the motor output level.' (Mowrey & McKay 1990:1311)

Gradient activation results in partial or incomplete gestures. (Pouplier, Chen, Goldstein & Byrd 1999)

Most errors are *ambiguous*, don't tell us much (Brown 2004).

fish grotto → frish gotto move r or move [RTR]
brake fluid → blake fruid swap r/l or move [lateral]

No speech errors unambiguously swap *segments*

*fits → fist, *stamp → tamps

*split → spilt, *split → plist

But some do unambiguously swap *features*

clear blue sky → glear plue sky (Fromkin, 1973)

And some do unambiguously swap *entire onsets*

squeaky floor → fleaky squoor (Fromkin, 1973)

'Unambiguous cases seem to support the psychological reality of distinctive features...and prosodic constituents like onsets... The remaining number of cases, which seem to be ambiguous in regard to unit activity (i.e., segments or syllable constituents) because of frequency of prosodic distribution, seem to be explained better in terms of onsets, nuclei, and codas....' (Brown 2004:100)

Evidence for prosody, segments, features

Feet

stress is assigned by feet

(Hayes 1980; 1995; Halle & Vergnaud 1987)

words are minimally a foot in many languages

(McCarthy & Prince 1986, 1990; Crowhurst 1992)

[μμ] in English, Latin, Greek, Fijian, etc.

[σσ] in Mohawk, Pitta-Pitta, Wangkumara, etc.

reduplication copies a foot in many languages

(McCarthy & Prince 1990)

feet are domains for phonological processes

(Kiparsky 1982; Hayes 1982; Jensen 2001)

Syllables

lexical access/storage uses syllable count
(Cutler 1986; Levelt 1989)

tip-of-tongue state matches in terms of syllable count
(Brown & McNeill 1966; many others)

malapropisms match in terms of syllable count
(Fromkin 1973; Fay & Cutler 1977)

word, root, affix minima/maxima
(McCarthy & Prince 1986; Golston 1991 etc.)

language games that reverse syllables
(Clements 1986)

poetic meter based on syllables
(Chinese, Vietnamese, Hmong)

phonotactics
(too many to begin to list)

syllabaries
(cuneiform, Cherokee, etc.)

contrastive syllabification
(Clements 1986b; Ladefoged et al. 1998; Bosch 1998)

children's URs seem to be syllabified
(Curtin 2001)

native speakers' ability to count syllables
(except Japanese, where moras are more salient)

syllables act as physiological unit of organization
(Krakow 1989; Browman & Goldstein 1995)

in articulation
(Fujimura 1990; Sproat & Fujimura 1993; Krakow 1999)

in word recognition
(Wingfield et al. 1997; Lindfield et al. 1999)

in acquisition by children and, arguably, the species
(MacNeilage 1998; MacNeilage & Davis 1990, 1993, 1999, 2000; Carstairs-McCarthy 1998)

Moras

attract stress
(Trubetzkoy 1939)

model consonant and vowel length
(McCawley 1968)

model phonetic length
(Hubbard 1995)

license extraprosodic sounds
(Hyman 1985, Bagemihl 1991, Zec 1994, Lin 1997)

are used in language games and poetic meter
(Shiritori, Haiku, etc.)

can be counted by native speakers
(Japanese)

form morabaries (syllabaries based on moras)
(Poser 1992)

are conserved in second language acquisition
(Broselow & Park 1995)

are conserved in compensatory lengthening
(Hayes 1989)

Onsets

universally preferred, even by children
(Jakobson 1962)

commonest locus for speech errors
(Shattuck-Hufnagel 1986)

used in language games and poetic meter
(Pig Latin, Ubbly-Dubby; Alliteration)

used in blends
(Bat El 2006)

Rhymes

phonotactic domain
 (VV or VC in many languages)
 domain for phonological processes
 (nasalization, etc.)
 used in language games and poetic meter
 (Pig Latin, Ubbly-Dubby; Rhyming)
 used in blends
 (Bat El 2006)

Segments

?

Features/Gestures

distinguish minimal pairs

 spread in assimilation, dissimilation, harmony, etc.

 directly observable (as gestures)

 the bedrock of speech

Are segments physically real?

identifiable in motor production or in *segments* of the acoustic speech signal? **No.**

Theoretically real?

needed to adequately model observable grammatical patterns? **Doesn't look like it.**

Cognitively real?

discoverable in an experimental setting, language processing, language acquisition? **Doesn't look like it.**



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