

The P600 for singular 'they':

How the brain reacts when John decides to treat themselves to sushi

Grusha Prasad, Johns Hopkins University

Joanna Morris, Hampshire College

Mark Feinstein, Hampshire College

Introducing the question

Mary decided to treat themselves to sushi.

John decided to treat themselves to sushi.

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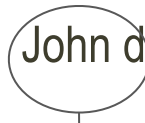


+ singular



- singular

John decided to treat themselves to sushi.



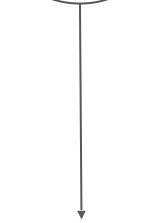
+ singular



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Introducing the question

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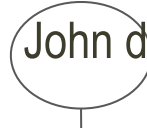


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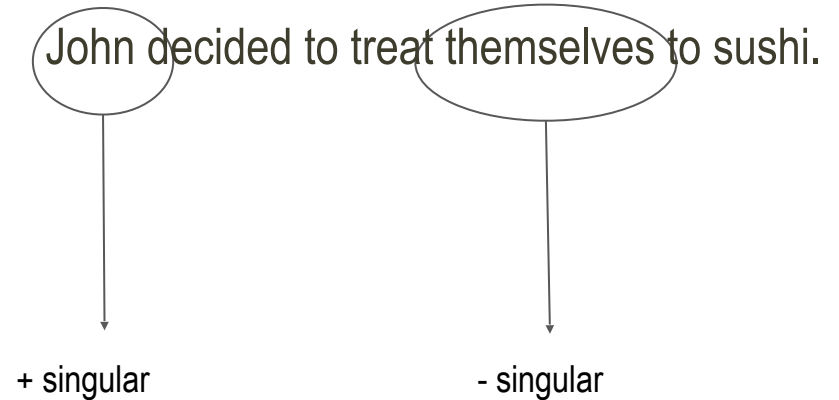
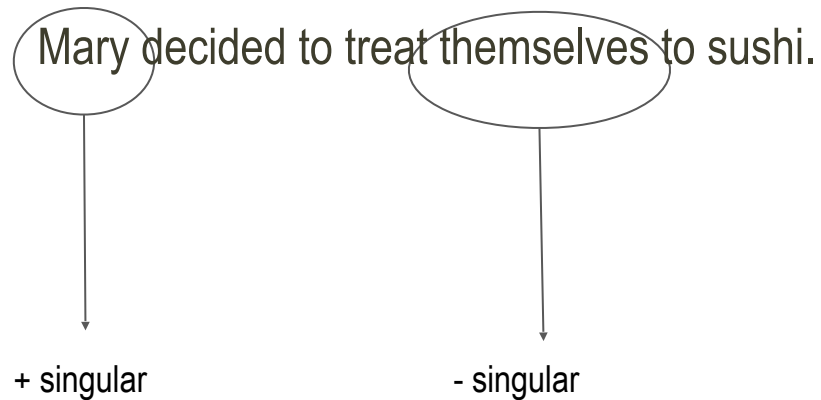
+ singular



- singular

Unacceptable/ungrammatical because of **number violation**

Introducing the question



Unacceptable/ungrammatical because of **number violation**

This should be true for all singular antecedents

However...

1. Everyone decided to treat themselves to sushi
2. Every man decided to treat themselves to sushi
3. The participant decided to treat themselves to sushi
4. Mary decided to treat themselves to sushi

However...

1. **Everyone decided to treat themselves to sushi** ✓
2. Every man decided to treat themselves to sushi ?
3. The participant decided to treat themselves to sushi ?
4. **Mary decided to treat themselves to sushi** ✗

These sentences don't seem equally infelicitous.
BUT they all have the same number violation.

Our hypothesis

Mary decided to treat themselves to sushi.



+ feminine



0-feminine

John decided to treat themselves to sushi.



- feminine



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Unacceptable/ungrammatical because of **gender violation**

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1. Antecedents marked as 0-feminine should be felicitous when co-indexed with 'themselves'
2. If Mary can be construed as 0-feminine, 'themselves' should be felicitous

Outline of the presentation

1. An account of what kinds of antecedents are associated with 0-feminine and why we might expect these to be more felicitous with 'they' / 'themselves'
2. Discussion of whether it is possible for antecedents like 'Mary' to ever be associated with 0-feminine and predictions for processing effort
3. Experimental design to test these predictions
4. Results

Antecedents and their features: When is something not felicitous?

Underlying assumptions

Feature type	Feature	Antecedents	Pronouns
Gender	+feminine	'Mary',	she/ herself
	-feminine	'John'	he/ himself
	0-feminine	'the participant(s) 'John and Mary'	they/themselves
Number	+singular	'Mary', 'John', 'the participant'	she/herself, he/ himself
	-singular	'John and Mary', 'the participants'	they/themselves

Underlying assumptions

For a given antecedent, the pronoun with the least number of feature mismatches is the most felicitous and takes the least effort to co-index with the antecedent

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Antecedent features	Pronoun features	Number of mismatches
'Mary' or 'some woman' (+feminine, +singular)	he (-feminine, +singular)	1
	she (+feminine, +singular)	0
	they (0-feminine, -singular)	2

Feature mismatch for associating different singular antecedents with 'they'

Antecedent type	Examples	Features	Number mismatch with 'they'
Unambiguous gender	Mary	+feminine +singular	2
Ambiguous gender	The participant	0-feminine +singular	1

they:
0-feminine
-singular

Singular unambiguous antecedents have more mismatches with 'they' and hence take more processing effort.

Is 'the participant' really 0-feminine?

“My friend was very excited”

- ▶ People tend to assume “my friend” is either male or female

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- ▶ Definite determiners like ‘the’ and ‘my’ cause people to imagine specific individuals
- ▶ Specific individuals tend to be associated with a default gender (either +feminine or -feminine)
- ▶ This gender can vary between individuals and can also be overwritten

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- ▶ Frequently co-occur with 'they' (Balhorn 2004)

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- ▶ Generics like 'someone', 'everyone' pick out individuals from a set of people.
- ▶ Not associated with gender for the same reason groups of people are not associated with gender (in English)
- ▶ Frequently co-occur with 'they' (Balhorn 2004)
- ▶ Lower reading times with 'they' when compared to 'he' and 'she' (Foertsch and Gernsbacher 1997)

Feature mismatch for associating different singular antecedents with ‘they’

Antecedent type	Examples	Features	Number mismatch with ‘they’
Unambiguous gender	Mary	+feminine +singular	2
Ambiguous gender Specific antecedent	The participant	0-feminine ± feminine +singular	2
Ambiguous gender Generic antecedent	Someone	0-feminine +singular	1

they:
0-feminine
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Feature mismatch for associating different singular antecedents with 'they'

Antecedent type	Examples	Features	Number mismatch with 'they'
Unambiguous gender	Mary	+feminine +singular	2
Unambiguous gender Generic antecedent	Some woman	+feminine +singular	2
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Ambiguous gender Generic antecedent	Someone	0-feminine +singular	1

they:
0-feminine
-singular

Can 'the participant' and/ or 'Mary' ever be associated with 0-feminine?

What if we made no assumptions about a person's gender?

- It is possible to **not** make assumptions about gender until given more information.

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 - People are in an environment where it is **inefficient** to make gender assumptions and one must frequently **reevaluate** faulty gender assumptions

What if we made no assumptions about a person's gender?

- It is possible to **not** make assumptions about gender until given more information.
- This can occur because...
 - ▶ People are in an environment where it is **inefficient** to make gender assumptions and one must frequently **reevaluate** faulty gender assumptions
 - ▶ People have an **intellectual commitment** to the idea of non-binary gender identity

What if we made no assumptions about a person's gender?

	High frequency gender non-binary environment	Low frequency gender non-binary environment
High intellectual commitment	Non-binary individuals	Non-binary individuals
Medium intellectual commitment	Binary individuals	Binary individuals
Low intellectual commitment	Binary individuals	Binary individuals

What if we made no assumptions about a person's gender?

	High frequency gender non-binary environment	Low frequency gender non-binary environment
High intellectual commitment	Non-binary individuals <i>High practice group</i>	Non-binary individuals
Medium intellectual commitment	Binary individuals	Binary individuals
Low intellectual commitment	Binary individuals	Binary individuals

Feature mismatch for associating different singular antecedents with 'they' for high practice group

Antecedent type	Example	Features	Number mismatch with they
Unambiguous gender Specific antecedent	Mary	0-feminine ?? +feminine +singular	1 ??
Unambiguous gender Generic antecedent	Some woman	+feminine +singular	2
Ambiguous gender Specific antecedent	The participant	0-feminine? ±feminine +singular	1 ?
Ambiguous gender Generic antecedent	Someone	0-feminine +singular	1

they:
0-feminine
-singular

Question 1

Is the processing effort for singular ‘they’ equivalent for different kinds of singular antecedents?

We assume reduced processing effort if the antecedent is 0-feminine...

- ‘*someone*’: always 0-feminine
- ‘*the participant*’ and ‘*Mary*’: 0-feminine **if** people do not make default gender assumptions
- ‘*some woman*’: never 0-feminine

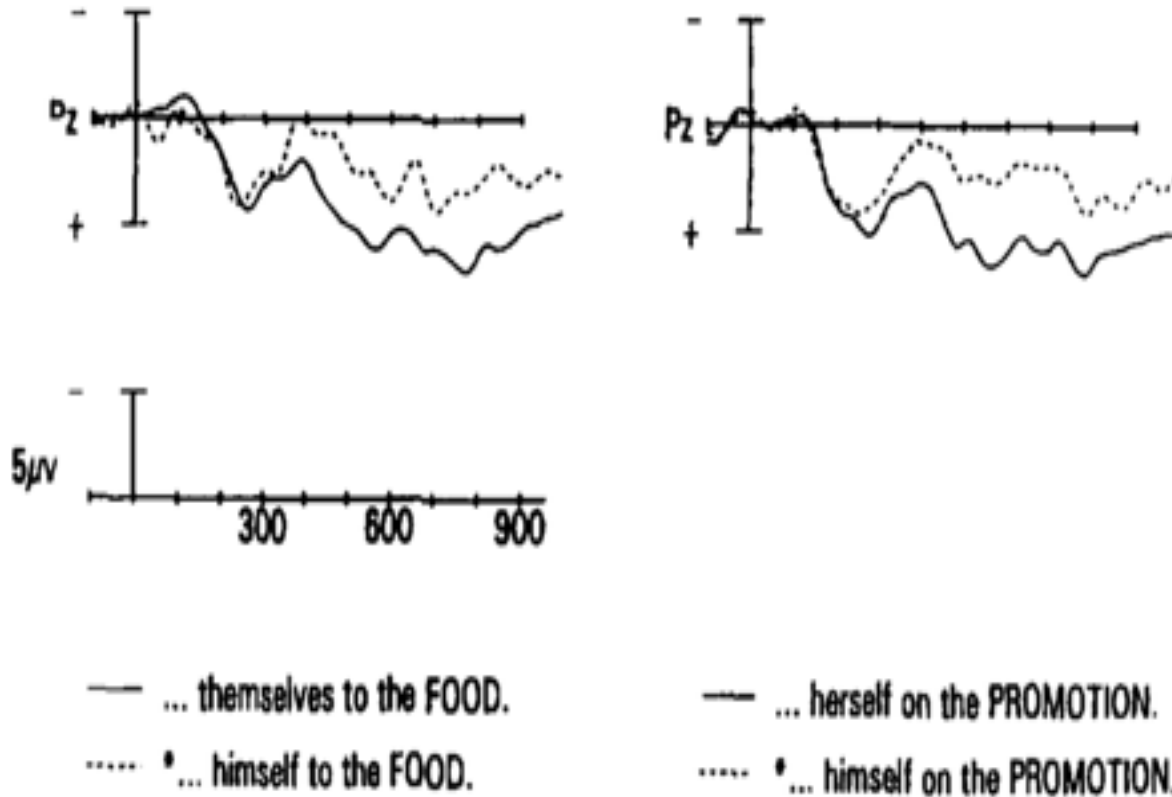
Question 2

Is there a difference between the pronoun ‘they’ and the anaphor ‘themselves’?

It may be more difficult to co-index ‘themselves’ with a singular antecedent because ‘themselves’ has morphological plural marking

P600 as a measure of processing effort

Osterhout and Mobley (1995) found a P600 for both gender and number violations



Participants

- Right handed monolingual native speakers of English
- All participants had frequent interactions with individuals who were transgender or who identified as gender non-binary ('high practice' group) as measured by questions on a demographic survey
- Two groups
 - Binary: People who identified as being either male or female. This group included transgender men and women.
 - Non-binary: People who identified as having a non-binary gender identity
- The groups did not statistically vary in level of practice with gender neutral pronouns, in linguistic proficiency or in linguistic background

Experimental design

Reflexives

	himself	herself	Singular themselves	Plural themselves
Generic Ambiguous	Someone in this group needs to pull himself together	Someone in this group needs to pull herself together	Some people in this group need to pull themselves together	Someone in this group needs to pull themselves together
Generic Unambiguous	Every woman must learn to stand up for himself	Every woman must learn to stand up for herself	All women must learn to stand up for themselves	Every woman must learn to stand up for themselves
Specific Ambiguous	The stranger poured himself a cup of coffee	The stranger poured herself a cup of coffee	The strangers poured themselves a cup of coffee	The stranger poured themselves a cup of coffee
Specific Unambiguous	John decided to treat himself to some sushi	John decided to treat herself to some sushi	John and Mary decided to treat themselves to some sushi	John decided to treat themselves to some sushi

Pronouns

	he/ him/ his	she/ her/ hers	plural they/ them/ their	singular they/ them/ their
Generic Ambiguous	Everyone in the group was fixed in his own ways	Everyone in the group was fixed in her own ways	All the people in the group were fixed in their own ways	Everyone in the group was fixed in their own ways
Generic Unambiguous	No man wanted to let the chance slip through his fingers	No man wanted to let the chance slip through her fingers	Most men did not want to let the chance slip through his fingers	No man wanted to let the chance slip through their fingers
Specific Ambiguous	The musician performed better when left to his own devices	The musician performed better when left to her own devices	The musicians performed better when left to their own devices	The musician performed better when left to their own devices
Specific Unambiguous	Margaret is very good at thinking on his feet	Margaret is very good at thinking on her feet	Margaret and Stephen are very good at thinking on their feet	Margaret is very good at thinking on their feet

Other details

- 50 sentences X 4 pronouns X 4 antecedents → 800 sentences with pronouns, 800 with reflexives.
- 400 distractors with no pronouns/reflexives (200 with idioms, 200 without)
- Auditorily presented over two sessions
- Session 1: 400 reflexive sentences, 400 pronoun sentences, 400 distractors
- Session 2: 400 reflexive sentences, 400 pronoun sentences, 400 distractors (same distractors as session1)
- Each session was between 1 and 2 weeks apart

Analyses

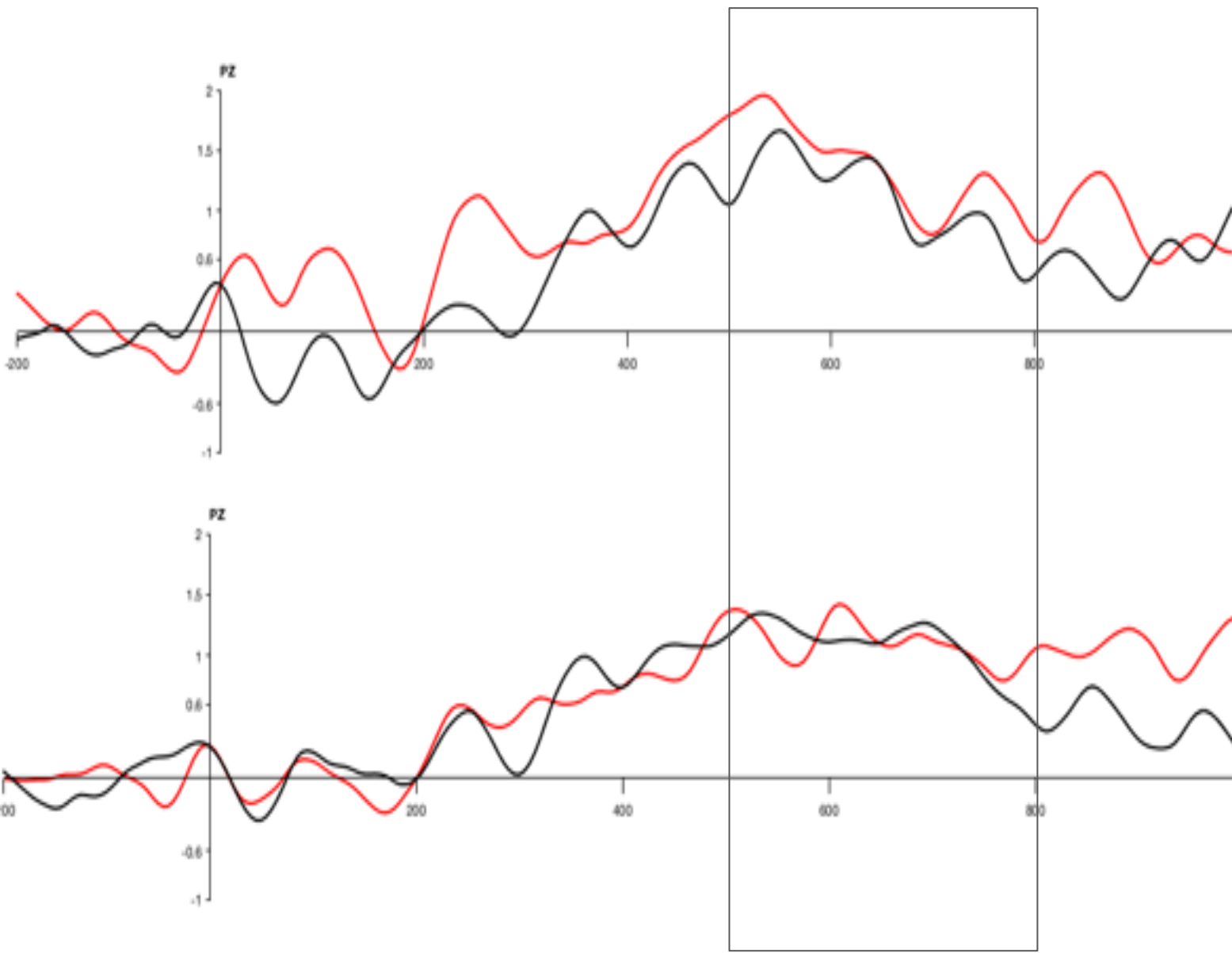
		Generic		Specific	
		Ambiguous	Unambiguous	Ambiguous	Unambiguous
Reflexive	Singular	someone themselves	some man/woman themselves	the participant themselves	John/Mary themselves
	Plural	some people they/themselves	some men/women they/themselves	the participants they/themselves	John and Mary they/themselves
Pronoun	Singular	someone they	some man/woman they	the participant they	John/Mary they
	Plural	some people they	some men/women they	the participants they	John and Mary they

Results

Details about the analyses

- P600 = mean amplitude singular 'they' -- mean amplitude plural 'they'
 - ▶ Time window: 500-800 ms
 - ▶ Electrodes: 10 posterior electrodes
- Participants with more than 35% trials rejected from experimental conditions were excluded
 - ▶ 20 participants from the binary group included (2 excluded)
 - ▶ 18 participants from the non-binary group included (4 excluded)
- A separate Specificity x Ambiguity x Group ANOVA was run for reflexives and pronouns.

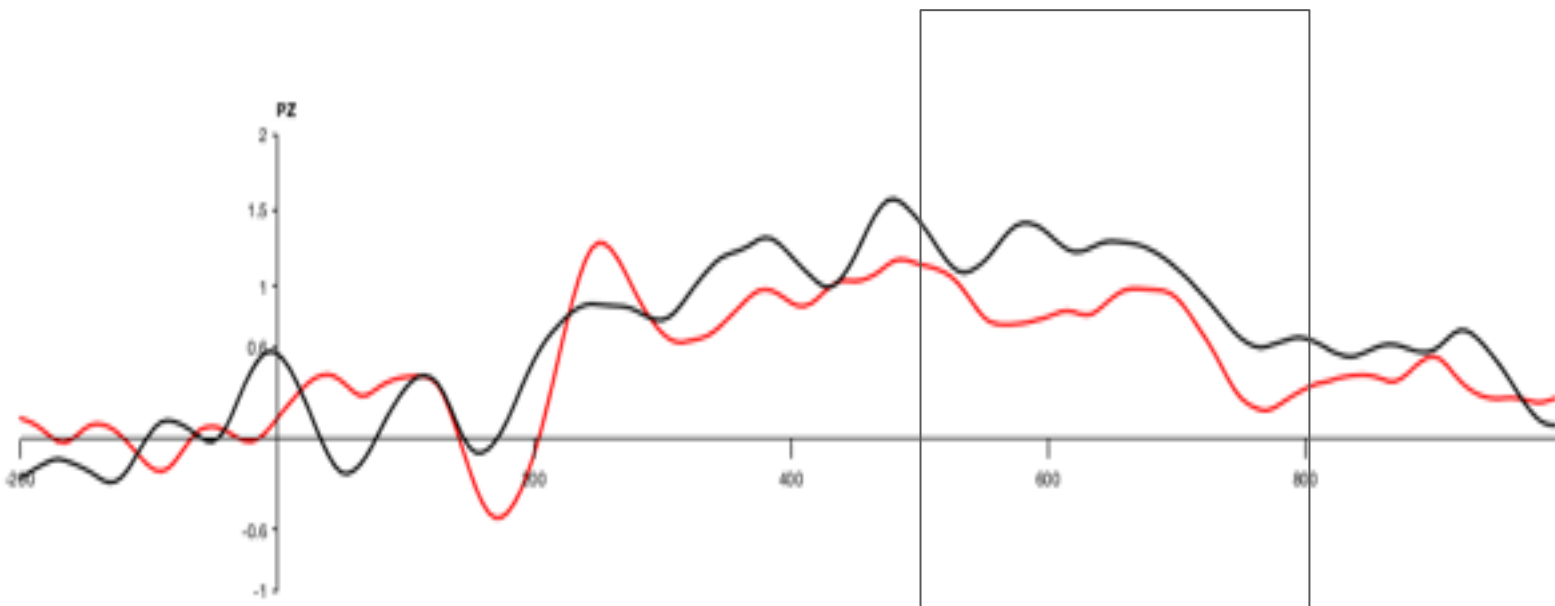
Data for 'themselves'



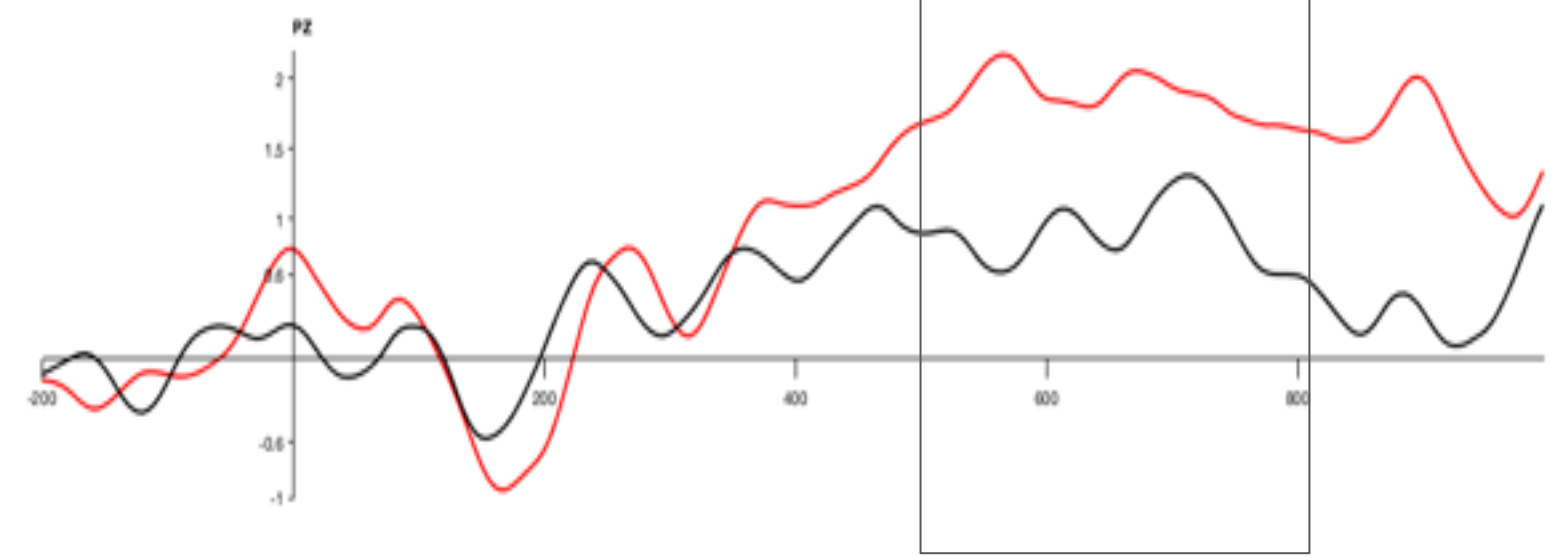
Someone
Some people

The participant
The participants

Singular antecedent themselves ...
Plural antecedent ... themselves ...



Some woman
Some women



Mary
John and Mary

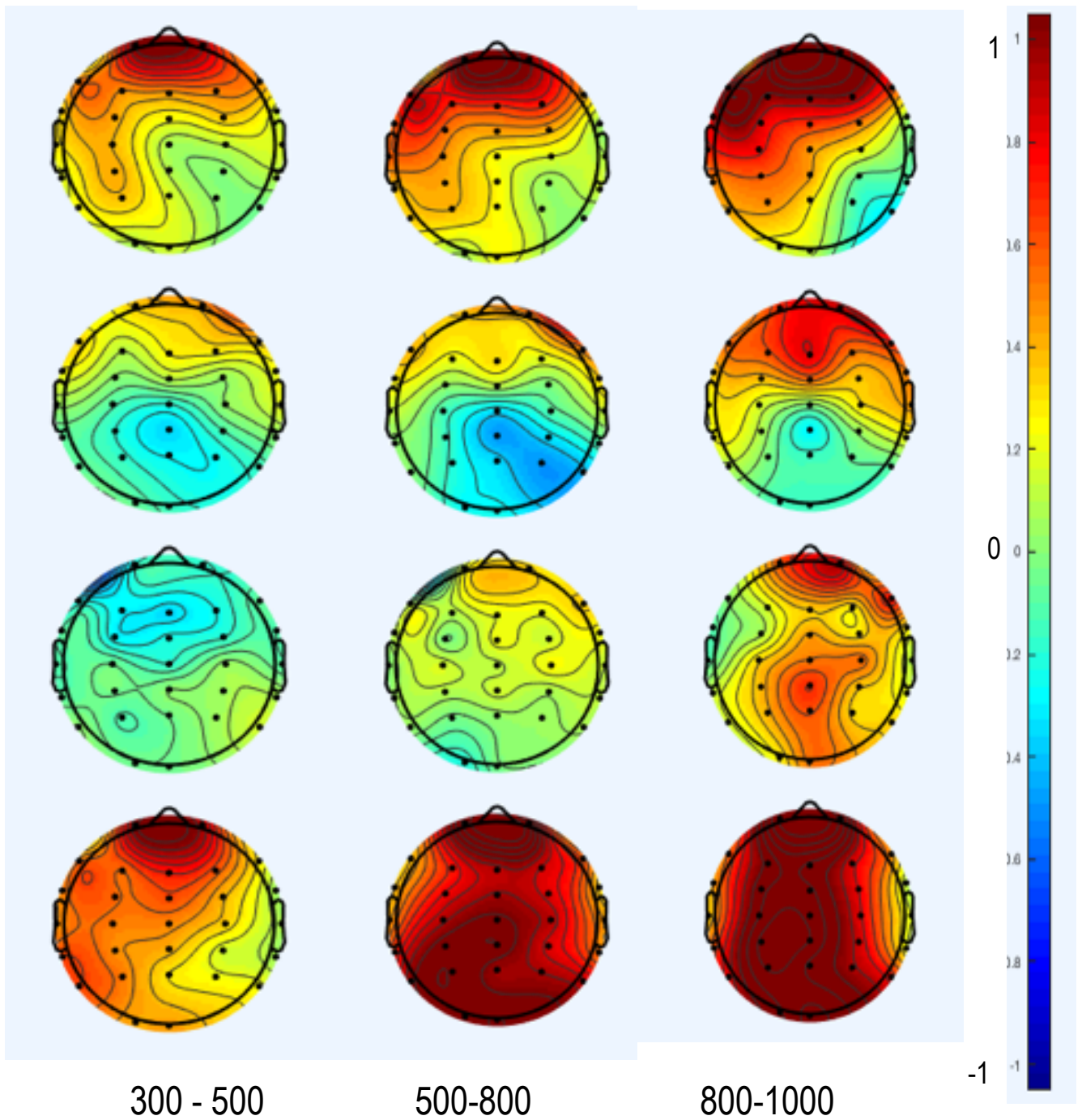
Singular antecedent themselves ...
Plural antecedent ... themselves ...

someone MINUS some people

some woman MINUS some women

the participant MINUS the participants

Mary MINUS John and Mary



300 - 500

500-800

800-1000

-1

1

1.8

1.6

1.4

1.2

0

1.2

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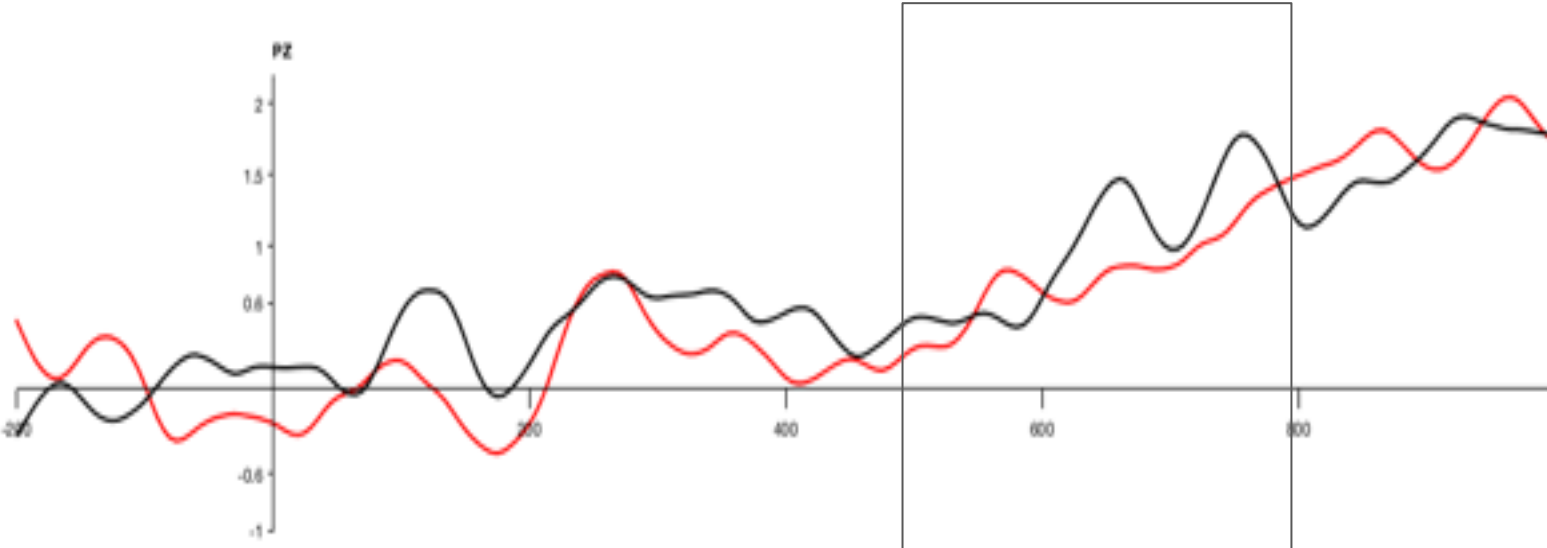
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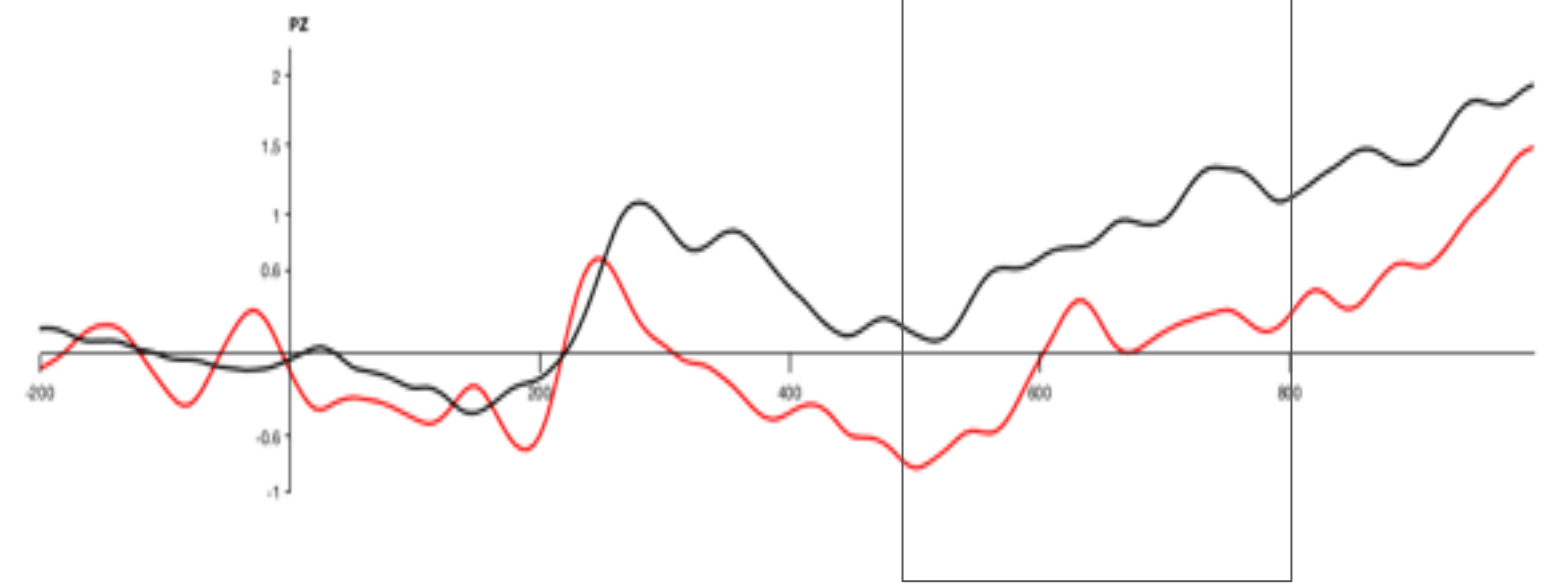
Positivity

Negativity

Data for 'they'

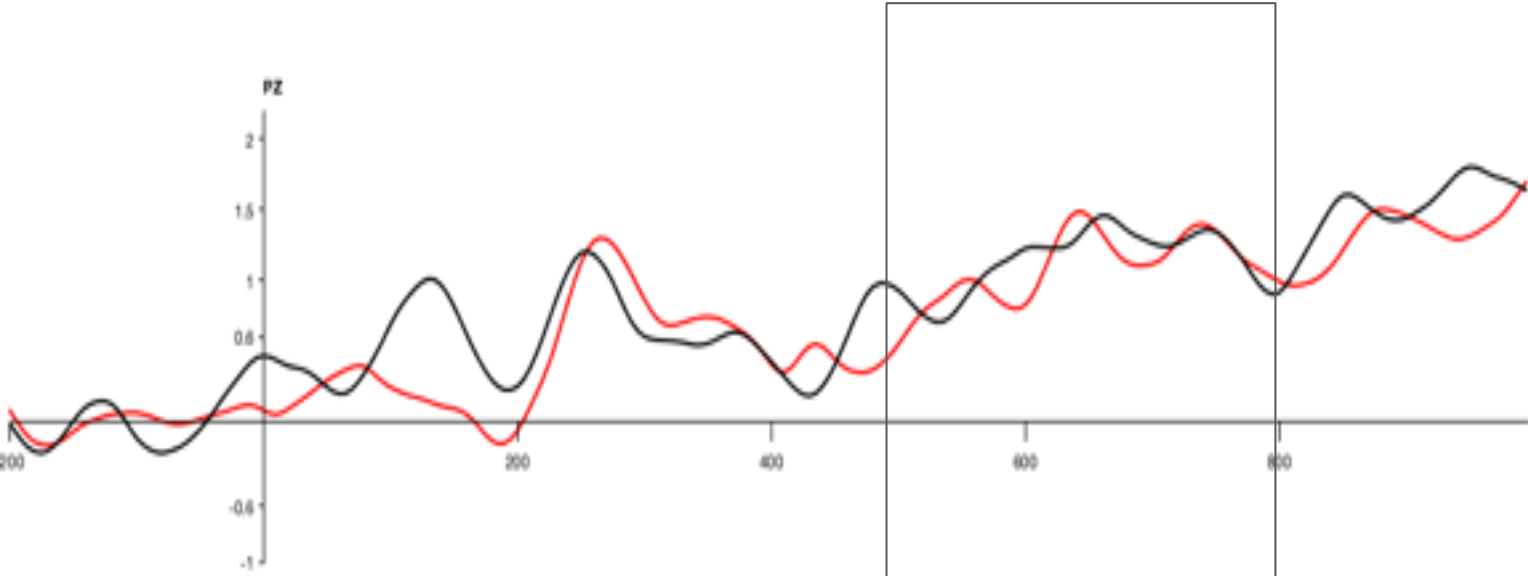


Someone
Some people

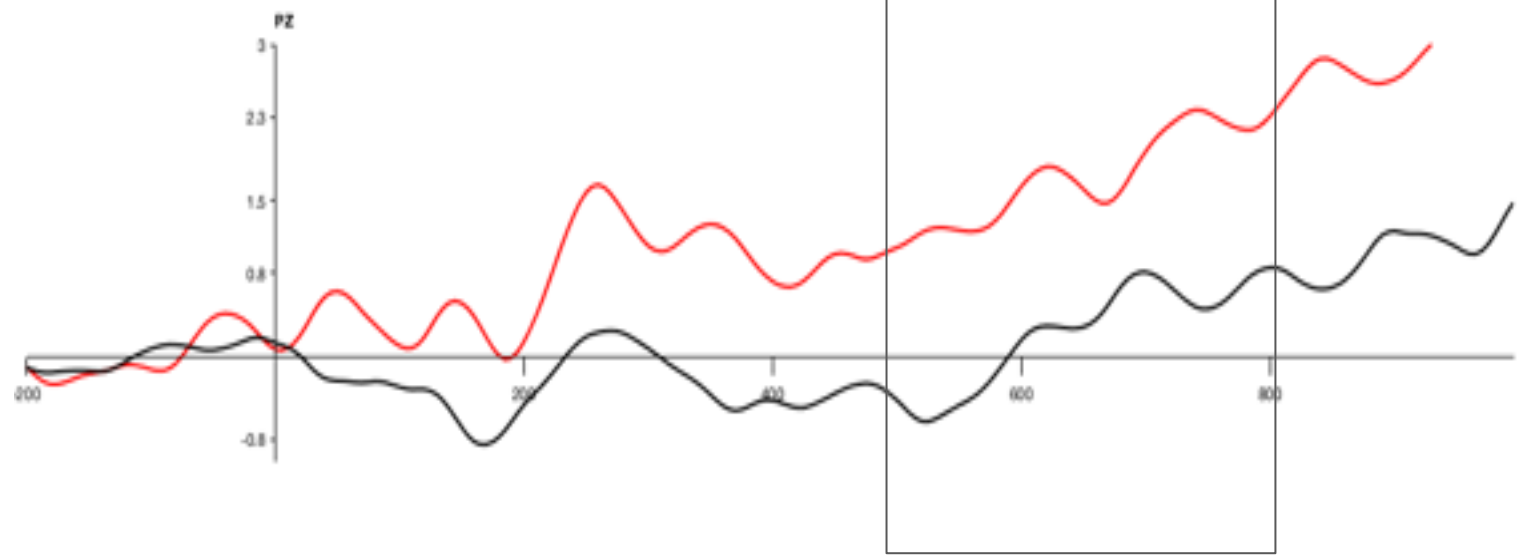


The participant
The participants

Singular antecedent they ...
Plural antecedent ... they ...



Some woman
Some women



John
John and Mary

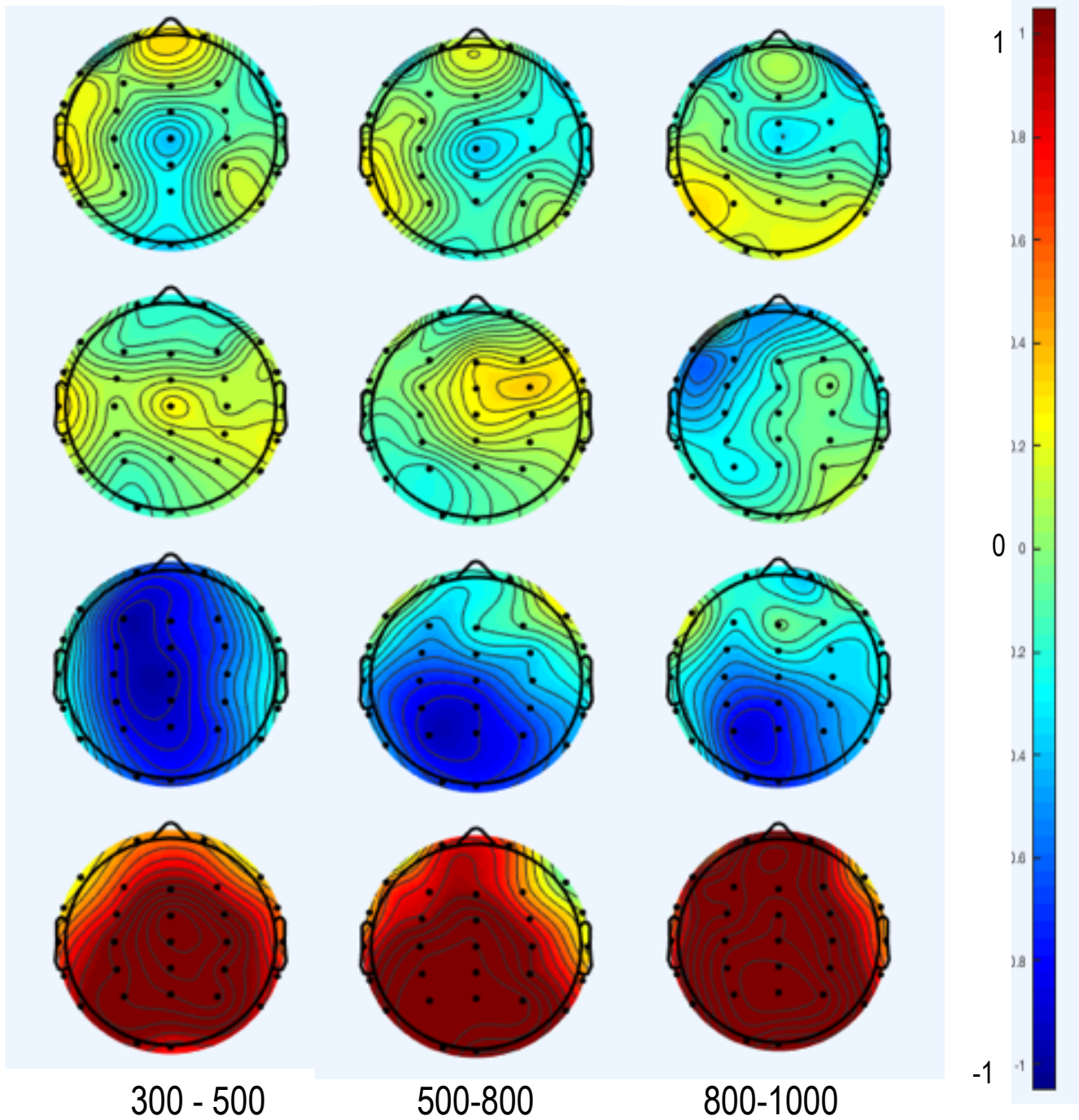
Singular antecedent they ...
Plural antecedent ... they ...

someone MINUS some people

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the participant MINUS the participants

Mary MINUS John and Mary



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Conclusions

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Conclusions

- Singular 'they' is a gender rather than number violation
- It is easier to co-index 'they/themselves' with a singular antecedent with ambiguous gender vs. a singular antecedent with unambiguous gender
- This is true even though 'themselves' has a morphological plural marker
- Even people who are in an environment where there are many individuals who identify as gender non-binary and have high intellectual commitment to conceptualizing gender as non-binary cannot associate Mary with 0-feminine

Further questions

- Given that even people who are in an environment where there are many individuals who identify as gender non-binary and have high intellectual commitment to conceptualizing gender as non-binary cannot associate Mary with 0-feminine, does this mean these people will find it difficult to use singular 'they' for very masculine or feminine looking individuals?

Further questions

- Given that even people who are in a high frequency non-binary environment and have high intellectual commitment to conceptualizing gender as non-binary cannot associate Mary with 0-feminine, does this mean these people will find it difficult to use singular 'they' for very masculine or feminine looking individuals?
- What would the processing effort look like for gender neutral names like 'Alex'? For specific antecedents with stereotypical gender like 'nurse'?

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- What would the processing effort look like for gender neutral names like 'Alex'? For specific antecedents with stereotypical gender like 'nurse'?
- Would the results look the same for a person who personally knew a non-binary 'Mary'?
Can people learn to expect 'themselves' with 'Mary'?

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- What would the processing effort look like for gender neutral names like 'Alex'? For specific antecedents with stereotypical gender like 'nurse'?
- Would the results look the same for a person who personally knew a non-binary 'Mary'? Can people adapt to expect 'themselves' with 'Mary'?
- How can this be extended to languages that have grammatical gender? What about languages that have a gender neutral pronoun? Would the processing effort for associating 'Mary' with the gender neutral pronoun still be high?

Acknowledgements

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