Production of verb deaccenting under repetition, entailment, and bridging

Jeffrey Geiger & Ming Xiang
University of Chicago

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Background

Models of deaccenting licensing need to account for the relationship between the discourse status and emphasis of constituents.

(Taglicht 1982, Selkirk 1984, Rochemont 1986, Rooth 1992, Tancredi 1992, Schwarzschild 1999, Wagner 2012)

Background

A constituent that is discursively given, in a structurally isomorphic position, can be deaccented. (Tancredi 1992)

"John saw Mary, and **Bill** *saw* **Sue**."

Background

It has been proposed that "instantiation" in the prior discourse goes beyond simple repetition.

Claim: Constituents that are inferable from the prior discourse context can be deaccented.

"She called him a Republican, and then **he** *insulted* **her**."
(Rooth 1992, Tancredi 1992)

Background

Several accounts of deaccenting licensing rely on entailment or other inferencing relations to determine which constituents can be deaccented:

Rochemont 1986
Tancredi 1992
Williams 1997
Schwarzschild 1999

Background

However, only introspective judgments about the acceptability of deaccenting inferable constituents have been reported.

There has not been rigorous empirical investigation of whether inferable constituents are deaccented as readily as repeated constituents.

If deaccenting is not licensed by inference relations, or it is only marginally licensed compared to repeated constituents, it calls into question accounts in which entailment or other inferencing relations are a key player in determining emphasis

Road map

Experiment 1 - Production
> No phonetic evidence speakers deaccent inferable verbs

Experiment 2 - Perception of naturalistic data
> Perception by naive speakers matches production pattern

(available in discussion)

Experiment 3 - Perception of manipulated data
> Cross-spliced canonically accented or deaccented verbs
> into inferable position; listeners rated the felicitousness
> of these tokens similarly to discourse-new rather than
> discourse-old verbs

Experiment 1 - Production

Production study examining emphasis of discourse-new, inferable, and discourse-old verbs.

Experiment 1 - Production

In general, discourse-new verbs should be accented.

Discourse-old verbs should be deaccented.

Do inferable verbs behave like new verbs or old verbs?

Design & stimuli

Participants read *"SVO and SVO"* sentences

Embedded in irrelevant carrier paragraph

ex. *Veronica hugged Laura, and Ron embraced Laura.*

Items 1-6 - Entailment as inferencing relation

Object status	Verb status	Sentence	Mean verb relatedness*
New	Unrelated	Elijah *rebuffed* Eric, and **Ron embraced Laura**.	1.8 / 7
	Related (Entailment)	Elizabeth *hugged* Eric, and **Ron embraced Laura**.	6.7 / 7
	Repeated	Oliver *embraced* Eric, and **Ron embraced Laura**.	N/A
Old	Unrelated	Andrea *rebuffed* Laura, and **Ron embraced Laura**.	1.8 / 7
	Related (Entailment)	Veronica *hugged* Laura, and **Ron embraced Laura**.	6.7 / 7
	Repeated	Christina *embraced* Laura, and **Ron embraced Laura**.	N/A

*From separate norming study

Items 7-12 - Bridging as inference relations

Object status	Verb status	Sentence	Mean verb relatedness
New	Unrelated	Matilda *offended* Griffin, and **Al seduced Noah**.	2.1 / 7
	Related (Bridging)	Maximilian *charmed* Griffin, and **Al seduced Noah**.	5.5 / 7
	Repeated	Marissa *seduced* Griffin, and **Al seduced Noah**.	N/A
Old	Unrelated	Madeline *offended* Noah, and **Al seduced Noah**.	2.1 / 7
	Related (Bridging)	Angelina *charmed* Noah, and **Al seduced Noah**.	5.5 / 7
	Repeated	Jocelyn *seduced* Noah, and **Al seduced Noah**.	N/A

Procedure

Participants view full carrier paragraph on screen (controlled by Psychopy)

Silently read entire paragraph and plan production

Each participant read all 12 items in all 6 conditions

Double-walled sound booth
Shure SM10A head-mounted mic
Zoom H4n recorder

Participants

10 native American English speakers from campus community

5 female, mean age 21.9

Cash or course credit

Results & analysis

Critical sentences forced aligned with FAVE

(Phone level boundaris determined using phonemic word representations
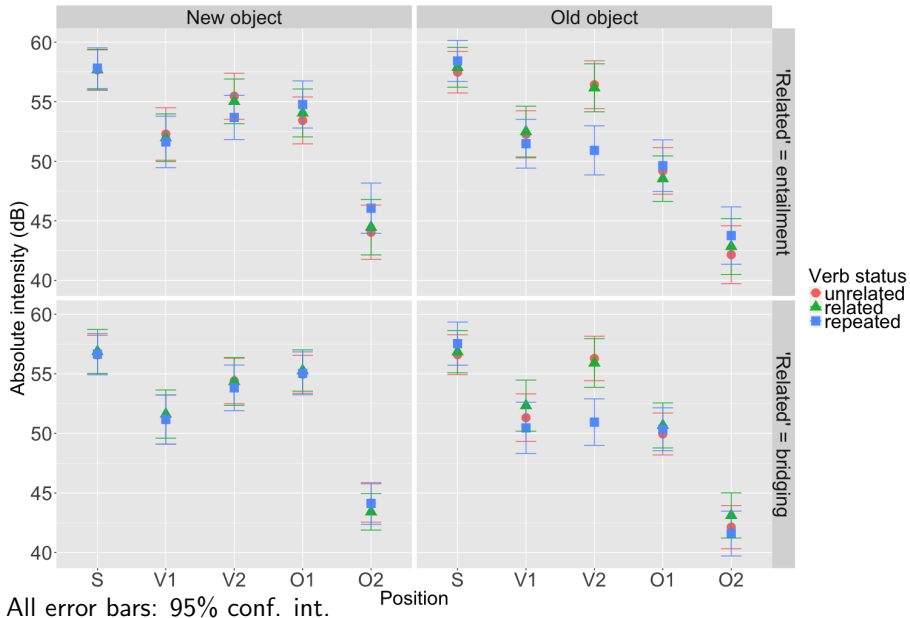from the HTK toolkit and CMU Am. Eng. Pronouncing Dictionary).

Results & analysis

Using ProsodyPro (Xu 2013), mean intensity, duration, and mean f_0
extracted for each second-clause nucleus
(cf. Sluijter & van Heuven 1996, Campbell & Beckman 1997, Turk &
White 1999)

Manual correction for creaky voice and other spurious values

Results - Mean intensity

All error bars: 95% conf. int.

Results

Results for duration and mean f_0 qualitatively similar

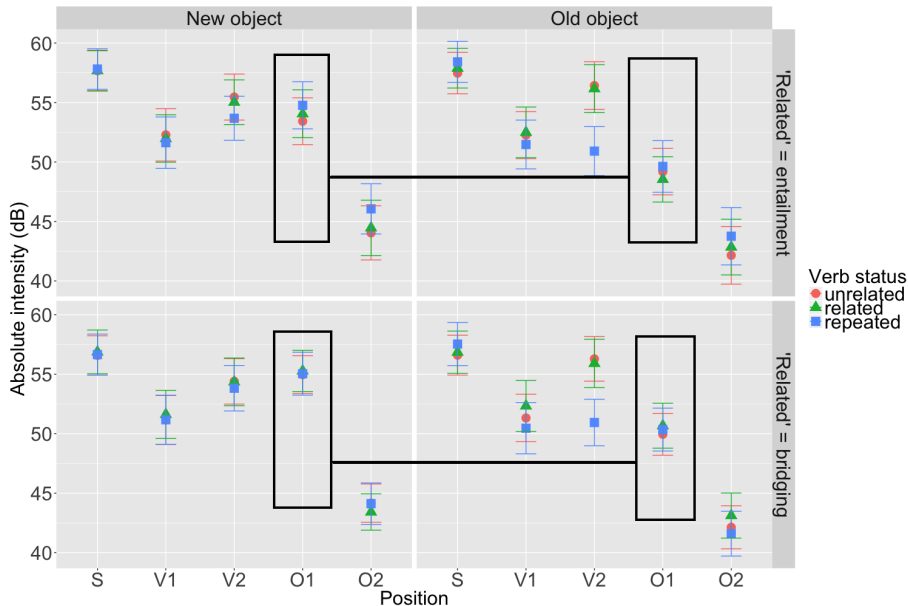(Plots available in discussion period)

Analysis - objects

Paradigm check:

Old objects should be less emphasized than new objects

Check for first object syllable (stressed syllable of object)

Analysis - objects

Analysis - objects

Linear mixed-effects regression:

Maximal interaction of verb status, object status, inferencing type

Random effects for participant and item

Analysis - objects

Mean intensity, duration, mean f_0:

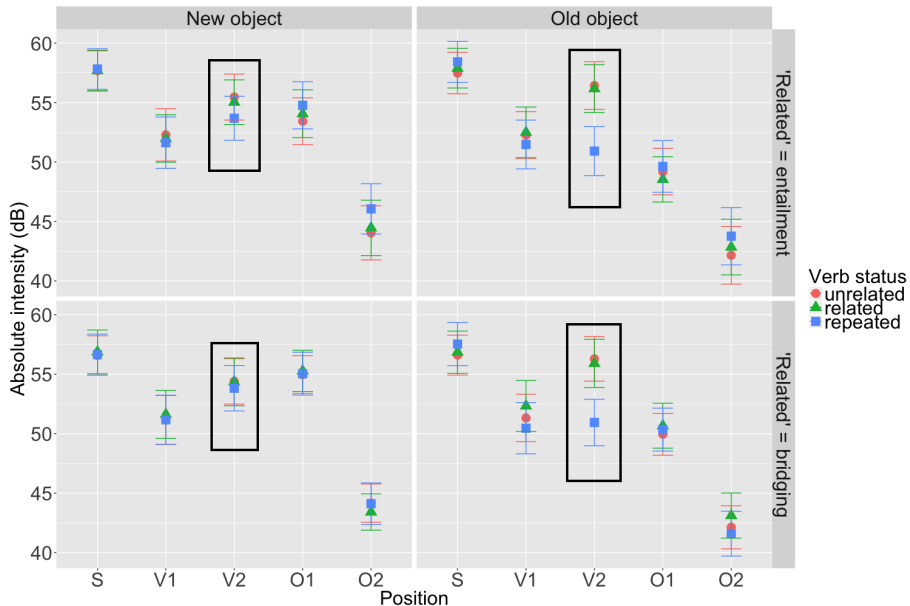Significant main effect of object status (all p's<.001)

As expected, phonetic values lower for old than new objects

Analysis - verbs

Is deaccenting licensed on inferable verbs?

Examine effect of verb status on second (stressed) verb syllable

Analysis - verbs

Analysis - verbs

Intensity

Significant interaction between verb status and object status (p<.001)

Paired comparisons:

	New objects		Old objects	
unrelated-related	n.s.	p>.8	n.s.	p>.7
unrelated-repeated	*	p<.05	***	p<.001
related-repeated	n.s.	p<.1	***	p<.001

Analysis - verbs

Duration

Significant interaction between verb status and object status ($p<.05$)

Paired comparisons:

	New objects		Old objects	
unrelated-related	n.s.	p>.9	n.s.	p>.7
unrelated-repeated	**	p<.01	***	p<.001
related-repeated	**	p<.01	***	p<.001

Analysis - verbs

Mean f_0

Significant interaction between verb status and object status ($p<.001$)

Paired comparisons:

	New objects		Old objects	
unrelated-related	n.s.	$p>.8$	n.s.	$p>.1$
unrelated-repeated	n.s.	$p>.1$	***	$p<.001$
related-repeated	*	$p<.05$	***	$p<.001$

Experiment 1 - Summary

All three phonetic variables showed reliable deemphasis of old objects compared to new objects.

$\longrightarrow$ Paradigm is sensitive to emphasis.

Experiment 1 - Summary

With an old object, phonetic values are lower for repeated verbs than for unrelated or related verbs

Values for unrelated and related verbs are not reliably different

For new objects, similar trends, but less robust

(V1 and O2 were also analyzed and the results are qualitatively similar)

Potential issue 1

Analysis above is based on raw phonetic values

But phonetic values relativized by speaker or by sentence might be more appropriate for characterizing emphasis

Potential issue 1

Reanalysis by:

z-transformed values by speaker
Values relativized to carrier sentence
Values relativized to second-clause subject

No qualitative change to findings

Sample plots and discussion available in discussion period

Potenial issue 2

These phonetic correlates do not sufficiently capture the emphasis status of the constituents

Alternately, emphasis is perceived categorically, and phonetic values do not map straightforwardly to perceptions of emphasis

Experiment 2 - Perception of Experiment 1 productions

Do naive speakers perceive the verbs and objects from Experiment 1 to be accented or deaccented?

Design & stimuli

Stimuli: Second-clause SVO recordings from Experiment 1

Clipped after *"and"* to isolate second clause from conditioning environment

Design & stimuli

Design from Experiment 1 is maintained (verb status, object status, inference type)

But, constituents that condition relationship are hidden from participants

Procedure

Experiment conducted using Ibex Farm with participants recruited on
Amazon Mechanical Turk

Procedure

The sentence you will hear is:

Al seduced Noah.

Pay attention to the word:

Noah

Press any key to hear the sentence.

Procedure

In this sentence, was the word *Noah* emphasized or not emphasized?

1. emphasized

2. not emphasized

Procedure

Each participant rated 18 constituents

Rotated through experimental conditions, items, and voice of speaker
(Experiment 1 participant)
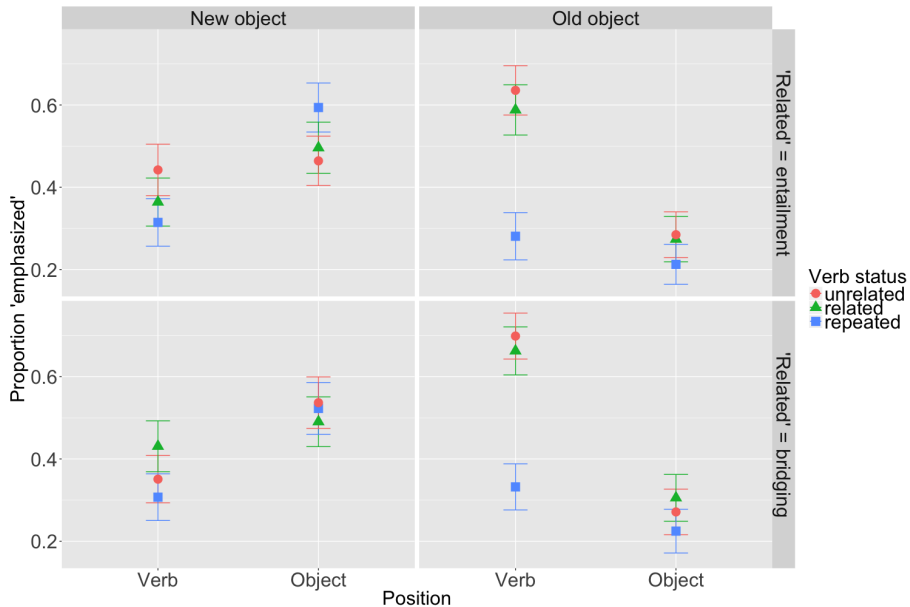
Participants

200 participants recruited on AMT

23 excluded from analysis for inattention or self reporting as non-native English speaker

Among analyzed participants: 62 female, mean age 34.3

Monetary compensation through AMT platform
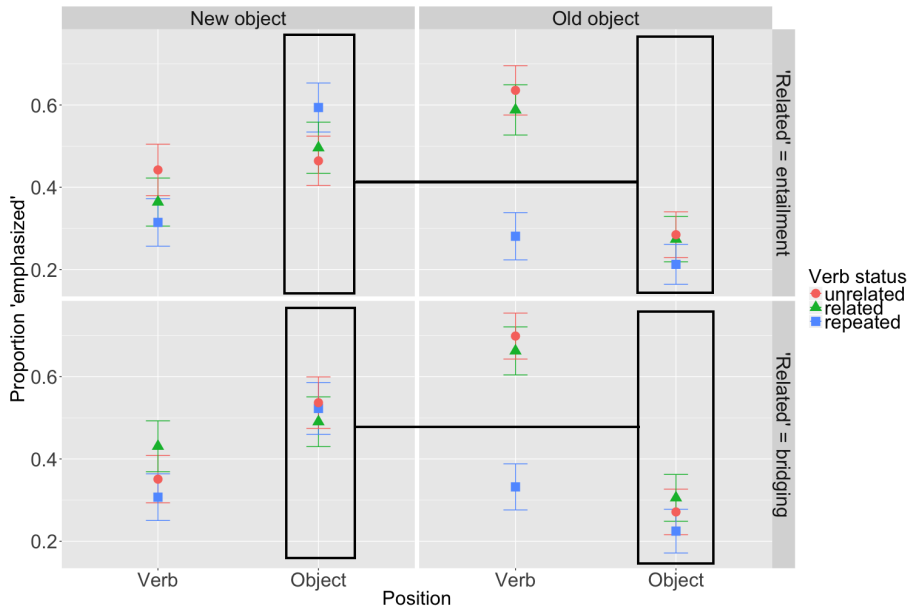
Results

Analysis

Logistic mixed-effects regression

emphasized response coded as success

Maximal interaction between verb status, object status, inferencing type

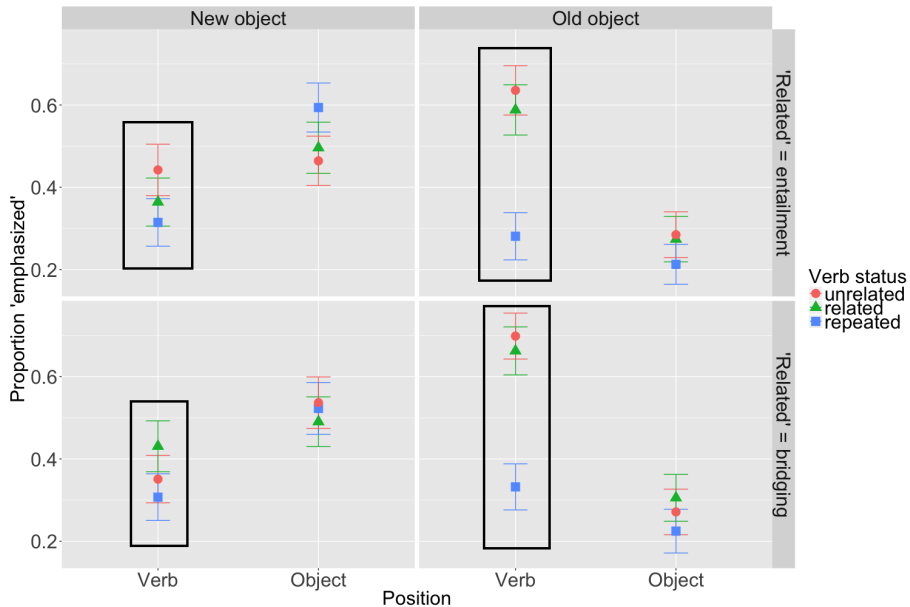Random effects for participant, item, Experiment 1 participant

Analysis

Analysis

Significant main effect of object type (p<.001)

Old objects are perceived as emphasized less often

Paradigm is sensitive to emphasis as expected

Analysis

Analysis

Significant interaction between verb status and object status ($p<.001$)

Paired comparisons:

	New objects		Old objects	
unrelated-related	n.s.	$p>.9$	n.s.	$p>.3$
unrelated-repeated	**	$p<.01$	***	$p<.001$
related-repeated	**	$p<.01$	***	$p<.001$

Experiment 2 - Summary

Experiment 2 was sensitive to emphasis - correctly identified old objects as deaccented relative to new objects

Naive listeners' categorization of constituents as emphasized or not emphasized closely tracked the phonetic variables

With an old object, unrelated and related verbs are perceived as more accented than repeated verbs.

Perception of emphasis for unrelated and related verbs was not reliably different.

Experiment 1 conclusions are supported

Potential issue 3

Experiments 1 and 2 suggest that speakers do not choose to deaccent inferable constituents

But, listeners may judge deaccented inferable constituents to be felicitous

Question: Is deaccenting of inferable constituents **optionally** licensed?

Experiment 3 - Perception of cross-spliced inferable verbs

(Work in progress!)

Experiment 1 provided second-clause verbs that were either canonically deaccented (repeated verbs) or canonically accented (unrelated verbs)

Experiment 3 available in discussion: Cross-spliced repeated-verb and unrelated-verb second-clause productions with each type of first clause (unrelated, related, repeated)

Conclusion

Both the phonetic analysis (Experiment 1) and the associated perception study (Experiment 2) reliably detected emphasis patterns

In production, repeated verbs are less emphasized than unrelated and related verbs (with an old object)

The emphasis of unrelated and related verbs was never reliably different

Conclusion

Preview: In the cross-splicing perception study (Experiment 3), listeners largely treated related verbs as discourse-new

No evidence that listeners found deaccenting of inferable constituents felicitous in old-object sentences

Conclusion

The results undermine the assumption that deaccenting can be licensed via inferencing relations rather than overt instantiation in the discourse context

Suggests reanalysis is necessary for accounts of deaccenting licensing that rely on entailment or other inferencing relations

Loose ends

General numeric trend toward lower emphasis on related verbs - marginal licensing?

Participants' awareness of inferencing relation - ecological validity

Possible different phonetic/phonological realization of deaccenting under inference
(e.g., "canonically" deaccented constituents in Experiment 3 were judged as infelicitous because they were not the "normal" type of deaccenting under inference)

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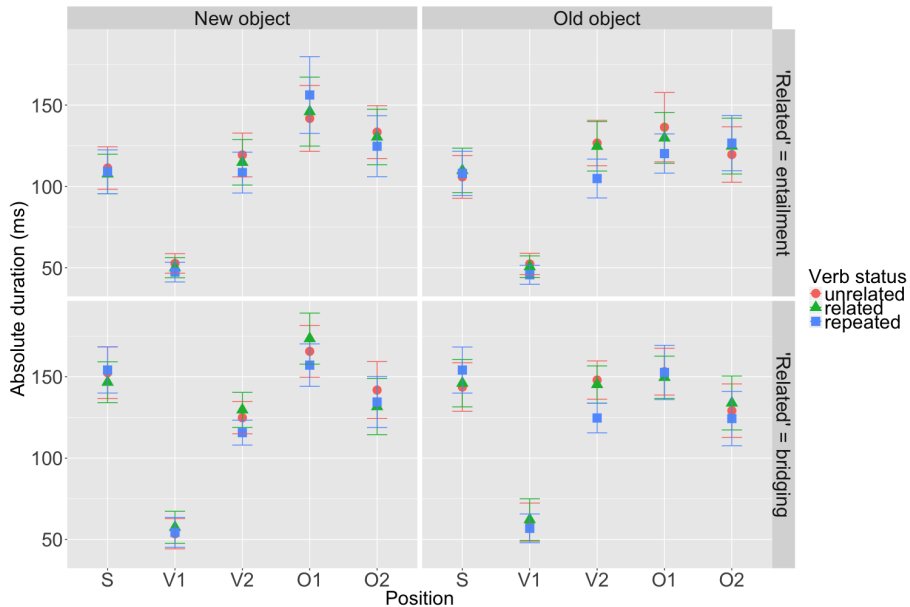
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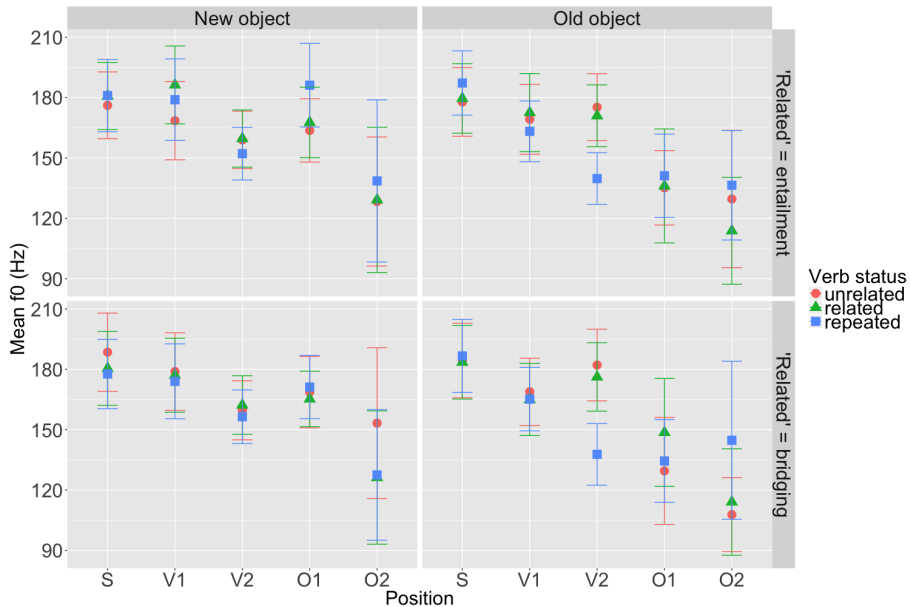
Young, S. J. (1994). *The HTK Hidden Markov Model Toolkit: Design and philosophy*. Entropic Cambridge Research Laboratory, Ltd.
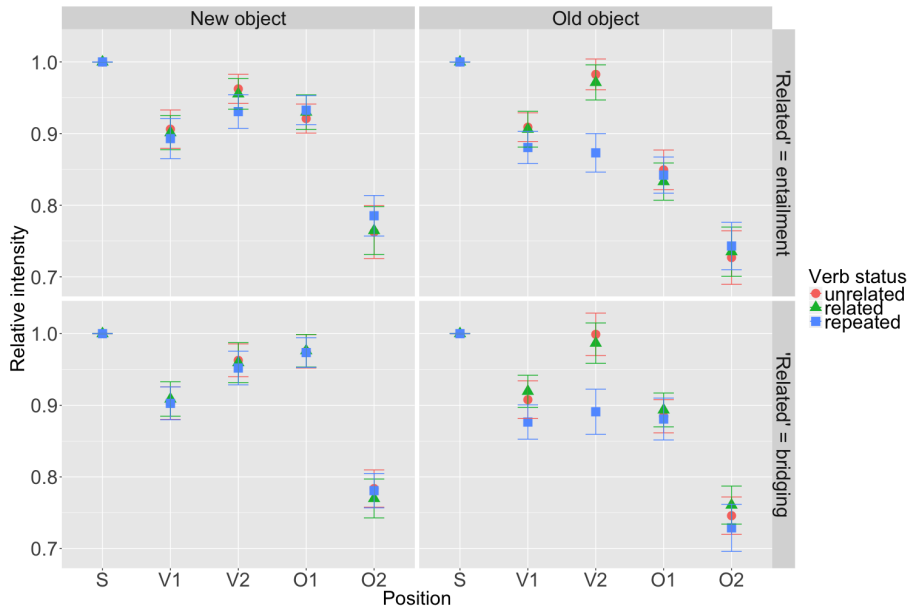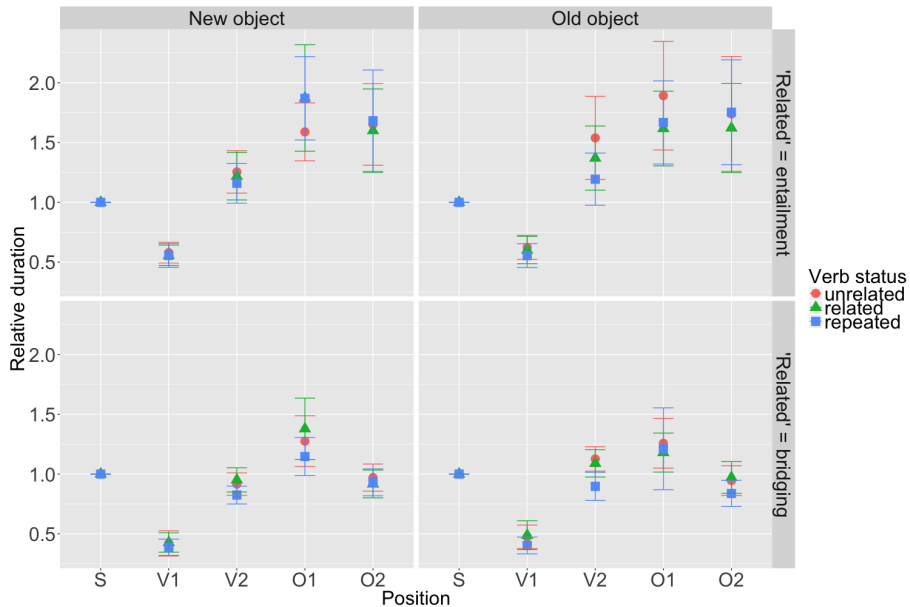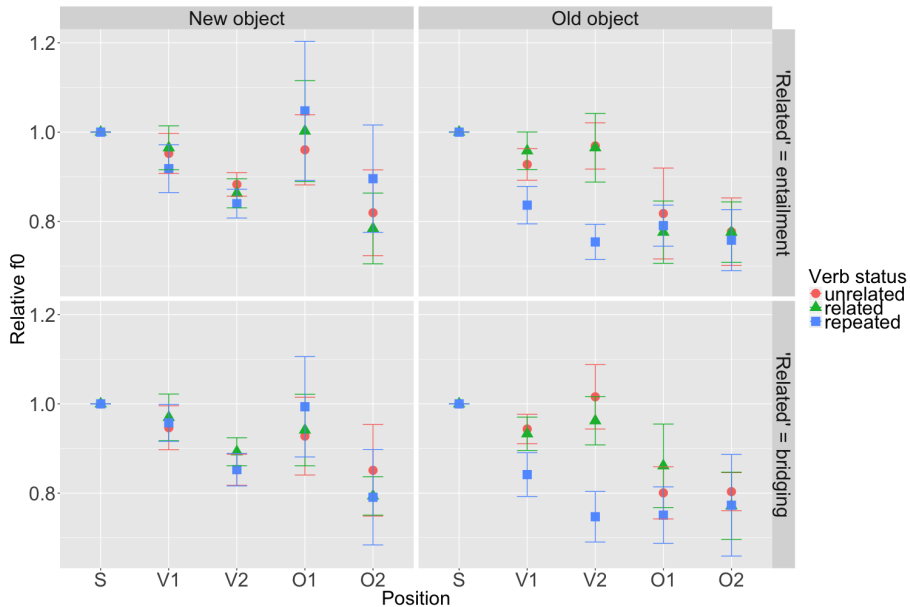
Duration

Mean f$_0$

Relative intensity

Relative duration

Relative f₀

Experiment 2 analysis - entailment/bridging items split

Significant three-way interaction: verb status, object status, inferencing type ($p < .05$)

Paired comparisons for new objects only:

	Entailment items		Bridging items	
unrelated-related	n.s.	$p > .1$	n.s.	$p > .1$
unrelated-repeated	**	$p < .01$	n.s.	$p > .2$
related-repeated	n.s.	$p > .3$	***	$p < .001$

Experiment 3 - Perception of cross-spliced inferable verbs

Felicitous
Accented unrelated (discourse-new) verbs
Deaccented repeated (discourse-old) verbs

Infelicitous
Deaccented unrelated (discourse-new) verbs
Accented repeated (discourse-old) verbs

Do related (inferable) verbs behave like unrelated or repeated verbs?

Design and stimuli

Verb status	Accent status	Sentence
Unrelated	Accented	Andrea rebuffed Laura, and Ron embraced Laura.
	Deaccented	Andrea rebuffed Laura, and Ron embraced Laura.
Related	Accented	Veronica hugged Laura, and Ron embraced Laura.
	Deaccented	Veronica hugged Laura, and Ron embraced Laura.
Repeated	Accented	Christina embraced Laura, and Ron embraced Laura.
	Deaccented	Christina embraced Laura, and Ron embraced Laura.

Same design for new objects, bridging items

Design & stimuli

Expanded stimulus set: 24 entailment items and 24 bridging items

Two Experiment 1 participants (one female, one male) returned to record extra stimuli using Experiment 1 design

Procedure

Experiment run on Ibex Farm, recruitment via AMT

Procedure

The sentence you will hear is:

Adrian refused Ezra, and Neil admired Ryan.

Press any key to hear the sentence.

Procedure

On a scale from 1 to 7, where 1 is the least natural and 7 is the most natural,
how natural did you find the "melody" or "tune" of this sentence?

Less natural | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | *More natural*

Procedure

Each participant rated 24 sentences

Rotated through speaker, item, condition

Participants

144 participants recruited via AMT

1 self-reported non-native English speaker excluded

67 female, mean age 36.7
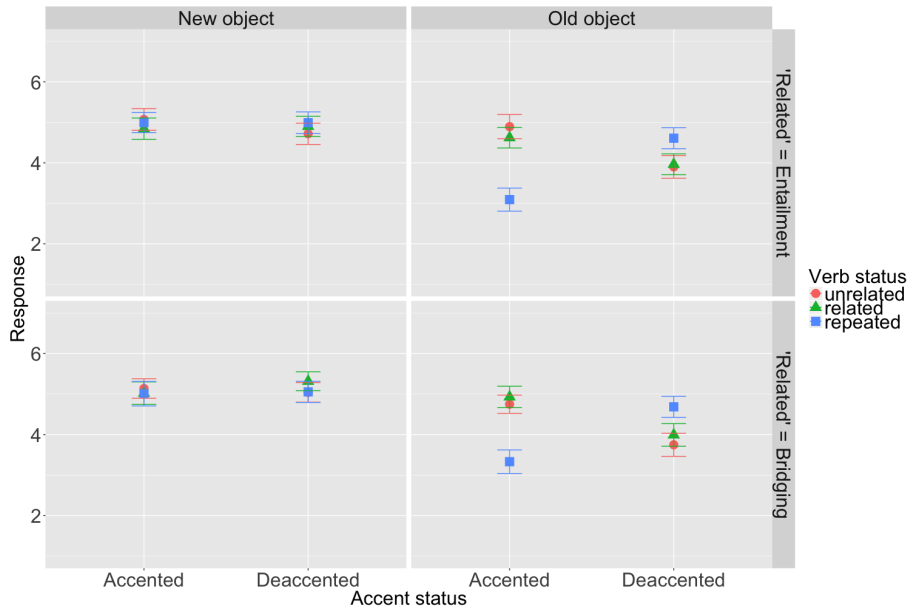
Monetary compensation via AMT

Pre-processing

First-pass attention screening:

Remove trials with RT less than typical sound file length (3500 ms)

401 of 3456 $= 11.6\%$ of trials excluded

Results

Analysis

Linear mixed effects regression model

Maximal interaction of verb status, object status, accent status on verb

Random effects for participant, item, speaker

Analysis

Significant three-way interaction of verb status, object status, verb accent

Paired comparisons by object status and verb accent:

For new-object sentences, all effects of verb status n.s. (p's >.1)

For old-object sentences:

	Accented verb	Deaccented verb
unrelated-related	n.s. p>.9	n.s. p>.4
unrelated-repeated	*** p<.001	*** p<.001
related-repeated	*** p<.001	*** p<.001

Experiment 3 - Summary

As in previous experiments, repeated verbs reliably patterned differently from unrelated and related verbs in the presence of an old object

Related verbs never reliably patterned differently from unrelated verbs

Participants generally found accenting of inferable verbs to be felicitous, and deaccenting of inferable constituents to be infelicitous (in the sentence types where there are infelicitous accent types)

No evidence that deaccenting is licensed when a constituent is inferable from prior discourse