How do L1-Korean speakers understand English VP-ellipsis and Gapping?

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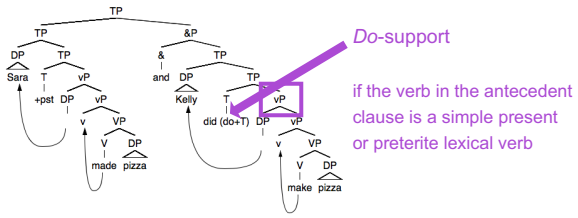
Overview

1. Previous literature on **VP-ellipsis (VPE)**
2. Previous literature on **Gapping**
3. The present study
4. Method
5. Results
6. Discussion & Conclusion

VPE

- VP deletion
  (Chomsky, 1995; Fiengo & May, 1994; Hankamer & Sag, 1976; Sag, 1976)

(1) Sara made pizza, and Kelly did **[e]** too.



Do-support

if the verb in the antecedent clause is a simple present or preterite lexical verb

Previous research on VPE

- Availability of both sloppy and strict interpretations of elided **pronouns** (L1 acquisition research only)

(2) Oscar bites **his** apple, and Bert does **[e]** too.

- Sloppy reading

(2a) Oscar bites his apple, and Bert bites **Bert's** apple.

- Strict reading

(2b) Oscar bites his apple, and Bert bites **Oscar's** apple.

(adapted from Foley, Núñez del Prado, Barbier & Lust, 2003, p. 53, (1))

(Foley et al., 2003; Thornton & Wexler, 1999;
for Korean, see J. Kim, 2012; for Chinese, see Su, 2013)

Previous research on VPE

- Parallelism constraint (L1/L2 acquisition research)

(3) a. Someone took the wood out to the shed last night.
Tom told us that Sally did **[e]**. (**VPE**-Active)

b.* The wood was taken out to the shed last night.
Tom told us that Sally did **[e]**. (**VPE**-Passive)

(adapted from Duffield & Matsuo, 2009, p. 17, (15))

(for L1 acquisition, see Arregui, Clifton, Frazier & Moulton, 2006;
Matsuo, 2007; Matsuo & Duffield, 2001; Tanenhaus & Carlson, 1990;
for L2 acquisition, see Al-Thubaiti, 2018; Duffield & Matsuo, 2009; Hawkins, 2012)

Duffield & Matsuo (2009): Parallelism

- L2ers' knowledge of the parallelism constraint in English **VPE** (e.g., (3))
- Participants:
  - Native English speakers (n = 22)
  - L1-Dutch L2ers of English (n = 20)
  - L1-Japanese L2ers of English (n = 19)
  - L1-Spanish L2ers of English (n = 20)

Note: According to Duffield and Matsuo, neither the L1 grammars nor the Target Language (TL) input is able to lead L2ers to know that English **VPE** is sensitive to parallelism

Duffield & Matsuo (2009): Parallelism

- Judgment task
  - Participants were asked to judge "whether the target sentence is a sensible and accurate completion of the [context sentence]" (p. 312)
- Results: Acceptability judgments (% acceptance)

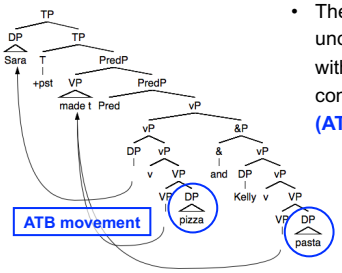
	VPE-Active	*VPE-Passive	Difference
Native English speakers (*n* = 22)	90	48	*p* < .001 ***
L1-Dutch L2ers (*n* = 20)	89	74	*p* < .05 *
L1-Japanese L2ers (*n* = 19)	68	57	*p* < .05 *
L1-Spanish L2ers (*n* = 20)	68	62	*ns*

Duffield & Matsuo (2009): Parallelism

- Given that all three L1s lack VPE, it is unclear why the 3 groups patterned differently
- Whether L2 proficiency and other important factors (e.g., length of exposure) were comparable across the L1-based groups is unreported

Gapping

(4) Sara made pizza, and Kelly **[e]** pasta.



- The VP is unpronounced under conditions of identity with the VP in the other conjunct by **across-the-board (ATB) movement**

(Johnson, 2000, 2009)

Previous research on Gapping

- Direction of **Gapping** (L2 acquisition research only)

(for English, see O'Grady, 1999;
for Japanese, see Kanno, 1999; O'Grady, 1999)

- Constraint on **Gapping** direction:
  Each **head-complement order** predicts the impossibility of a particular **Gapping** direction

(5) a. verb-object languages (e.g., English):
[S ... V ...] [S ... **Ø** ...] vs. *[S ..... **Ø**] [S ..... V]

b. object-verb languages (e.g., Japanese):
*[S ... V ...] [S ... **Ø** ...] vs. [S ..... **Ø**] [S ..... V]

(adapted from O'Grady, 1999, p. 143, (6))

Gapping in English: Forward Gapping

(6) a. **Gapping** in the second conjunct:
[John reads Time] and [Sue **[e]** Newsweek].

b. **Gapping** in the first conjunct:
* [John **[e]** Time] and [Sue reads Newsweek].

(adapted from O'Grady, 1999, p. 142, (1))

Gapping in Japanese: Backward Gapping

(7) a. **Gapping** in the first conjunct:
[John-wa Time-o **[e]**] [Sue-wa Newsweek-o yon-da].
[John-TOP Time-ACC] [Sue-TOP Newsweek-ACC read-PST]
'John Time and Sue read Newsweek.'

b. **Gapping** in the second conjunct:
*[John-wa Time-o yon-de] [Sue-wa Newsweek-o **[e]**].
[John-TOP Time-ACC read-GER] [Sue-TOP Newsweek-ACC]
'John read Time and Sue Newsweek.'

(adapted from O'Grady, 1999, p. 142, (2))

O'Grady (1999)

- L2ers' knowledge of **Gapping** in English and Japanese
- Participants:
  - Native speakers of English (n = 10)
  - L1-Japanese L2ers of English (n = 34)
  - Native speakers of Japanese (n = 10)
  - L1-English L2ers of Japanese (n = 75)
- Acceptability judgment task with 5-point Likert scale
  - Forward **Gapping** (k = 5); Backward **Gapping** (k = 5)

O'Grady (1999)

- Results: Gapping in English

	Forward Gapping	* Backward Gapping	Difference
Native English Speakers (n = 10)	3.74	1.42	p < .001 ***
L1-Japanese L2ers of English (n = 34)	2.33 X	1.75 ✓	p < .01 **

O'Grady (1999)

- Results: Gapping in Japanese

	* Forward Gapping	Backward Gapping	Difference
Native Japanese Speakers (n = 10)	1.26	4.52	p < .001 ***
L1-English L2ers of Japanese (n = 75)	3.09 ??	2.36 X	p < .001 ***

- The results might be due to low proficiency or short exposure

Research gaps

- Empirical findings related to **VPE**:
  For L2, limited to the parallelism constraint
  → **Interpretation contrasts** between **VPE** and **Gapping**
- L2 proficiency and L2 exposure:
  Not reported in previous L2 studies
  → Independent measure of L2 proficiency
  → Background questionnaire to gather information about the L2ers' exposure to the TL

Interpretation contrast

VPE and **Gapping** in English differ in terms of whether they permit the argument following the conjunction to be interpreted as the missing verb's subject (**subject reading**) or object (**object reading**)

Gapping in English

(8) Mom hugged the boy at home
  a. and dad **[e]** in the park
  b. and **[e]** dad in the park.

(9) a. Subject reading (SR):
  'Mom hugged the boy at home and **dad** hugged the boy in the park.'
  b. Object reading (OR):
  'Mom hugged the boy at home and mom hugged **dad** in the park.'

→ **ambiguous**

VPE in English

(10) Mom hugged the boy at home and dad did **[e]** too.

a. SR:
'Mom hugged the boy at home and **dad** hugged the boy at home.'

b. OR:
* 'Mom hugged the boy at home and mom hugged **dad** at home.'

→ **unambiguous**

Gapping in Korean: Backward Gapping

- Korean has **Gapping**

(Sohn, 1999)

(11) Appa-nun$_i$ sonyen-un kongwen-eyse **[e]**,
dad-TOP boy-TOP park-in
emma-nun cip-eyse t_i an-ass-e-yo.
mom-TOP home-at hug-PST-DECL-POL

a. SR:
'**Dad** hugged mom at home and **dad** hugged the boy in the park.'

b. OR:
'Mom hugged **dad** at home and the boy hugged **dad** in the park.'

→ SR and OR possible,
but can be **unambiguous** with the aid of case markers

VPE in Korean

- Korean lacks **VPE**

(e.g., Ahn, 2018; Goldberg, 2005; J.-S. Kim, 2006; M.-K. Park, 1997)

False Korean analogues to VPE

- Argument Ellipsis (AE) (Goldberg, 2005; S. Kim, 1999)

(12) Emma-ka cip-eyse sonyen-ul an-ass-ko, appa-to **[e]** an-ass-e-yo.
mom-NOM home-at boy-ACC hug-PST-and dad-also hug-PST-DECL-POL

- 'Do so' anaphora (M.-K. Park, 2015)

(13) Emma-ka cip-eyse sonyen-ul an-ass-ko, appa-to **kulay**-ss-e-yo.
mom-NOM home-at boy-ACC hug-PST-and dad-also do.so-PST-DECL-POL

- Pseudo-VPE (J.-S. Kim, 1997)

(14) Emma-ka cip-eyse sonyen-ul an-ass-ko, appa-to **[e]** -i-ess-e-yo.
mom-NOM home-at boy-ACC hug-PST-and dad-also -cop-PST-DECL-POL

→ SR and OR possible—thus, **ambiguous**

Summary: Interpretation contrast

	English		Korean	
	SR	OR	SR	OR
VPE	✓	*	N/A	N/A
(AE)			✓	✓
('Do so' anaphora)			✓	✓
(Pseudo-VPE)			✓	✓
Gapping	✓	✓	✓	✓

→ Learnability problem for L1-Korean L2ers of English

∵ No available sources:
(a) L1 grammar, (b) TL input, (c) explicit instruction,
(d) analogy between the two constructions

(Schwartz & Sprouse, 2000, 2013)

Research question

- Do L1-Korean L2ers of English (come to) know the contrast between possible vs. impossible interpretations of **VPE** and **Gapping** in English?

Method: Participants

	Native English speakers (L1-English; *n* = 27 → 25)	L1-Korean L2ers of English (L2-English; *n* = 25)
Age (yr)	24.48 (*SD* = 6.35)	22.72 (*SD* = 2.51)
Age of Onset (yr)	N/A	9.04 (*SD* = 1.14)
Length of Exposure (yr)	N/A	13.15 (*SD* = 3.56)

Method: Procedure

1. Language background questionnaire
2. Acceptability judgment task
3. Picture-sentence matching task
4. Picture narration task as a measure of proficiency

Method: PSMT

- Picture-sentence matching task (PSMT) was designed and administered in PsychoPy
- Participants were presented with a pair of pictures along with a monoclausal description of each picture; they then judged whether the subsequent target sentence matched the pair of pictures by pressing one of three buttons



Method: PSMT

- 2 × 2 Latin-square design
  - *Construction*: VPE vs. Gapping
  - *Interpretation*: SR vs. OR
- Stimuli (*k* = 24, half match)
  - 16 experimental items (4 items per condition) + 8 fillers
  - Natural prosody for all items (modeled on Carlson, 2001)

Method: Sample target stimuli

VPE-SR (MATCH; κ = 4)

Context: Mom hugged the boy at home.	Dad hugged the boy at home too.
	

Target: Mom hugged the boy at home and dad did too.

VPE-OR (MISMATCH; κ = 4)

Context: Mom hugged the boy at home.	Mom hugged dad at home too.
	

Target: Mom hugged the boy at home and dad did too.

Method: Sample target stimuli

Gapping-SR (MATCH; κ = 4)

Context: Mom hugged the boy at home.	Dad hugged the boy in the park.
	

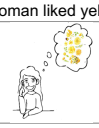
Target: Mom hugged the boy at home and dad in the park.

Gapping-OR (MATCH; κ = 4)

Context: Mom hugged the boy at home.	Mom hugged dad in the park.
	

Target: Mom hugged the boy at home and dad in the park.

Method: Sample fillers

Ungrammatical **Gapping** (*k* = 4; MISMATCH)	
Context: The woman liked yellow flowers.	The man hated red flowers.
	
Target: The woman liked yellow flowers, and the man red flowers.	

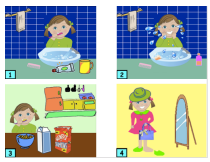
Object mismatch (*k* = 4; MISMATCH)	
Context: Kyle opened the window.	Helen closed the window.
	
Target: Kyle opened the window, and Helen closed the door.	

Method: PNT

- Picture narration task (PNT)
- Instructions:

  Please tell a story following the sequence presented in the 3 sets of 4 pictures.

(based on K.-S. Park, 2014)



Method: PNT

- Morphosyntactic complexity: Verbal density
- Lexical complexity: Moving-average type-token ratio

  (Covington & McFall, 2010)
- Accuracy: Rate of error-free T-units

→ *z*-scores

→ combined into a final English proficiency score (L2 range: −3.94 to 3.67)

Data analysis

1. Exclusion of 2 English native speakers who incorrectly judged ≥ 3 of the 4 ungrammatical **Gapping** fillers
2. Exclusion of "I don't know" judgments
   - 0.25% of English native speaker data
   - 0.75% of L2 data

Data analysis

3. Mixed-effects logistic regression analysis on the judgments, with the maximal random effects structure permitted by the design

   (Barr, Levy, Scheepers, & Tily, 2013)

   - Fixed effects: *Construction*, *Interpretation*, and *Group*; *Proficiency* and *Exposure* (L2 data only)
   - Random effects: *participants* and *items*

Results: By group

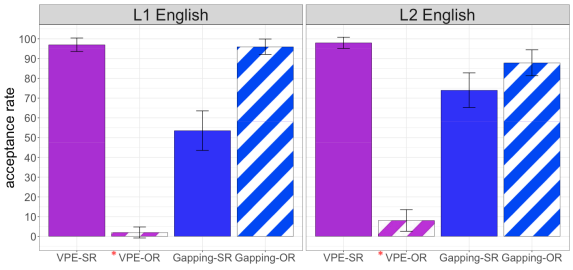


Figure 1. Acceptance rate per condition and group. Error bars indicate 95% confidence intervals (CIs).

Results: L1 English

Construction	$b = -2.69$, $SE = 1.70$, $p = 0.12$
Interpretation	**$b = 2.78$, $SE = 1.31$, $p < .05$ ***
Construction × Interpretation	**$b = 14.98$, $SE = 3.63$, $p < .001$ ****
VPE-SR > VPE-OR	**$b = 6.95$, $SE = 0.83$, $p < .001$ *****
Gapping-SR < Gapping-OR	**$b = -3.88$, $SE = 1.39$, $p < .01$ ****
VPE-SR > Gapping-SR	**$b = 3.94$, $SE = 0.93$, $p < .001$ *****
VPE-OR < Gapping-OR	**$b = -8.61$, $SE = 0.00$, $p < .001$ *****

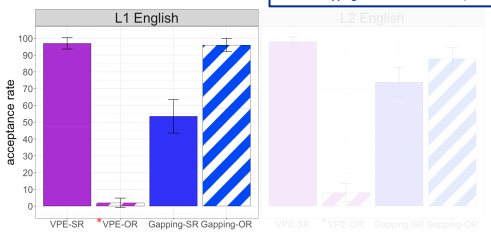


Figure 1. Acceptance rate per condition and group. Error bars indicate 95% confidence intervals (CIs).

Results: L2 English

Construction	$b = -2.70$, $SE = 1.74$, $p = 0.12$
Interpretation	**$b = 5.21$, $SE = 1.86$, $p < .01$ ****
Proficiency	$b = -0.56$, $SE = 0.39$, $p = 0.15$
Exposure	$b = -0.15$, $SE = 0.27$, $p = 0.57$
Construction × Interpretation	**$b = 15.06$, $SE = 3.55$, $p < .001$ *****
Construction × Proficiency	$b = -0.63$, $SE = 0.76$, $p = 0.40$
Interpretation × Proficiency	$b = -0.38$, $SE = 0.76$, $p = 0.62$
Construction × Exposure	$b = 0.01$, $SE = 0.52$, $p = 0.99$
Interpretation × Exposure	$b = 0.13$, $SE = 0.53$, $p = 0.81$
Proficiency × Exposure	$b = 0.13$, $SE = 0.53$, $p = 0.81$
Construction × Interpretation × Proficiency	$b = -0.61$, $SE = 1.39$, $p = 0.66$
Construction × Interpretation × Exposure	$b = 0.01$, $SE = 1.00$, $p = 0.99$
Construction × Proficiency × Exposure	$b = -0.20$, $SE = 0.48$, $p = 0.67$
Interpretation × Proficiency × Exposure	$b = -0.05$, $SE = 0.51$, $p = 0.92$
Construction × Interpretation × Proficiency × Exposure	$b = 0.77$, $SE = 0.96$, $p = 0.42$
VPE-SR > VPE-OR	**$b = 15.94$, $SE = 4.47$, $p < .001$ *****
Gapping-SR vs. Gapping-OR	$b = -1.93$, $SE = 1.22$, $p = 0.11$
VPE-SR > Gapping-SR	**$b = 3.33$, $SE = 1.65$, $p = 0.04$.**
VPE-OR < Gapping-OR	**$b = -28.19$, $SE = 11.36$, $p < .025$ ***

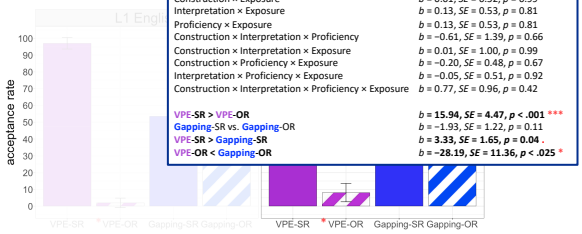


Figure 1. Acceptance rate per condition and group. Error bars indicate 95% confidence intervals (CIs).

Back to research question

- Do adult L1-Korean L2ers of English (come to) know the contrast between possible vs. impossible interpretations of **VPE** and **Gapping** in English?

  → **Yes!**

  → L1-Korean L2ers, like native English speakers, displayed significantly lower acceptance of **VPE**-OR than the other three conditions

Discussion & Conclusion: 1

- Note that the contrasts at issue constitute an L2 learnability problem:

  (a) The contrasts are not present in the L1
  (b) They are not explicitly taught in the L2 classroom
  (c) They cannot be learned from TL input alone using domain-general operations
  (d) They cannot be acquired via analogy between the two phenomena

(Schwartz & Sprouse, 2000, 2013)

→ **Our results provide evidence that the domain-specific cognitive system that constrains L1 acquisition also constrains L2 acquisition**

Outstanding issues

- Why do native English speakers exhibit a significant difference in the rate of acceptance between **Gapping**-SR and **Gapping**-OR?
- Is this attributable to grammar?

  → **No!**

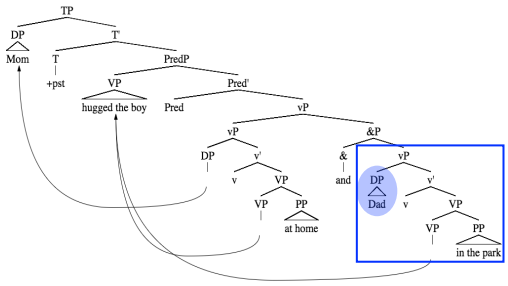
  → Even though **Gapping**-SR was accepted at a lower rate than **Gapping**-OR, its acceptance was nevertheless **significantly higher** than that of ungrammatical ***VPE**-OR

Gapping-SR dispreference: 3 proposals

- Kobayashi (2005, p. 188):
  "Remnants [material stranded after Gapping has applied] must be new information to serve as a contrast, and new information tends to appear in clause-final position. Hence in general cases, an object remnant is preferred to a subject remnant."
- William O'Grady (p.c., 11 October 2019):
  In the absence of evidence to the contrary, the processor prefers coordinate structures to have identical subjects (since this favors topic continuity)
- Frazier (1978) and Gibson (1998):
  Parsers prefer the **simplest** legitimate syntactic analysis consistent with the word string

Analysis of Gapping-SR

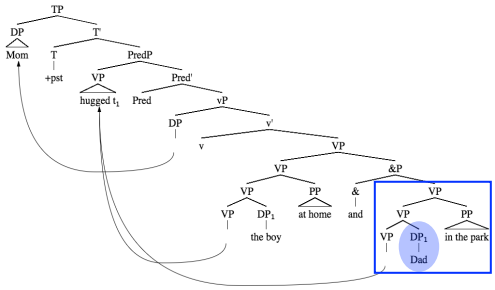
- **Gapping**-SR



(adapted from the analyses of Johnson, 2000, 2009; Zoerner, 1999)

Analysis of Gapping-OR

- **Gapping**-OR



(adapted from the analyses of Johnson, 2000, 2009; Zoerner, 1999)

Additional supporting data: RTs

- Analysis of reaction time (RT) data
  → Unit: From the offset of the target sentence to the point of judgment

1. Removal of extreme values (> 30 seconds)
   - 0.25% of L2 data
2. Replacement of outliers
   - RT values > 2.5 *SD*s above or below the mean for each condition per participant were replaced with that participant's mean RT for that condition
   - 2.76% of native English speaker data
   - 0.76% of L2 data
3. Log transformation

Additional supporting data: RTs

4. Mixed-effects linear regression analysis on the RTs, with the maximal random effects structure permitted by the design

(Barr, Levy, Scheepers, & Tily, 2013)

- Fixed effects: *Construction*, *Interpretation*, and *Group*; *Proficiency* and *Exposure* (L2 data only)
- Random effects: *participants* and *items*

Results: By group

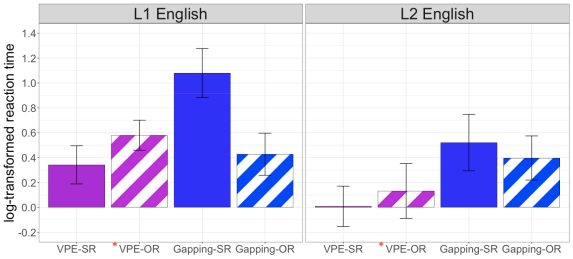


Figure 2. Log-transformed RTs per condition and group. Error bars indicate 95% confidence intervals (CIs).

Results: L1 English

Construction	$b = -0.29$, $SE = 0.09$, $p < .01$ **
Interpretation	$b = 0.20$, $SE = 0.08$, $p < .05$ *
Construction × Interpretation	$b = -0.89$, $SE = 0.19$, $p < .001$ ***
VPE-SR < VPE-OR	$b = -0.24$, $SE = 0.10$, $p < .025$ *
Gapping-SR > Gapping-OR	$b = 0.65$, $SE = 0.14$, $p < .001$ ***
VPE-SR < Gapping-SR	$b = -0.74$, $SE = 0.14$, $p < .001$ ***
VPE-OR vs. Gapping-OR	$b = 0.15$, $SE = 0.11$, $p = 0.19$

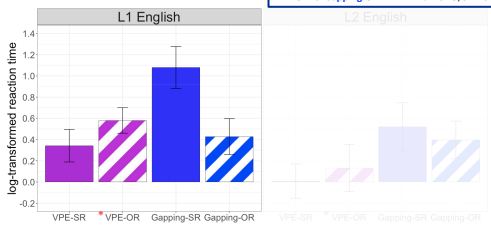


Figure 2. Log-transformed RTs per condition and group. Error bars indicate 95% confidence intervals (CIs).

Results: L2 English

Construction	***b* = −0.39, *SE* = 0.11, *p* < .01 ****
Interpretation	*b* = −0.02, *SE* = 0.10, *p* = 0.83
Proficiency	*b* = −0.02, *SE* = 0.02, *p* = 0.30
Exposure	*b* = 0.06, *SE* = 0.05, *p* = 0.29
Construction × Interpretation	*b* = −0.24, *SE* = 0.20, *p* = 0.24
Construction × Proficiency	*b* = 0.02, *SE* = 0.02, *p* = 0.44
Interpretation × Proficiency	*b* = 0.02, *SE* = 0.01, *p* = 0.28
Construction × Exposure	*b* = −0.06, *SE* = 0.05, *p* = 0.28
Interpretation × Exposure	*b* = 0.02, *SE* = 0.05, *p* = 0.64
Proficiency × Exposure	*b* = 0.00, *SE* = 0.01, *p* = 0.78
Construction × Interpretation × Proficiency	*b* = 0.04, *SE* = 0.03, *p* = 0.20
Construction × Interpretation × Exposure	*b* = −0.07, *SE* = 0.09, *p* = 0.43
Construction × Proficiency × Exposure	*b* = 0.00, *SE* = 0.01, *p* = 0.99
Interpretation × Proficiency × Exposure	*b* = 0.01, *SE* = 0.01, *p* = 0.13
Construction × Interpretation × Proficiency × Exposure	*b* = 0.00, *SE* = 0.02, *p* = 0.99

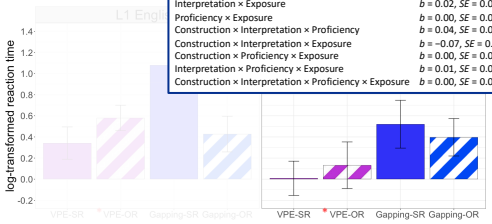


Figure 2. Log-transformed RTs per condition and group. Error bars indicate 95% confidence intervals (CIs).

Discussion & Conclusion: 2

- The significantly lower acceptance of **Gapping**-SR pertains to processing, not to grammar
- Lower acceptability of **Gapping**-SR does not necessarily indicate impossibility of that interpretation; Rather, its low acceptance rate may come from parsing difficulty, as shown in the increased RTs in this condition

Work-in-progress

- Acquisition of the interpretation contrasts between **VPE** and **Gapping** in English by L1 children and early L2ers
- Acquisition of the grammaticality contrasts between **VPE** and **Gapping** in English by L1 children and early/late L2ers
- Second language processing of **Gapping** sentences
- Natural language processing analysis of **VPE** and **Gapping**

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