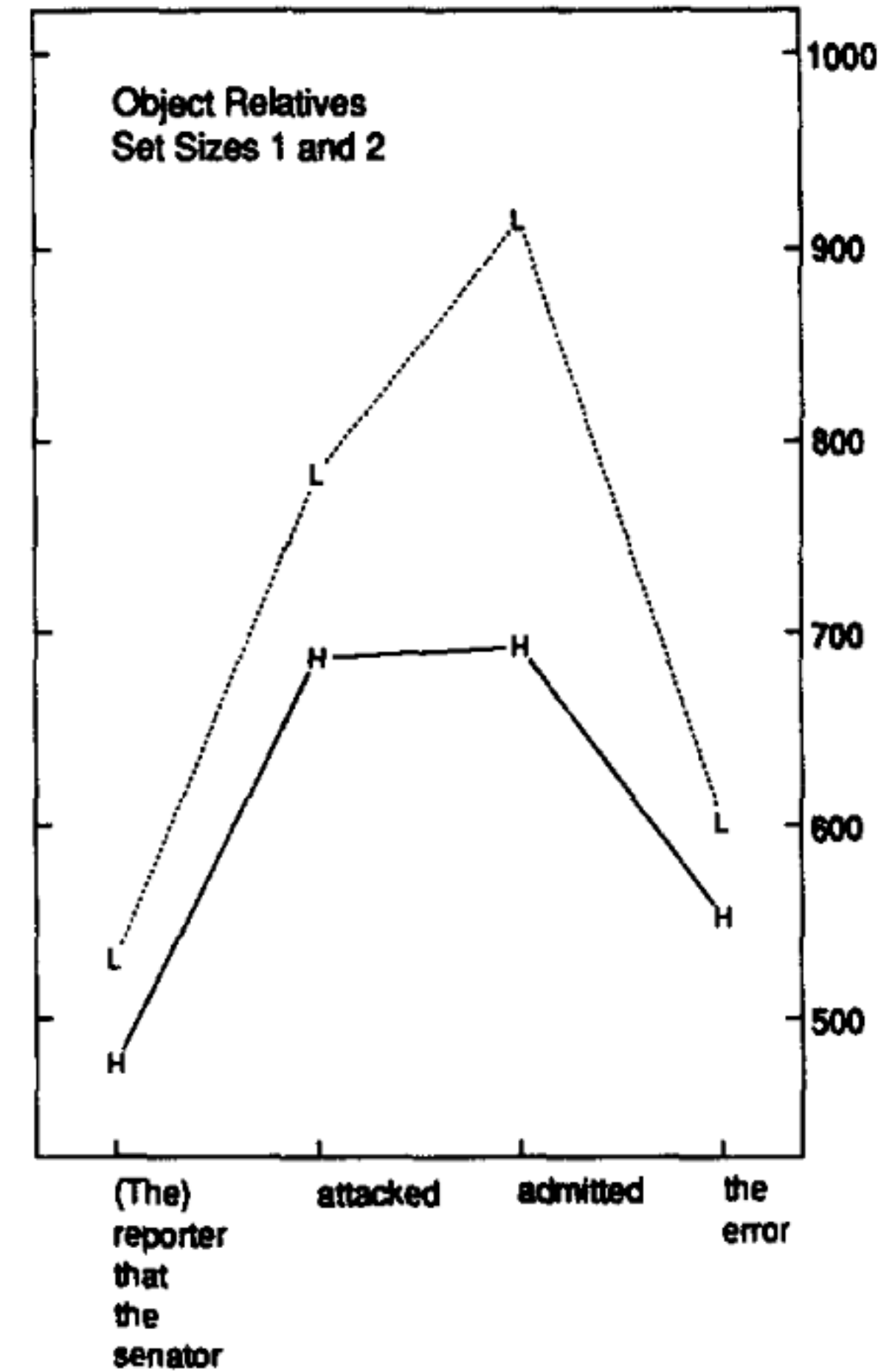
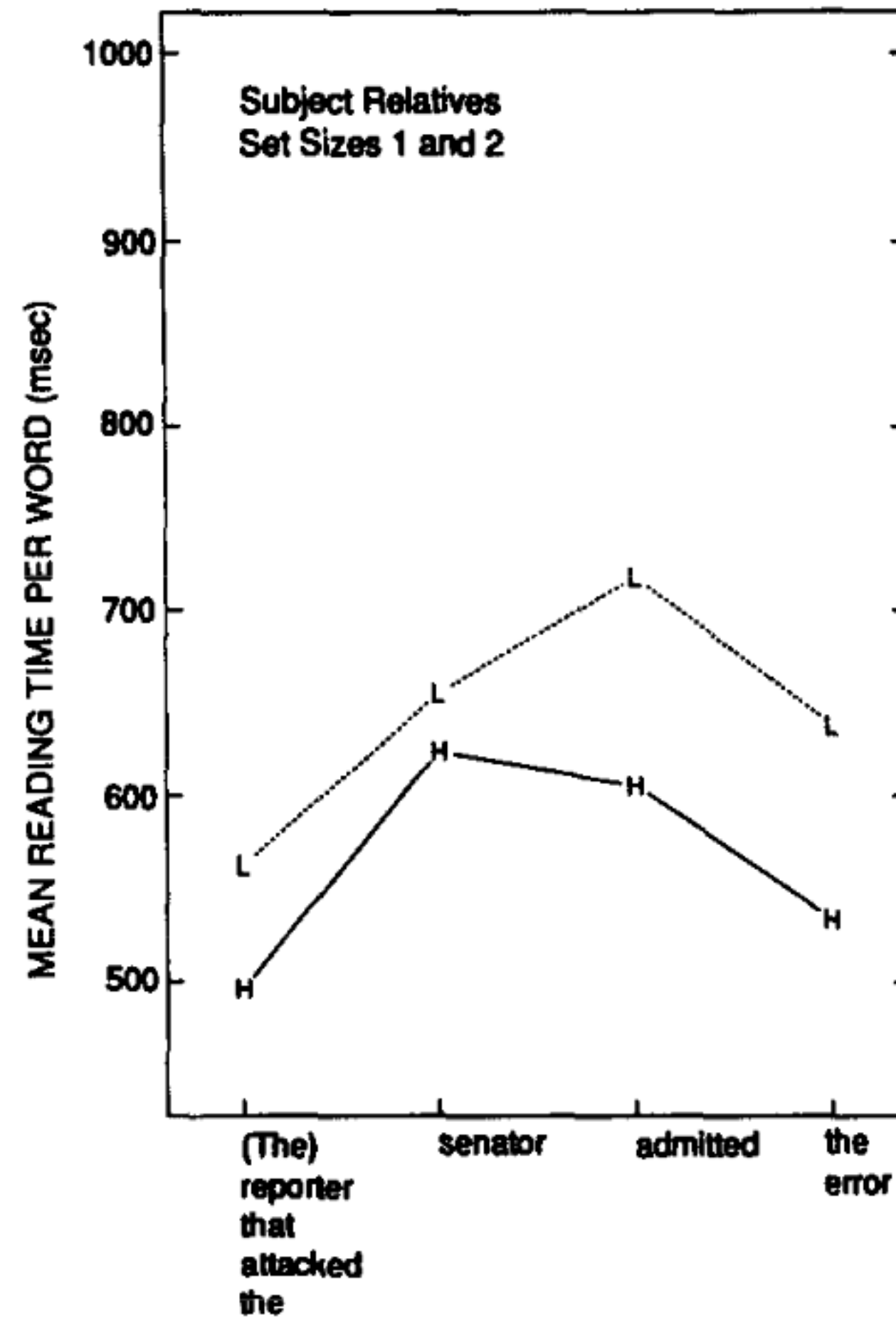
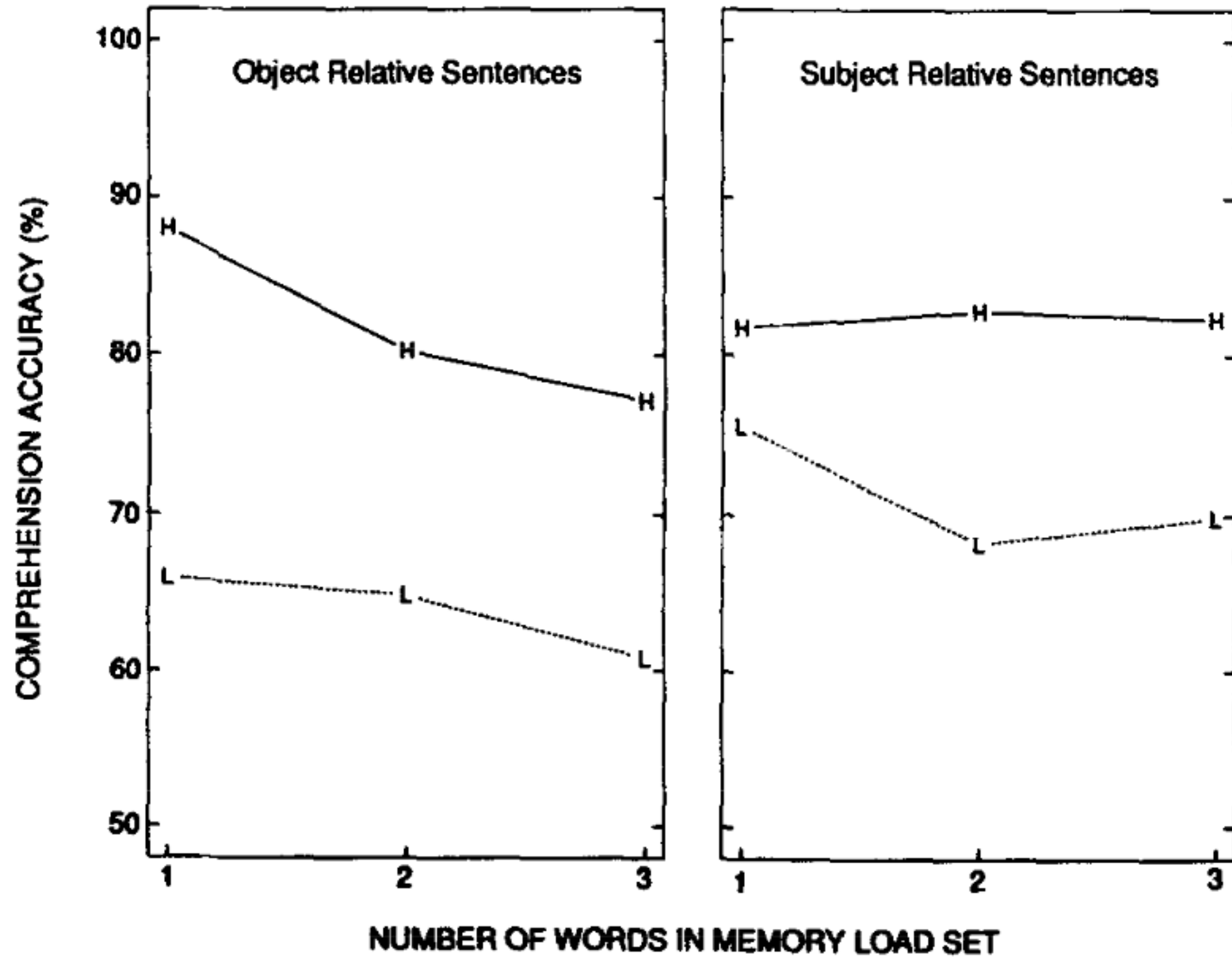


# King & Just 1991



# Ford 1983

MEAN REACTION TIMES IN MILLISECONDS FOR EACH WORD AS A  
FUNCTION OF SENTENCE STRUCTURE

Word	Subject relative	Object relative	d	K-S $F''$	$p$
Initial main clause noun	413	415	+2	<1	n.s.
Relative pronoun	357	357	0	<1	n.s.
Relative clause determiner	361	362	+1	<1	n.s.
Relative clause noun	438	437	-1	<1	n.s.
Relative clause verb	416	441	+25	6.21 ( $df = 1.36, 31.92$ )	<.05
Main clause verb	436	461	+25	4.21 ( $df = 1.39, 29.73$ )	<.05
Main clause determiner	374	389	+15	3.81 ( $df = 1.45, 35.87$ )	<.05
Final main clause noun	502	499	-3	<1	n.s.

# Grodner & Gibson 2005

Table 1  
Mean reading times (ms) at the same word suggest a preference of SRs at the embedded verb, as highlighted in bold (Grodner & Gibson, 2005, Table A1). The column follows the word order in ORs from left to right

Type	<i>who</i>	Det	Noun	RC Verb
SR	349.8	334.3	384.0	<b>354.8</b>
OR	343	348.1	357.6	<b>422.0</b>

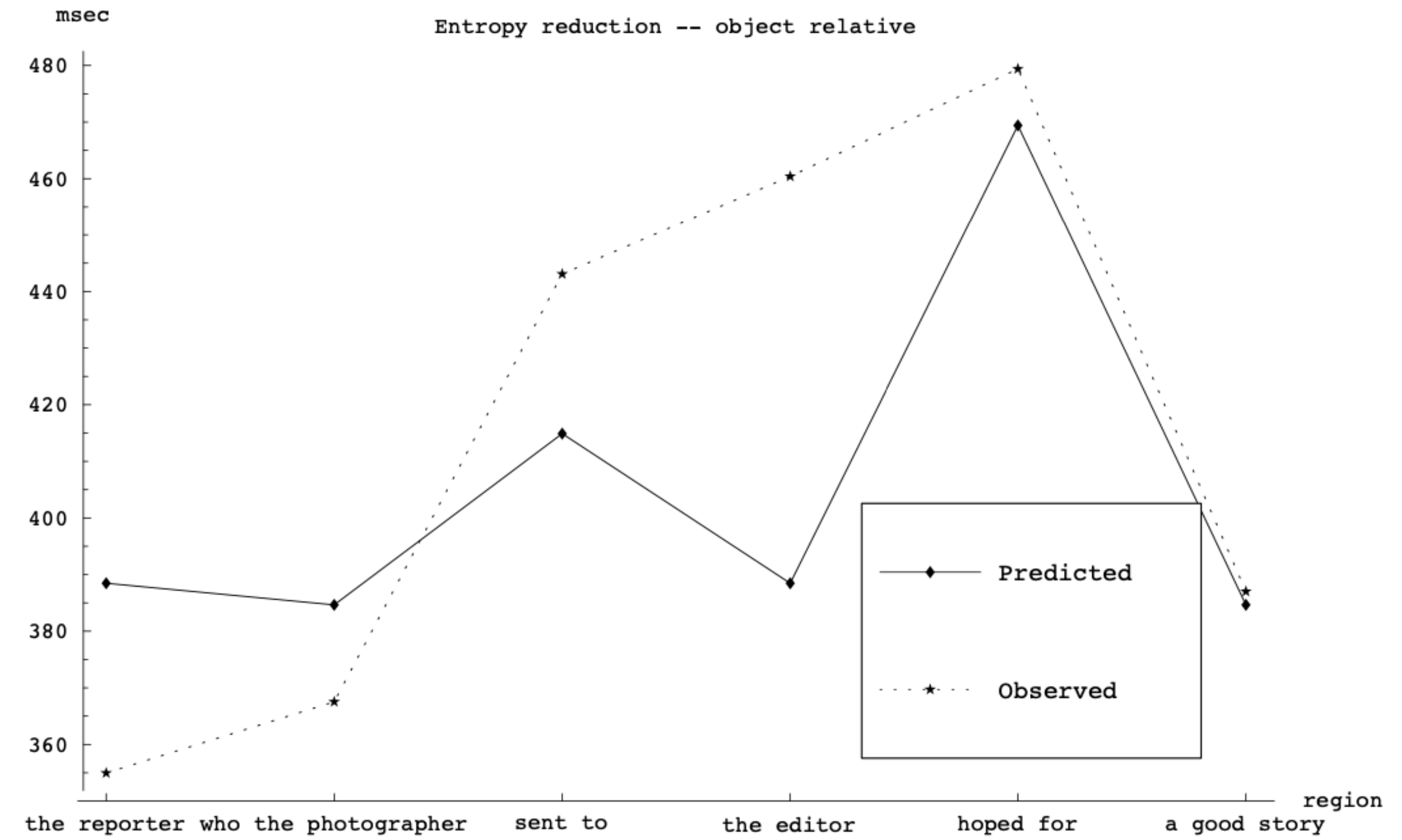
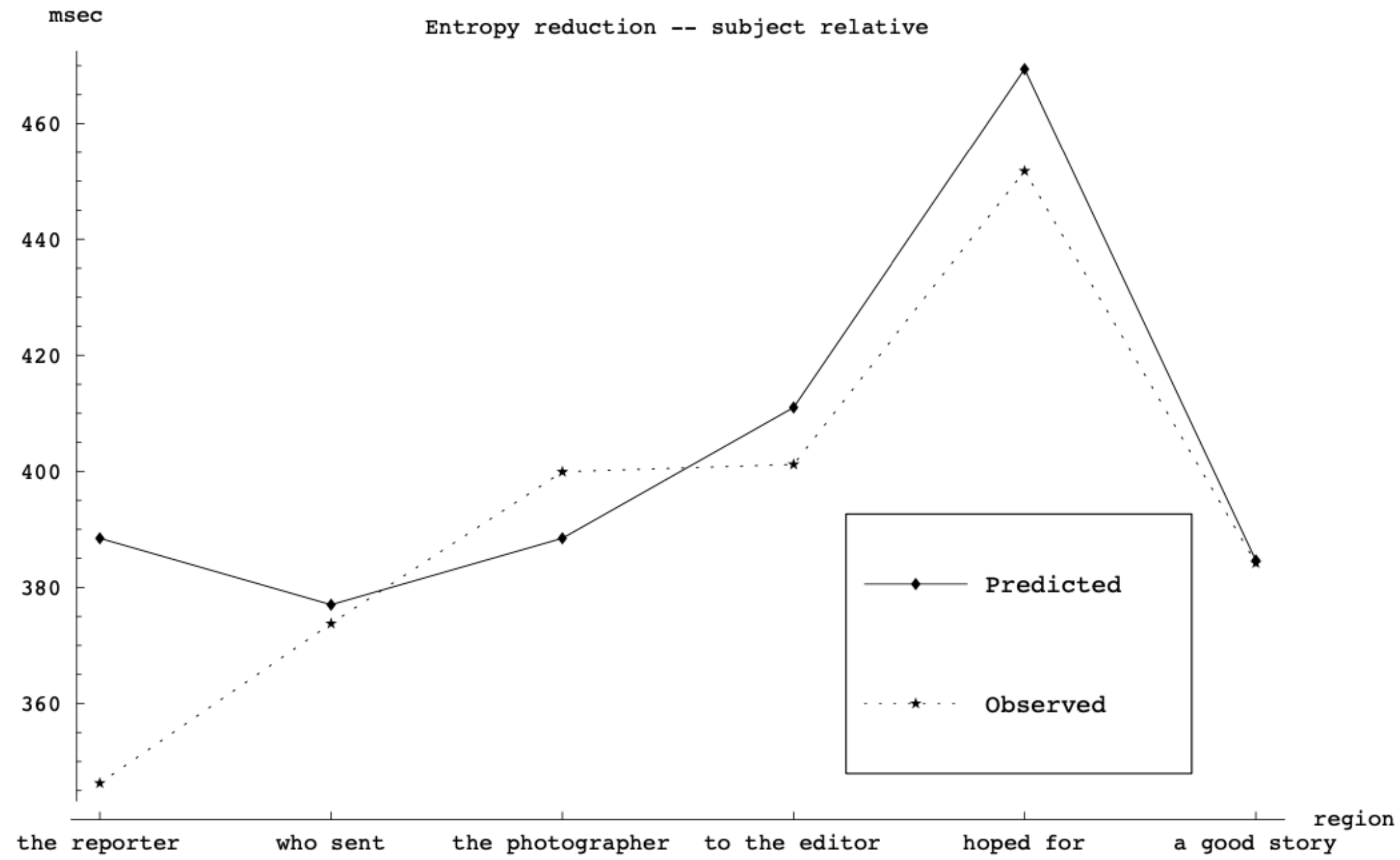
# Staub 2010

**Table 1**

Means (in ms) for reading time measures, and proportions for regressions and skipping measures, by condition, for each critical word of sentences in Experiment 1. Significant and marginal effects based on linear mixed effects models described in the text are identified ( $p < .01^{**}$ ;  $p < .05^*$ ;  $p < .10^{\wedge}$ ).

	Relative pro ( <i>that</i> )	Determiner ( <i>the</i> )	Noun ( <i>fireman</i> )	RC verb ( <i>noticed</i> )	Matrix verb ( <i>hurried</i> )
<i>First fixation duration</i>					
SRC	224	230	239	223	286
ORC	232	231	222	267	286
RC type effect	8	1	-17 <sup>**</sup>	44 <sup>**</sup>	0
<i>Gaze duration</i>					
SRC	237	239	316	270	357
ORC	250	249	266	318	346
RC type effect	13 <sup>^</sup>	10	-50 <sup>**</sup>	48 <sup>**</sup>	-11
<i>Go-past time</i>					
SRC	283	272	375	333	429
ORC	303	382	459	420	432
RC type effect	20	110 <sup>**</sup>	84 <sup>**</sup>	87 <sup>**</sup>	3
<i>p(regress)</i>					
SRC	0.12	0.12	0.16	0.17	0.11
ORC	0.11	0.36	0.40	0.15	0.11
RC type effect	-0.01	0.24 <sup>**</sup>	0.24 <sup>**</sup>	-0.02	0.00
<i>p(skip)</i>					
SRC	0.32	0.55	0.12	0.10	0.02
ORC	0.32	0.48	0.12	0.03	0.02
RC type effect	0	-0.07 <sup>^</sup>	0	-0.07 <sup>**</sup>	0

# Hale 2003



# Chen & Hale 2021

Surprisal and entropy reduction predict the reading difficulty at each word in RCs, with the loci of subject advantage highlighted in bold

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	Type	that	Det	Noun	RC verb
Surprisal	SR	4.54	<b>0.51</b>	0	0.84
	OR	4.54	<b>5.84</b>	0	0.14
Entropy Reduction	SR	0	<b>0.68</b>	0	<b>1.87</b>
	OR	0	<b>1.32</b>	0	<b>2.07</b>

---

# Chen & Hale 2021

The attestation counts and examples of relevant constructions in Penn Treebank 3. The underline in the RC examples marks the extraction site

Construction	Example	Count
SR	<i>the forces that <u>  </u> threatened her</i>	2,564
OR with relative pronoun	<i>the parts <b>which</b> he wrote <u>  </u></i>	377
OR without relative pronoun	<i>the teenagers I interviewed <u>  </u></i>	1,202
NP extracted from PP	<i>the life they believe in <u>  </u></i>	123
NP with RC modifier	<i>the data <b>we seek</b> <u>  </u></i>	6,869
NP without RC modifier	<i>the data</i>	94,216
pronoun as subject	<i><b>they</b> miss the hot cereal</i>	27,801
NP as subject	<i><b>the method</b> changed</i>	13,639
pronoun as object	<i>he chose <b>me</b></i>	2,954
NP as object	<i>he got <b>the approval</b></i>	7,347
pronoun as embedded subject	<i>the designation <b>she</b> liked <u>  </u></i>	643
NP as embedded subject	<i>the product which <b>the SEC</b> approved <u>  </u></i>	117
OR with transitive verb	<i>the teenagers I <b>interviewed</b> <u>  </u></i>	837
OR with ditransitive verb	<i>a set I <b>gave</b> <u>  </u> to the Salvation Army</i>	91
PP adjunct to intransitive verb	<i>it all began <b>on an autumn afternoon</b></i>	8,129
PP adjunct to transitive verb	<i>Charlie ate some supper <b>in the kitchen</b></i>	7,490
PP complement	<i>it may refer <b>to a specific person</b></i>	2,946



# Chen & Hale 2021

Prob	Remainder
0.217	<i>Det Noun that Det Noun Vt Vt Det Noun</i>
0.094	<i>Det Noun that Det Noun Vt Vt Pronoun</i>
0.077	<i>Det Noun that Det Noun Vt Vi Prep Det Noun</i>
0.058	<i>Det Noun that Det Noun Vt Vi</i>
0.032	<i>Det Noun that Det Noun Vt Vt Det Noun Prep Det Noun</i>
0.029	<i>Det Noun that Det Noun <b>Vph Prep Vt Det Noun</b></i>
0.025	<i>Det Noun that Det Noun Vt Vph Prep Det Noun</i>
0.024	<i>Det Noun that Det Noun <b>Vdi Prep Det Noun Vt Det Noun</b></i>
0.016	<i>Det Noun that Det Noun Vt Prep Det Noun Vt Det Noun</i>
0.010	<i>Det Noun that Det Noun Vt Vdi Pronoun Prep Det Noun</i>
...	...
entropy = 6.287	

ER=2.07

Prob	Remainder
0.320	<i>Det Noun that Det Noun Vt Vt Det Noun</i>
0.138	<i>Det Noun that Det Noun Vt Vt Pronoun</i>
0.114	<i>Det Noun that Det Noun Vt Vi Prep Det Noun</i>
0.085	<i>Det Noun that Det Noun Vt Vi</i>
0.048	<i>Det Noun that Det Noun Vt Vt Det Noun Prep Det Noun</i>
0.037	<i>Det Noun that Det Noun Vt Vph Prep Det Noun</i>
0.024	<i>Det Noun that Det Noun Vt Prep Det Noun Vt Det Noun</i>
0.021	<i>Det Noun that Det Noun Vt Vdi Pronoun Prep Det Noun</i>
0.021	<i>Det Noun that Det Noun Vt Vt Pronoun Prep Det Noun</i>
0.017	<i>Det Noun that Det Noun Vt Vi Prep Det Noun Prep Det Noun</i>
...	...
entropy = 4.213	



# Yun et al 2013

## (1) Chinese

### a. SRC

[ $e_i$  shushi furen de] (jingli $_i$ )  
knows tycoon DE manager/someone

‘the manager/someone who knows the tycoon’

### b. ORC

[furen shushi  $e_i$  de] (jingli $_i$ )  
tycoon knows DE manager/someone

‘the manager/someone who the tycoon knows’

## (3) Korean

### a. SRC

[ $e_i$  uywon ul pinanhan] kica $_i$   
senator Acc criticize.Adn reporter

‘the reporter who criticized the senator’

### b. ORC

[uywon i  $e_i$  pinanhan] kica $_i$   
senator Nom criticize.Adn reporter

‘the reporter who the senator criticized’

# Yun et al 2013

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## Subject advantage

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C. Lin and Bever ([2006](#); [2007](#); [2011](#))

C. Lin ([2008](#); [submitted](#))

F. Wu ([2009](#))

F. Wu et al. ([2012](#))

Vasishth et al. ([2013](#))

Jäger et al. ([in press](#))

F. Wu and Kaiser ([submitted](#))

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## Object advantage

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F. Hsiao and Gibson ([2003](#))

B. Chen et al. ([2008](#))

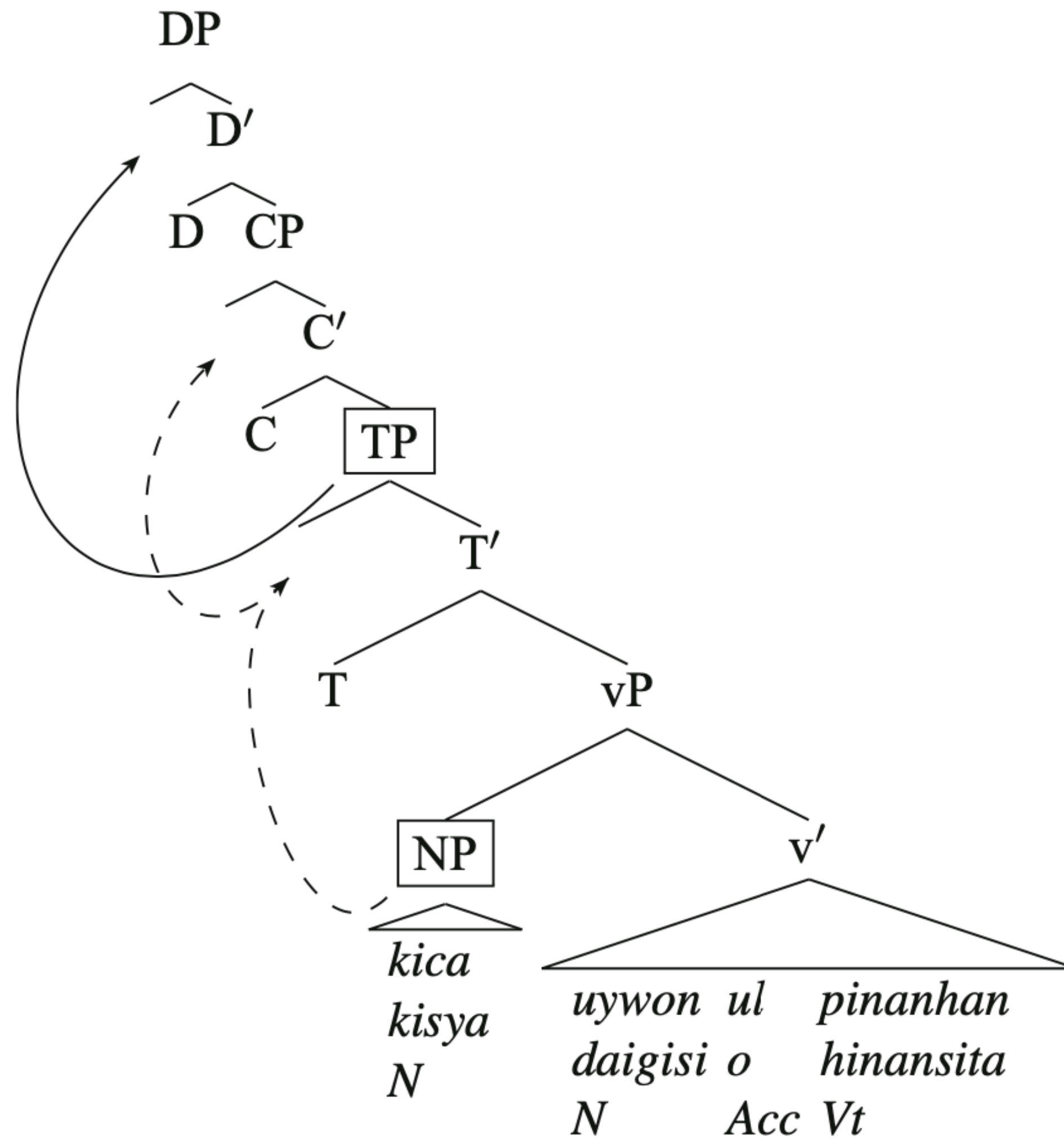
Y. Lin and Garnsey ([2011](#))

Packard et al. ([2011](#))

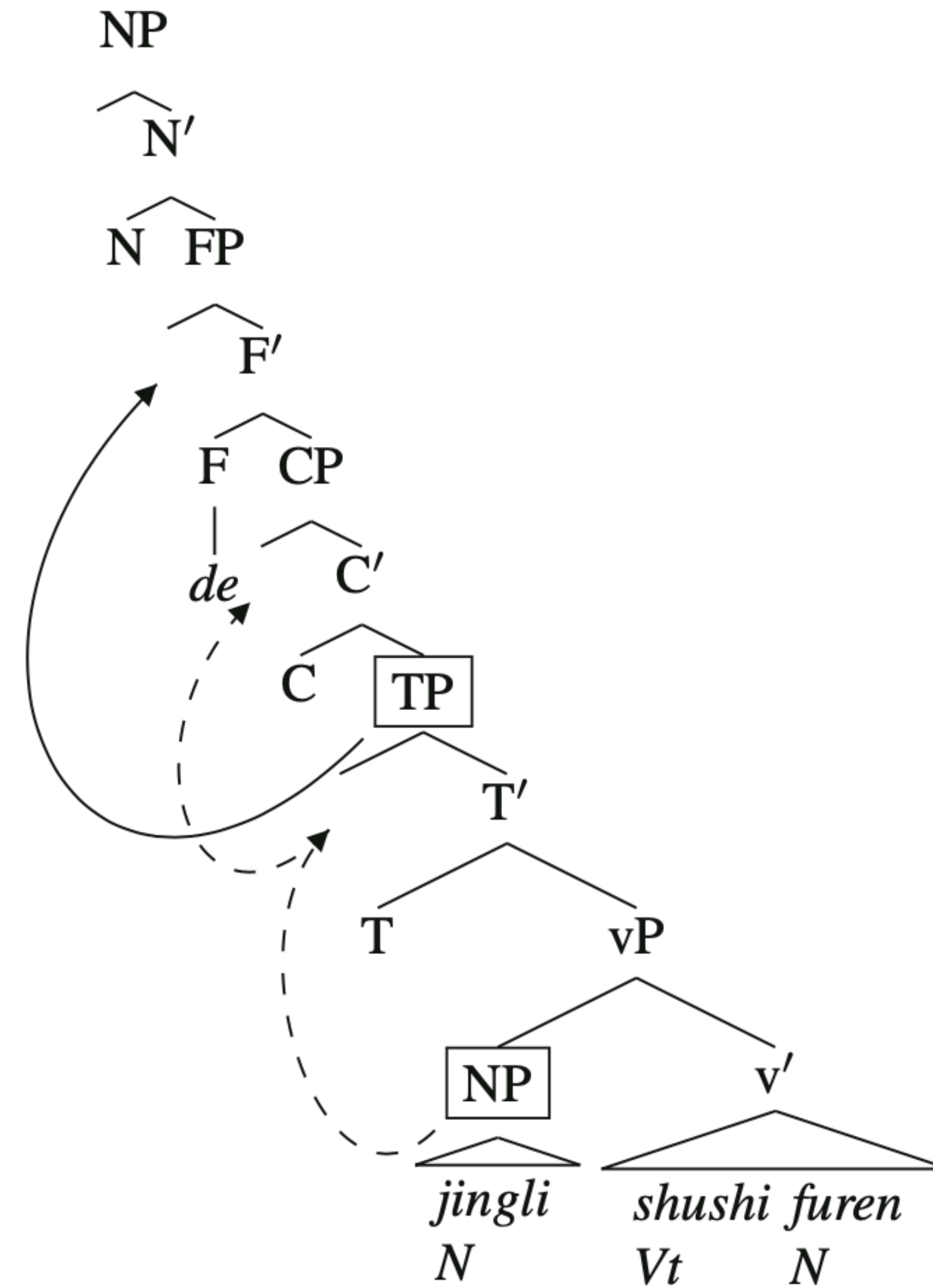
Qiao et al. ([2012](#))

Gibson and H. Wu ([2013](#))

# Yun et al 2013



(a) Korean and Japanese



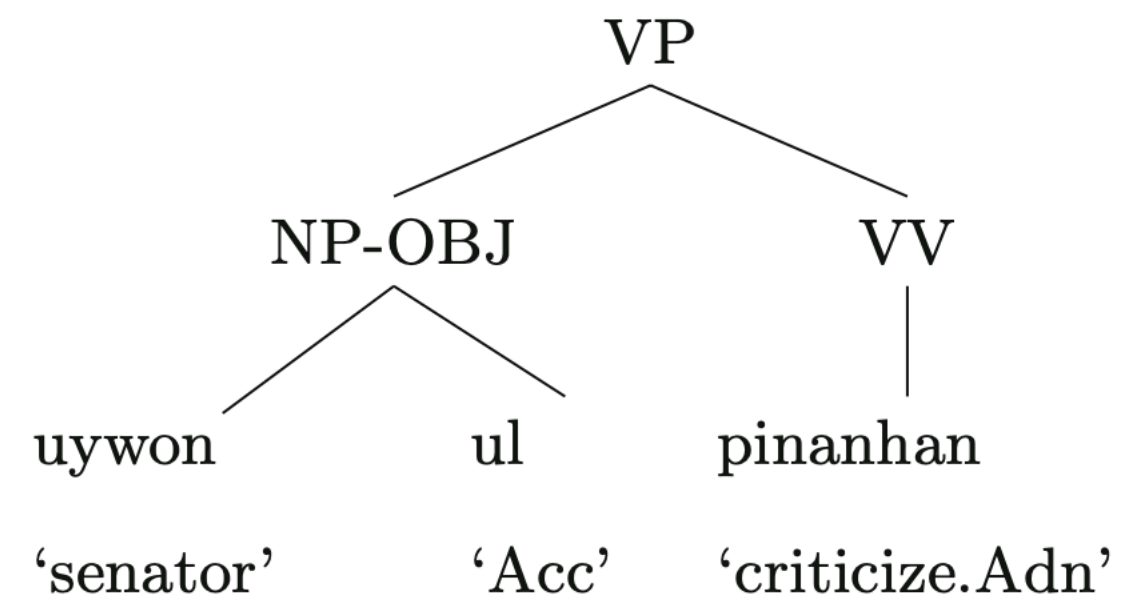
(b) Chinese

# Yun et al 2013

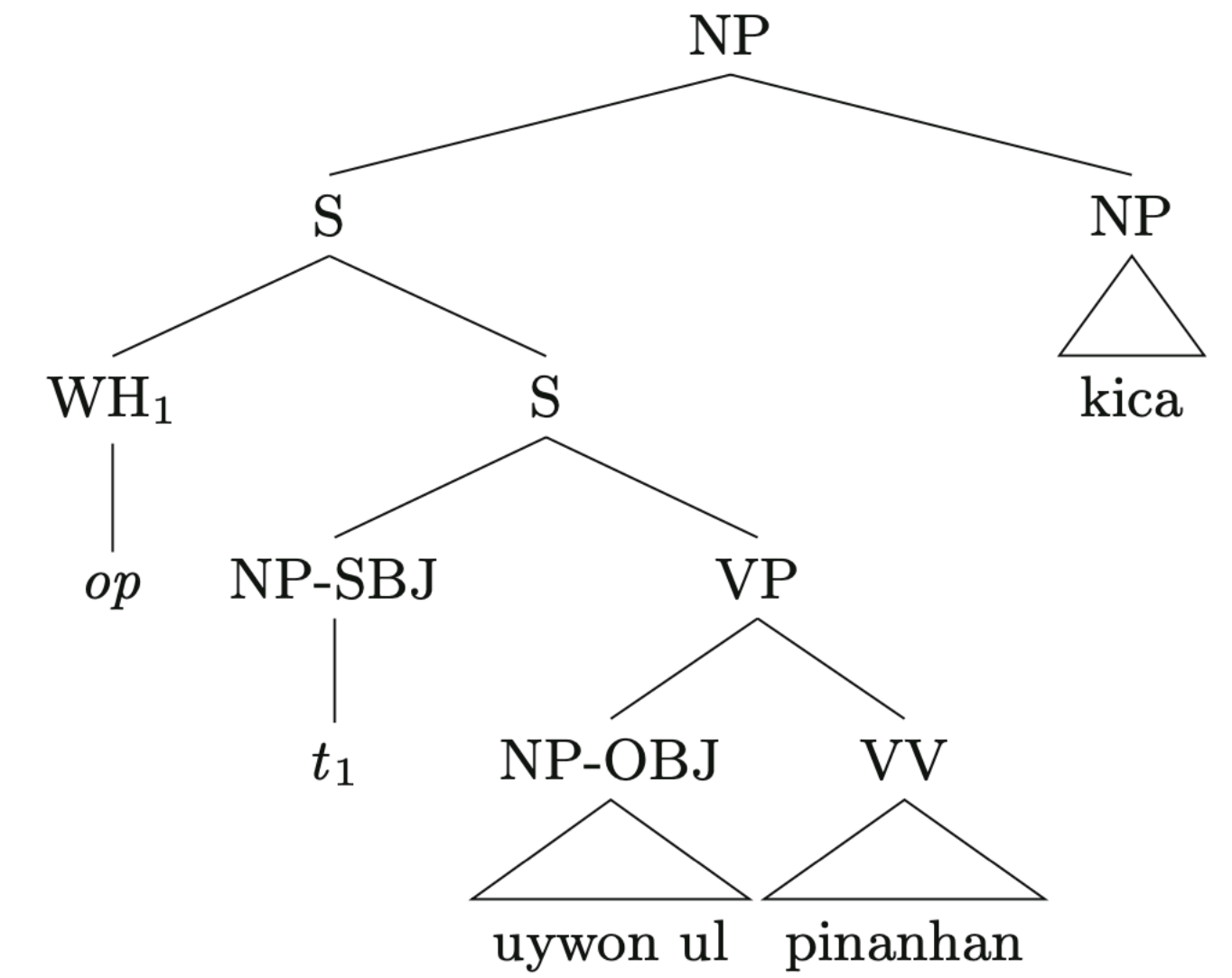
intransitive verb	1417
transitive verb	1038
<i>pro</i> in subject position	594
non- <i>pro</i> noun phrase in subject position	961
<i>pro</i> in object position	23
non- <i>pro</i> noun phrase in object position	1015
subject relative clause	1030
object relative clause	130
relative clause	1160
complement clause	902
noun phrase with complement clause or relative clause	2062
noun phrase consisting of only a simple noun	1976

# Yun et al 2013

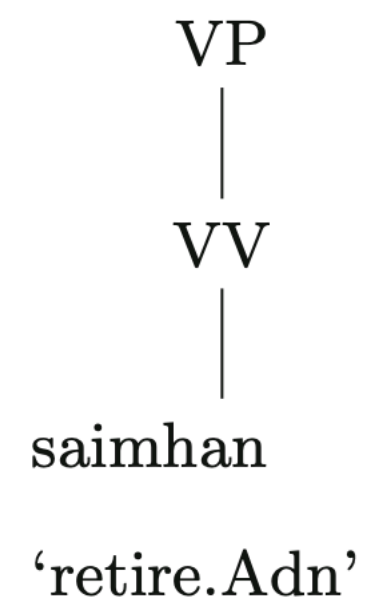
transitive configuration



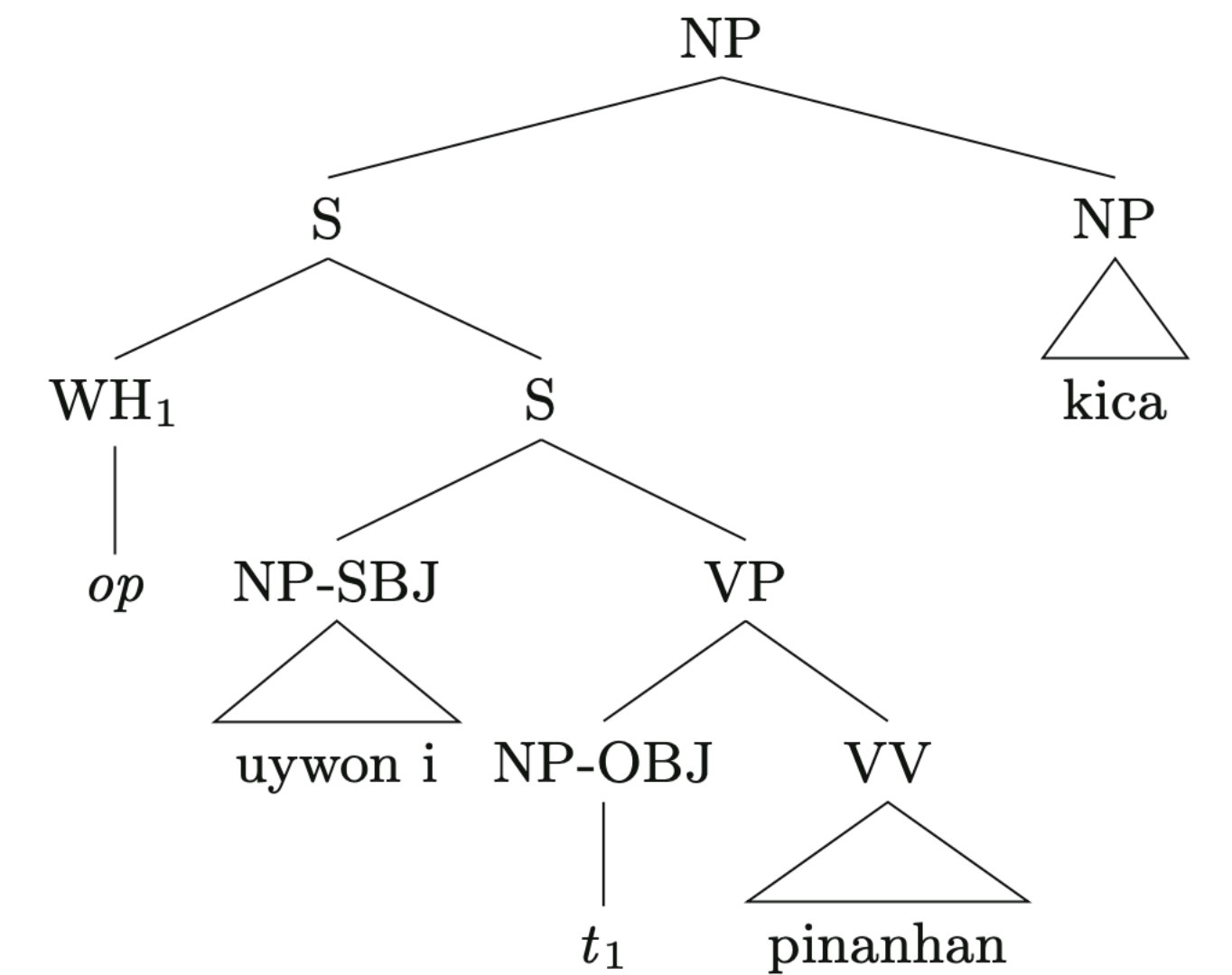
SRC configuration



intransitive configuration



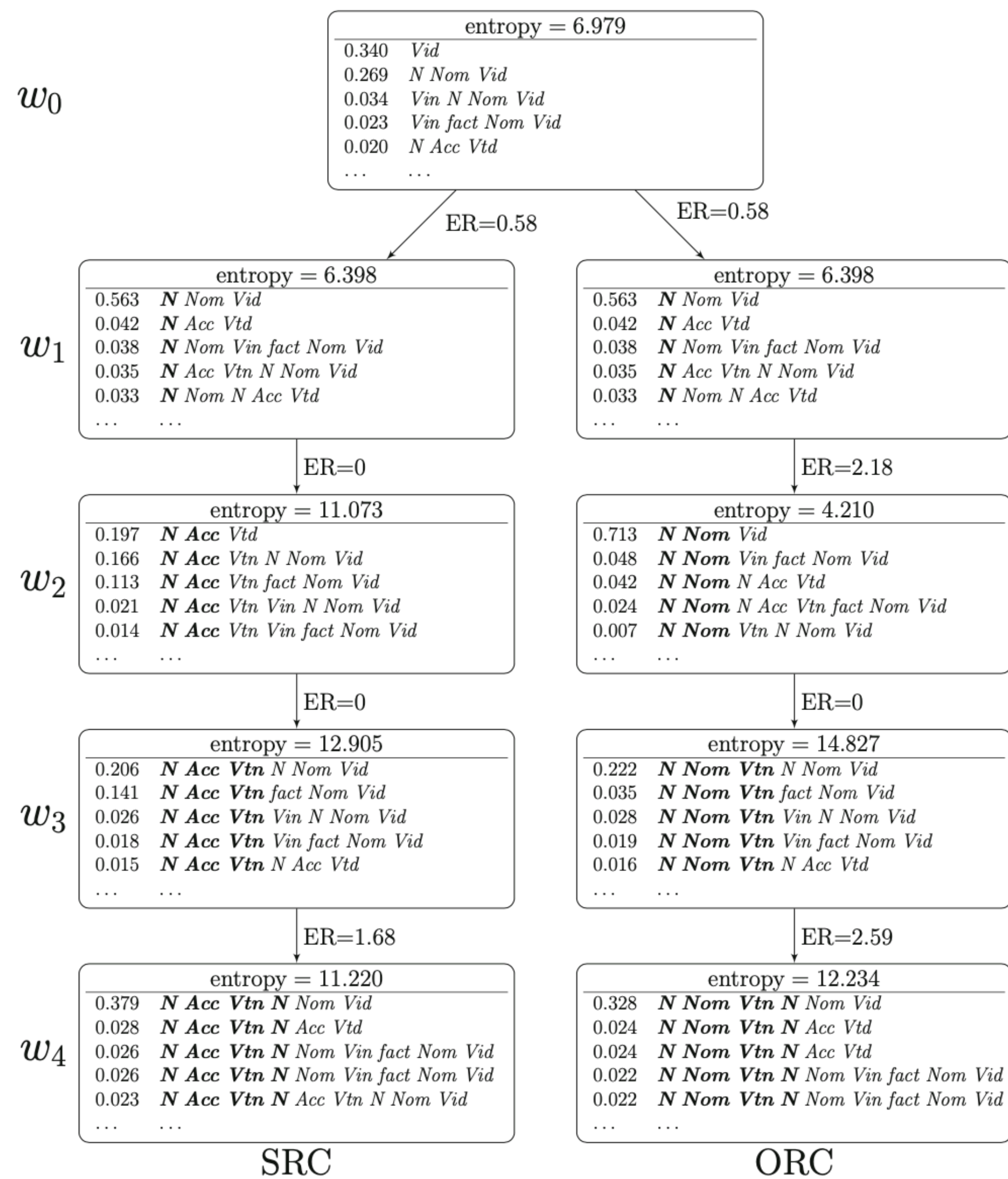
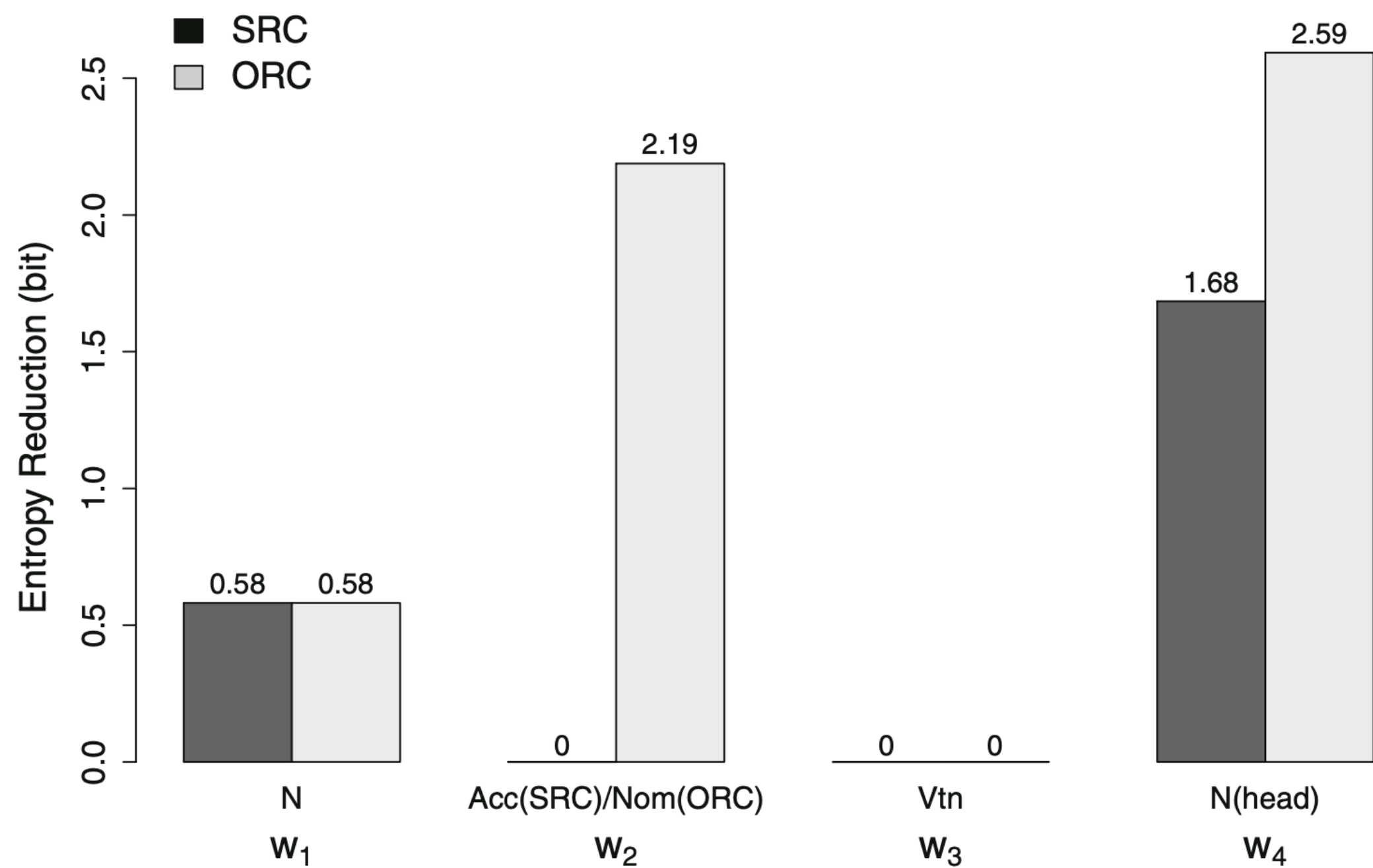
ORC configuration





# Yun et al 2013

## Korean



# Yun et al 2013

## Chinese

a. “Disambiguated” Chinese SRC

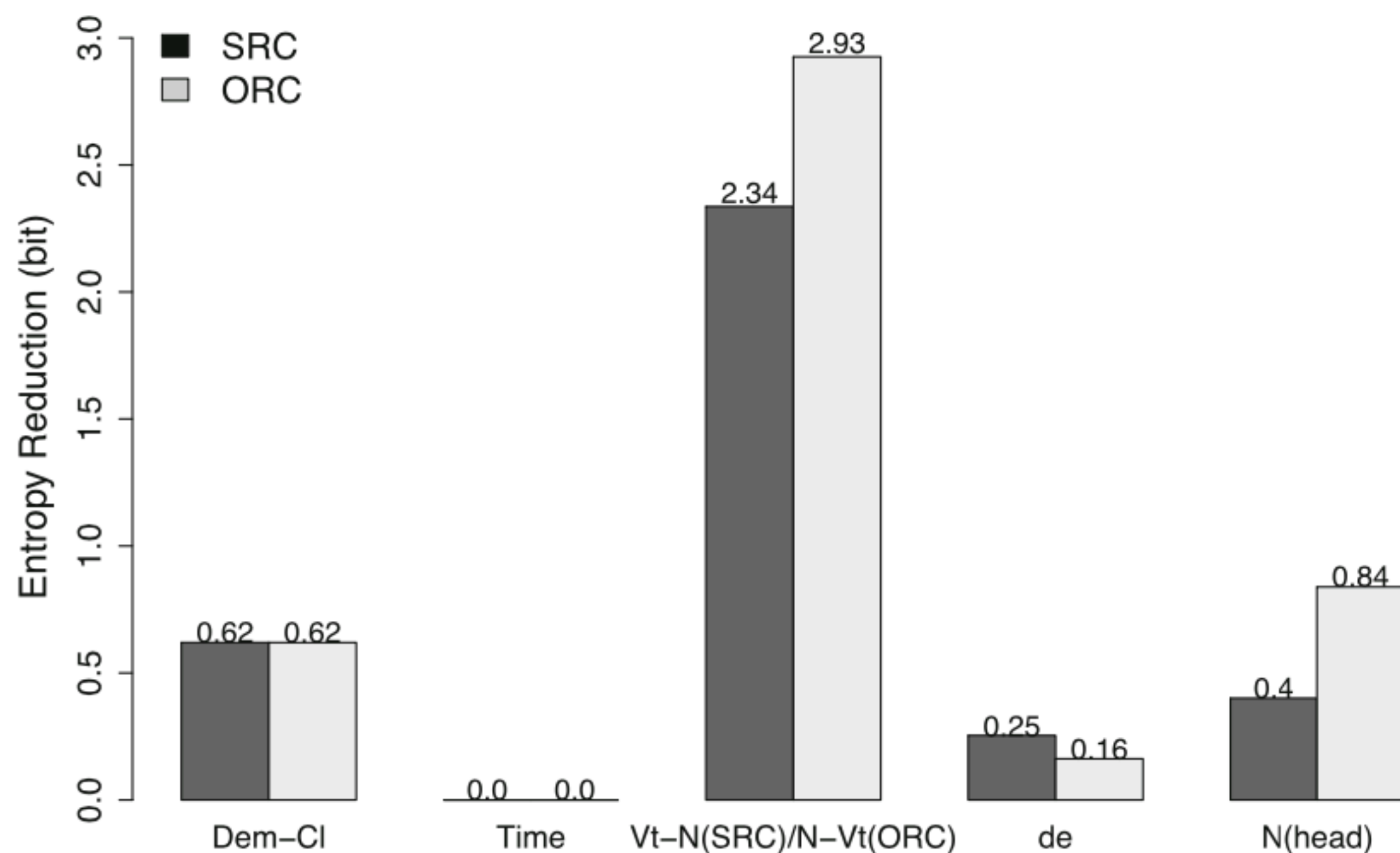
na ge zuotian [ e<sub>i</sub> yaoqing fuhao de ] guanyuan;  
that.Dem Cl yesterday.Time [ t invite.Vt tycoon.N DE ] official.N

‘the official who invited the tycoon yesterday’

b. “Disambiguated” Chinese ORC

na ge zuotian [ fuhao yaoqing e<sub>i</sub> de ] guanyuan;  
that.Dem Cl yesterday.Time [ tycoon.N invite.Vt t DE ] official.N

‘the official who the tycoon invited yesterday’

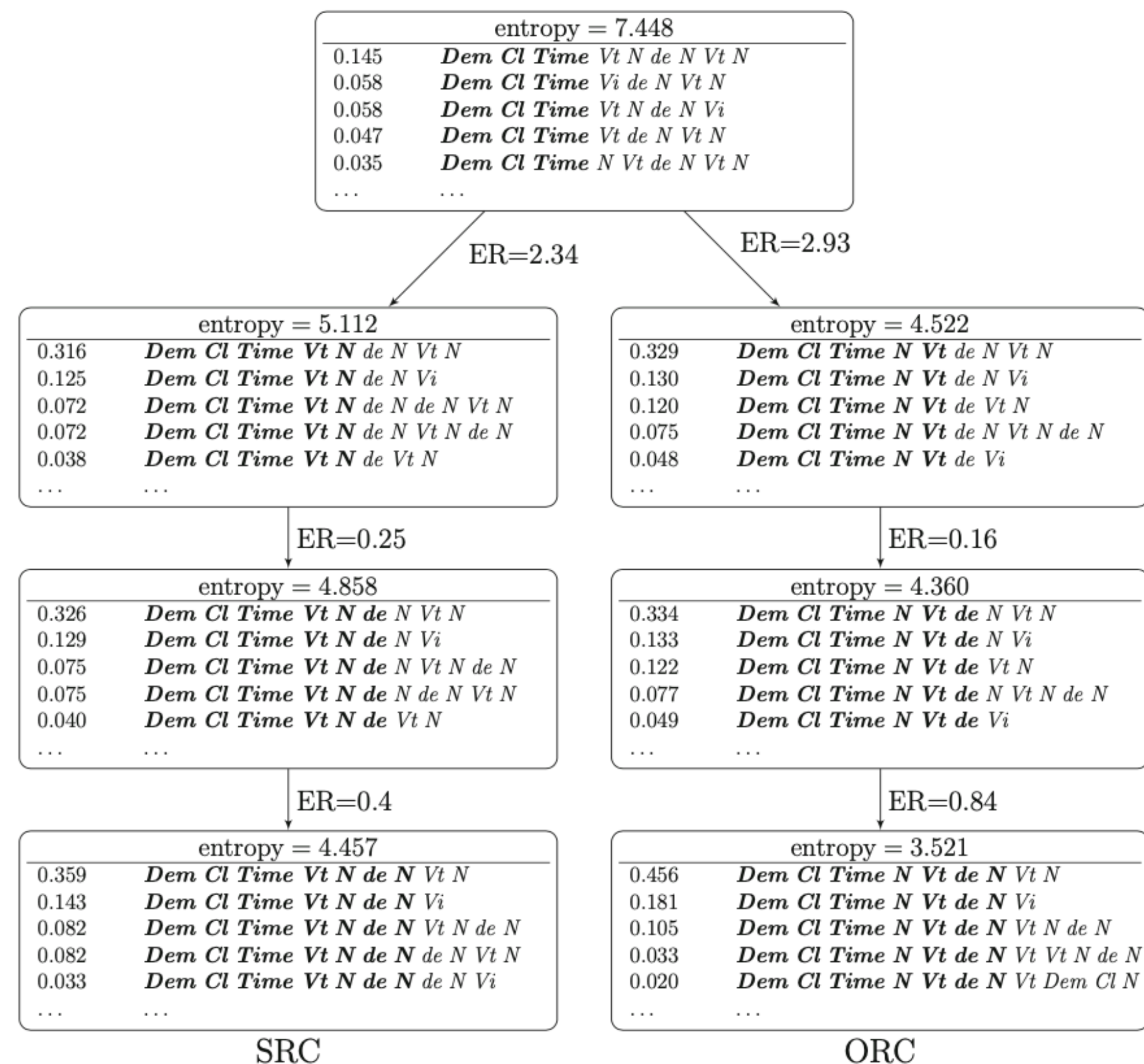


Dem-Cl-Time

RC Region

DE

N(head)



ER predictions for “disambiguated” Chinese RCs



# Alternatives

Broad Categories		General Proposals
WORD ORDER	Bever (1970); MacDonald and Christiansen (2002)	The sequence of words in SRCs is closer to the canonical word order than that in ORCs.
PARALLEL FUNCTION	Sheldon (1974)	SRCs are easier to process than ORCs because their head nouns play the same role in both the main clause and the subordinate clauses.
PERSPECTIVE MAINTENANCE	MacWhinney (1977, 1982)	SRC structures maintain the human perspective and should be easier to process than those that shift it, e.g. ORCs.
ACCESSIBILITY HIERARCHY	Keenan and Comrie (1977)	Universal markedness hierarchy of grammatical relations ranks the relativization from subject higher.
MEMORY BURDEN	LINEAR DISTANCE: Wanner and Maratsos (1978); Gibson (2000); Lewis and Vasishth (2005)	ORCs are harder because they impose a greater memory burden.
	STRUCTURAL DISTANCE: O'Grady (1997); Hawkins (2004)	
STRUCTURAL FREQUENCY	TUNING HYPOTHESIS: Mitchell, Cuetos, Corley, and Brysbaert (1995); Jurafsky (1996)	SRCs occur more frequently than ORCs and therefore are more expected and easier to process.
	SURPRISAL: Hale (2001); Levy (2008)	ORCs are more difficult because they require a low-probability rule.
	ENTROPY REDUCTION: Hale (2006)	ORCs are harder because they force the comprehender through more confusing intermediate states.