Whenever the psycholinguist checks, prosodic phrasing and verb bias interact

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Background

- **Kjelgaard & Speer (1999)**
  - Boundary location determined initial structure of closure ambiguity in cross-modal naming
    - Whenever the lady checks the room **]** IT'S < IS
    - Whenever the lady checks **]** the room IS < IT'S
  - Same effect for intonation boundaries (IP) and intermediate boundaries (ip)
    [[... $]_{ip}$[... $]_{ip}]_{IP}$
  - Verbs as a set were **equi-biased** (i.e., few were strongly biased toward late or early closure)
- **Garnsey, Pearlmutter, Myers, & Lotocky (1997)**
  - Plausibility determined initial structure for equi-bias verbs in eye tracking (i.e., reading)
    - The sales clerk acknowledged the shirt should have been marked down.
    - The sales clerk acknowledged the error should have been detected earlier. ***GP Condition***
  - In contrast, plausibility had little effect on biased verbs

Research Question

Do prosodic boundaries (IPs & ips) determine initial closure structure for all verb bias conditions?

Experimental Variables

- **Verb Bias**: Three Sets (Connine et al. [1984] sentence completion data)
  LOADS the car {**IT'S**/is} packed full. **TRANSITIVE** (all prefer DO)
  Whenever the lady CHECKS the room {**IT'S/IS**} empty. **EQUI** (mixed, verbs = Kj & Sp, 1997)
  MOVES the door {it's/**IS**} easy to see. **INTRANSITIVE** (all prefer NO DO)
- **Location/Type of Prosodic Boundary**
  Whenever the lady loads $]_{ip}]_{IP}$ the car **EARLY (ip, IP)**
  Whenever the lady loads the car $]_{ip}]_{IP}$ **LATE (ip, IP)**
- **Plausibility of Ambiguous NP as Direct Object**
  Whenever the lady loads the car $_{plaus}$ /the sun $_{implaus}$

Method: Cross-Modal Naming

- Hear beginning of utterance, name visual target, use target to complete the sentence
  E1, E2: Analyzed RTs from late closure completions to IT'S, early closure completions to IS
  E3: Analyzed RTs from early closure completions to implausible NPs

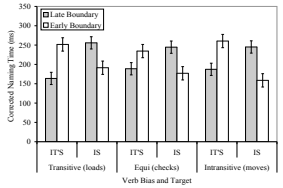
Predictions from Processing Accounts (NP plausible as DO)

- **Classic**
  - Garden path model (Frazier & Clifton, 1996), maximize arguments (Ferreira & McClure, 1997)
  - Build DO at ambiguous NP: IT'S < IS
  - Phrasing and verb bias influence reanalysis
- **Schafer (1997): Prosody First**
  - Prosodic Visibility: ips reduce visibility between incoming material and attachment sites
    - Late Boundary (V + NP are visible, build DO): IT'S < IS
    - Early Boundary (V and NP are less visible than NP and target): $IS_{\text{build SUBJ}} < IT'S_{\text{force DO}}$
  - Interpretive Domain Hypothesis: IPs wrap up any outstanding semantic/pragmatic processing
  - Verb bias influences reanalysis
- **Boland's (1997) Concurrent Model**
  - Syntax: Multiple representations weighted by verb bias & influenced by other constraints
  - Semantics: One representation
  - Blodgett (2004): Boundary location (i.e., prosody/syntax integration) influences weights
    - Late Boundary: IT'S < IS
    - Early Boundary Intransitive/Equi: IS < IT'S; EB Transitive: IT'S ≤ IS

Experiment 1: Intonation Phrases, Verb Bias, & Plausible NPs

Early Boundary H*]]$_{\text{L-H\%}}$ H*
Late Boundary H* H*]]$_{\text{L-H\%}}$
Whenever the noun Vs the noun

Visual Target: IT'S / IS



Correlations
(all verbs divided into Transitive or Intransitive)

LB Tran IS: slower RTs as more transitive
R^2=.37 p=.01

EB Tran IT'S: slower RTs as late boundary more acceptable in auditory norms
R^2=.28 p<.05

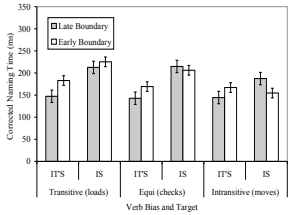
EB Tran IS: slower RTs as late boundary more acceptable in auditory norms
R^2=.21 p=.06

- IP location determines initial structure as in Kjelgaard & Speer (1997)
  - Late Boundary: IT'S < IS
  - Early Boundary: IS < IT'S
- Correlations support Schafer's (1997) Interpretive Domain Hypothesis
  - Reanalysis for Late Boundary IS: DO → SUBJ
    - Happens at naming for Transitive, but post-naming for Intransitive
    - Reanalysis hard when IP triggers commitment to subordinate meaning
  - No evidence of reanalysis for Early Boundary IT'S: SUBJ → DO
    - Transitive RTs *slower* as late boundary acceptability grows *stronger* (IT'S and IS)
      - IP triggers commitment to dominant semantic interpretation
      - IP triggers commitment to syntactic structure
    - Syntactic reanalysis: SUBJ → TOPIC (Whenever the lady loads, the van—it's...)
    - Transitive undergo semantic reanalysis: DO → NO DO

Experiment 2: Intermediate Phrases, Verb Bias, & Plausible NPs

Early Boundary H*]$_{\text{H-}}$ H*
Late Boundary H* H*]$_{\text{H-}}$
Whenever the noun Vs the noun

Visual Target: IT'S / IS



Correlations
(all verbs divided into Transitive or Intransitive)

LB Intran IS: slower RTs as less intransitive
R^2=.33 p<.05

EB Tran IS: slower RTs as more transitive
R^2=.18 p=.09

EB Intran IS: slower RTs as less intransitive
R^2=.16 p=.13 (R^2=.42 p=.01 w/o 2 strongest)

- Unlike Kjelgaard & Speer (1997), ip location does not determine initial structure
  - Late Boundary: IT'S < IS
  - Early Boundary Transitive, Equi: IT'S < IS; Early Boundary Intransitive: IT'S = IS
  - Reanalysis IS: DO → SUBJ
    - When Early Boundary: Happens at naming
    - When Late Boundary: Happens at naming for Intransitive, but post-naming for Transitive
    - Reanalysis hard when verb and boundary support DO
- Unlike Kjelgaard & Speer, current ip materials show late closure bias in visual norms and late boundary bias in auditory norms

Experiment 3: Boundaries, Verb Bias, & Plausibility

No Boundary H*
Intermediate Boundary H*]$_{\text{H-}}$
Intonation Boundary H*]]$_{\text{L-H\%}}$
Whenever the noun Vs

Visual Target: Plausible Direct Object / Implausible Direct Object

Proportion of Late Closure Completions

	Tran		Equi		Intran	
	Plaus	**Impl**	**Plaus**	**Impl**	**Plaus**	**Impl**
No Boundary	.87	.32	.81	.27	.82	.10
Intermediate	.75	.22	.66	.11	.48	.03
Intonation	.53	.12	.42	.04	.22	.03

- Boundary, verb bias, and plausibility all contribute to the ultimate structure and interpretation
- RTs: Able to compare across implausible target early closure completion
  - One effect in those RTs (not shown here): Intransitive No Boundary especially slow
    - Hard to build DO when verb intransitive and NP implausible as DO
    - Hard to reanalyze to SUBJ when No Boundary

Correlations: Implausible Targets, Early Closure Completions
(All verbs divided into Transitive or Intransitive)

		Verb Bias*	**NP acceptability as DO**	**NP...as SUBJ**
Tran	No Boundary	---- (N=8/17)	faster as more acceptable R^2=.21 p=.06	slower as more acceptable R^2=.19 p=.08
Tran	ip	faster as more transitive R^2=.28 p=.05 (N=14/17)	----	----
Intran	IP	faster as more intransitive R^2=.21 p=.07 (N=16/17)	----	----

*This measure excludes the items in each boundary condition that failed to elicit early closure completions.

- Transitive & No Boundary: Attempt to build DO
- Transitive & ip: Reduced Prosodic Visibility or Early Boundary reduces weight of DO structure
  - Transitivity bias mediates NP into DO structure
  - Reanalysis to SUBJ structure happens post-naming
- Intransitive & IP: Commitment to intransitive interpretation and structure
  - Intransitivity bias mediates NP into SUBJ structure
  - Able to project SUBJ structure when syntactic & semantic representations both NO DO
  - Intransitive verb, early boundary, IP, implausible NP: all add weight to SUBJ structure

Conclusions

- **Cross-Modal Naming = Sensitive to syntactic, prosodic, & semantic effects**
  - Initial Structure
  - Garden Path Effects, Prosody/Syntax Mismatch
  - Reanalysis
- **Results most consistent with following processing account**
  - Schafer (1997): phonological processor → input to syntactic & semantic processors
  - Schafer (1997): IPs trigger semantic/pragmatic wrap-up
  - Schafer (1997): ips influence syntactic integration

  - **Modifications**
  - Verb bias and boundary location influence availability of initial structure
    - Serial Structure: Prosodic Visibility – Parallel Structures: Boundaries support alternatives
    - Plausible NPs and late closure bias support DO structure and mask effects
  - IPs trigger commitment to syntactic structure