Today

Case study: a-adjectives (asleep)
Construction Learning studies

Goals:
To provide evidence for items and emergent generalizations
To provide evidence for two facilitory factors in learning language

Language is filled with semi-regular phrasal form-function correspondences that must be learned

To the bed
vs.
To bed

[P N]: {to bed, school, to dinner, to (regular activity)}
Specialized interpretation

*in hospital (ok in Br. English)

Idiosyncrasies (Berson and Goldberg, forthcoming):

Many a <time period> <Subj-Aux Inversion S>
  e.g. "Many a night have I wept into a salad bowl full of frosted flakes"

Form: Many (pl. det.) + a (sg. det.); SAI
Function: subjective stance toward broadly construed non-future events:
  99% involve first person subject
  Many a night have I/we > Many a night have you/they …
  0 hits for Many a night will I (> 2240 for other aux);

Adjectives
Test constructions in English:
  modify nouns
  appear after seem
  appear prenominally

Word
  e.g., Avocado, anaconda, and

Word (partially filled)
  e.g., pre-N, V-ing

Idiom (filled)
  e.g., Going great guns, give the Devil his due

Idiom (partially filled)
  e.g., jog <someone’s> memory,
  send < someone> to the cleaners
  <someone’s> for the asking

Idiom (partially filled)
  The Xer the Yer
  (e.g., The more you think about it, the less you understand)

Frequent Idiom (partially filled); Passive
  (e.g., The armadillo was hit by a car)

Frequent Idiom (unfilled)
  Ditransitive construction:
  Subj V Obj1 Obj2
  (e.g., He gave her a fish taco; He baked her a muffin)
<table>
<thead>
<tr>
<th>Google hits</th>
<th>attributive</th>
<th>predicative</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>asleep--child</td>
<td>1%</td>
<td>99%</td>
<td>11,041</td>
</tr>
<tr>
<td>afloat--ship</td>
<td>0.01%</td>
<td>99.99%</td>
<td>1580</td>
</tr>
<tr>
<td>alive--mammal</td>
<td>0.01%</td>
<td>99.99%</td>
<td>3400</td>
</tr>
<tr>
<td>agghast--audience</td>
<td>16%</td>
<td>84%</td>
<td>1043</td>
</tr>
<tr>
<td>abashed--child</td>
<td>3%</td>
<td>97%</td>
<td>566</td>
</tr>
<tr>
<td>ablaze--building</td>
<td>0.01%</td>
<td>99.99%</td>
<td>4179</td>
</tr>
<tr>
<td>afraid--child</td>
<td>0.01%</td>
<td>99.99%</td>
<td>796K</td>
</tr>
<tr>
<td>average:</td>
<td>3%</td>
<td>97%</td>
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The distribution between a-adjectives and semantically similar non-a-adjectives is significantly different: $\chi^2(1 N=179,843) = 48801$, $p < .00001$.

**Explanation for the distribution:**

Historical "persistence":

- asleep < in sleep
- afloat < in float
- ablaze < in blaz

As PPs, "the on sleep child"
Assume a-adjectives are synchronically “underlyingly” prepositional phrases?

The man under the bed had escaped the police. (postnominal PP)

*The man asleep had escaped the police. (postnominal a-adjective)
The man, asleep on the floor, had escaped the police.

*The man short had escaped the police. (postnominal (non a-) adjective)
The man, short even with his boots on, had escaped the police.

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<tr>
<td>Afraid &lt;&gt; “on fraid”</td>
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Instead afraid < p. ppl of affray (v.): “to startle”

Speakers have assimilated afraid to category of a-adjectives.

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<td>94%</td>
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<td>Alive: a + live; cf. liv</td>
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<td>Aghast: a + ghast; cf. ghastly</td>
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<td>Assiduous: a + busy; cf. busily</td>
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<tr>
<td>Ashamed: a + shame; cf. shameful</td>
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<tr>
<td>Astute: a + sharp; cf. sharply</td>
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<tr>
<td>Acute: a + sharp; cf. sharply</td>
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<tr>
<td>Absurd: a + absurd; cf. absurdity</td>
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<tr>
<td>Abused: a + abuse; cf. abused</td>
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<tr>
<td>Adult: a + adult; cf. adulthood</td>
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Non-segmentable as a + root: unrestricted

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| Historical facts motivate the generalization that a-adjectives should be segmentable as a + root. | |


Input statistics from the days when a-adjectives were PPs have been perpetuated.

Synchronically, speakers form a category of a-adjectives on the basis of phonology and morpho-syntax and assimilate new members to this category.

usage-based model: we record a great deal of item-specific information and we generalize (intelligently) over it.

A-adjectives experiment (Goldberg and Boyd, forthcoming)

- Undergraduate native speakers of English ($n = 32$)
- Production task

An example trial

Here are two foxes.

dead
alive

24 target items

REAL:
- a-adjs: ablaze, afloat, afraid, aghast, alive, asleep
- non-a-adjs: flaming, floating, frightened, shocked, living, sleepy

NONSENSE:
- a-adjs: ablim, adax, afap, agreep, alaz, aspril
- non-a-adjs: breem, chammy, flitzy, gecky, slooky, veeby

24 counterbalanced fillers:

Prototypical adjectives: likely to elicit prenominal use: the bad dog

bad, good, smart, dumb, fast, slow, old, young, rich, poor, strong, awak

Present tense verbs: likely to elicit predicative use: the dog that bites

bites, camping, cooks, cries, gambles, runs, runs, smokes, snowboards, travels, reads, writes

Fillers elicited the intended structure 99% of the time.

Manipulations

- Phonology: whether the adjective used was an A-adjective or not.
- Adjective status: whether the adjective used was real or nonce (e.g., asleep vs. aleep).

- Dependent variable: P(prenominal)
Results (Goldberg and Boyd, forthcoming)

Percentage of prenominal productions

- a adjective
- non-a adjective
- real
- nonsense

Restriction on real adjectives is stronger than restriction on nonsense adjectives.

Main effect: A-adjectives are less preferred in attributive position than non-A adjectives (59.47% v. 94.14%). \( F(1, 31) = 69.42, p < .0001 \). Interaction of phonology and real vs nonsense, \( F(1, 31) = 70.25, p < .0001 \).

Learning the restriction

- “the afraid man”
- How do kids learn to avoid using a-adjectives prenominally?

Statistical Preemption

If a child expects,

the afraid man

But hears

the man who was afraid


No negative evidence

“Don’t say the afraid man, please say the man is afraid.”

Me loves you, Mommy.

I have just completed a colorful mural on my bedroom wall with indelible markers.

Why was the effect attenuated with novel adjectives?

Hypothesis:

Unclear whether novel adjectives should be viewed as segmentable or not, since they were not assigned meaning.

Novel adjs. weren't preempted by predicative use.
Design

- Exposure Block
  - 6 “practice trials”: participants witness 2 novel a-adjectives in RC position; preemptive context.

- Test Block
  - 16 critical trials interleaved with 16 filler trials.
    - 2 novel a-adjectives were seen during exposure, 2 new novel adjectives.
    - To encourage response variability, fillers were strongly biased towards either an attributive or RC response.

Recall: experiment #1 results (Goldberg and Boyd, forthcoming)

Restriction on real adjectives was stronger than restriction on nonce adjective.

Results of Exp. #2: with preemptive context: (n=20)

No difference between novel a-adjectives seen during exposure (20%) and those that weren't (27.5%), t(19) = -1, p = .33.

Experiment 3: pseudo-preemptive context

Are people smart enough to know when a context is truly preemptive?

Exposure to pseudo-preemptive context:

*The fox that's adax and proud of itself…*

Notice that prenominal attributive construction is unavailable:

*The proud of itself fox…*

*The afek and proud of itself fox….*

Results of Exp. #3: with pseudo-preemptive context: (n=20)

Subjects rationally ignore pseudo-preemptive context (e.g., *The fox that was adax and proud of itself*).

Summary

We retain a surprising amount of item-based information

Some generalizations about language are due to historical persistence (and lack synchronic motivation).

We also (intelligently) generalize over item-specific facts afraid & novel a-adjs

We can learn what not to say via statistical preemption (rationally ignoring pseudo-preemptive contexts)
More on construction-learning

- Statistical preemption
- Learning a novel phrasal construction
  - Shared concrete similarity
  - An interesting age-effect

Some background….

- *She mooped him something.*
- What does *moop* mean?

Learning a novel construction:

- Experiments designed to test whether a novel argument structure construction can be generalized without explicit instruction.

Exposure condition: witnessed 16 instances of novel construction with 5 novel verbs
(4-4-4-2-2)

Control condition: watched same 16 video clips without sound
Test: forced choice

- Determine which scene a sentence corresponds to:
  - Scene #1: scene of appearance
  - Scene #2: matched foil scene

Comparison of two conditions (mean age 6;4, n=34) (Casenhiser & Goldberg 2005, Dev. Sci.)

- Learning is not likely an effect of preexisting knowledge:
  - Novel construction violates a proposed universal
    - Locative phrase -> oblique (PP in English)
  - Construction relating “appearance” meaning to unusual verb position is unusual.

Is it possible to encourage the formation of an abstract construction?

- Generalization from instances is not automatic: it requires that one instance “remind” the learner of another instance.
- It also requires that the learner “notice” shared or related attributes.

(c.f Allen and Brooks 1991; Goldstone 1994; Markman & Gentner 1993; Gentner and Namy 2000, 2006; Ross et al. 1998; Resor and Furrow 1977; Ross 1987)

- Include more items that share (relevant) concrete similarity:
  - Greater number of items that share the same nonsense verb.
skewed exposure condition: 8-2-2-2
(balanced) exposure condition: 4-4-4-2-2
Control: watched video without sound

Controlled for overall token/type frequency:
Total # of scenes: 16
Type frequency (number of novel verbs): 5

All three conditions watched exactly the same video

<table>
<thead>
<tr>
<th>Construction</th>
<th>Corpus data</th>
<th>Total # of verb types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subj V Oblique</td>
<td>39% go (136/353)</td>
<td>39 verbs</td>
</tr>
<tr>
<td>Subj V Obj Obj2 Recall</td>
<td>44% give (226/517)</td>
<td>&gt; 13 verbs</td>
</tr>
<tr>
<td>Subj V Scomp</td>
<td>40% think (Kidd et al. to appear)</td>
<td>8 verbs</td>
</tr>
<tr>
<td>Subj V [poss way] PP</td>
<td>40% make (Goldberg 1996)</td>
<td>&gt;50 verbs</td>
</tr>
</tbody>
</table>
General Purpose Verbs

- GO
- PUT
- MAKE
- DO
- GET
- GIVE

- Learned early and used frequently, cross-linguistically
- Finnish, French, Japanese, Korean, Hebrew (Bowerman 1973; Gregoire 1937; Sanches 1978; Park 1977; Clark 1978; Ninio 1999)

Why the high frequency?

Compare:
- Go with amble
- Put with chill

Go, put are more frequent because they apply in a wider range of contexts (Zipf 1935; Bybee et al. 1992; Heine 1993)

The learning mechanism does not appear to be specific to language

An initial, low-variance sample of the most frequently occurring members allows the learner to get a ‘fix’ on what will account for most of the category members (Elia and Anderson 1984; cf. also Avrahami et al. 1997).

Goldberg & Casenhiser (2006): same facilitory effect in non-linguistic categorization (of random dot patterns)

Idiomatic constructions also often have high-frequency exemplars:

<table>
<thead>
<tr>
<th>Construction</th>
<th>Idiomatic expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPN construction</td>
<td>house by house; day after day</td>
</tr>
<tr>
<td>Time away</td>
<td>Dancin’ the night away</td>
</tr>
<tr>
<td>V+ that!</td>
<td>Screw that!</td>
</tr>
<tr>
<td>The Xer the Yer</td>
<td>The more the merrier</td>
</tr>
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More recent work (with undergrad participants) has addressed possible concerns

- Additional control conditions
- Mapping trials: evidence that speakers know the specifics of the linking pattern:
  - Theme locative V → Locative Theme V
- Subjects can use the novel construction in production tasks
- Some knowledge of the construction lasts at least as long as one week…

Younger children’s performance
(Boyd and Goldberg, unpublished)
We know that young children are more conservative than adults in their production and comprehension:


Why don’t younger children do well on this task?
Lack of “critical mass” of instances?
→ Perhaps they don’t recognize the abstract similarity across exemplars.
   Exemplars may be too varied.

New study (Boyd and Goldberg, to appear, *Lingua*)

Further reduce variability in the input by limiting the number of arguments used.

Narrow the constructional meaning:

NP_theme       NP2_locative       V
“the builder APPROACHES the doctor (in varying manners)”

Test for varying degrees of generalization.

Three age groups

Five year olds (M=5;2)
Seven year olds (M=7;6)
Adults (M=22.4)
**Results**

**Intransitive trials (distinguishing novel construction from familiar construction)**

- 0 year olds
- 25% correct on intransitive trials
- 50% correct on intransitive trials
- 75% correct on intransitive trials
- 100% correct on intransitive trials

**Mapping trials (identifying word order as Theme-Loc V)**

- Five year olds only show evidence of generalizing the V slot in the novel construction.
- They are at chance on all-novel test trials and at mapping trials.
- Seven year olds show evidence of generalization (in all-novel and mapping trials), but still show an advantage on old-items.
- Adults are ready generalizers: they are consistently at ceiling.

**Ruling out alternative explanations**

- Simple order effect? 5-year-olds getting tired or distracted across trials?
  - But there is no decline across blocks of intransitive trials.
  - No: this would not explain adults’ or 7-year-olds’ above-chance performance on mapping trials; it would also not explain why 5-year-olds did worse with increasing novelty.
Younger children are more conservative, they do not generalize as broadly when exposed to the same input.

They may not perceive the abstract relationships as readily.

Given the degree of idiosyncrasy in language, this initial conservatism may in fact help children.

### Children as super-generalizers?

When children perceive a generalization, they often overgeneralize more than adults (e.g., Kam and Newport 2005):

Generalization is easier than differentiation by item

But generalization requires recognition of category; this is not as easy for children.

### Today

**Evidence for both items and generalizations**

- a-adjecives: existence of the minor pattern; generalization to new instances construction-learning studies: advantage of old items growing ability to generalize

**Evidence for two facilitory factors in learning language**

- Statistical preempt (a-adj study)
- Evidence for very narrow generalizations in younger children.