Trilingual reading: The effect of cognates, ‘false friends’, and language proficiency

Lectura trilingüe: El efecto de cognados, ‘falsos amigos’ y la competencia ligüística. Leitura Trilíngue: O efeito de cognatos, ‘falsos amigos’ e a competência lingüística.

Bernhard Angele[1], Pâmela Freitas Pereira Toassi[2], Timothy J. Slattery[1] and Elisangela Nogueira Teixeira[2]

ECEM 2019, Thursday, August 22 2019

[1]Bournemouth University, [2]Federal University of Ceará

Introduction

- This study came about as a direct consequence of ECEM 2017

Introduction

- This study came about as a direct consequence of ECEM 2017
- Collaboration funded by the Newton Fund through the Royal Society

Introduction

- This study came about as a direct consequence of ECEM 2017
- Collaboration funded by the Newton Fund through the Royal Society
- Question: How do bilinguals represent the words they know in all their languages?

Introduction

- This study came about as a direct consequence of ECEM 2017
- Collaboration funded by the Newton Fund through the Royal Society
- Question: How do bilinguals represent the words they know in all their languages?
    - One possibility: Two separate lexicons; bilinguals (mostly) access meaning by accessing their L1 (Revised Hierarchical Model, Kroll & Stewart, 1994)

Introduction

- This study came about as a direct consequence of ECEM 2017
- Collaboration funded by the Newton Fund through the Royal Society
- Question: How do bilinguals represent the words they know in all their languages?
    - One possibility: Two separate lexicons; bilinguals (mostly) access meaning by accessing their L1 (Revised Hierarchical Model, Kroll & Stewart, 1994)
    - Alternative: Lexicons are not separate. Bilinguals can activate all their lexical representations at any time. Task demands determine which words are responded to (BIA+, Dijkstra and van Heuven, 2002)

Past results

- From behavioural studies:

Past results

- From behavioural studies:
    - not much evidence for separate lexicons and selective access

Past results

- From behavioural studies:
    - not much evidence for separate lexicons and selective access
        - Cognate facilitation effects: e.g. for EN/ES speakers: “error” processed faster than “mistake”

Past results

- From behavioural studies:
    - not much evidence for separate lexicons and selective access
        - Cognate facilitation effects: e.g. for EN/ES speakers: “error” processed faster than “mistake”
        - False friends cause interference: e.g. “sensible” vs. “sensitive”

Past results

- From behavioural studies:
  - not much evidence for separate lexicons and selective access
    - Cognate facilitation effects: e.g. for EN/ES speakers: “error” processed faster than “mistake”
    - False friends cause interference: e.g. “sensible” vs. “sensitive”
  - more direct connections between L2 words and meaning than there should be according to RHM

Past eye movement results

- Not very many eye movement results:

Past eye movement results

- Not very many eye movement results:
    - Libben & Titone (2009): Cognates facilitate processing and interlingual homographs (false friends) interfere with processing in both early and late L2 reading measures

Past eye movement results

- Not very many eye movement results:
  - Libben & Titone (2009): Cognates facilitate processing and interlingual homographs (false friends) interfere with processing in both early and late L2 reading measures
  - Cognates processed faster in L2 reading (Cop, Dirix, Van Assche, Drieghe, Duyck, 2017)

Past eye movement results

- Not very many eye movement results:
  - Libben & Titone (2009): Cognates facilitate processing and interlingual homographs (false friends) interfere with processing in both early and late L2 reading measures
  - Cognates processed faster in L2 reading (Cop, Dirix, Van Assche, Drieghe, Duyck, 2017)
  - Last ECEM: Toassi, Mota, & Teixera (2017): Effect of triple cognates (Portuguese/Italian/German). Trilinguals process triple cognates faster than double cognates

Current study

- Questions:

Current study

- Questions:
    - Is the (triple) cognate effect based on visual similarity?

Current study

- Questions:
  - Is the (triple) cognate effect based on visual similarity?
  - For triple cognates, does it help you if you are good at all three languages or is one sufficient?

Current study

- Questions:
  - Is the (triple) cognate effect based on visual similarity?
  - For triple cognates, does it help you if you are good at all three languages or is one sufficient?
  - Is the cognate facilitat

Method

- Participants: 41 Portuguese-Spanish-English trilinguals in Ceará, Brazil reading 100 *English* (L3) sentences with embedded cognates/false friends or control words

Method

- Participants: 41 Portuguese-Spanish-English trilinguals in Ceará, Brazil reading 100 *English* (L3) sentences with embedded cognates/false friends or control words
- Target words: 50 true cognates, 50 false friends

Method

- Participants: 41 Portuguese-Spanish-English trilinguals in Ceará, Brazil reading 100 *English* (L3) sentences with embedded cognates/false friends or control words
- Target words: 50 true cognates, 50 false friends
- All false friends with English were true cognates between Spanish and Portuguese

Method

- Participants: 41 Portuguese-Spanish-English trilinguals in Ceará, Brazil reading 100 *English* (L3) sentences with embedded cognates/false friends or control words
- Target words: 50 true cognates, 50 false friends
- All false friends with English were true cognates between Spanish and Portuguese
- Visual noise manipulation

Example cognates and controls

English	Portuguese	Spanish	English word frequency (per million)	False friend
actor	ator	actor	22.0	no
cereal	cereal	cereal	4.7	no
error	erro	error	41.2	no
piano	piano	piano	20.3	no
origin	origem	origen	31.9	no
security	segurança	seguridad	148.5	no
lecture	leitura	lectura	17.8	yes
advertising	advertência	advertencia	45.0	yes
computer	computador	computadora	144.5	yes
support	suporte	soporte	309.6	yes
date	data	dato	171.6	yes

Example stimuli

Cognate/False friend condition	Control condition	False friend?
Carl argued that his father's error was similar to his own.	Carl argued that his father's laugh was similar to his own.	FALSE
Bob saw that the piano was beautiful.	Bob saw that the bench was beautiful.	FALSE
They said that the origin could not be determined.	They said that the winner could not be determined.	FALSE
The neighbors said that the destruction came as a complete surprise.	The neighbors said that the improvement came as a complete surprise.	FALSE
They thought that their assumption would never be questioned.	They thought that their friendship would never be questioned.	FALSE
They said that the inspector was nervous during the trial.	They said that the plaintiff was nervous during the trial.	FALSE
Dan needed to call the qualified physician in order to solve his problem.	Dan needed to call the qualified gardeners in order to solve his problem.	TRUE
John said that the initial lecture helped with the rest of the research.	John said that the initial choices helped with the rest of the research.	TRUE
The boy's finger was hurt after the incident.	The boy's throat was hurt after the incident.	TRUE
An old ship carrying a bomb sank deep into the sea.	An old ship carrying a gift sank deep into the sea.	TRUE
While he was out with Jane, John worried about his actual girlfriend showing up.	While he was out with Jane, John worried about his lovely girlfriend showing up.	TRUE
The missionaries gave alms to the villagers so they could open a workshop.	The missionaries gave saws to the villagers so they could open a workshop.	TRUE

Hypotheses 1

- If lexical access occurs across languages:

Hypotheses 1

- If lexical access occurs across languages:
    - Target words that are visually familiar (cognates/false friends) should be processed faster than those that are unfamiliar (control words)

Hypotheses 1

- If lexical access occurs across languages:
    - Target words that are visually familiar (cognates/false friends) should be processed faster than those that are unfamiliar (control words)
- If processing is influenced by the degree of overlap (or lack thereof) word meaning:

Hypotheses 1

- If lexical access occurs across languages:
    - Target words that are visually familiar (cognates/false friends) should be processed faster than those that are unfamiliar (control words)
- If processing is influenced by the degree of overlap (or lack thereof) word meaning:
    - Target words that are false friends should be more difficult (slower) to process than target words that are true cognates

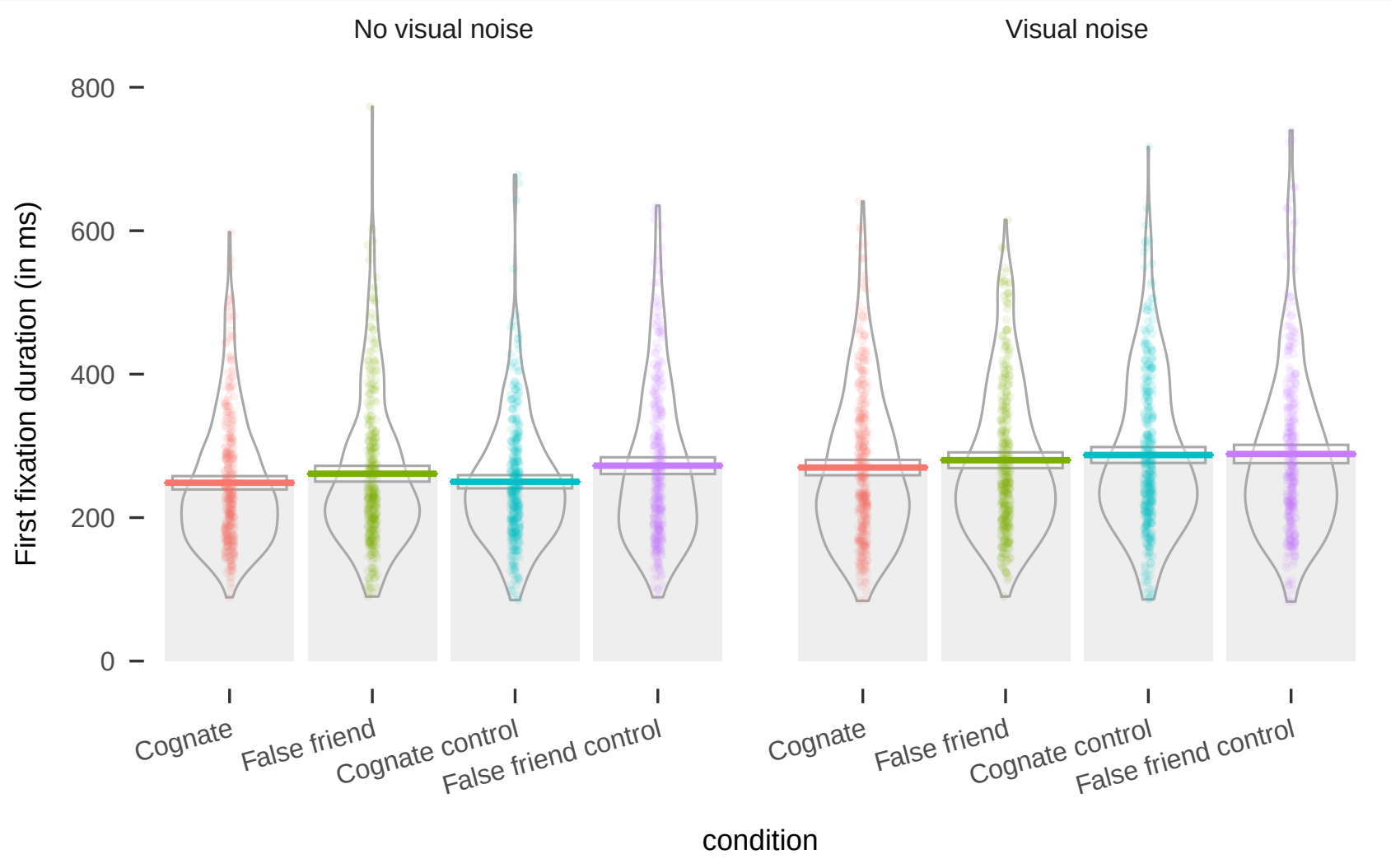
Hypotheses 1

- If lexical access occurs across languages:
    - Target words that are visually familiar (cognates/false friends) should be processed faster than those that are unfamiliar (control words)
- If processing is influenced by the degree of overlap (or lack thereof) word meaning:
    - Target words that are false friends should be more difficult (slower) to process than target words that are true cognates
- If the presence visual noise leads to more top-down processing and reliance on memory:

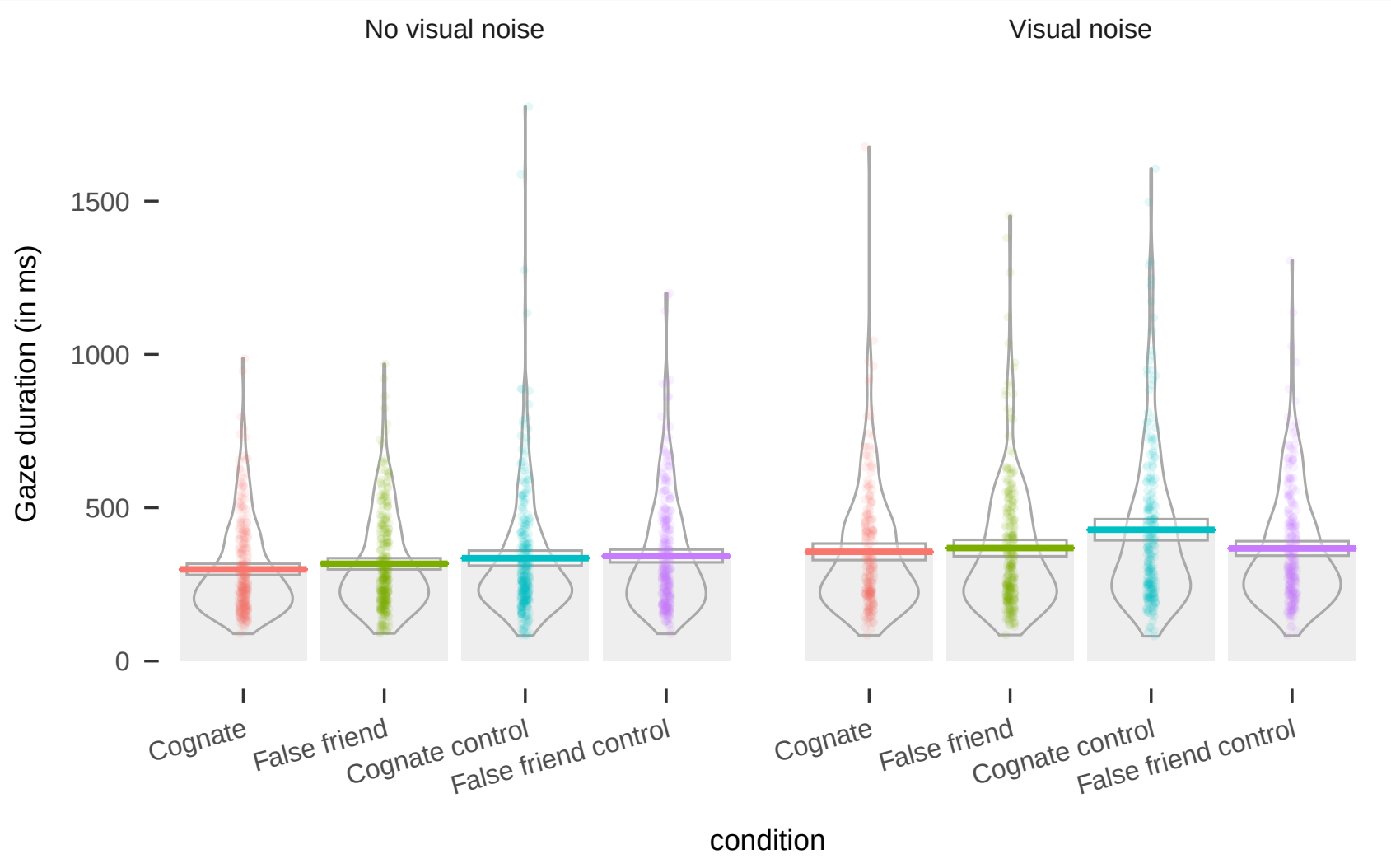
Hypotheses 1

- If lexical access occurs across languages:
    - Target words that are visually familiar (cognates/false friends) should be processed faster than those that are unfamiliar (control words)
- If processing is influenced by the degree of overlap (or lack thereof) word meaning:
    - Target words that are false friends should be more difficult (slower) to process than target words that are true cognates
- If the presence visual noise leads to more top-down processing and reliance on memory:
    - The effects of visual familiarity and of semantic overlap should be stronger in the presence of visual noise.

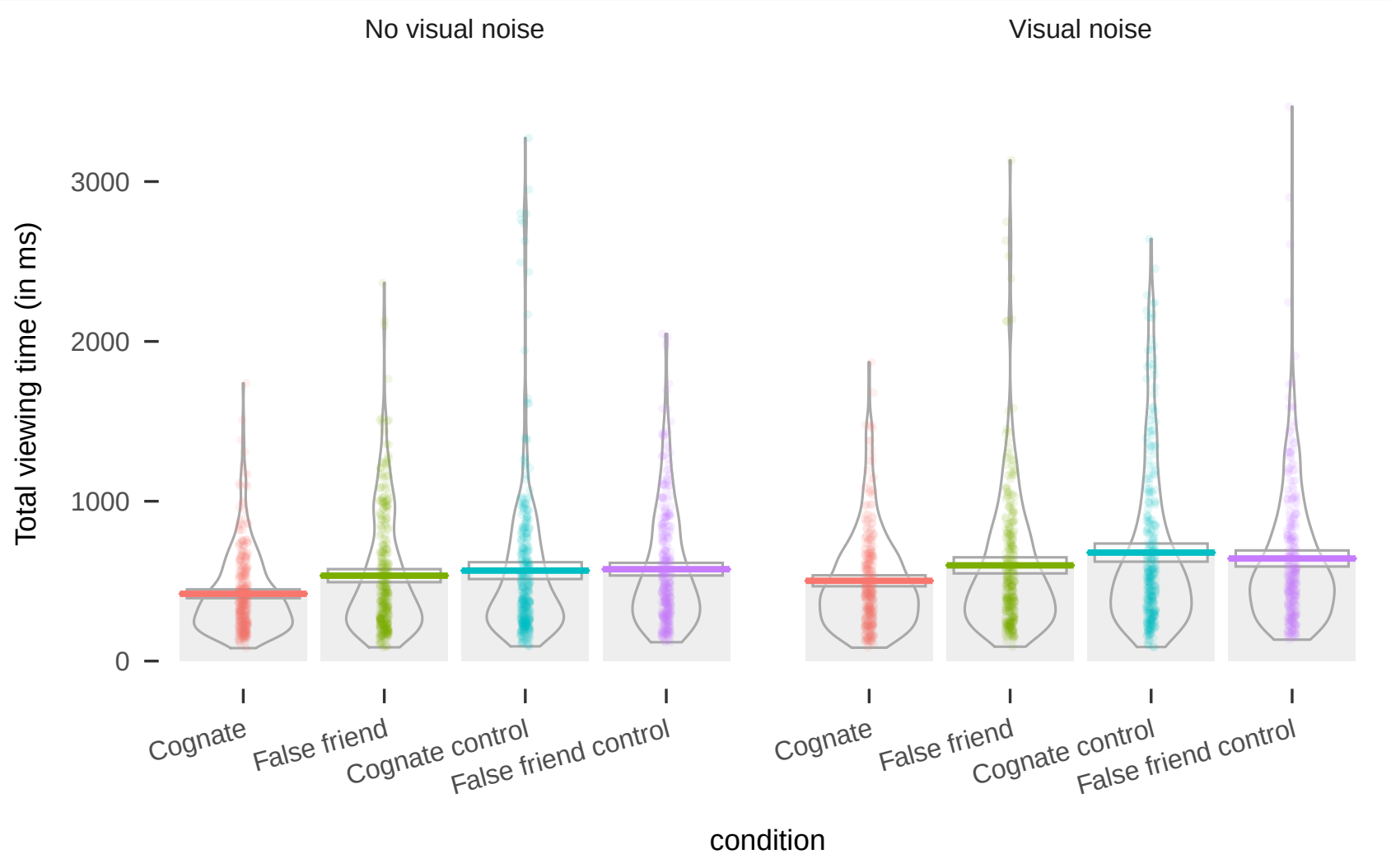
Results: First fixation duration



Results: Gaze duration



Results: Total viewing time



Effect of cognate condition and noise: First fixation duration (target word)

Effect	b	SE	t	df	p
Intercept	5.53	0.03	177.47	37.87	< .001
ConditionCognate vs Control	0.04	0.02	2.19	2,734.01	.029
ConditionControl vs False Friend Control	-0.03	0.02	-1.78	275.92	.075
ConditionTrue Cognate vs False Friend	0.00	0.01	0.24	2,733.92	.812
Noise	0.04	0.01	6.98	2,713.80	< .001
ConditionCognate vs Control by Noise	0.03	0.02	1.63	2,723.48	.103
ConditionControl vs False Friend Control by Noise	0.03	0.02	1.79	2,715.25	.073
ConditionTrue Cognate vs False Friend by Noise	0.02	0.01	1.71	2,716.95	.088

Effect of cognate condition and noise: Gaze duration (target word)

Effect	b	SE	t	df	p
Intercept	5.77	0.05	128.14	43.71	< .001
ConditionCognate vs Control	0.12	0.03	4.34	2,003.57	< .001
ConditionControl vs False Friend Control	0.06	0.04	1.51	164.80	.133
ConditionTrue Cognate vs False Friend	0.04	0.02	2.03	1,998.68	.043
Noise	0.09	0.01	9.11	2,005.86	< .001
ConditionCognate vs Control by Noise	0.02	0.03	0.89	1,997.10	.376
ConditionControl vs False Friend Control by Noise	0.06	0.03	2.42	1,999.27	.016
ConditionTrue Cognate vs False Friend by Noise	0.02	0.02	1.17	1,995.47	.240

Effect of cognate condition and noise: Total viewing time (target word)

Effect	b	SE	t	df	p
Intercept	6.18	0.06	103.73	47.33	< .001
ConditionCognate vs Control	0.20	0.03	7.05	2,397.40	< .001
ConditionControl vs False Friend Control	-0.04	0.05	-0.72	133.42	.470
ConditionTrue Cognate vs False Friend	0.04	0.02	2.11	2,400.37	.035
Noise	0.09	0.01	8.45	2,398.75	< .001
ConditionCognate vs Control by Noise	0.00	0.03	-0.02	2,396.56	.987
ConditionControl vs False Friend Control by Noise	0.03	0.03	1.01	2,393.98	.312
ConditionTrue Cognate vs False Friend by Noise	0.00	0.02	0.08	2,396.56	.937

Hypotheses 1 revisited

- Target words that are visually familiar (cognates/false friends) *are indeed* processed faster than those that are unfamiliar (control words) in both early and late measures

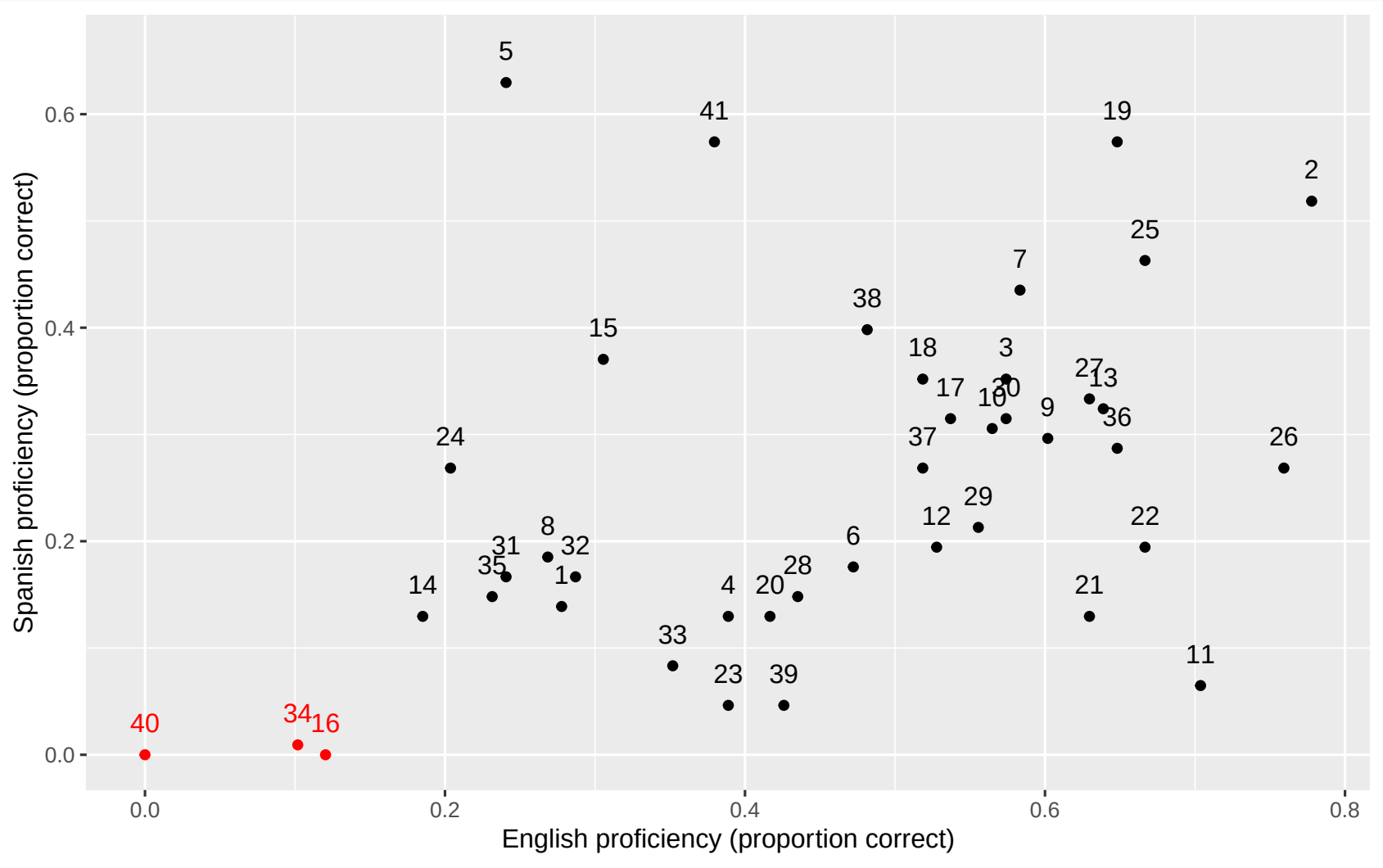
Hypotheses 1 revisited

- Target words that are visually familiar (cognates/false friends) *are indeed* processed faster than those that are unfamiliar (control words) in both early and late measures
- Semantic overlap effects (false friend interference) *only occur* in late measures (TVT)

Hypotheses 1 revisited

- Target words that are visually familiar (cognates/false friends) *are indeed* processed faster than those that are unfamiliar (control words) in both early and late measures
- Semantic overlap effects (false friend interference) *only occur* in late measures (TVT)
- Visual noise slows down processing in general, but it doesn't see to increase top-down reliance on lexical memory

Participant proficiency



We excluded participants 16, 34, 40 because of very low English proficiency

Hypotheses 2

- Participants with high English proficiency should process both the target words and the control words faster

Hypotheses 2

- Participants with high English proficiency should process both the target words and the control words faster
- Since all the target words are true cognates between Portuguese and Spanish, participants with high Spanish proficiency should process the target words faster (but not the control words)

Hypotheses 2

- Participants with high English proficiency should process both the target words and the control words faster
- Since all the target words are true cognates between Portuguese and Spanish, participants with high Spanish proficiency should process the target words faster (but not the control words)
- Semantic overlap effects (false friend interference) should be stronger for participants who are highly proficient in Spanish

Proficiency effects: First fixation duration (target word)

Effect	b	SE	t	df	p
Intercept	5.53	0.03	195.12	35.34	< .001
ConditionCognate vs Control	0.03	0.02	1.93	2,744.53	.054
ConditionControl vs False Friend Control	-0.03	0.02	-1.67	308.90	.095
ConditionTrue Cognate vs False Friend	0.00	0.01	0.16	2,741.93	.876
English	-0.60	0.17	-3.50	34.00	.001
Spanish	0.19	0.19	1.01	34.20	.319
Noise	0.04	0.01	6.81	2,700.10	< .001
ConditionCognate vs Control by English	0.08	0.11	0.72	2,700.13	.471
ConditionControl vs False Friend Control by English	0.13	0.11	1.19	2,705.56	.233
ConditionTrue Cognate vs False Friend by English	-0.02	0.08	-0.31	2,707.37	.754
ConditionCognate vs Control by Spanish	0.11	0.12	0.91	2,698.21	.364
ConditionControl vs False Friend Control by Spanish	0.05	0.13	0.37	2,700.53	.708
ConditionTrue Cognate vs False Friend by Spanish	0.08	0.09	0.84	2,708.38	.402
English by Spanish	-0.81	1.06	-0.76	34.48	.450
ConditionCognate vs Control by Noise	0.03	0.02	1.41	2,708.53	.160
ConditionControl vs False Friend Control by Noise	0.03	0.02	1.72	2,700.23	.086
ConditionTrue Cognate vs False Friend by Noise	0.02	0.01	1.23	2,700.60	.218
English by Noise	-0.02	0.04	-0.45	2,762.73	.652
Spanish by Noise	0.04	0.05	0.90	2,740.06	.369
ConditionCognate vs Control by English by Spanish	0.32	0.68	0.47	2,761.99	.638

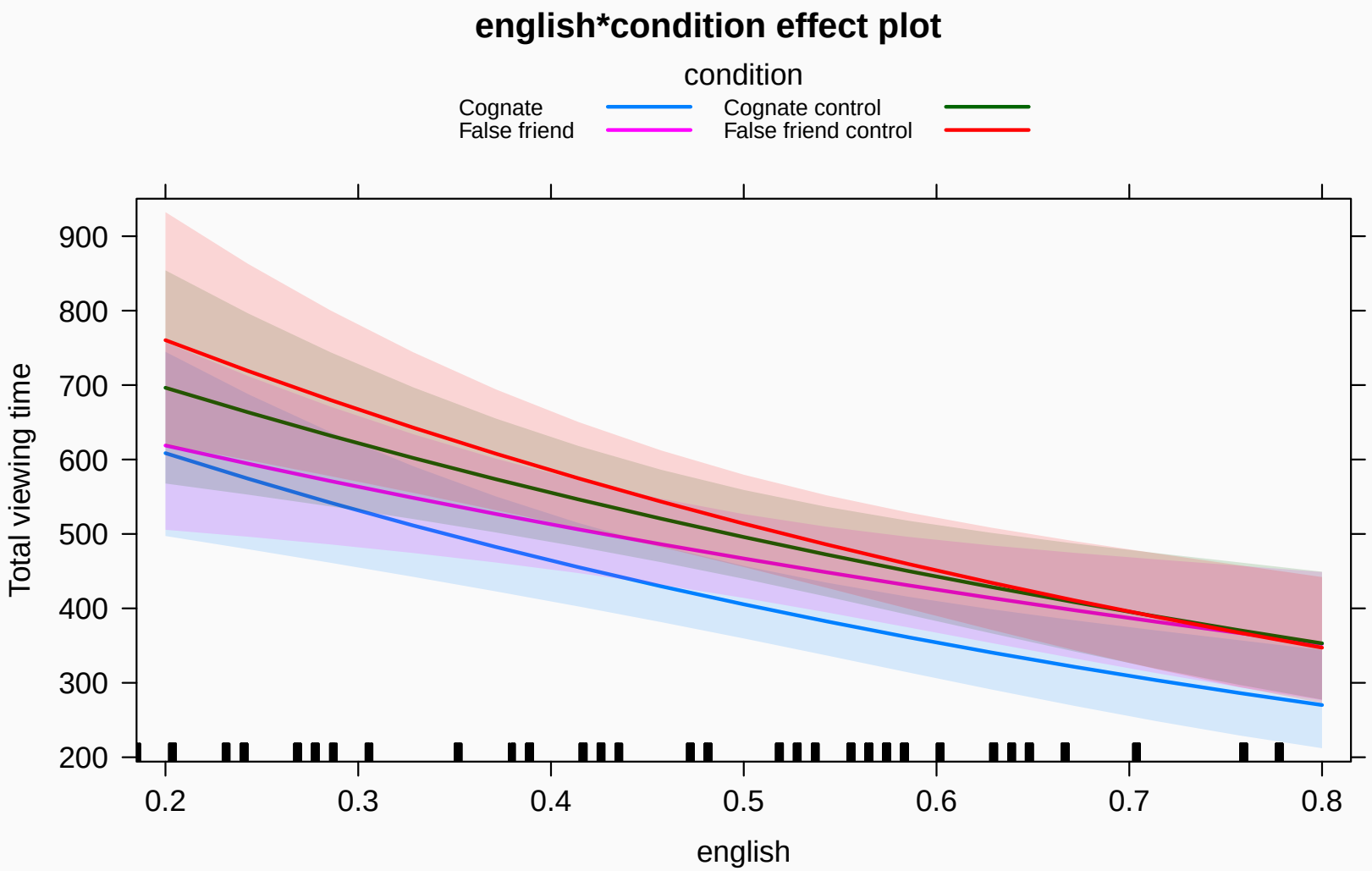
Effect of proficiency: Gaze duration (target word)

Effect	b	SE	t	df	p
Intercept	5.76	0.04	140.66	41.77	< .001
ConditionCognate vs Control	0.12	0.03	4.19	1,985.52	< .001
ConditionControl vs False Friend Control	0.06	0.04	1.46	179.91	.145
ConditionTrue Cognate vs False Friend	0.03	0.02	1.60	1,982.16	.110
English	-0.89	0.23	-3.80	33.55	.001
Spanish	0.05	0.27	0.17	33.80	.864
Noise	0.09	0.01	8.90	1,987.90	< .001
ConditionCognate vs Control by English	-0.18	0.17	-1.06	1,972.90	.288
ConditionControl vs False Friend Control by English	-0.09	0.17	-0.56	1,991.30	.574
ConditionTrue Cognate vs False Friend by English	-0.01	0.12	-0.06	1,970.74	.952
ConditionCognate vs Control by Spanish	0.31	0.19	1.60	1,969.34	.110
ConditionControl vs False Friend Control by Spanish	-0.19	0.19	-0.98	1,969.42	.329
ConditionTrue Cognate vs False Friend by Spanish	-0.08	0.14	-0.56	1,968.58	.575
English by Spanish	-1.41	1.45	-0.98	34.39	.335
ConditionCognate vs Control by Noise	0.03	0.03	1.05	1,979.78	.296
ConditionControl vs False Friend Control by Noise	0.06	0.03	2.04	1,979.43	.042
ConditionTrue Cognate vs False Friend by Noise	0.01	0.02	0.72	1,978.33	.469
English by Noise	-0.04	0.06	-0.64	2,012.40	.524
Spanish by Noise	-0.04	0.07	-0.57	2,004.05	.571
ConditionCognate vs Control by English by Spanish	0.06	1.09	0.05	2,004.42	.959

Effect of proficiency: Total viewing time (target word)

Effect	b	SE	t	df	p
Intercept	6.18	0.05	116.78	49.19	< .001
ConditionCognate vs Control	0.20	0.03	6.14	2,388.19	< .001
ConditionControl vs False Friend Control	-0.04	0.05	-0.71	152.46	.482
ConditionTrue Cognate vs False Friend	0.05	0.02	2.06	2,387.31	.040
English	-1.18	0.30	-4.00	35.33	< .001
Spanish	0.41	0.33	1.24	36.20	.224
Noise	0.09	0.01	7.68	2,384.25	< .001
ConditionCognate vs Control by English	0.22	0.20	1.12	2,378.60	.264
ConditionControl vs False Friend Control by English	0.17	0.20	0.85	2,378.86	.395
ConditionTrue Cognate vs False Friend by English	0.30	0.14	2.15	2,376.11	.032
ConditionCognate vs Control by Spanish	-0.26	0.24	-1.07	2,390.46	.283
ConditionControl vs False Friend Control by Spanish	-0.32	0.25	-1.30	2,381.61	.193
ConditionTrue Cognate vs False Friend by Spanish	-0.30	0.17	-1.75	2,386.01	.080
English by Spanish	-2.52	1.83	-1.38	38.11	.177
ConditionCognate vs Control by Noise	0.00	0.03	-0.10	2,387.44	.923
ConditionControl vs False Friend Control by Noise	0.03	0.03	0.84	2,375.62	.399
ConditionTrue Cognate vs False Friend by Noise	0.00	0.02	-0.12	2,386.14	.905
English by Noise	-0.01	0.07	-0.15	2,416.92	.881
Spanish by Noise	-0.13	0.09	-1.55	2,391.27	.122
ConditionCognate vs Control by English by Spanish	0.63	1.39	0.45	2,388.14	.652

Effect of English proficiency: Total viewing time



Hypotheses 2 revisited

- Readers who are highly proficient in English *indeed show* much faster processin overall

Hypotheses 2 revisited

- Readers who are highly proficient in English *indeed show* much faster processin overall
- *However*, highly proficient English readers are (relatively) show a much larger difference between true cognates and false friends in TVT than English readers with low proficiency

Hypotheses 2 revisited

- Readers who are highly proficient in English *indeed show* much faster processin overall
- *However*, highly proficient English readers are (relatively) show a much larger difference between true cognates and false friends in TVT than English readers with low proficiency
- *No effect* of Spanish proficiency (in general or on false friends)

Conclusions

- Trilinguals' performance when reading triple cognates seems to be mostly influenced by their proficiency in the language they are reading in, not their other non-native language.

Conclusions

- Trilinguals' performance when reading triple cognates seems to be mostly influenced by their proficiency in the language they are reading in, not their other non-native language.
- In early processing and for low proficiency readers, visual familiarity (across languages) seems to be most important

Conclusions

- Trilinguals' performance when reading triple cognates seems to be mostly influenced by their proficiency in the language they are reading in, not their other non-native language.
- In early processing and for low proficiency readers, visual familiarity (across languages) seems to be most important
- For highly proficient readers, the semantic overlap between the visually familiar words becomes much more important in later processing

Conclusions

- Trilinguals' performance when reading triple cognates seems to be mostly influenced by their proficiency in the language they are reading in, not their other non-native language.
- In early processing and for low proficiency readers, visual familiarity (across languages) seems to be most important
- For highly proficient readers, the semantic overlap between the visually familiar words becomes much more important in later processing
- Visual noise does not seem to affect cognate facilitation or false friend interference.

Open questions

- Knowing Spanish does not seem to add much in terms of cognate facilitation with English when you already know Portuguese

Open questions

- Knowing Spanish does not seem to add much in terms of cognate facilitation with English when you already know Portuguese
    - Is this true for other language combinations? For example, would an English native speaker benefit more from knowing Spanish when reading in Portuguese?

Open questions

- Knowing Spanish does not seem to add much in terms of cognate facilitation with English when you already know Portuguese
    - Is this true for other language combinations? For example, would an English native speaker benefit more from knowing Spanish when reading in Portuguese?
- False friends may cause more trouble in language production than in comprehension. Will knowing an additional language help or hurt you in production?

Open questions

- Knowing Spanish does not seem to add much in terms of cognate facilitation with English when you already know Portuguese
    - Is this true for other language combinations? For example, would an English native speaker benefit more from knowing Spanish when reading in Portuguese?
- False friends may cause more trouble in language production than in comprehension. Will knowing an additional language help or hurt you in production?
- Are trilinguals better people?

Thank you very much.

- Muchas gracias.

Thank you very much.

- Muchas gracias.
- Muito obrigado.

Thank you very much.

- Muchas gracias.
- Muito obrigado.
- Questions? Preguntas? Perguntas?