More participants, fewer trials:
A silver lining of moving eye-tracking experiments online

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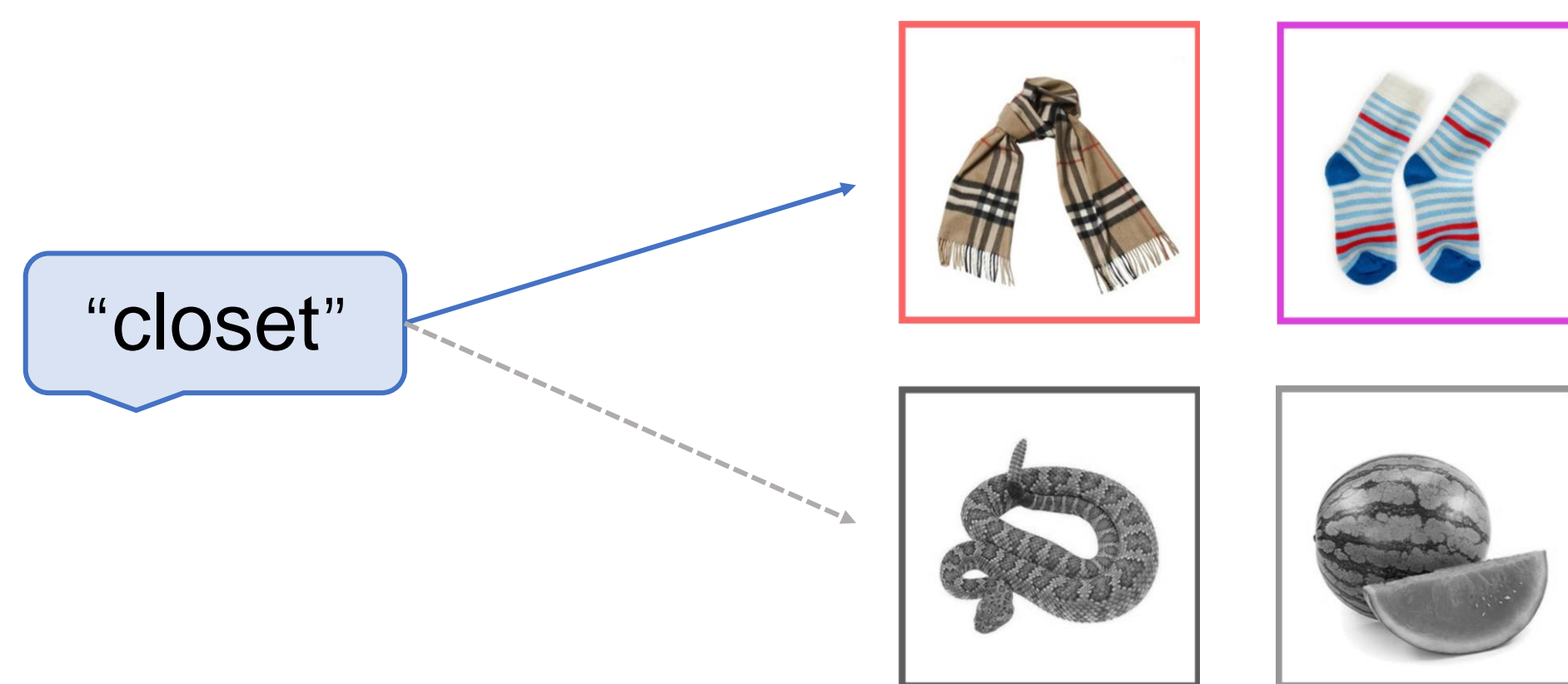
LAPP

1. Goals

- To replicate prior in-lab results [1] with web-based eye-tracking.
- To test whether behavior changes across an experiment.

2. Phenomenon
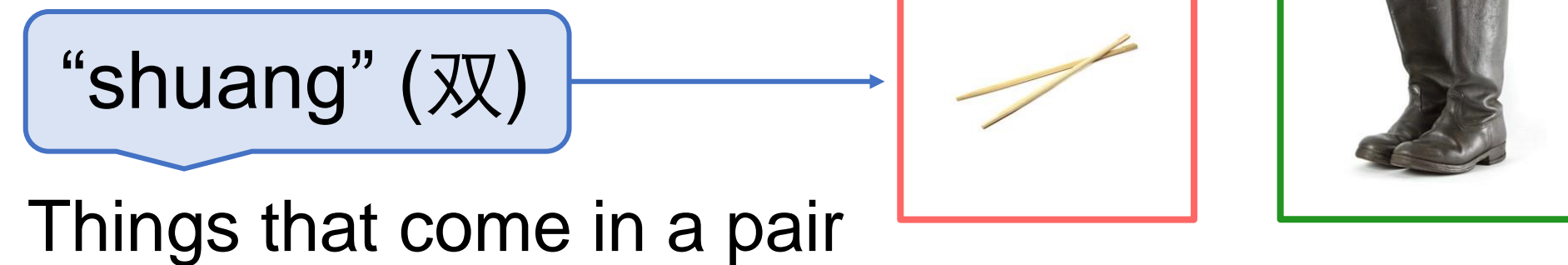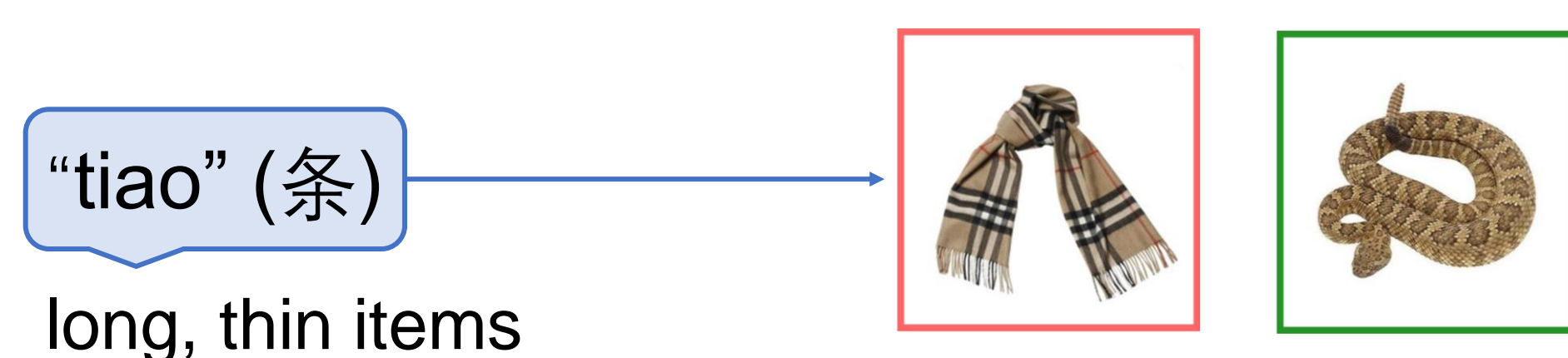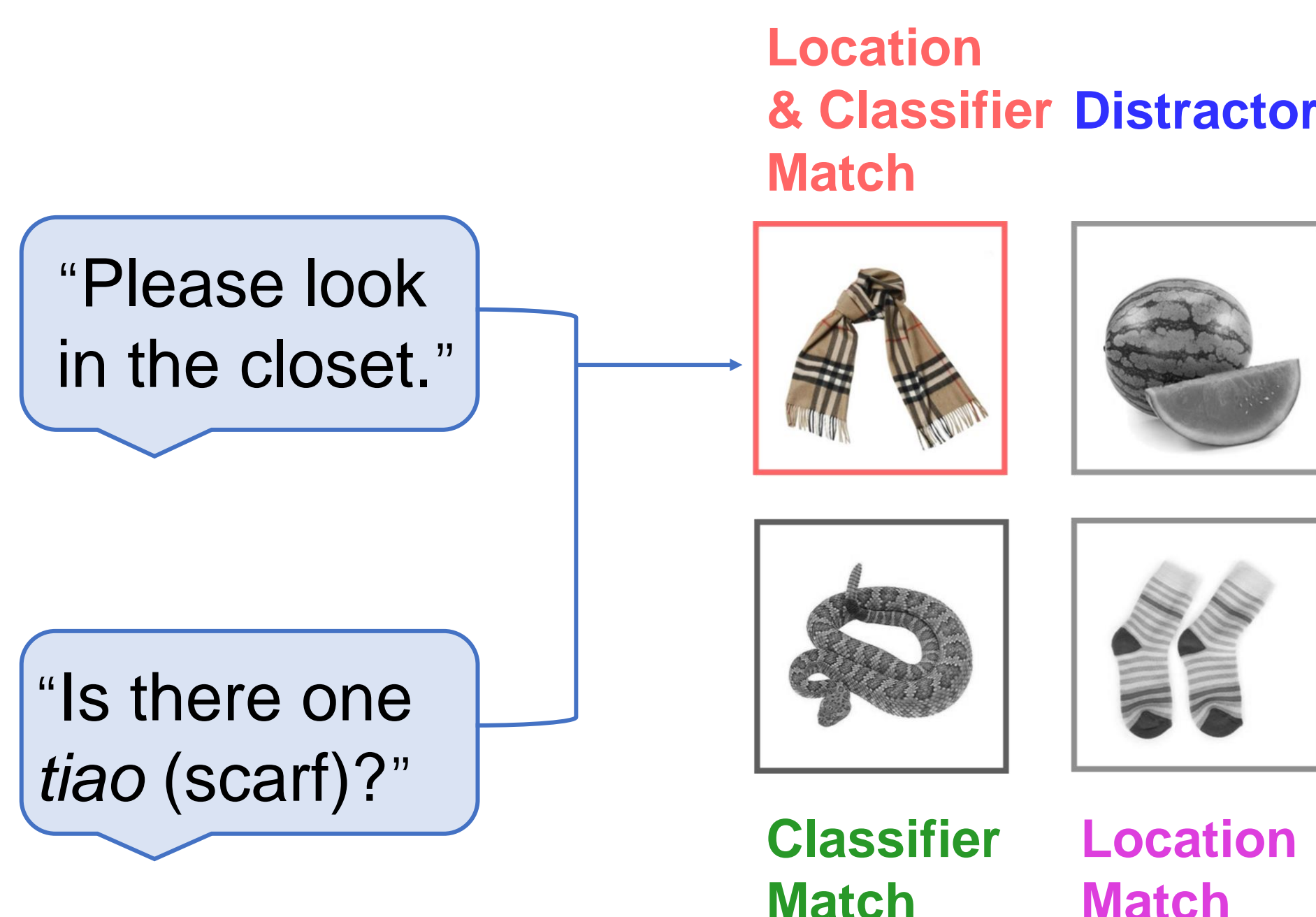
Using semantic cues to facilitate predictions

- **Location-specific cues:**

  "closet"

- **(Chinese) Classifier-specific cues:**

  "tiao" (条)
  long, thin items

  "shuang" (双)
  Things that come in a pair

- **Integrating two cues:**

  Location & Classifier Match   **Distractor**

  "Please look in the closet."

  "Is there one *tiao* (scarf)?"

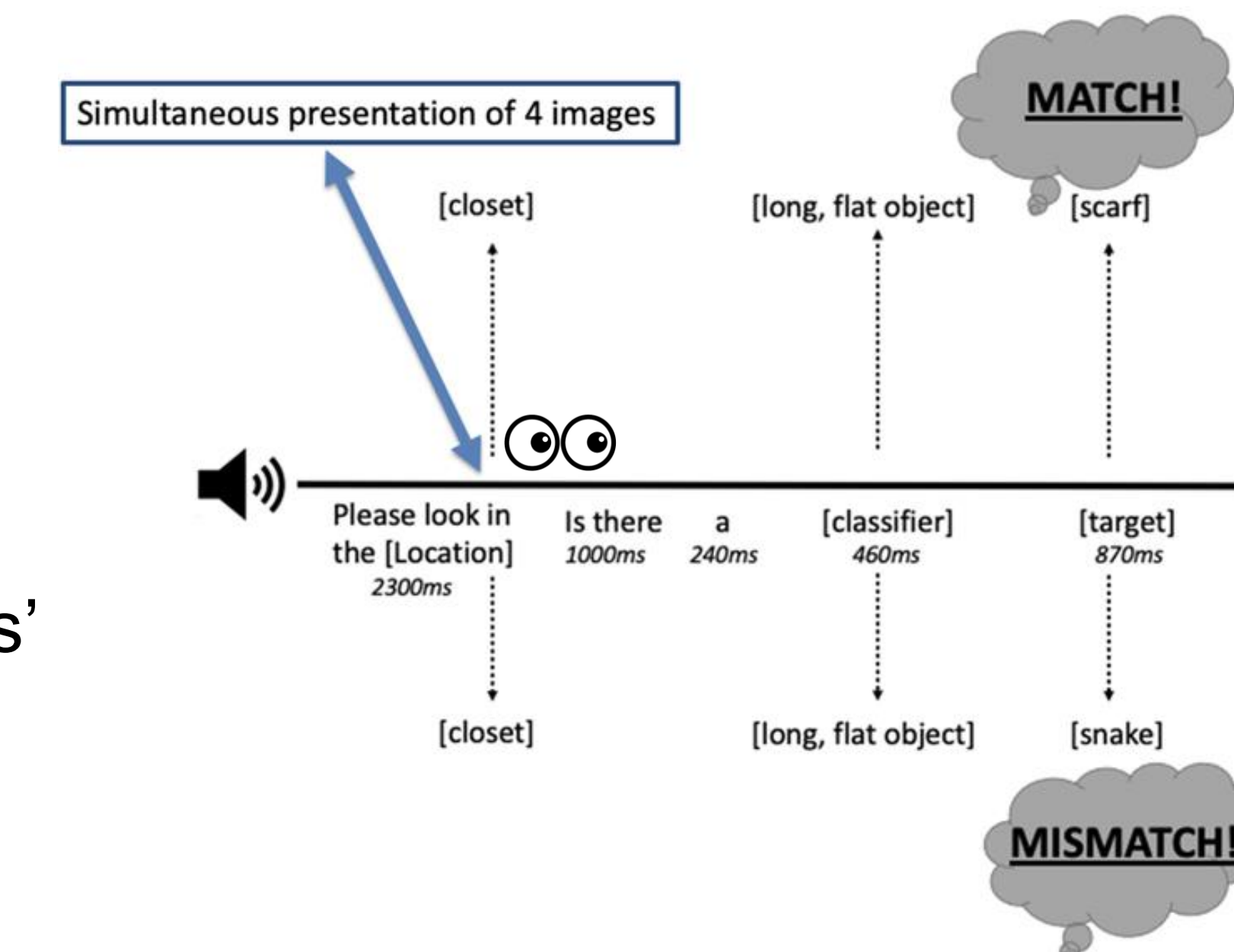 **Classifier Match**   **Location Match**

3. Method

Norming task

- $N_{L1\ English\ Monolinguals}=37$; $N_{L1\ Mandarin\ L2\ English} = 31$
- E.g., "How likely it is to find a [snake] in [the closet]?"

Web-based visual world experiment

- $N_{L1\ Mandarin\ (L2\ English)}= 47$; $N_{L2\ Mandarin\ (L1\ English)} = 46$
- 14 match trials, 14 mismatch trials, 20 fillers
- **Time-course analysis** captures real-time changes of participants' looks
- **Location Advantage analysis** measures the extent to which participants use location information (see note 1)

Simultaneous presentation of 4 images

MATCH!

Please look in the [Location] 2300ms | Is there 1000ms | a 240ms | [classifier] 460ms | [target] 870ms

MISMATCH!

4. Results

Time-course analysis:

— **Location & Classifier Match**   - - - **Classifier Match**   ...... **Location Match**   -·-·- **Distractor**
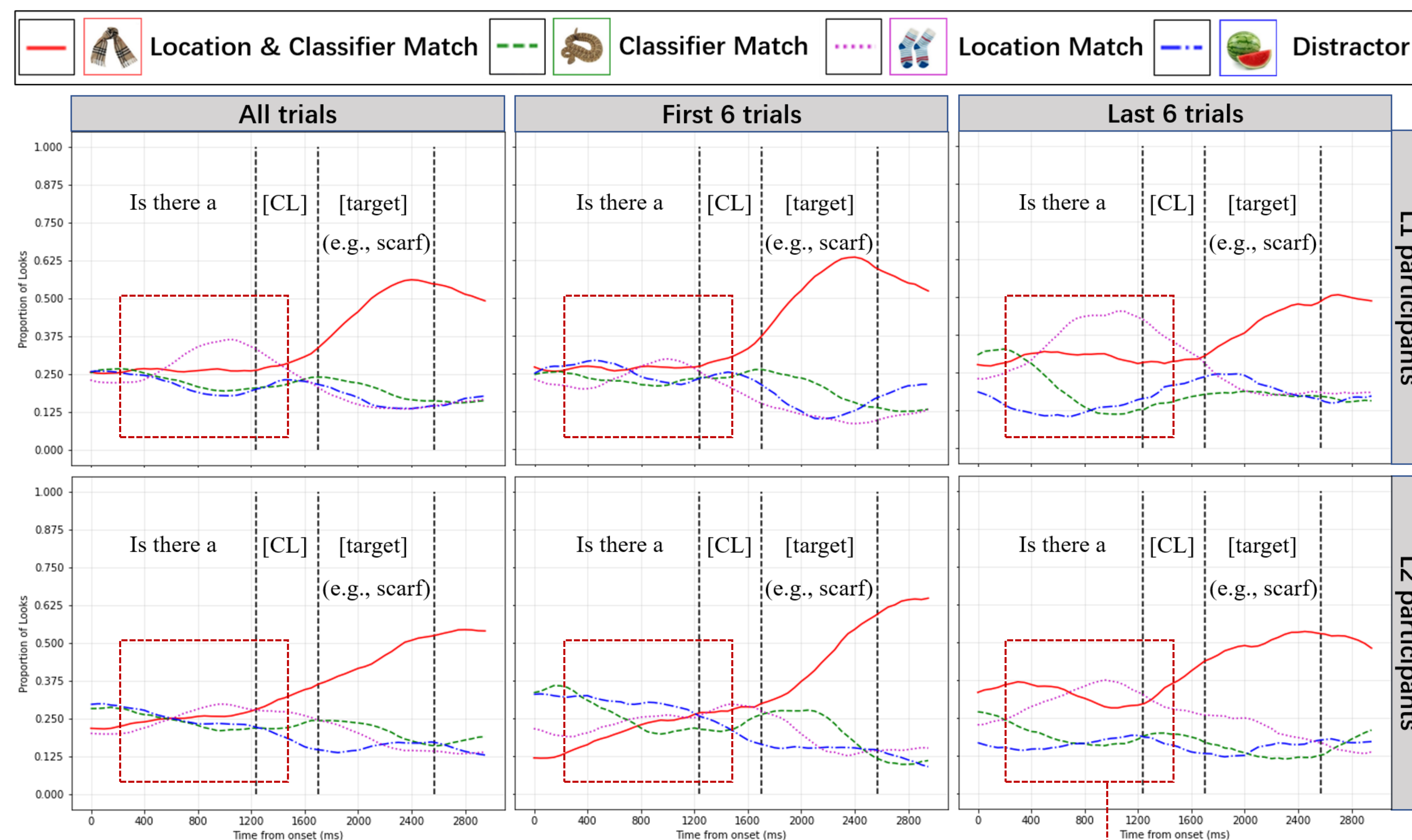

Figure 1. Time-Course Analysis of Looks to Four AOIs in Match Trials

Location Advantage analysis:

Table 1. Fixed Effects of Location Advantage from the Linear Mixed-Effect Regression

	All trials	First 6 trials	Last 6 trials
GroupL2	−0.11 (.14)	**−0.23 (.06)**	−0.03 (.79)
ConditionMismatch	0.01 (.97)	0.15 (.19)	−0.25 (.15)
GroupL2:ConditionMismatch	0.02 (.87)	0.17 (.31)	−0.14 (.38)

Note: Formula: LocAdv ~ Group * Condition + (1 | Participant) + (1 | Trial)

L2 listeners showed less (if any) sensitivity to location information in early trials but similarly high sensitivity in late trials, suggesting task-specific adjustments over the course of the experiment.

5. Conclusions

- As in [1], both L1 and L2 listeners can integrate location and classifier information to make predictions.
- Repeated exposure to experimental manipulations risks changing participants' responses over the course of an experiment.
- Web-based eye-tracking provides a good opportunity to test many more participants on fewer items, which may better capture language processing patterns.

Note

(1) Location Advantage = ($Count_{LocationMatch}$ + $Count_{Location\&ClassifierMatch}$ − $Count_{ClassifierMatch}$ − $Count_{Distractor}$) / ($Count_{Total}$)

Note: Considering that a 200-ms delay is expected between hearing the acoustic stimuli and executing eye movements accordingly, Location Advantage was calculated within 200 ms after the onset of the [location] till 200 ms after the onset of the [classifier], covering a time window of 1250 ms (25*50-ms time bins).

Reference

[1] Wiener, S., & Rohde, H. (2018). *Immediate integration of real-world knowledge and classifier cues during Mandarin sentence processing.* Talk at the 30th North American Conference on Chinese Linguistics (NACCL). Columbus, OH.