

The Nata Goulandris Lecture



Learning to spell in English

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Outside in approach

Look at dyslexics' performance on tasks **outside** of reading and spelling

Identify the tasks on which people with dyslexia have difficulty, with the goal of shedding light on the causes of the dyslexics' reading and spelling problems

Inside out approach

Look **inside** reading and spelling by examining the nature of the tasks themselves

Determine whether people with dyslexia have more serious problems with some aspects of reading and spelling than with others, with the goal of shedding light on the causes of dyslexics' problems

Inside out approach for spelling

Plan of talk

What knowledge do skilled spellers possess?

How do typically developing children acquire this knowledge?

Do dyslexics have more serious problems with some aspects of spelling than with others?

What knowledge do skilled spellers possess?

Lexicon of spellings

Cat stored for /kæt/, *green* stored for /grin/

Not rote but motivated

Formal motivations: *cat* and *green* are graphically possible in English, as are *dat* and *greep*; *ckat* and *grren* are graphically odd

Functional motivations: the *c* of *cat* functions to represent the /k/

People use formal and functional motivations developed for familiar words to fill in missing information about less familiar words and to spell new words

Blandine vs. Blandeen

How do typically developing children acquire this knowledge?

Learning to spell involves building a lexicon, moving from a small number of poorly motivated entries to a large number of well motivated ones

Most children in literate societies begin to learn about the formal properties of lexical entries at an early age

Early knowledge of formal properties of writing

SAM

vs.

S

A

M

BEP

vs.

申欠兵

pppp

vs.

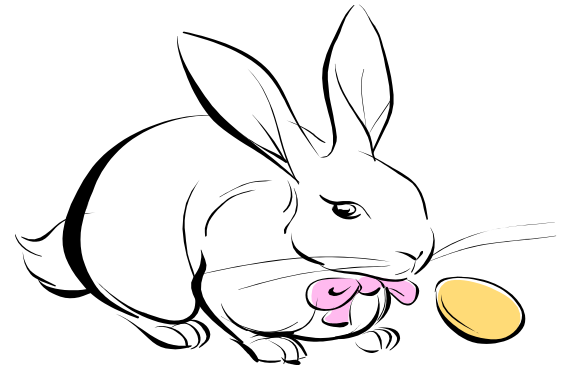
palg

Children's early ideas about function of writing

Young children often don't understand that each piece of writing represents a specific linguistic unit



“don't cross the street”
“don't go”



“Easter bunny”
“rabbit”

mosquito vs. *whale*

Children who don't understand that spellings stand for specific linguistic units can't begin to develop a spelling lexicon in which the entries are functionally motivated

These children **can** begin learning about the formal properties of writing

chet for *will*

Building a spelling lexicon

First entry is often child's first name

Good knowledge of form: Brendan and
Prendan

Poor knowledge of function: Valentina and
Valentino

Functional motivations

r of car

l of help

U.S. children's spellings that reflect use of letter
names

lfut

frm

yat

Segmentation

Children use whole letter names to avoid segmentation of spoken words into phonemes

Other spelling errors that reflect difficulties with segmentation

pa

mikeowave

rad

lfut

Classification

gres, jrs

sbitr

Phonemes with more than one possible spelling

Is /au/ spelled as *ou* (as in *out*) or *ow* (as in *now*)?

Ends of words

Before /l/ and /n/

Before other consonants

Phonemes with more than one possible spelling (cont.)

Why is vowel of *health* spelled as *ea*?

Why is third consonant of *musician* *c*?

Why is first vowel of *majority* *a*?

Morphemes tend to be spelled in a consistent way in English

Interim summary: Tasks for typically developing spellers

Learning about the formal properties of writing

Learning that writing represents language

Segmenting language into phonemes

Classifying phonemes in way assumed by conventional writing system

Tasks for typically developing spellers (cont.)

Learning about how such factors as phonological context and morphology can help in choosing among alternative spellings for phonemes

Developing a lexicon of well-motivated spellings

Spelling in children with dyslexia

Outside in approach

Inside out approach using **spelling level match** design

Have the dyslexics achieved this level of performance by using a different mixture of skills and abilities?

If so, should see different kinds of errors and different patterns of performance, potentially shedding light on causes of dyslexics' problems

Ideas about dyslexics' spelling

More difficulty relative to typical younger children in acquiring functional motivations than formal motivations for entries in spelling lexicon?

Within the category of functional motivations, special difficulty with spellings that are conditioned by morphology?

1. Bourassa and Treiman, 2003

30 children with dyslexia

mean age 11 years, 1 month

mean spelling grade level 2.5

30 typical younger children

mean age 7 years, 5 months

mean spelling grade level 2.4

Written and oral spelling of words and nonwords

Correctness of phonological skeleton

Correct : **drep** and **grip** for *drip*

Incorrect: **duripe** and **dimp** for *drip*

Reflects knowledge of functional
(phonological) motivations of spellings

Proportion of spellings with correct phonological skeleton

Group	Words		Nonwords	
	Written	Oral	Written	Oral
Dyslexic	.76	.68	.74	.65
Typical	.78	.70	.74	.65

Graphic acceptability

Acceptable: **tambo** for *tomato*

Not acceptable: **klmal** for *clean*

Reflects knowledge of formal motivations
of spellings

Proportion of spellings that are graphically acceptable

Group	Words		Nonwords	
	Written	Oral	Written	Oral
Dyslexic	.92	.90	.86	.87
Typical	.87	.89	.83	.84

Errors that occur at similar rates in dyslexic and typical children

Spellings based on letter names

jr for *jar*

Spellings that reflect segmentation problems

tip for *trip*

Spellings that reflect classification problems

grip for *drip*

Conclusions from Bourassa and Treiman, 2003

No evidence that children with dyslexia emphasize formal motivations more and functional motivations less when developing their spelling lexicons

Errors of children with dyslexia are quite similar to those of typical beginners

2. Cassar, Treiman, Moats, Pollo, and Kessler, 2005

25 children with dyslexia

mean age 11 years, 7 months

mean spelling grade level 2.2

25 typical younger children

mean age 6 years, 8 months

mean spelling grade level 2.1

Cassar et al. results

No significant differences between older dyslexics and younger typical children in correctness of phonological skeleton, or in other measures of phonological acceptability

No significant differences between older dyslexics and younger typical children in graphic acceptability of spellings, or in other measures of graphic knowledge

Can teachers distinguish spellings of older dyslexic children from those of typical younger children?

and	and	and
arm	run	rueme
boy	boy	boy
bump	boum	bump
cart	krke	crte
circle	crkl	srcle
city	situe	sity
cook	coke	cuke
correct	kract	crent
cut	cut	cute
dime	dime	dime
dress	drase	drese
enter	ntre	entr

Group	Prop. correct	Confidence rating (1-5)
All participants ($N = 44$)	.49	3.36
Participants with most teaching experience with children with serious reading and spelling problems ($N = 10$)	.51	3.55
Participants with teaching experience with both normally progressing young children and dyslexics ($N = 10$)	.50	3.39

Teachers' comments

“The more of these I did, the less confident I became.”

“I worked on this for a period of time ... all except two samples could be either a young typical child or an older dyslexic student. ... I did not fill out the other forms as I could not classify these students as either typical or dyslexic.”

Ideas about spelling in children with dyslexia

More difficulty relative to typical younger children in acquiring functional motivations than formal motivations for entries in spelling lexicon? **NO**

Within the category of functional motivations, special difficulty with spellings that are conditioned by morphology?

3. Bourassa, Treiman, and Kessler, 2006

25 children with dyslexia

mean age 11 years, 5 months

mean spelling grade level 2.6

25 typical younger children

mean age 7 years, 8 months

mean spelling grade level 2.6

Morphologically complex words with final clusters, stem can help children spell the first consonant of the cluster

tuned, bars

Morphologically simple words with final clusters, no stem that could help children spell the first consonant of the cluster

brand, Mars

Children who use morphology to aid spelling should produce more spellings that represent both phonemes of the cluster for morphologically complex words than for simple words

Proportion of spellings that represent both consonants of cluster

Group	Morphologically complex (e.g., <i>tuned</i>)	Morphologically simple (e.g., <i>brand</i>)
Dyslexic	.88	.82
Typical	.85	.77

Both groups use morphology to aid their spelling

4. Bourassa and Treiman, in preparation

32 children with dyslexia

mean age 15 years, 0 months

mean spelling grade level 4.7

32 typical younger children

mean age 9 years, 9 months

mean spelling grade level 4.8

Morphologically complex words where spelling of stem is retained

musician (cf. *music*), critical segment is *c*

Morphologically complex words where spelling of stem is not retained

pronunciation (cf. *pronounce*), critical segment is *ou*

If dyslexics have special difficulty with morphological basis of English spelling, should use critical segment less often than typical children when spelling words like *musician* and *pronunciation*

Proportion of spellings that use critical segment

Group	Complex words where spelling of stem is retained (e.g., <i>musician</i>)	Complex words where spelling of stem is not retained (e.g., <i>pronunciation</i>)
Dyslexic	.58	.29
Typical	.54	.32

Dyslexics use morphology in spelling to the same extent as typically developing younger children of the same spelling level

Leads to correct spellings in many cases:

musician

Leads to errors in some cases:

pronunciation

No evidence that children with dyslexia have special difficulty relative to typical children in grasping the morphological function of English spelling

Ideas about spelling in children with dyslexia

More difficulty relative to typical children in acquiring functional motivations than formal motivations for entries in spelling lexicon?

NO

Within the category of functional motivations, special difficulty with spellings that are conditioned by morphology?

NO

Our conclusions about spelling in children with dyslexia

Children with dyslexia learn to spell in much the same way as typical children, but more slowly

Slower learning of **all** aspects of spelling that we have examined

Same kinds of errors, generally at same rates

No evidence that dyslexic children are relatively good at some aspects of spelling and extremely poor at others

Inconsistencies across studies

Bruck and Treiman, 1990: Dyslexics significantly more likely than typical younger children of the same spelling level to omit second consonants of initial clusters

pa for *play*

Bourassa and Treiman, 2003; Cassar et al., 2005: Dyslexics **not** significantly more likely than younger typical children to make such errors

Consistencies across studies

No study has found dyslexics to make types of spelling errors that typical beginners do not make

Many published studies, as well as some unpublished ones, have found remarkable similarities between older children with dyslexia and typically developing younger children in error rates and patterns of performance

Discouraging aspects of these findings

Different spelling errors or different patterns of performance could have shed light on why dyslexic children are so slow

Encouraging aspects of these findings

What we have learned about spelling in typical children can be applied to children with dyslexia

Teaching

Need for teachers to appreciate logic behind English writing system and logic behind children's errors

Trouble spots in learning to spell are much the same for all children, but some children need more intensive instruction in order to overcome them

Thank you!

More information our research at:

<http://artsci.wustl.edu/~rtreiman/>

Email: rtreiman@wustl.edu

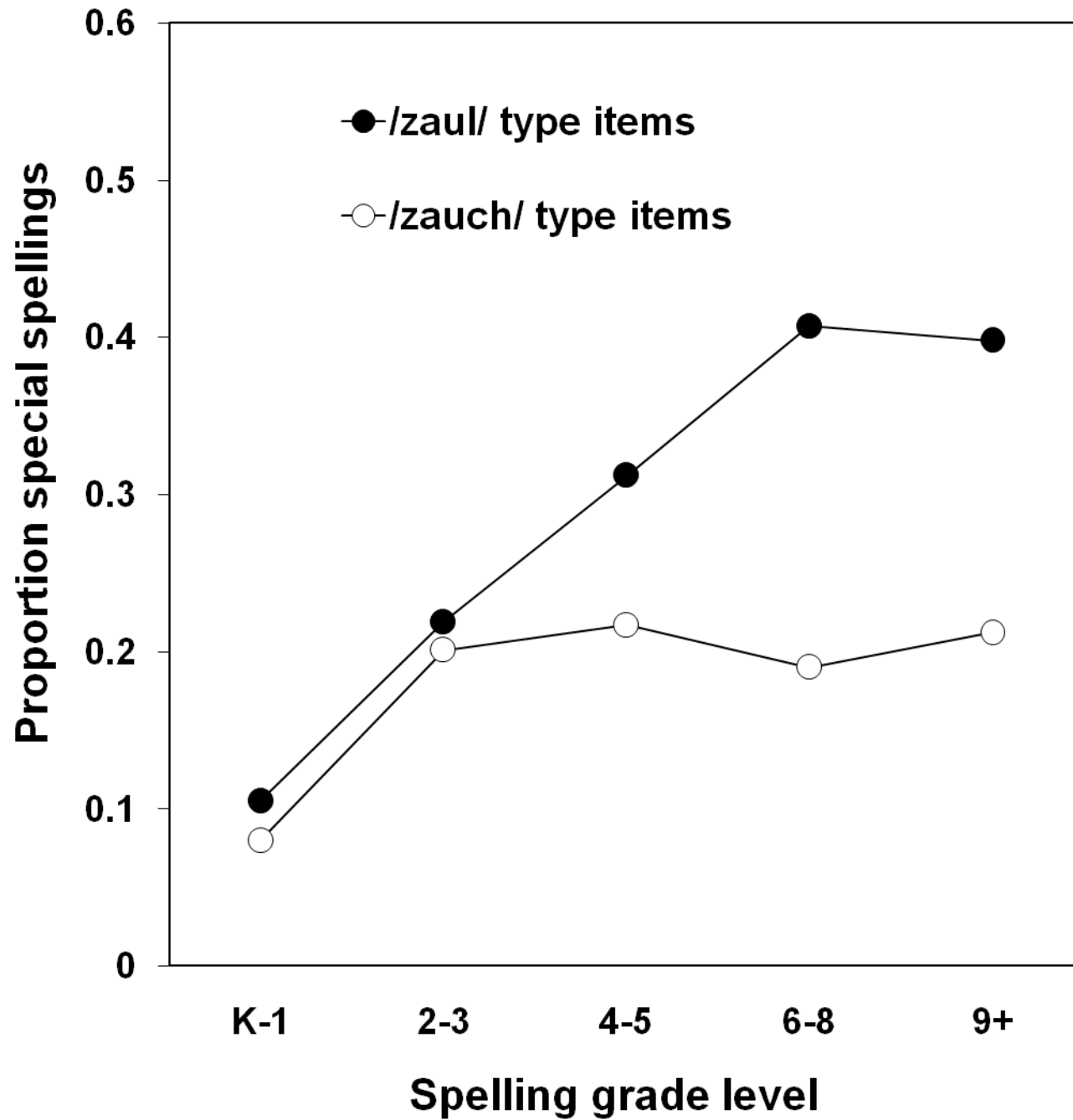
Testing knowledge of effects of phonological context

/zaul/

/zauch/

How often do people spell /au/ with *ow*?

If people more often use *ow* in /zaul/ than /zauch/, this would suggest that they use context in selecting spellings



Proportion of spellings with various characteristics in Cassar et al. 2005

Group	Correct phonological skeleton	Graphically acceptable
Dyslexic	.69	.85
Typical	.62	.79