

Variation, change, and child language learners:
A case study of variable voicing in English plurals

Laurel MacKenzie

New York University

NWAV 45 • November 6, 2016

The phenomenon

A phonologically opaque alternation in English plurals

singular	'wolf' /wɔlf/	'path' /pæθ/	'house' /haʊs/	'cat' /kæt/	'cough' /kɔf/	'kiss' /kɪs/
plural	[wɔlv-z]	[pæð-z]	[haʊz-əz]	[kæt-s]	[kɔf-s]	[kɪs-əz]

The phenomenon

Voicing is variable:

singular	'wolf' /wɔ lf /	'path' /pæ θ /	'house' /haʊ s /	'cat' /kæ t /	'cough' /kɔ f /	'kiss' /k ɪs /
plural	[wɔ lv -z]	[pæ ð -z]	[haʊ z -əz]	[kæ t -s]	[kɔ f -s]	[k ɪs -əz]
	~ [wɔ lf -s]	~ [pæ θ -s]	~ [haʊ s -əz]			

(Becker et al. 2012,
Ringe & Eska 2013)

This talk

Can the diachronic development and synchronic patterning of this alternation be understood in terms of processes of native language acquisition?

Outline

- Diachronic development
 - child language learners' ability to learn rules with exceptions
- Synchronic patterning
 - child language learners' ability to learn irregular lexical items

Diachronic development

The phenomenon

	'cat (pl.)' /kæ t-z /	'kiss (pl.)' /k ɪs-z /	'wolf (pl.)' /wɔ lf-z /	'path (pl.)' /pæ θ-z /	'house (pl.)' /haʊ s-z /
reg. voicing	—	—	[wɔ lv-z]	[pæ ð-z]	[haʊ z-z]
epenthesis	—	[k ɪs-əz]	—	—	[haʊ z-əz]
prog. voicing	[kæ t-s]	—	—	—	—
plural	[kæ t-s]	[k ɪs-əz]	[wɔ lv-z]	[pæ ð-z]	[haʊ z-əz]

The history

Old/early Middle English plural formation:

	'cat (pl.)' /kat-əs/	'wolf (pl.)' /wʊlf-əs/	'path (pl.)' /paθ-əs/	'house (pl.)' /hu:s-əs/
anterior fricative voicing	—	[wʊlv-əs]	[pað-əs]	[hu:z-əs]

(Lass 2000:142,
Ringe & Eska 2013:142)

The Tolerance Principle

Learners form productive generalizations
(rules) over evidence

R = IF X THEN Y

(Yang 2005b)

The Tolerance Principle

Learners form productive generalizations
(rules) over evidence

Exceptions are memorized

```
IF word = [e1] THEN [handle exception]
ELSE IF word = [e2] THEN [handle exception]
ELSE IF word = [e3] THEN [handle exception]
ELSE apply R
```

(Yang 2005b)

The Tolerance Principle

Learners form productive generalizations
(rules) over evidence

Exceptions are memorized

```
IF word in {e1, e2, e3} THEN [handle exception]
ELSE IF word = [e4] THEN [handle exception]
      ELSE apply R
```

(Yang 2005b)

The Tolerance Principle

Learners form productive generalizations (rules) over evidence

Exceptions are memorized

A learner can only tolerate a certain number of exceptions — beyond this number, it is no longer time-effective to “wait” to reach the rule

(Yang 2005b)

The Tolerance Principle

IF word in $\{e_1, e_2, e_3\}$ THEN [handle exception]
ELSE IF word = $[e_4]$ THEN [handle exception]
ELSE IF word = $[e_5]$ THEN [handle exception]
ELSE IF word = $[e_6]$ THEN [handle exception]
ELSE IF word = $[e_7]$ THEN [handle exception]
...
ELSE IF word = $[e_n]$ THEN [handle exception]
ELSE apply R

(Yang 2005b)

The Tolerance Principle

Learners form productive generalizations (rules) over evidence

IF [+vd] [-vd +ant +cont] [+vd]
THEN [-vd] → [+vd]

The Tolerance Principle

Middle English denominal verb formation:

	'permit (v.)' /lɛ:f-ən/	'bath (v.)' /baθ-ən/	'house (v.)' /hu:s-ən/
anterior fricative voicing	[lɛ:v-ən]	[bað-ən]	[hu:z-ən]

(Ringe & Eska 2013:142)

The Tolerance Principle

Exceptions are memorized

IF [+vd] [-vd +ant +cont] [+vd]
THEN [-vd] → [+vd]

(Ringe & Eska 2013:142)

The Tolerance Principle

Exceptions are memorized

IF [+vd] [-vd +ant +cont] [+vd]

IF word = /grasə/ 'grace' THEN do not apply

IF word = /pe:sə/ 'piece' THEN do not apply

12th c. French borrowings

ELSE [-vd] → [+vd]

(Ringe & Eska 2013:142)

The Tolerance Principle

Exceptions are memorized

IF [+vd] [-vd +ant +cont] [+vd]

IF word = /grasə/ 'grace' THEN do not apply

IF word = /pe:sə/ 'piece' THEN do not apply

IF word = /ko:fəs/ 'coughs' THEN do not apply

14th c. /x/ > /f/

ELSE [-vd] → [+vd]

(Lass 1992:63)

The Tolerance Principle

Exceptions are memorized

IF [+vd] [-vd +ant +cont] [+vd]

IF word = /grasə/ 'grace' THEN do not apply

IF word = /pe:sə/ 'piece' THEN do not apply

IF word = /ko:fəs/ 'coughs' THEN do not apply

IF word = /cʊfəs/ 'cuffs' THEN do not apply

IF word = /mʌθəs/ 'moths' THEN do not apply

IF word = /masəs/ 'masses' THEN do not apply

15th c. simplification of geminates

The Tolerance Principle

Too many exceptions?

when forming the plural, IF word in

{*wolf, path, house, ...*}

THEN [-vd +ant +cont] → [+vd]

Number of tolerable exceptions: $N / \ln(N)$

The Tolerance Principle

Too many exceptions?

when forming the plural, IF word in

{*wolf*, *path*, *house*, ...}

THEN [-vd +ant +cont] → [+vd]

/əʃ/ → /z/

The Tolerance Principle

Too many exceptions?

when forming the plural, IF word in

{*wolf, path, house, ...*}

THEN [-vd +ant +cont] → [+vd]

ELSE [+vd] → [αvd] / [αvd] _

Synchronic patterning

Methodology

Three audio corpora of American English

- Switchboard (1991–2)
- Fisher (2002–3)
- Philadelphia Neighborhood Corpus
(1973–2012)
(1990–2003)

N = 2158

Methodology

Two coders

Amy Hughes & Lucy Giannasi,
UG RAs extraordinaire



Methodology

Two coders

- Binary decision: voiced vs. voiceless
- Coded separately, then met to agree

Corpus	Agreement	Kappa
Switchboard	84%	0.68
Fisher	88%	0.76
PNC	88%	0.76

Methodology

30+ words

- f: *bee{f/ve}s, cal{f/ve}s, dwar{f/ve}s, el{f/ve}s, hal{f/ve}s, hoo{f/ve}s, kni{f/v}es, li{f/v}es, loa{f/ve}s, roo{f/ve}s, scar{f/ve}s, sel{f/ve}s, shel{f/ve}s, thie{f/ve}s, wi{f/v}es, wol{f/ve}s*
themsel{f/ve}s, bookshel{f/ve}s, werewol{f/ve}s, midwi{f/v}es
- θ: *baths, booths, cloths, faiths, moths, mouths, oaths, paths, truths, wreaths, youths*
tablecloths, homeopaths, psychopaths
- s: *houses, blouses, spouses*
clubhouses, greenhouses, courthouses

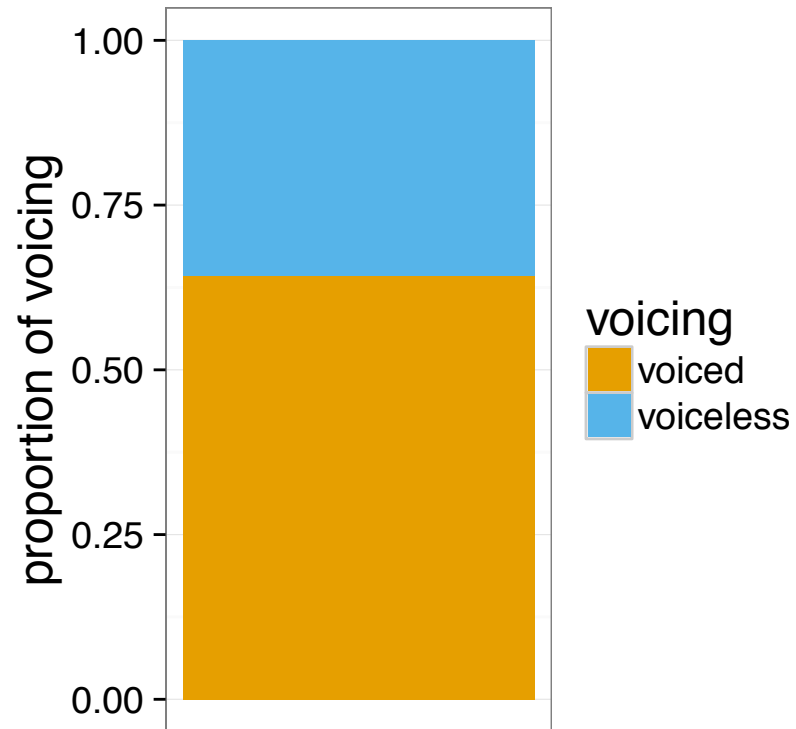
Methodology

Modeling predictors

- final segment ([f], [θ], [s])
- speaker year of birth
- (pseudo-)compound vs. bare stem
- corpus
- sex
- frequency of plural form in most common orthography, from SUBTLEX (Brysbaert & New 2009)
- stem identity (random effect)

Results

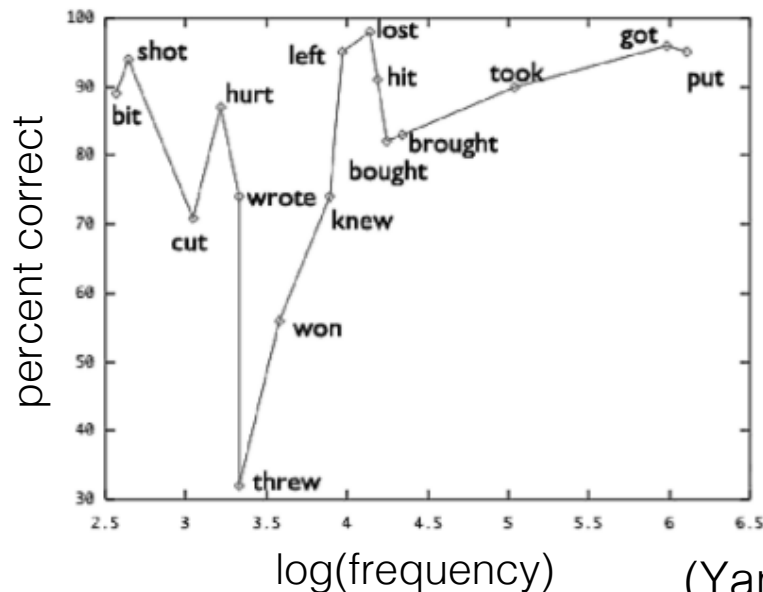
Overall voicing in data set



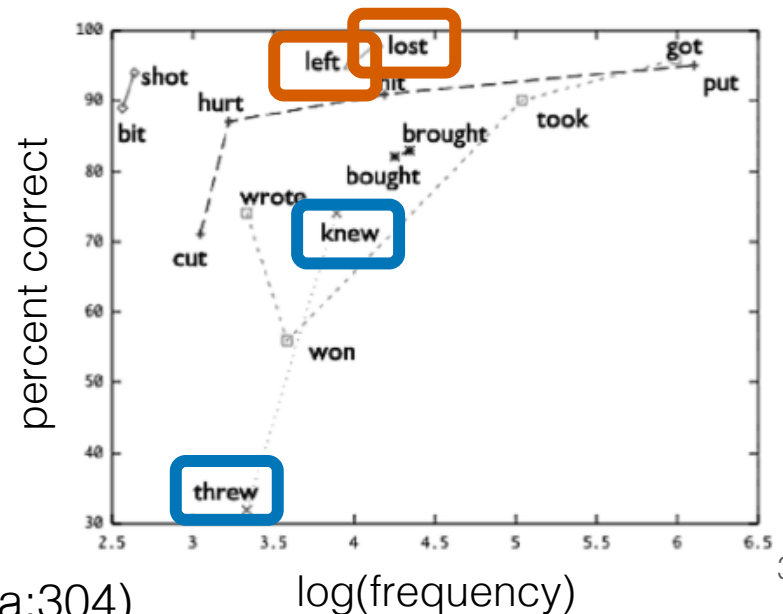
Salvation by Volume

A child is more likely to successfully learn an irregular form

- if the form itself is frequent
- and the class it belongs to is frequent



(Yang 2005a:304)



Results

	proportion of voicing	median frequency of words in class	significant by-word frequency effect?
-f	0.78	4900	yes ($p < 0.001$)
-s	0.52 **	975	no
-θ	0.41 ***	161	no

The present-day rule

when forming the plural, IF word in
{*wolf, path, house, ...*}

THEN [-vd +ant +cont] → [+vd]

ELSE IF word in {*moose, fish, sheep, ...*}

THEN *no change*

ELSE IF word in {*foot, goose, ...*}

THEN /u/ → /i/

ELSE [+vd] → [αvd] / [αvd] _

The present-day rule

when forming the plural, IF word in

{*wolf, elf ...*}

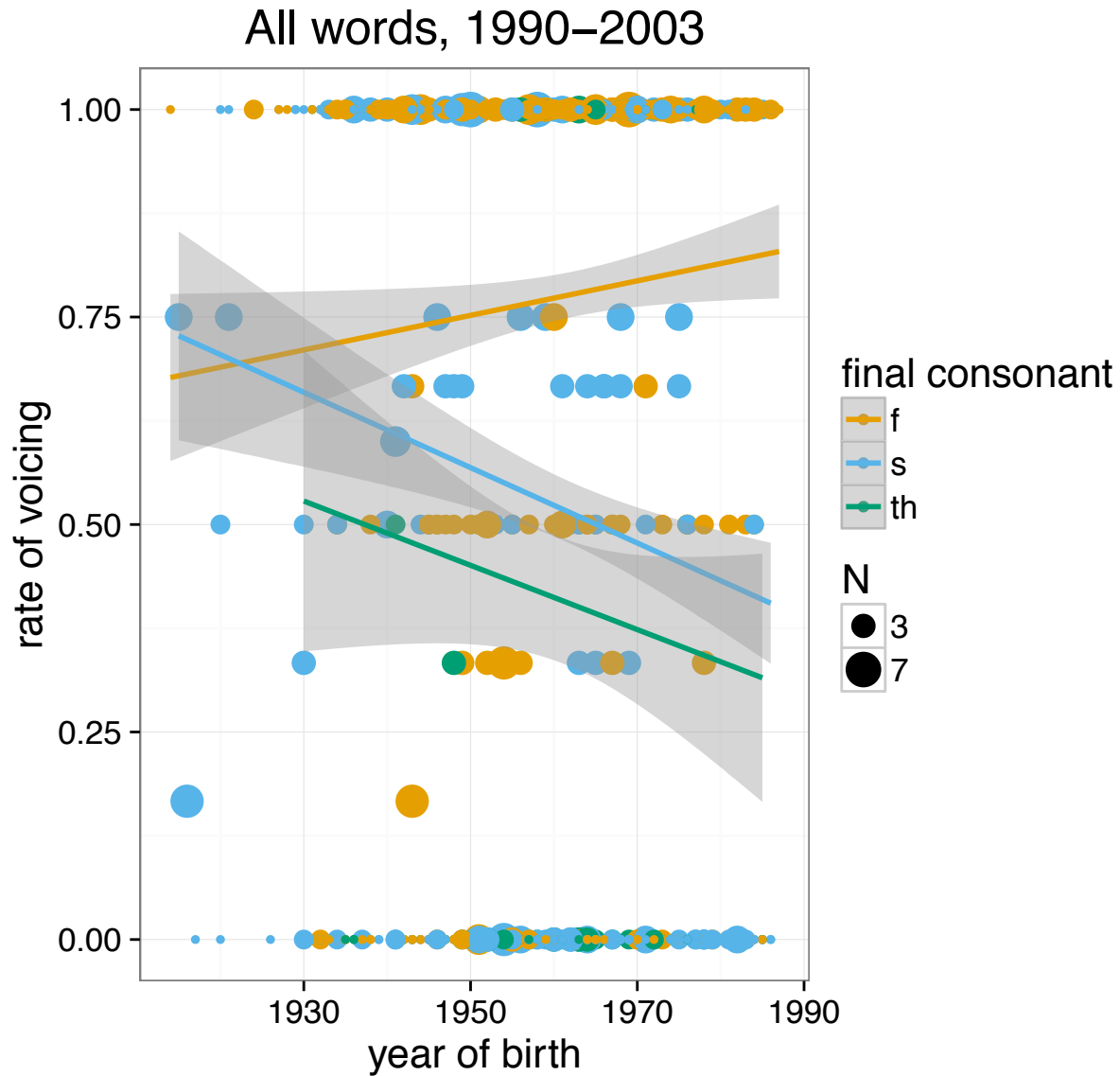
ELSE IF word in {*path, moth*}

ELSE IF word in {*house*}

THEN [-vd +ant +cont] → [+vd]

ELSE [+vd] → [αvd] / [αvd] _

Results



In sum

In the case of regressive fricative voicing,

- diachronic development may reflect acquirers' ability to handle exceptions
- synchronic patterning may reflect acquirers' sensitivity to frequency of irregulars

Processes of acquisition can shed light on patterns of change and variation.

Thank you!

Future directions

- paradigm uniformity
word's phonological form influenced by that of its relatives (Seyfarth 2015)
e.g. *frees* ≠ *freeze*
house (v) >> *houses*?
- children's input & production
infrequent in adult production = infrequent in child input?
site of change = site of learner errors? (Cournane 2014)
age-grading of f-final connected to learning how to spell?

References

- Brysbaert, Marc, and Boris New. 2009. Moving beyond Kučera and Francis: A critical evaluation of current word frequency norms and the introduction of a new and improved word frequency measure for American English. *Behavior Research Methods* 41:977–990.
- Cieri, Christopher, David Miller, and Kevin Walker. 2004. The Fisher corpus: A resource for the next generations of speech-to-text. In *Proceedings of the Fourth International Conference on Language Resources and Evaluation*, ed. Maria Teresa Lino, Maria Francisca Xavier, Fatima Ferreira, and Raquel Silva.
- Cournane, Ailis. 2014. In search of L1 evidence for diachronic reanalysis: Mapping modals. *Language Acquisition* 21:103–117.
- Godfrey, John J., Edward C. Holliman, and Jane McDaniel. 1992. SWITCHBOARD: Telephone speech corpus for research and development. In *Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing*, Volume 1, 517–520.
- Labov, William, and Ingrid Rosenfelder. 2011. The Philadelphia Neighborhood Corpus.
- Lass, Roger. 1992. Phonology and morphology. In *The Cambridge History of the English Language Volume 2: 1066–1476*, ed. Norman Blake, chapter 2, 23–155. Cambridge: Cambridge University Press.
- Lass, Roger. 2000. Phonology and morphology. In *The Cambridge History of the English Language Volume 3: 1476–1776*, ed. Roger Lass, chapter 3, 56–186. Cambridge: Cambridge University Press.
- Ringe, Donald and Joe Eska. 2013. *Historical Linguistics: Toward a Twenty-first Century Reintegration*. New York: Cambridge University Press.
- Seyfarth, Scott. 2016. Contextual and Morphological Effects in Speech Production. Doctoral Dissertation, University of California, San Diego.
- Yang, Charles. 2005a. The origin of linguistic irregularity. In *Language Acquisition, Change and Emergence: Essays in Evolutionary Linguistics*, ed. James W. Minett and William S.-Y. Wang, 297–328. Kowloon, Hong Kong: City University of Hong Kong Press.
- Yang, Charles. 2005b. On productivity. *Linguistic Variation Yearbook* 5:265–302.