Gaze is Fixed on Eye-contacting Face Longer than Eye-averting Face only when Searching the Contacting Eye among Averting Eyes

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Introduction

Gaze and eye contact are important for human communication
- Autistic children rarely engage in eye contact, and show gaze aversion

(Baron-Cohen, Campbell, Karmiloff-Smith, Grant & Walker, 1995; Richer & Coss, 1976).

Search asymmetry is reported in detection of human gaze stimuli.
- A straight gaze target among averted gaze distractors is detected faster than an averted gaze target among straight gaze distractors (Kleinke, 1986).
- Perception of other's gaze is asymmetric only when the head is deviated; gazing face target is found faster than averting gaze target (Conty, Tijus, Hugueville, Coelho & George, 2006).

Purpose

Static eye's stimuli -> **Dynamic gaze stimuli** in a virtual environment with eye tracking
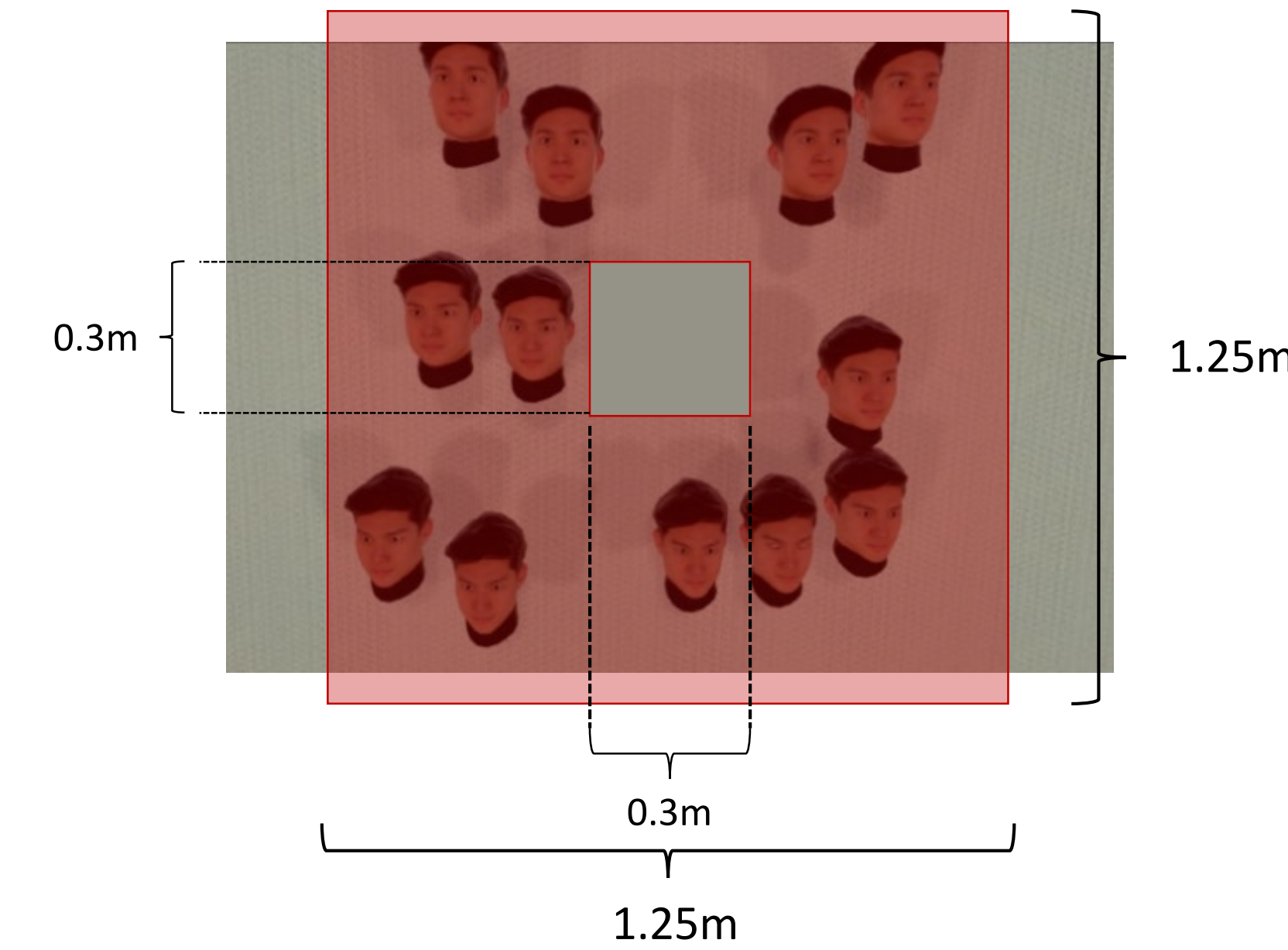To investigate human gaze detection behavior for eye contact and gaze aversion using visual search paradigm and eye fixation time analysis.

Stimuli

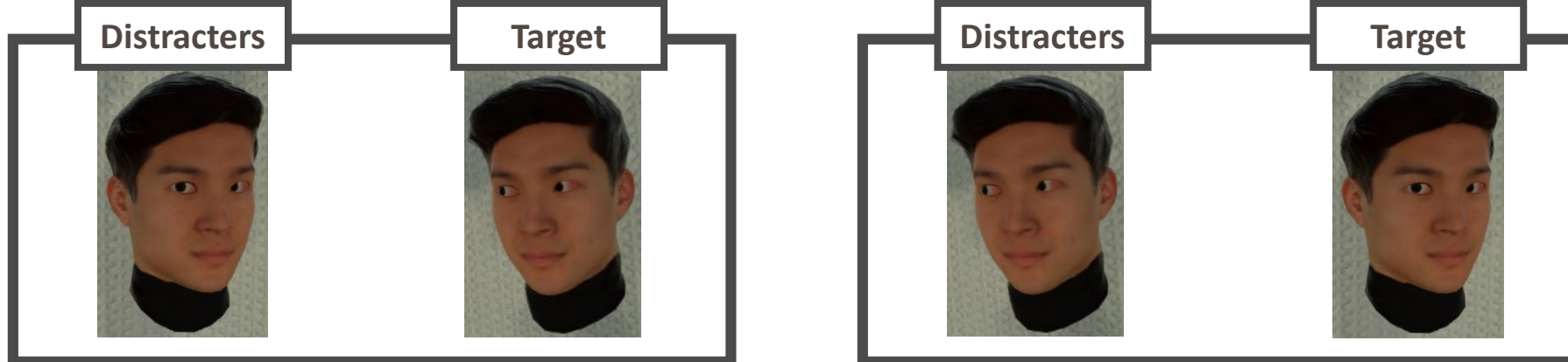**Dynamic** and **interactive** stimuli yoked by participants' eye contact

| Gazing Face | Averting Face | Blinking Face |

Looking straight ahead without participant's eye contact

0.3m   1.25m   0.3m   1.25m

Procedure

Experiment 1
- Gazing vs Averting:

Distracters   Target   Distracters   Target
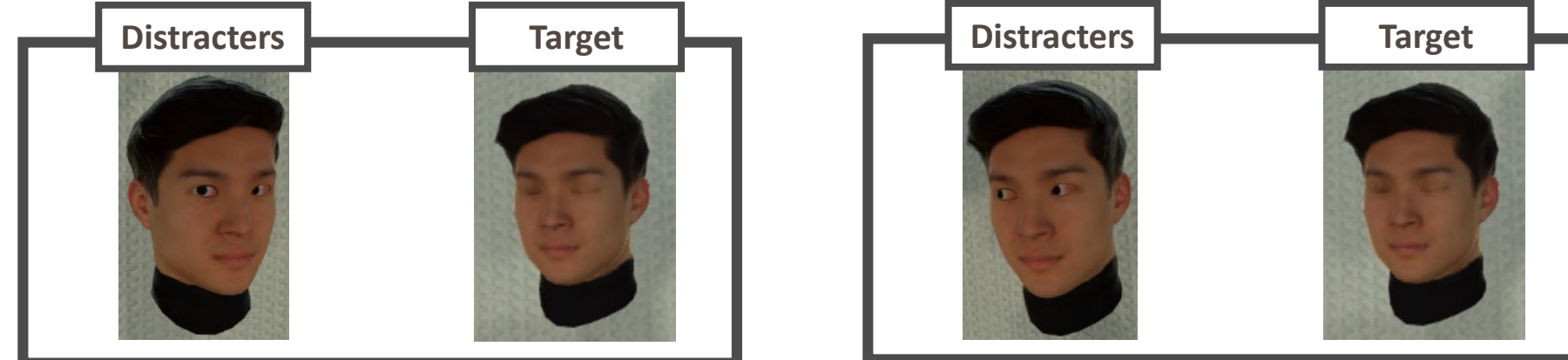
- Target existing (2) : absent, present
- Number of heads (3) : 4, 8, 12
- Head orientation (2) : upright, inverted

Experiment 2
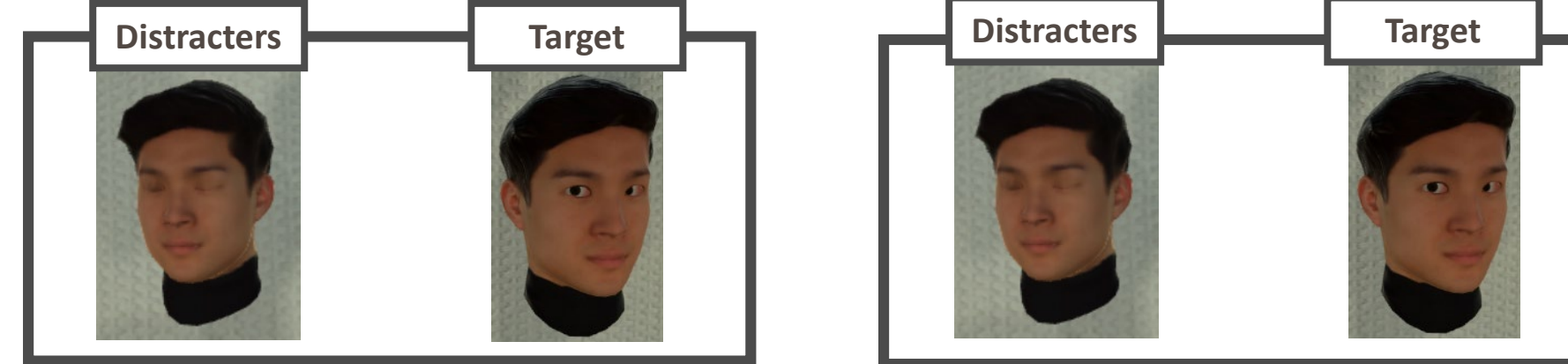- Blinking target – Gazing vs Averting distractors:

Distracters   Target   Distracters   Target

- Target existing (2) : absent, present
- Number of heads (3) : 4, 8, 12
- Head orientation (1) : upright

Experiment 3
- Gazing vs Averting target – Blinking distractors:

Distracters   Target   Distracters   Target

- Target existing (2) : absent, present
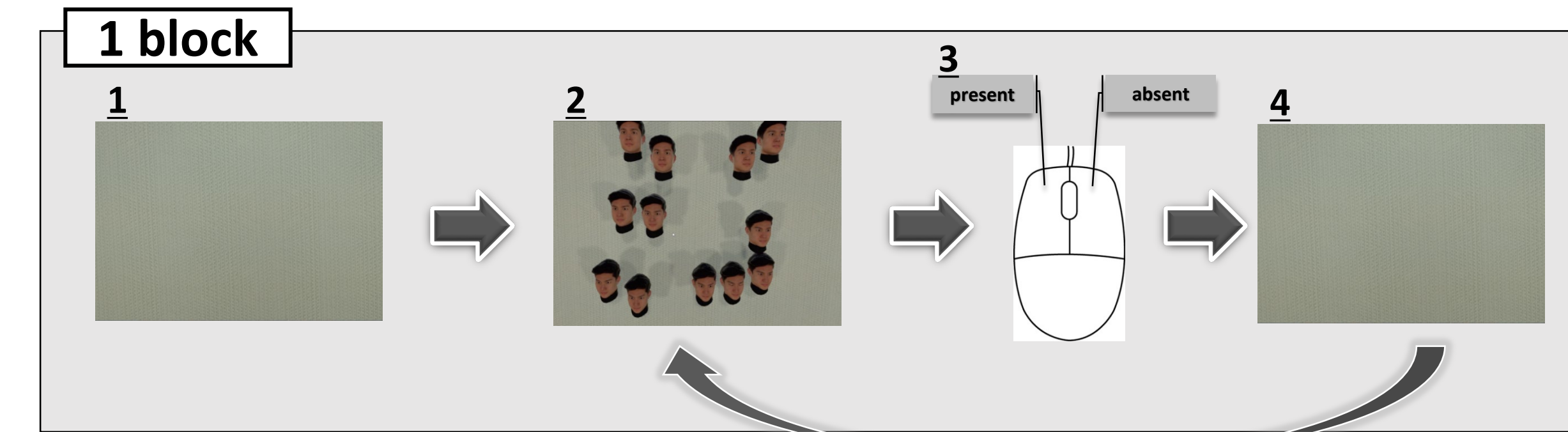- Number of heads (3) : 4, 8, 12
- Head orientation (1) : upright

**Task**

1 block

1   2   3 present absent   4

The participant were asked to judge whether the target existed or not.

1 block = The number of heads (3) x Head orientation (2 or 1) x with/without Target (2) x 10 repetitions = 120 or 60 trials in random order.
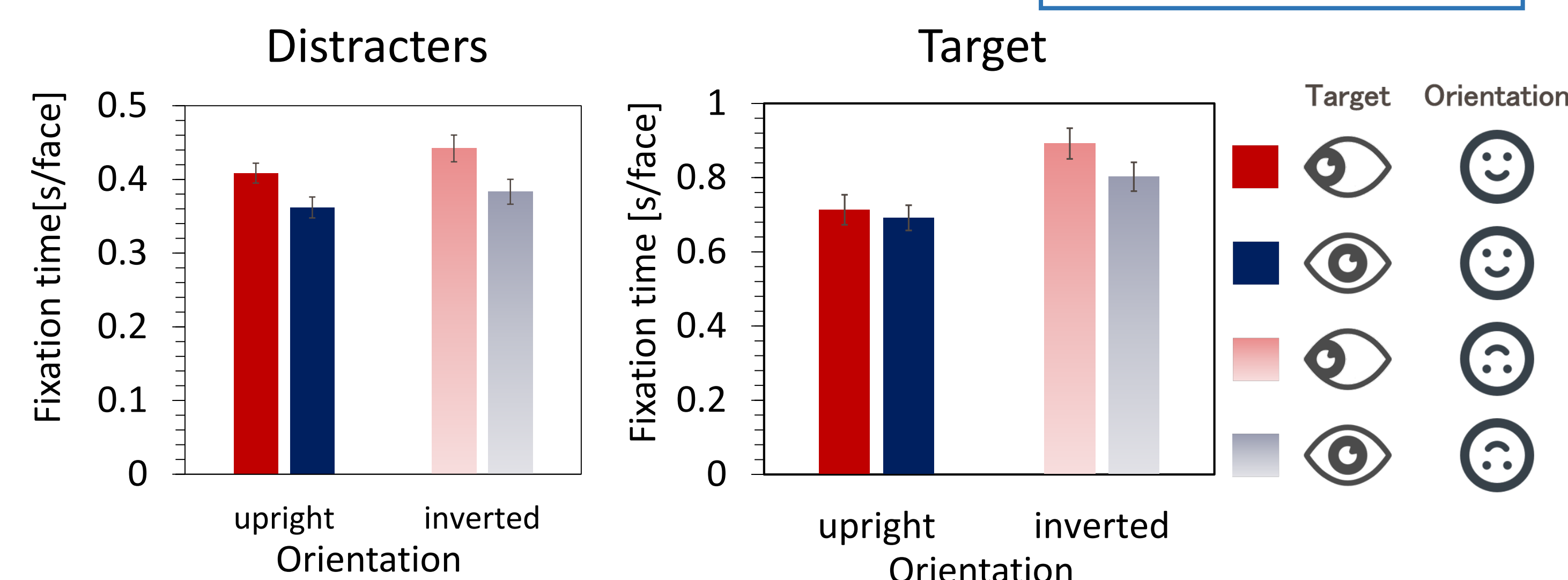Gaze behavior (2) x 2 repetitions (counter balanced) = 4 blocks = 480 or 240 trials.

Results & Discussion

Experiment 1

- **Reaction time**

Reaction time [s] vs Number of head (4, 8, 12)
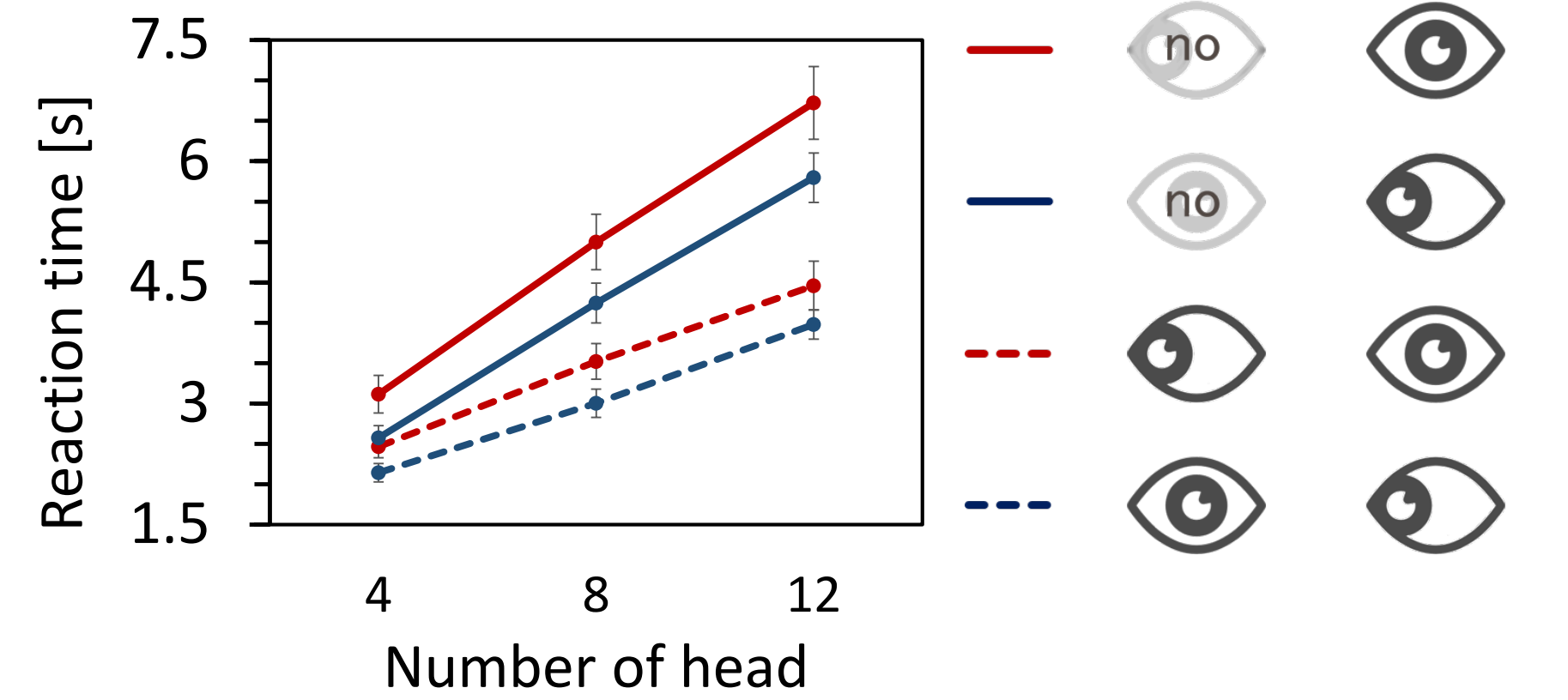
Target   Distracters

Experiment1

Reaction time

Gaze behavior × Target existing
$F(1,19)=5.3217$, p=.0325, $\eta_p^2=.2188$

Fixation time of distracters
Gaze behavior
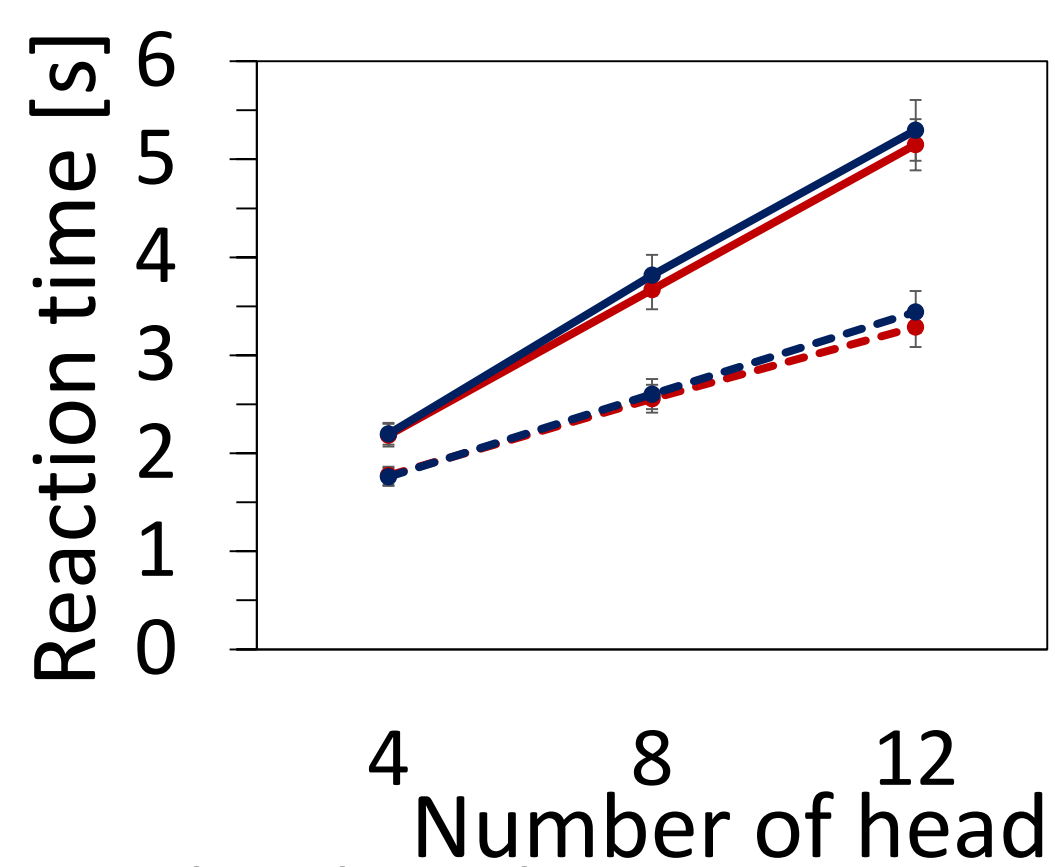$F(1,19)=63.7418$, p<.0001, $\eta_p^2=.7704$
Head orientation
$F(1,19)=23.0397$, p=.0001, $\eta_p^2=.5480$

Fixation time of target
Gaze behavior × Head orientation
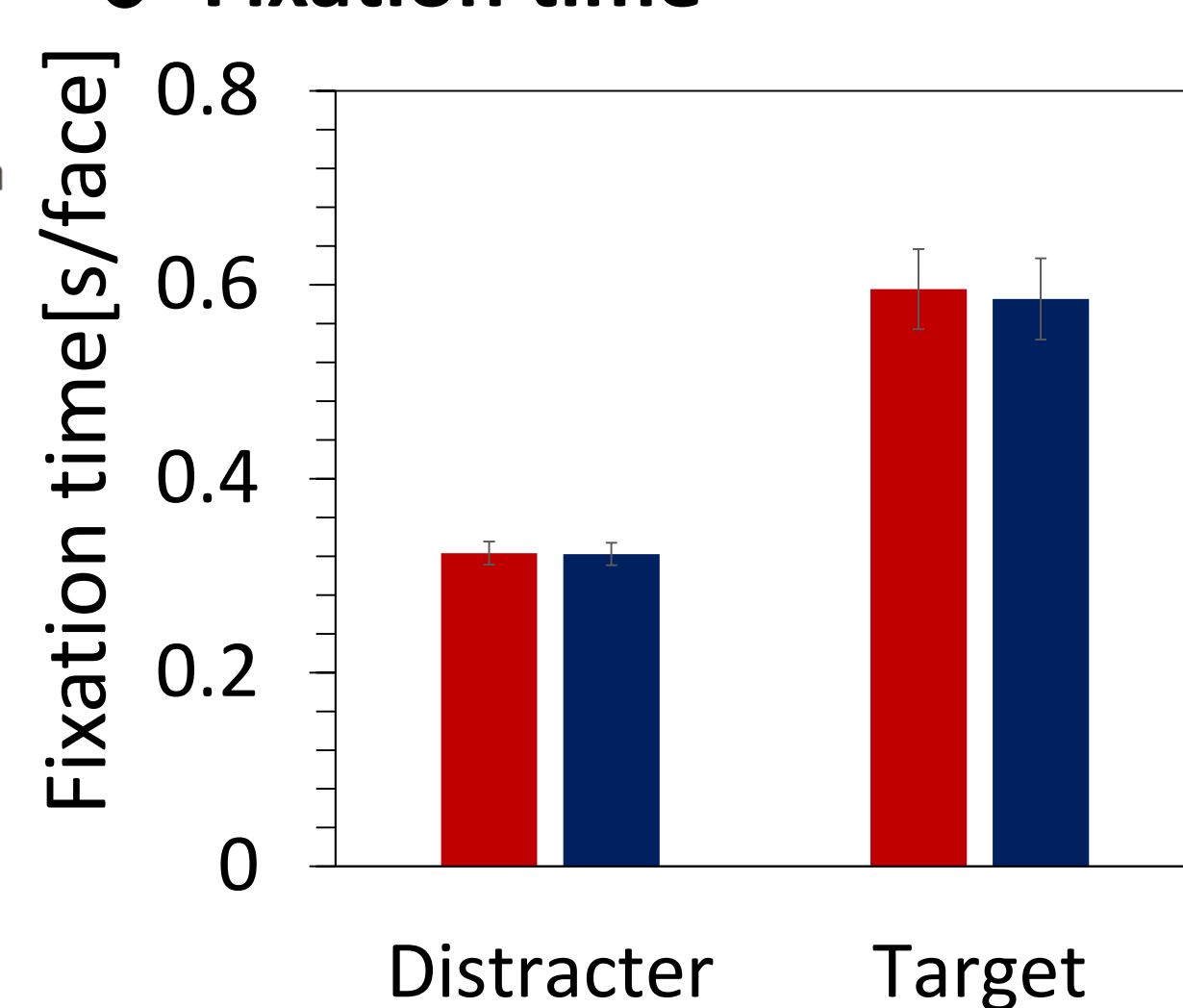$F(1,19)=5.3279$, p=.0324, $\eta_p^2=.2190$

Experiment2, 3
No significant effect of gaze behaviors

- **Fixation time**

Distracters

Fixation time [s/face] vs Orientation (upright, inverted)

Target

Fixation time [s/face] vs Orientation (upright, inverted)

Target   Orientation

Experiment 2

- **Reaction time**

Reaction time [s] vs Number of head (4, 8, 12)

- **Fixation time**

Fixation time[s/face] vs Distracter, Target

Experiment 3

- **Reaction time**

Reaction time[s] vs Number of head (4, 8, 12)

Target   Distracters

- **Fixation time**

Fixation time[s/face] vs Distracter, Target

Target   Distracters
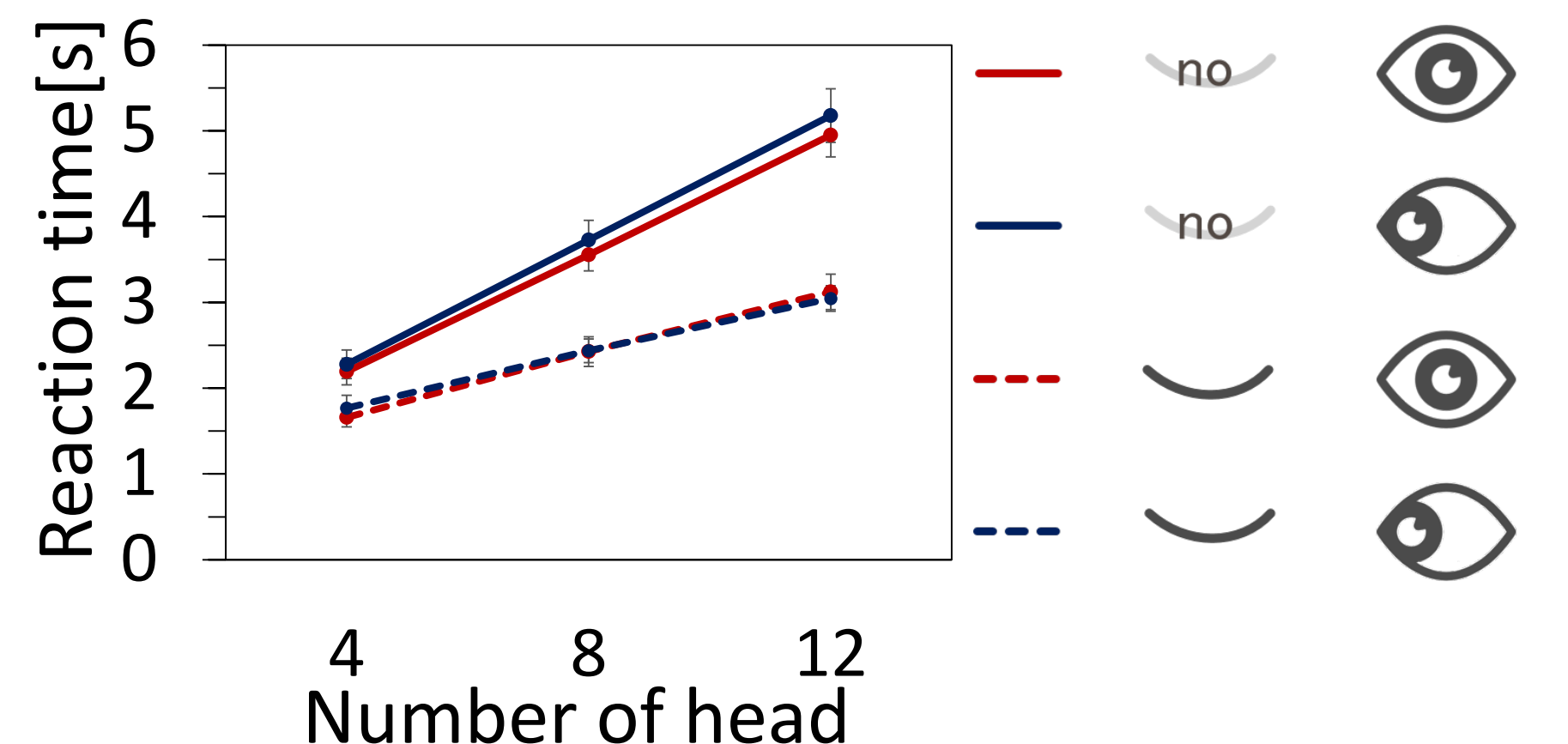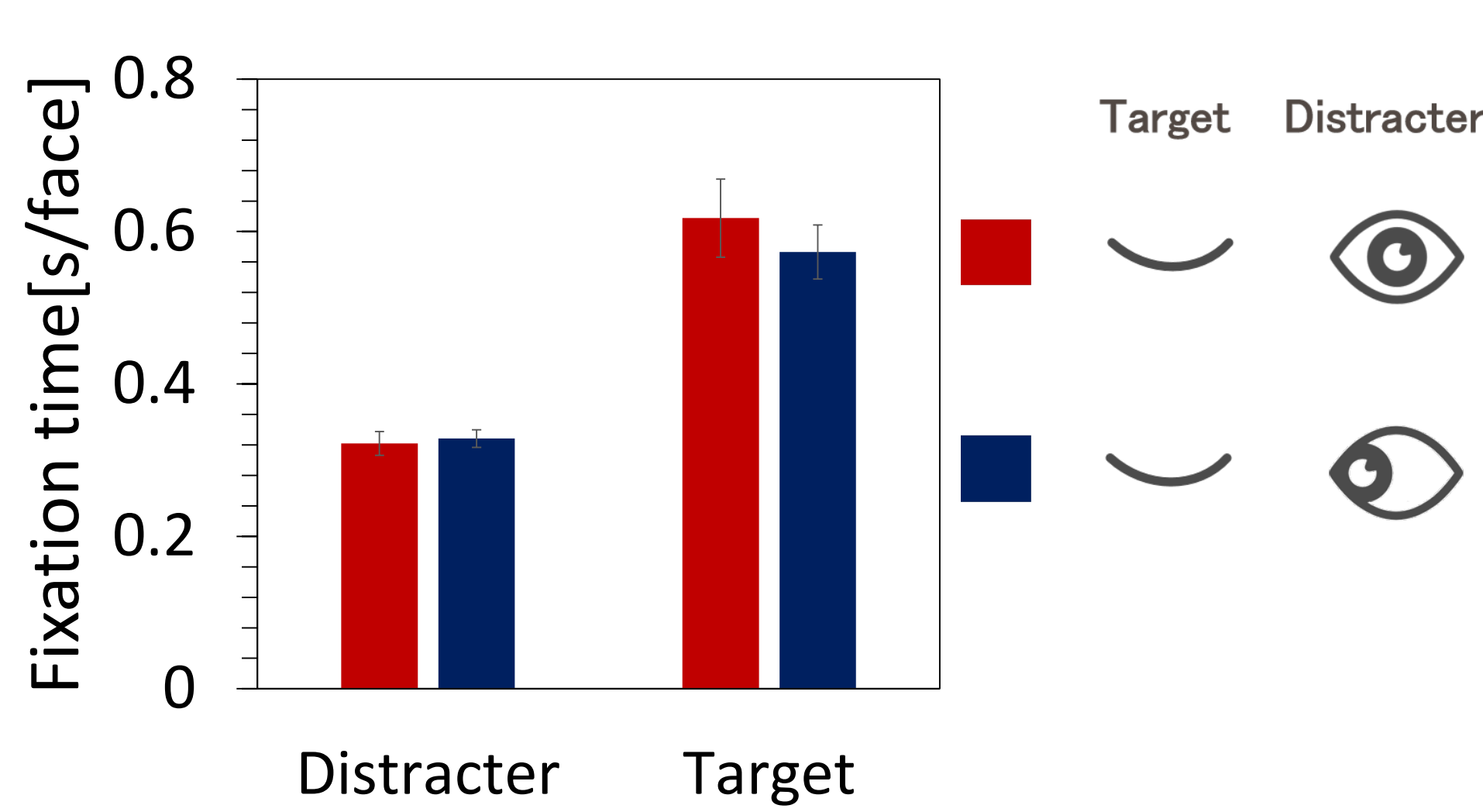
Discussion

- The upright face was detected faster than inverted face.
- Participants' eye-fixation time was significantly longer on the inverted face than the upright face.

➡ **Face inversion effect**

- The gazing target among averting distracters was detected faster than the opposite condition.
- Participants' eye-fixation time was significantly longer on the eye-contacting distracters than the eye-averting distracters only when the eye-contacting and eye-averting faces were mixed or in the social and intentional situation.

➡ **People tend to pay attention to the eye-contacting faces among the eye-averting faces.**

Conclusion

The asymmetry of visual search in the eye-contacting and eye-averting faces is related to human intentional communication.