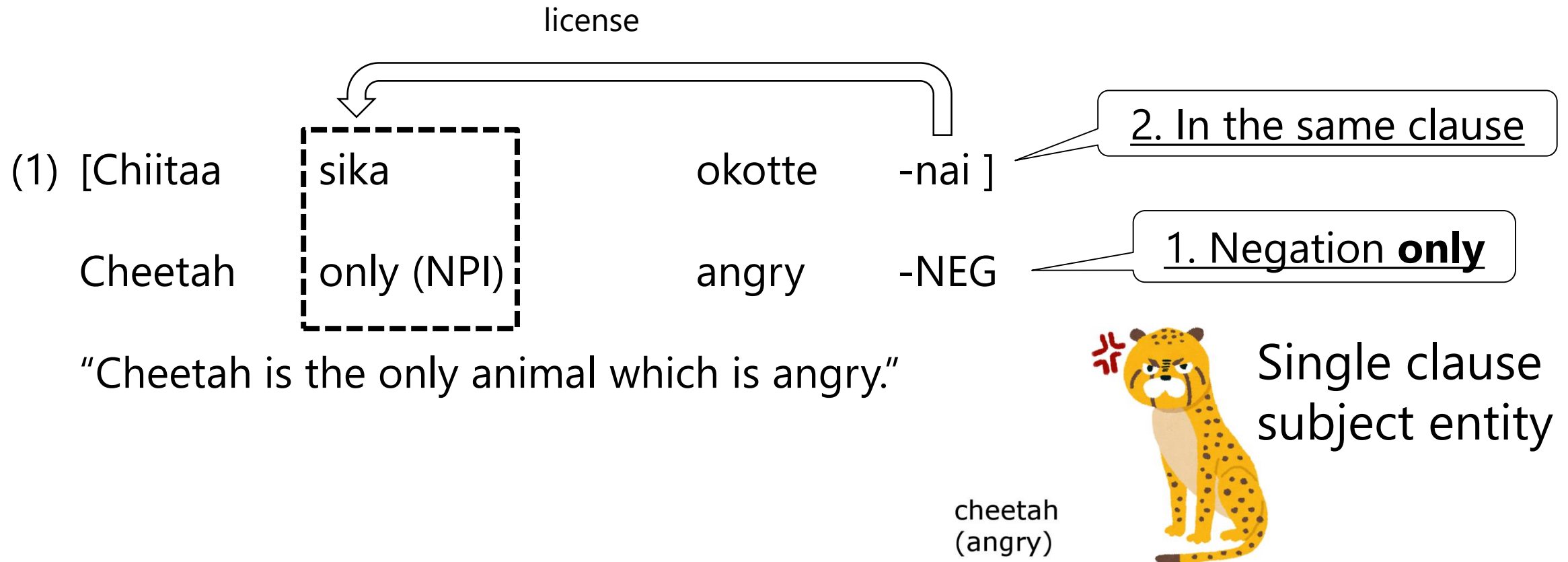


Structural predictions by agreement mismatches

Takeshi Kishiyama

Background of the study (Negative Polarity Items in Japanese)

- How are Japanese NPIs different from English NPIs?



Expectation of NEG lead by NPI

expectation (Yoshida, Bise, Kato)

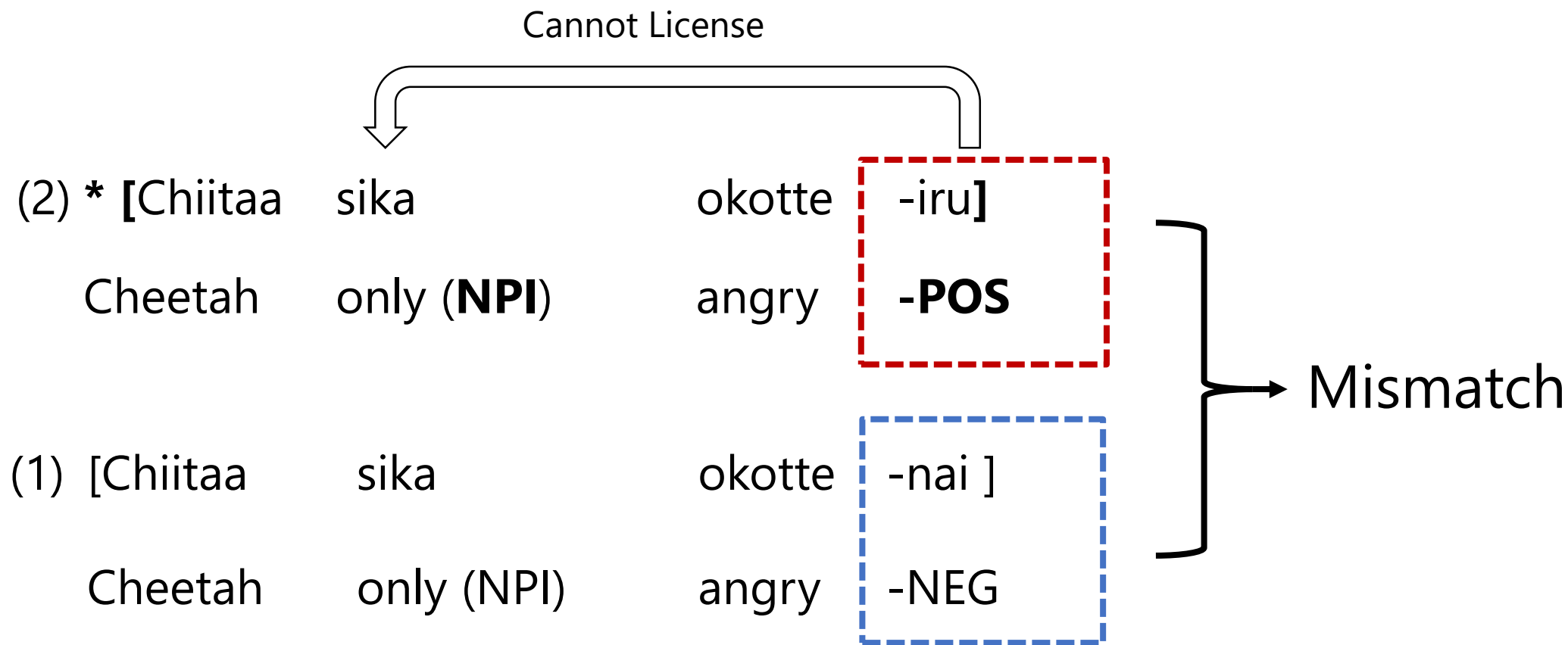
(1) [Chiitaa	sika	okotte	-nai]
Cheetah	only (NPI)	angry	-NEG

"Cheetah is the only animal which is angry."

cheetah
(angry)

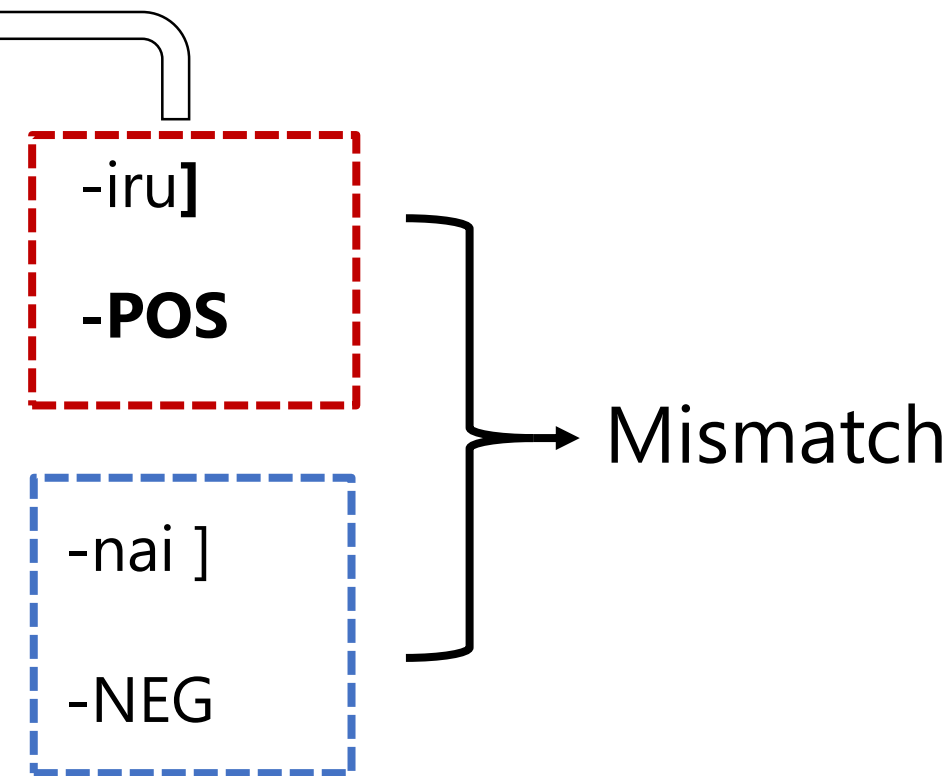


Mismatch between NPI and NEG



"Cheetah is the only animal which is angry."

Mismatch between NPI and NEG



s angry."

1. makes reader/listeners wait until another input which determines the structure.

2. makes them re-construct or even predict the upcoming structure to resolve the mismatch.

Bi-clausal structures can resolve the mismatch between NPI and NEG

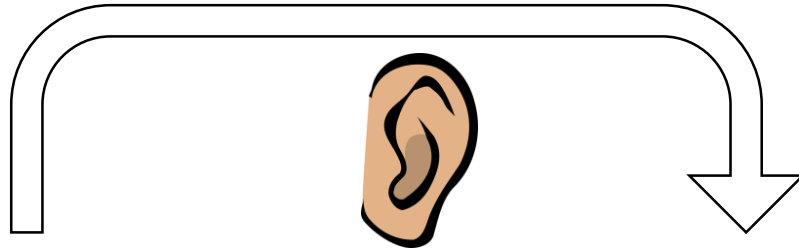
evidence for
relative clause

(3) [_{MC} Chiitaa sika [_{NP} [_{RC} okotte -iru] inoshishi]-o mi-nai]
Cheetah only (NPI) angry POS boar-ACC look-NEG
Cheetah is the only animal which looks at the boar which is angry."



Relative clause
head entity

expectation



(1) [Chiitaa

sika

okotte

-nai]

Cheetah

only (NPI)

angry

-NEG

Single clause
subject entity

"Cheetah is the only animal which is angry."



4700ms



(1) [Chiitaa
Cheetah

sika
only (NPI)

okotte
angry

-iru]

-POS

*



Mismatch condition

4700ms



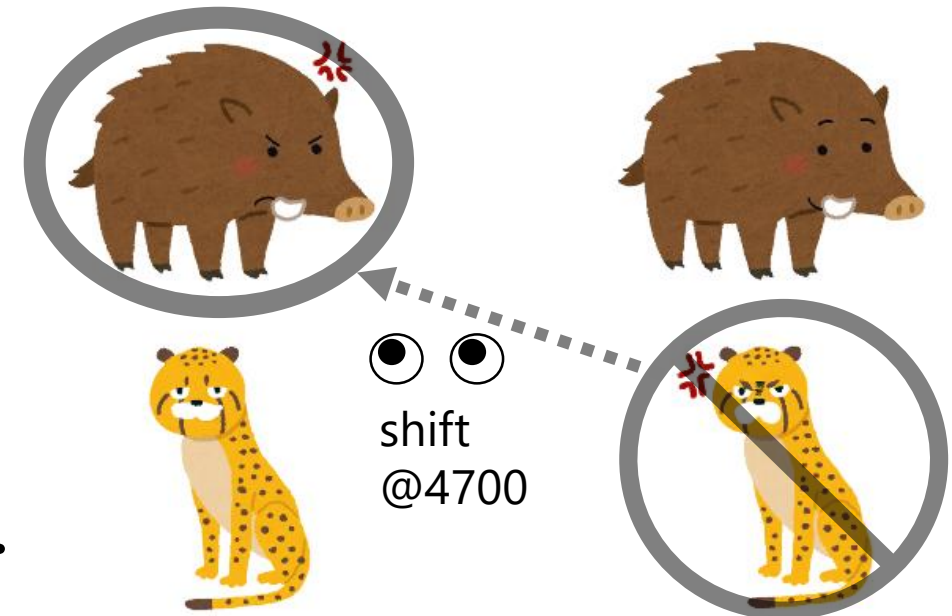
evidence for
relative clause

(3) [MC Chiitaa sika [NP [RC okotte -iru] inoshishi]-o mi-nai]
Cheetah only (NPI) angry POS boar-ACC look-NEG

Cheetah is the only animal which look at the boar which is angry."

1. There are two animals which are angry.
2. The animal which is angry is not the cheetah.

-> **The angry boar is the best candidate.**

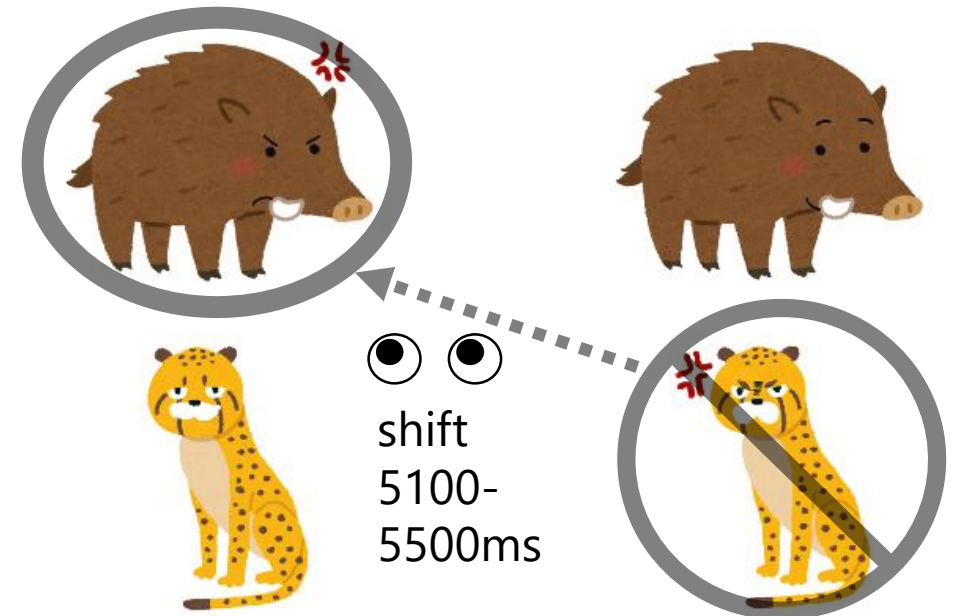


No-Mismatch condition

(3) [_{MC} Chiitaa **dake**] [_{NP} [_{RC} okotte -iru] inoshishi]-o mi-nai]
Cheetah only (Non-NPI) angry POS boar-ACC look-NEG
Cheetah is the only animal which look at the boar which is angry."

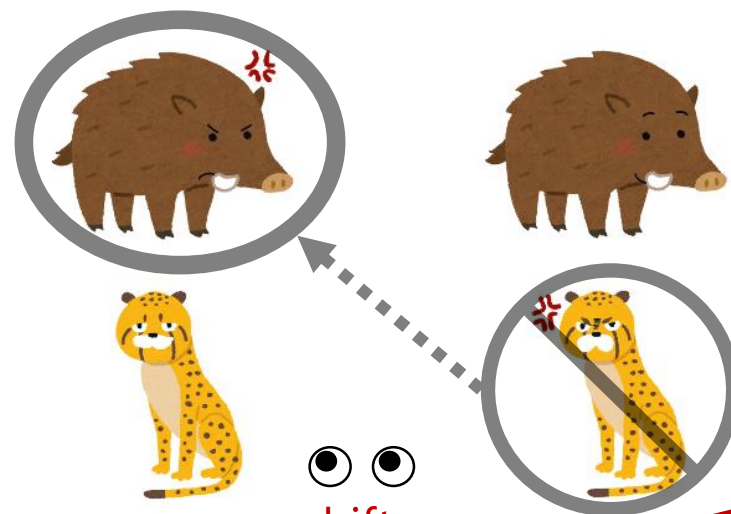
evidence for
relative clause

Relative clause
head entity



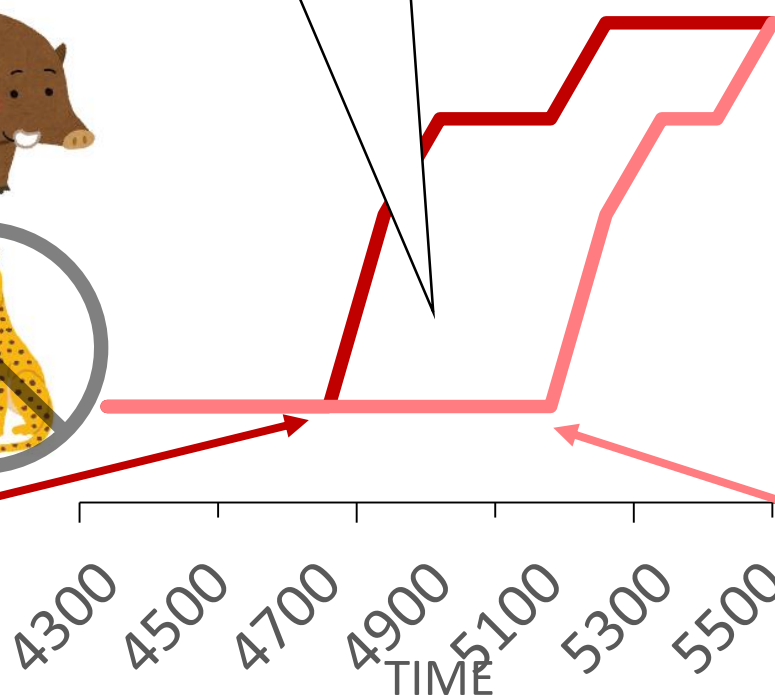
Predictions

Mismatch condition (NPI & Positive)

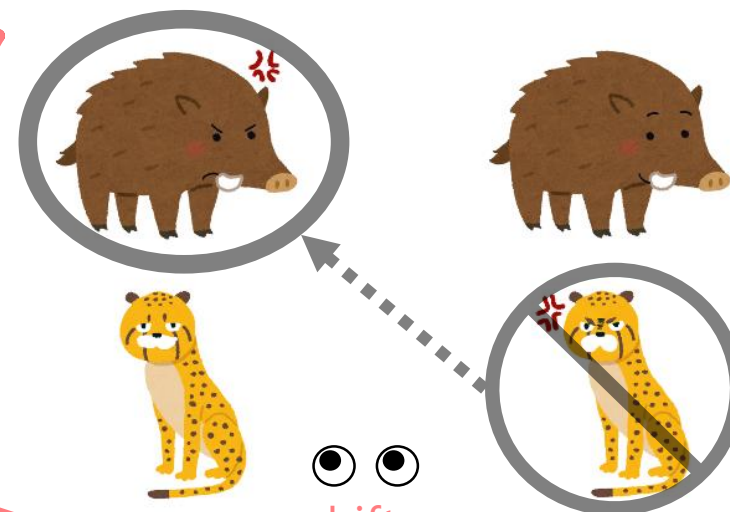


shift
@4700

The prediction effect
for the RC analysis



No-Mismatch condition (NPI & Positive)



shift
after

(3) $[_{MC}$ Chiitaa **sika** $[_{NP} [_{RC}$ okotte **-iru**]

Cheetah only (NPI) angry POS

(3) $[_{MC}$ Chiitaa **dake** $[_{NP} [_{RC}$ okotte **-iru**] inoshishi

Cheetah only (NPI) angry POS boar

Experiment

- 33 participants
- 24 items (Relative clause)
- 48 fillers (Non-relative clause)
- 2x2 conditions (Latin square design)
 - Each participant sees each item only in one condition)

NPI & Positive

- (4) a. [Chiitaa sika [okotte iru inoshishi-o mite-nak-atta]
Cheetah only (**NPI**) angry POS boar-ACC look-NEG-PST
Cheetah is the only animal which looked at the boar which is angry."

mismatch!

Non-NPI & Positive

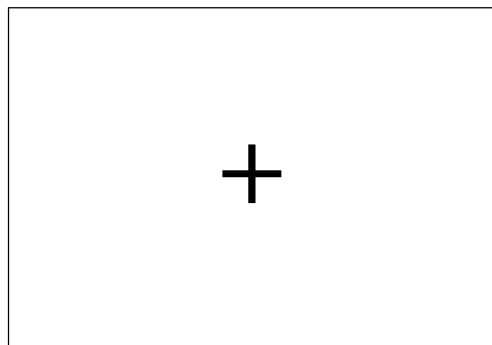
- b. [Chiitaa dake [okotte iru] inoshishi-o mite-nak-atta]
Cheetah only (**Non-NPI**) angry POS boar-ACC look-NEG-PST
Cheetah is the only animal which didn't look at the boar which is angry."

NPI & Negative

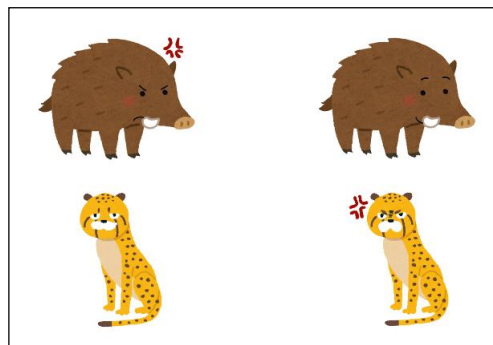
- c. [Chiitaa sika [okotte nai] inoshishi-o mite-nak-atta]
Cheetah only (**NPI**) angry NEG boar-ACC look-NEG-PST
Cheetah is the only animal which looked at the boar which is not angry."

Non-NPI & Negative

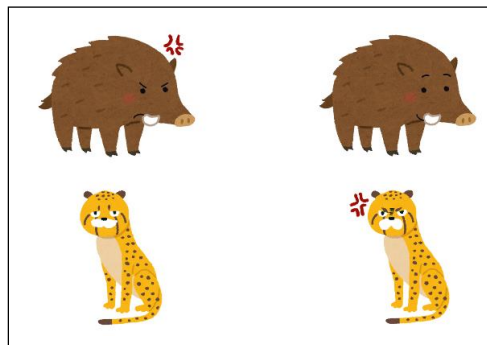
- d. [Chiitaa dake [okotte nai] inoshishi-o mite-nak-atta]
Cheetah only (**Non-NP**) angry NEG boar-ACC look-NEG-PST
Cheetah is the only animal which didn't look at the boar which is not angry."



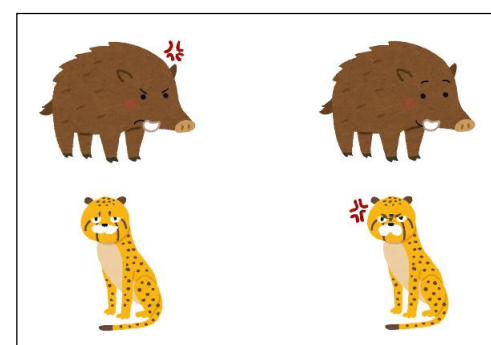
Fixation:
1000ms



Visual display:
2000ms



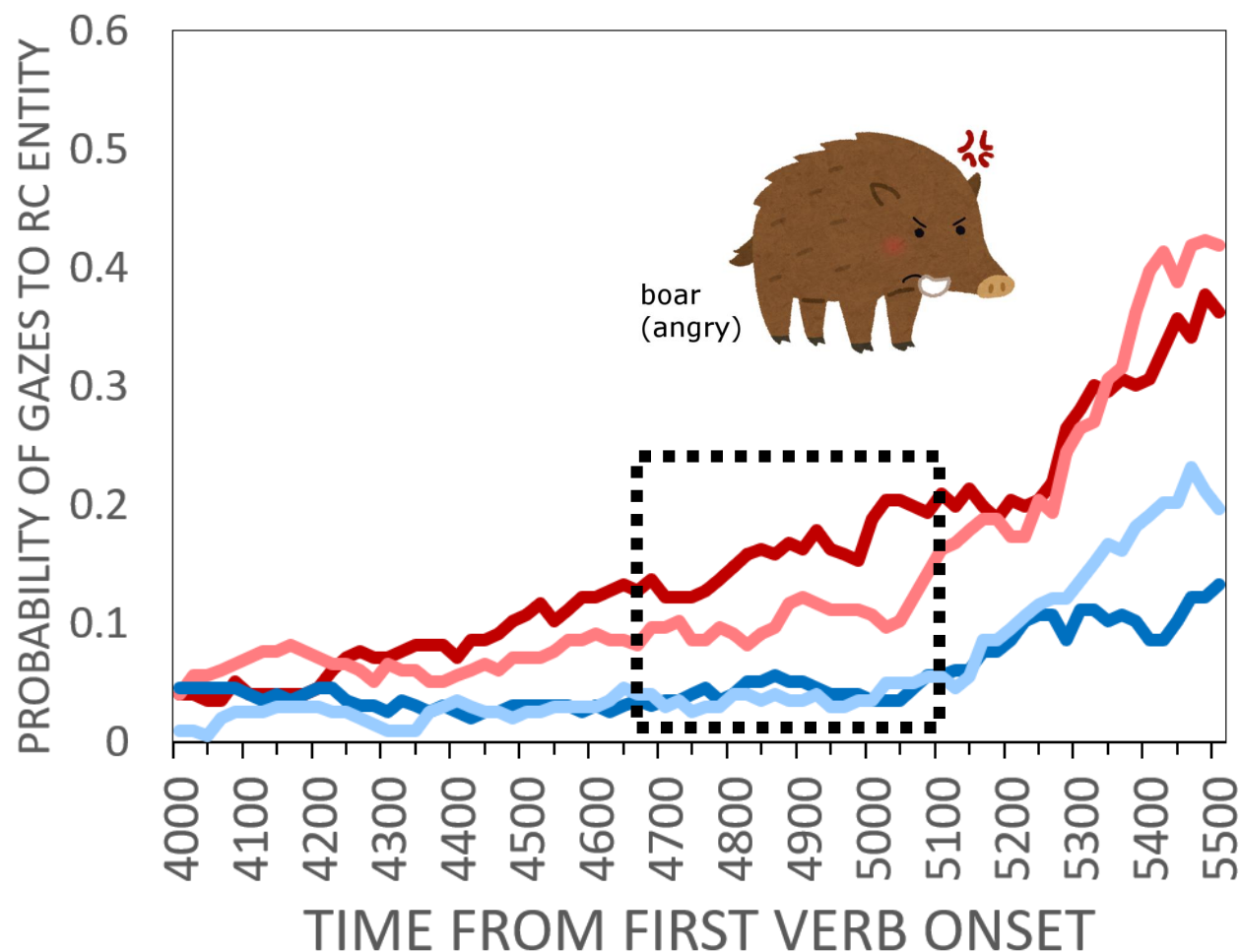
Spoken
sentence



Mouse
click



Gaze to RC head (4700ms—5100ms)



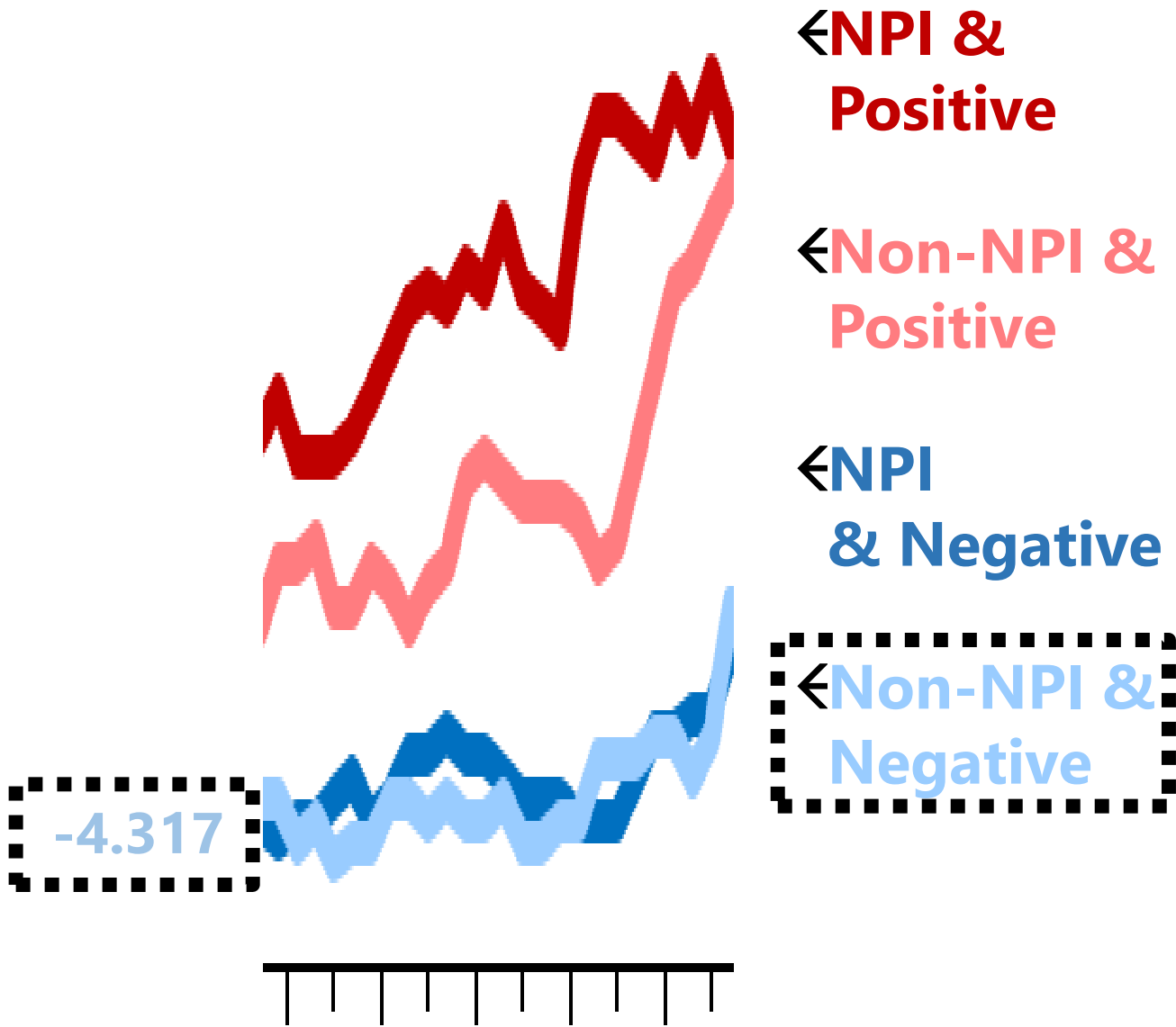
Backward selection

logit ~ np_i * aff + (1 | subj) + (1 | item)
model summary:

Factor	β	Std.	t	p
(Intercept)	-4.317	0.22	-19.26	
NPI	0.206	0.12	1.66	0.094 .
POL	0.831	0.12	6.70	< .001 ***
NPI:POL	0.264	0.12	2.13	0.032 *

Gaze to RC head(4700ms—5100ms)

Intercept(**Non-NPI & Negative**)

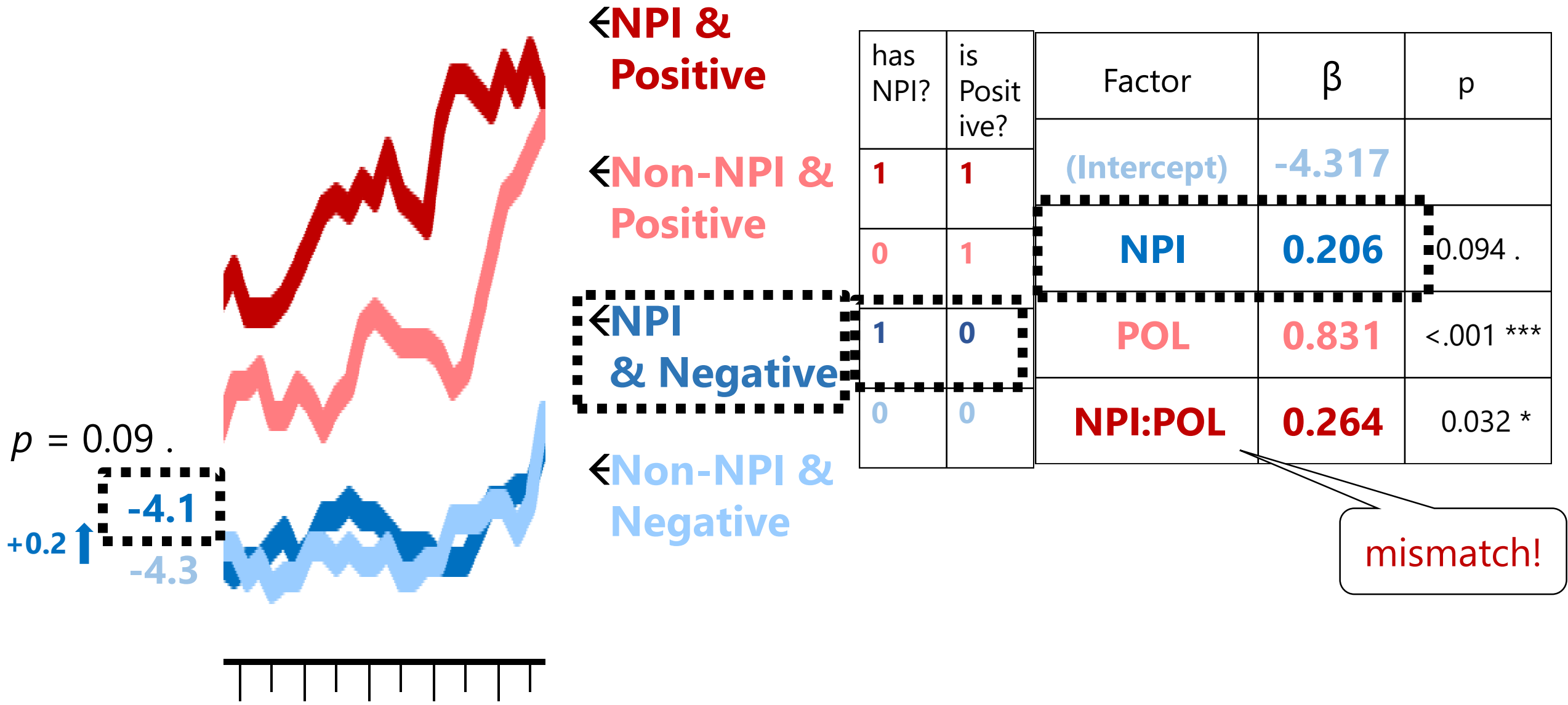


has NPI?	is Positive?	Factor	β	p
1	1	(Intercept)	-4.317	
0	1	NPI	0.206	0.094 .
1	0	POL	0.831	<.001 ***
0	0	NPI:POL	0.264	0.032 *

mismatch!

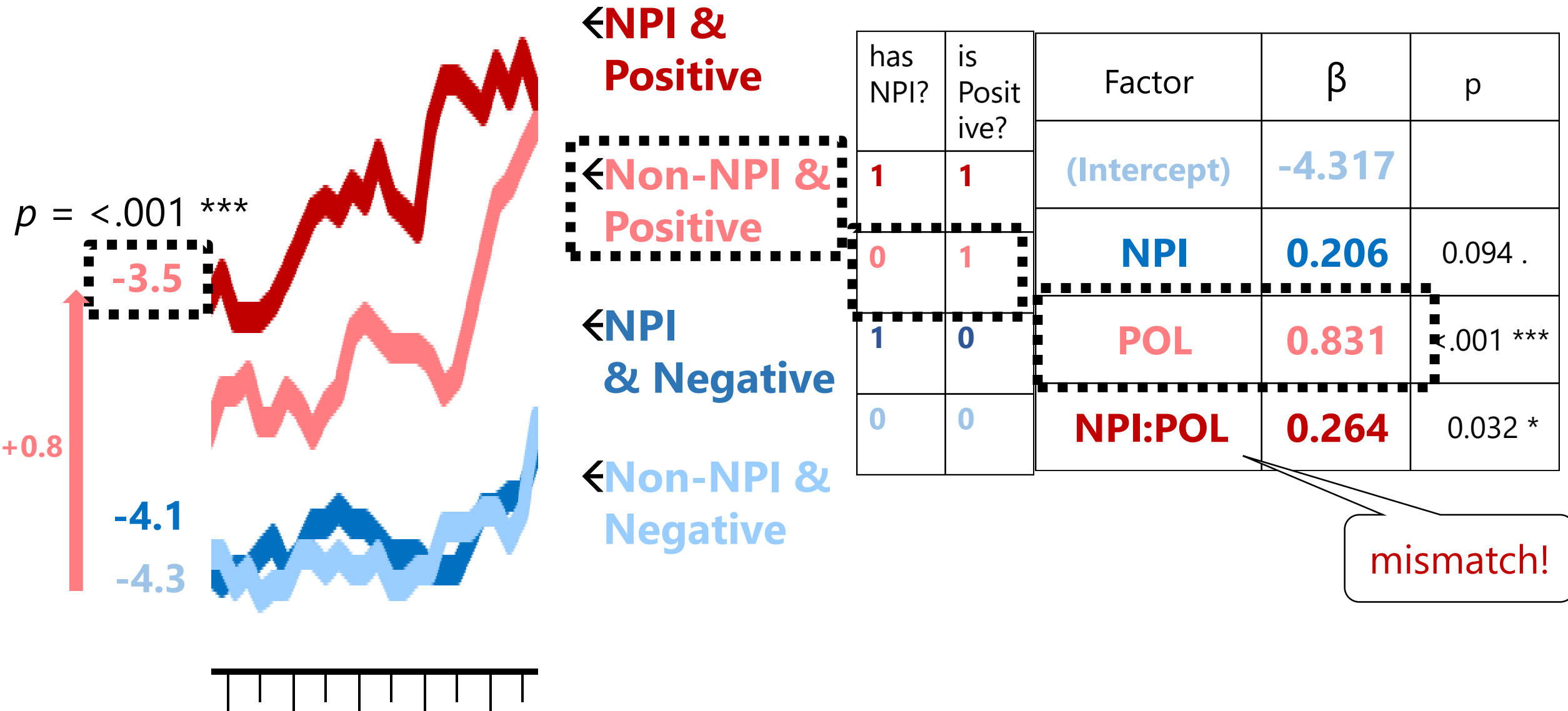
Gaze to RC head (4700ms—5100ms)

Main effect of NPI



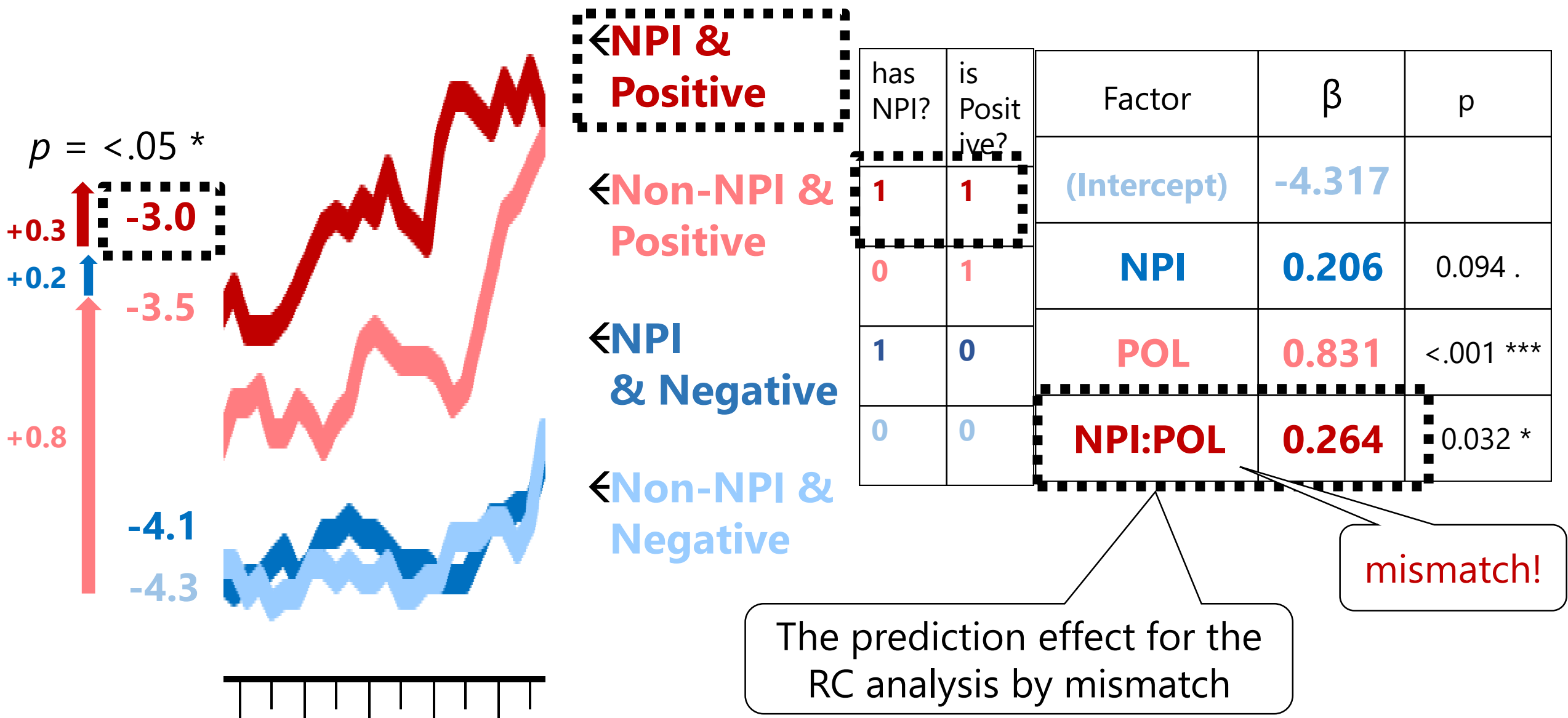
Gaze to RC head (4700ms—5100ms)

Main effect of Polarity (Positive)



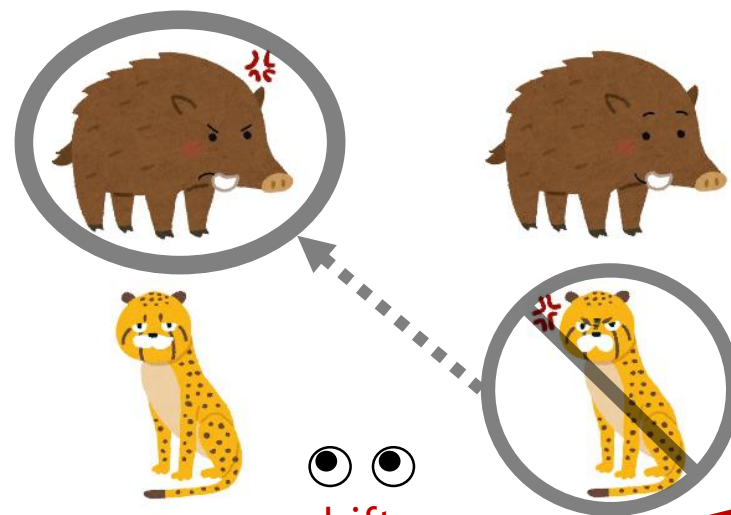
Gaze to RC head (4700ms—5100ms)

Interaction of NPI and Positive



Predictions

Mismatch condition (NPI & Positive)

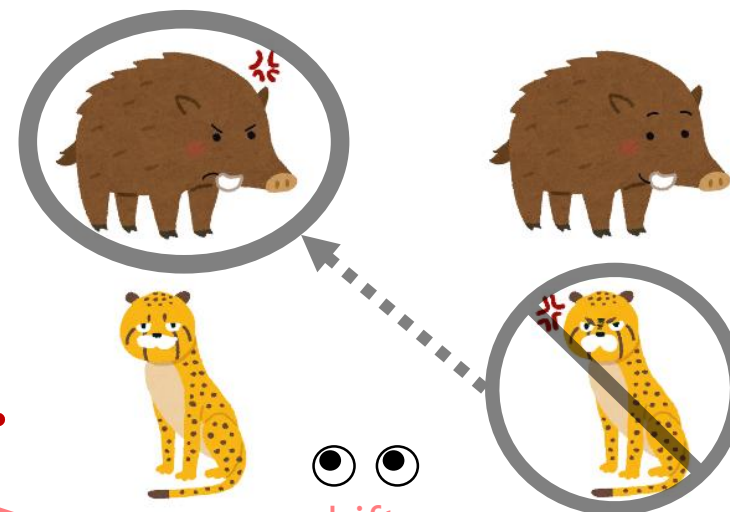


● ●
shift
@4700

4300 4500 4700 4900 5100 5300 5500
TIME

The prediction effect
for the RC analysis

No-Mismatch condition (NPI & Positive)

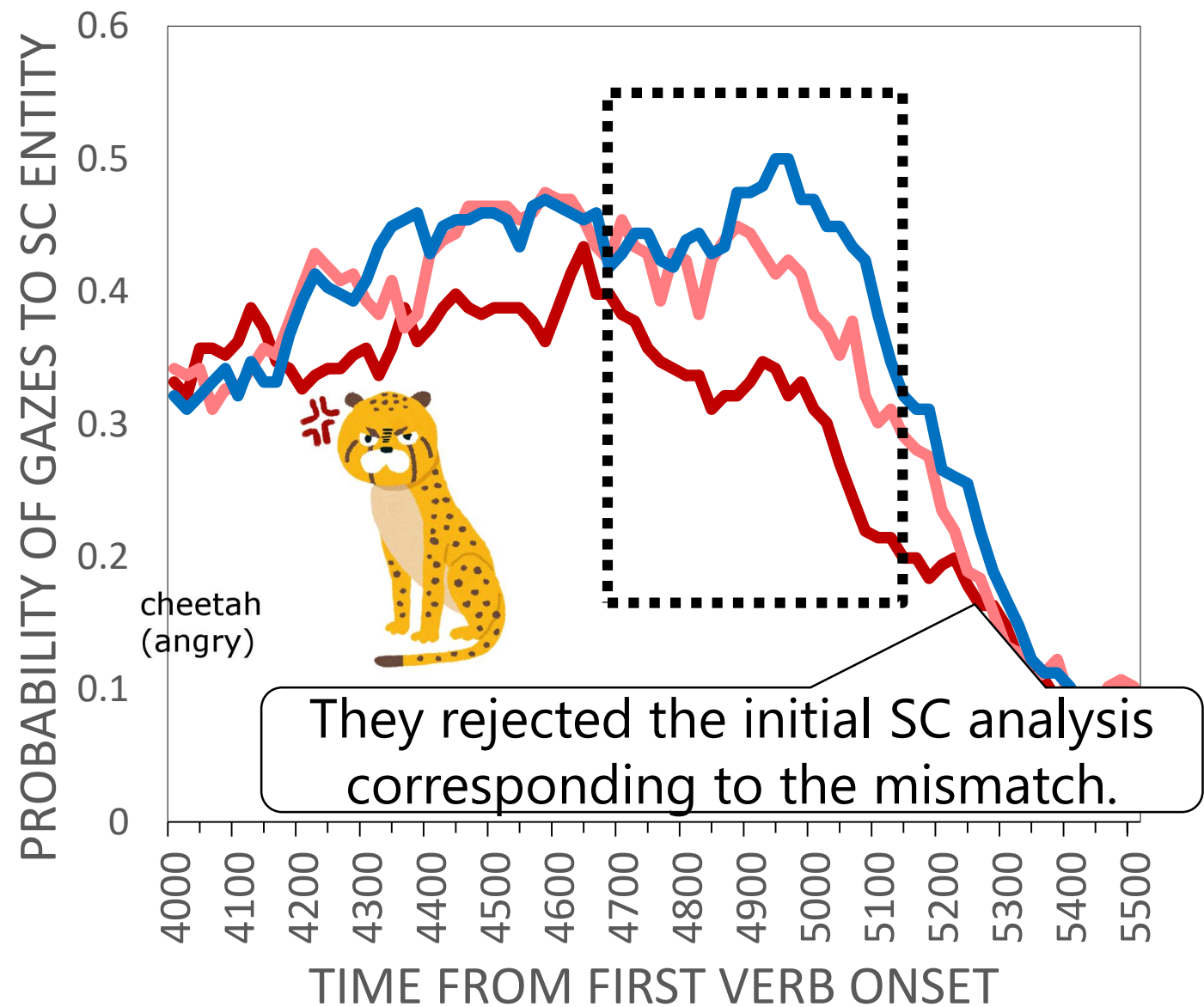


● ●
shift
after

(3) $[_{MC}$ Chiitaa **sika** $[_{NP} [_{RC}$ okotte -iru]
Cheetah only (NPI) angry POS

(3) $[_{MC}$ Chiitaa **dake** $[_{NP} [_{RC}$ okotte -iru] inoshishi
Cheetah only (NPI) angry POS boar

gaze to single clause subject entity



**NPI &
Positive**

**Non-NPI &
Positive**

**NPI
& Negative**

Mismatch

1

0

0

	β	Std.	t	p
(Intercept)	-0.037	0.316	-0.119	
mismatch	-0.723	0.183	-3.944	<.01***

Conclusion

- Agreement mismatches lead structural predictions.
 - The parsers make a prediction that goes beyond what is confirmed by the linguistic evidence
 - ... if it is contextually supported by the presence of visual objects hinting that there might be other entities involved in the situation.

What can we do next?

- Some effects should be reduced in (4a) compared to other conditions.
 - The processing load of NEG at the matrix level
 - The garden path effect corresponding to the second noun phrase
- We conduct the analysis of pupil-dilation which indicates the processing cost.