

Fearful faces as action feedback produce an enhanced temporal recalibration effect

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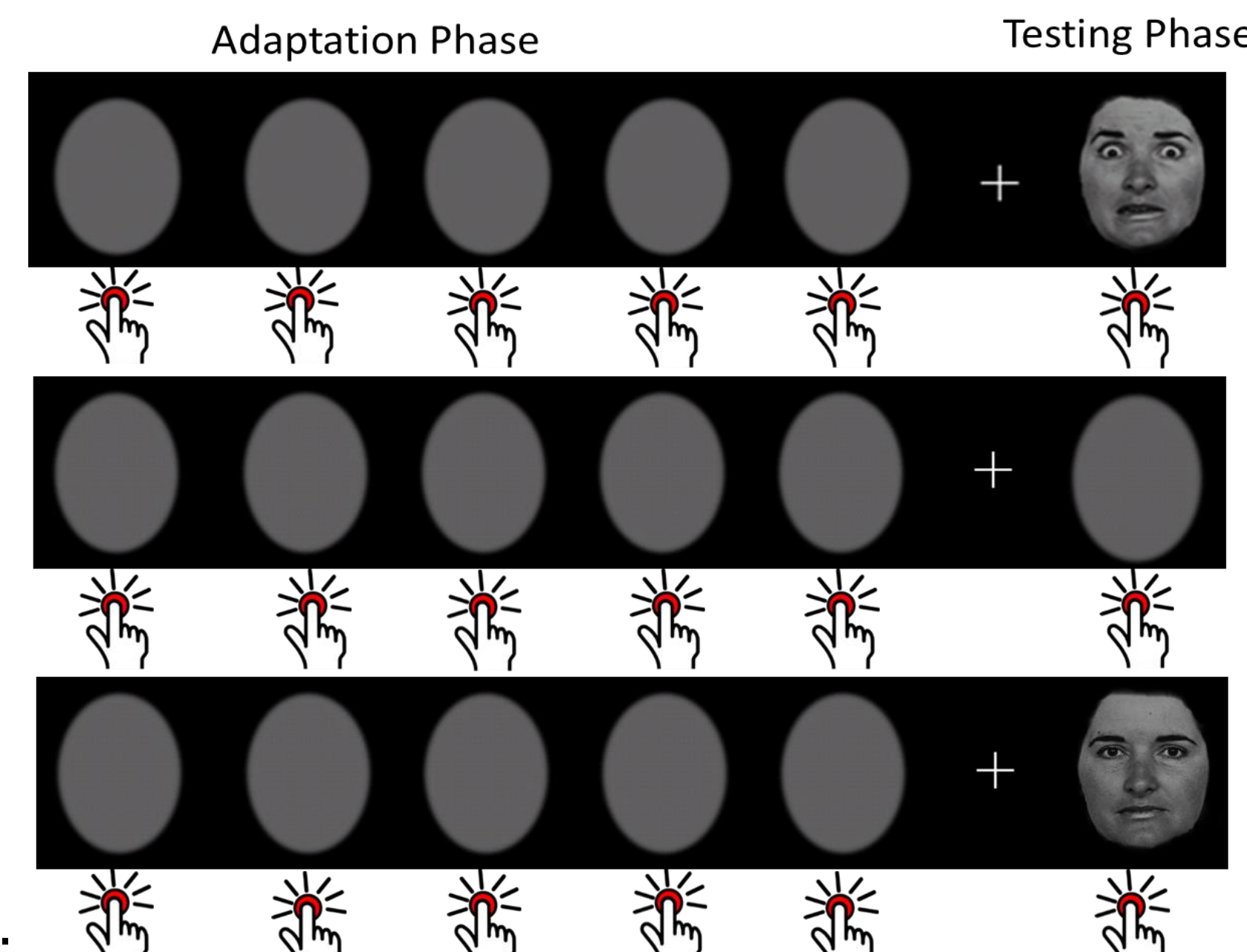
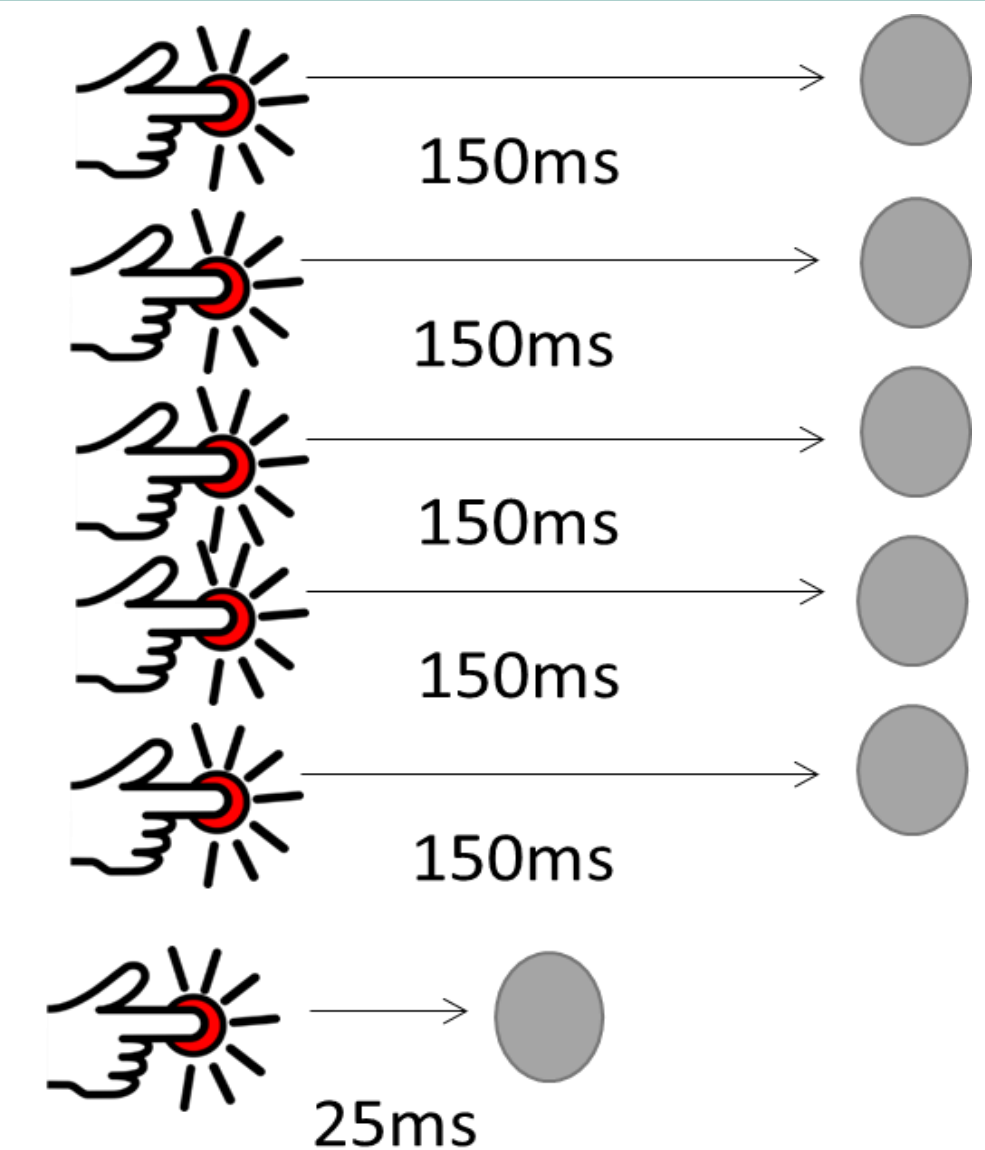


How do we process fearful faces?

- **Background:** Past research suggests that emotional faces are perceived earlier than neutral faces (West et al., 2010). This enhanced processing of emotional faces has been explained by the visual prior entry effect, which suggests that directed attention leads to accelerated processing of sensory stimuli (Titchener, 1908).
- **Study Aim:** To examine the visual prior entry effect we tested whether fearful face stimuli can modulate the degree of temporal recalibration, measured by the point of subjective simultaneity (PSS).
 - **Temporal recalibration:** The process by which the brain adapts itself to temporal asynchronies. Specifically, it refers to a subjective temporal compression between an action and its sensory feedback, after repeated exposure to delayed feedback. Hence, when sensory events (e.g. the presentation of an image) result from our own actions (e.g. a button press), the brain recalibrates the timing of these two events, to make them consistent with the idea that sensory feedback will follow a motor action without delay. It is measured using the PSS.
 - **PSS =** The point at which participants perceive their button press and the image as occurring at the same time.
- **Study:** We test this by examining differences in the PSS, when judging the temporal order of fearful faces versus ovals (Experiment 2) and neutral faces (Experiment 3).
- **Predictions:** If we observe larger PSS scores for fearful faces vs. other stimuli, this would suggest that fearful faces are perceived earlier in time, and are therefore prioritised by the visual system.

Method

- **Experiment 1 Validation of TR methodology:** Participants were asked to press a button six times approximately once per second. During the first five button presses (i.e. adaptation phase), participants were presented with an oval either 0ms (no-delay condition) or 150ms (delay condition) after each button press. On the 6th button press (i.e. testing phase), the oval was presented at one of seven test delays (-88, 0, 25, 50, 75, 100, 125ms). Participants were asked whether their 6th button press occurred before or after the oval stimulus appeared. Following delay adaptation, we hypothesised that participants would show increased PSS values, signalling a temporal recalibration effect, compared with no-delay during adaptation.
- **Experiment 2 Modulation of TR effect using fearful faces:** Participants took part in the delayed adaptation condition, but were presented with a fearful face or oval at the 6th button press.
- **Experiment 3:** We repeated experiment 2, however, participants were presented with fearful or neutral faces at the 6th button press.
- In both experiments, we hypothesized increased PSS values when participants were presented with fearful faces compared with other, less salient stimuli.



Results

- **Experiment 1: Results demonstrate the existence of the temporal recalibration effect (Figure 1).**

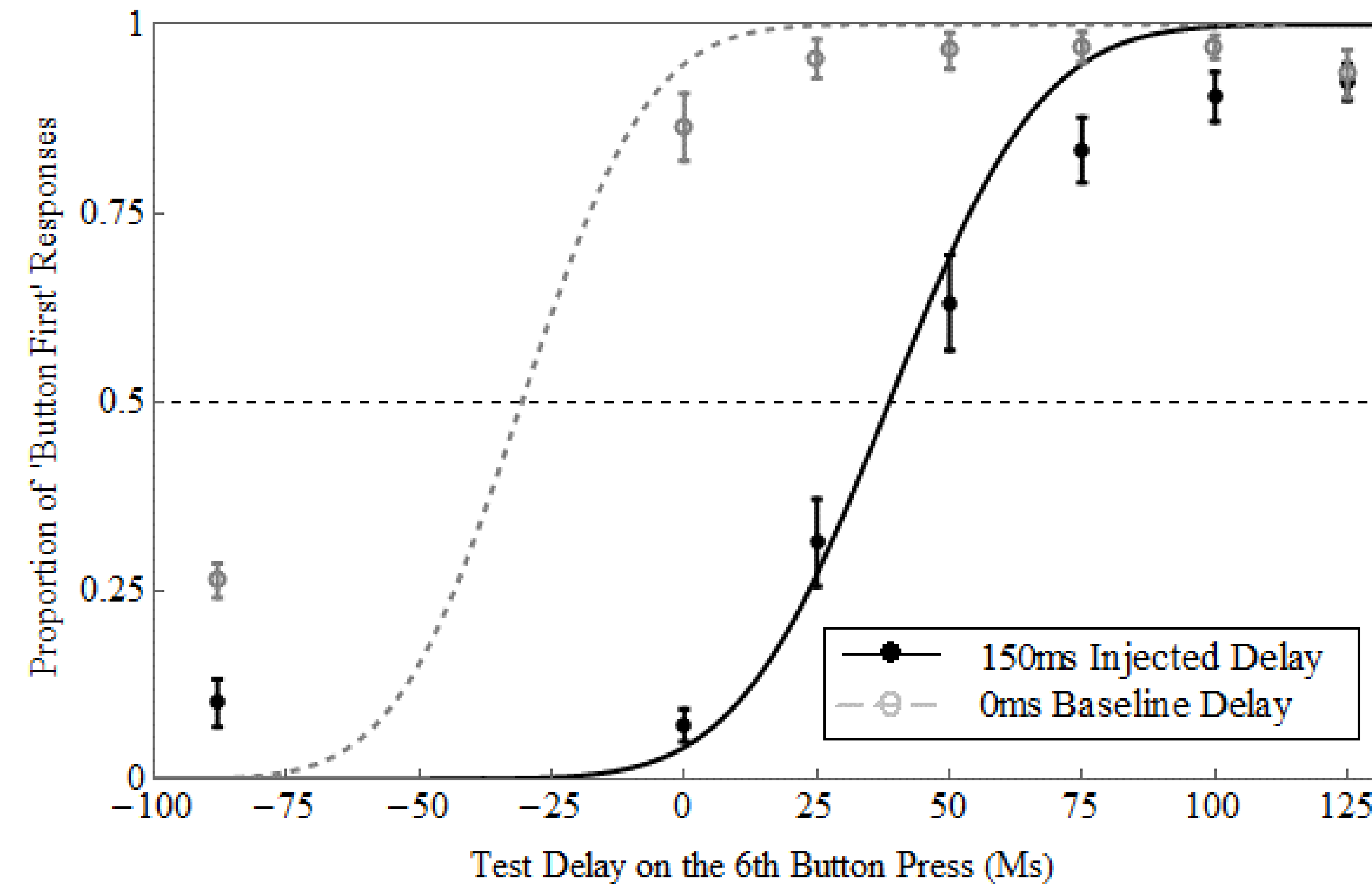


Figure 1: Inserting a delay during participants button press and flash during adaptation results in a rightward shift of the PSS ($p < .001$). Following adaptation, participants are more likely to state that the oval appeared before their button press.

- **Experiment 2: Results demonstrate a stronger temporal recalibration effect for fearful faces, compared with neutral ovals (Figure 2).**

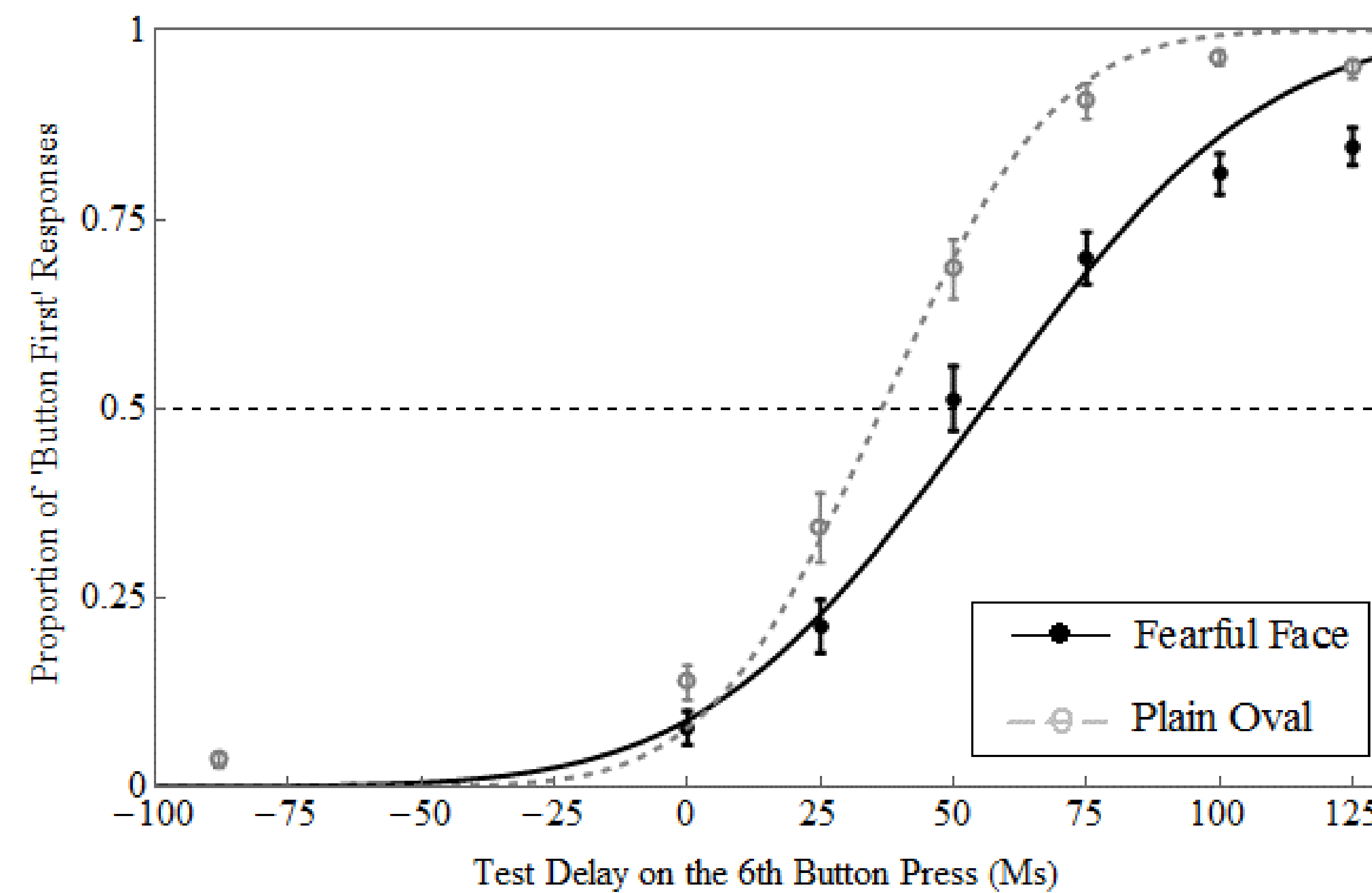


Figure 2: Presenting fearful faces at the 6th button press results in a greater rightward shift of the PSS ($p < .001$). Participants are more likely to state that the fearful face appeared before their button press, compared with ovals.

- **Experiment 3: Results demonstrate a stronger temporal recalibration effect for fearful faces, compared with neutral faces (Figure 3).**

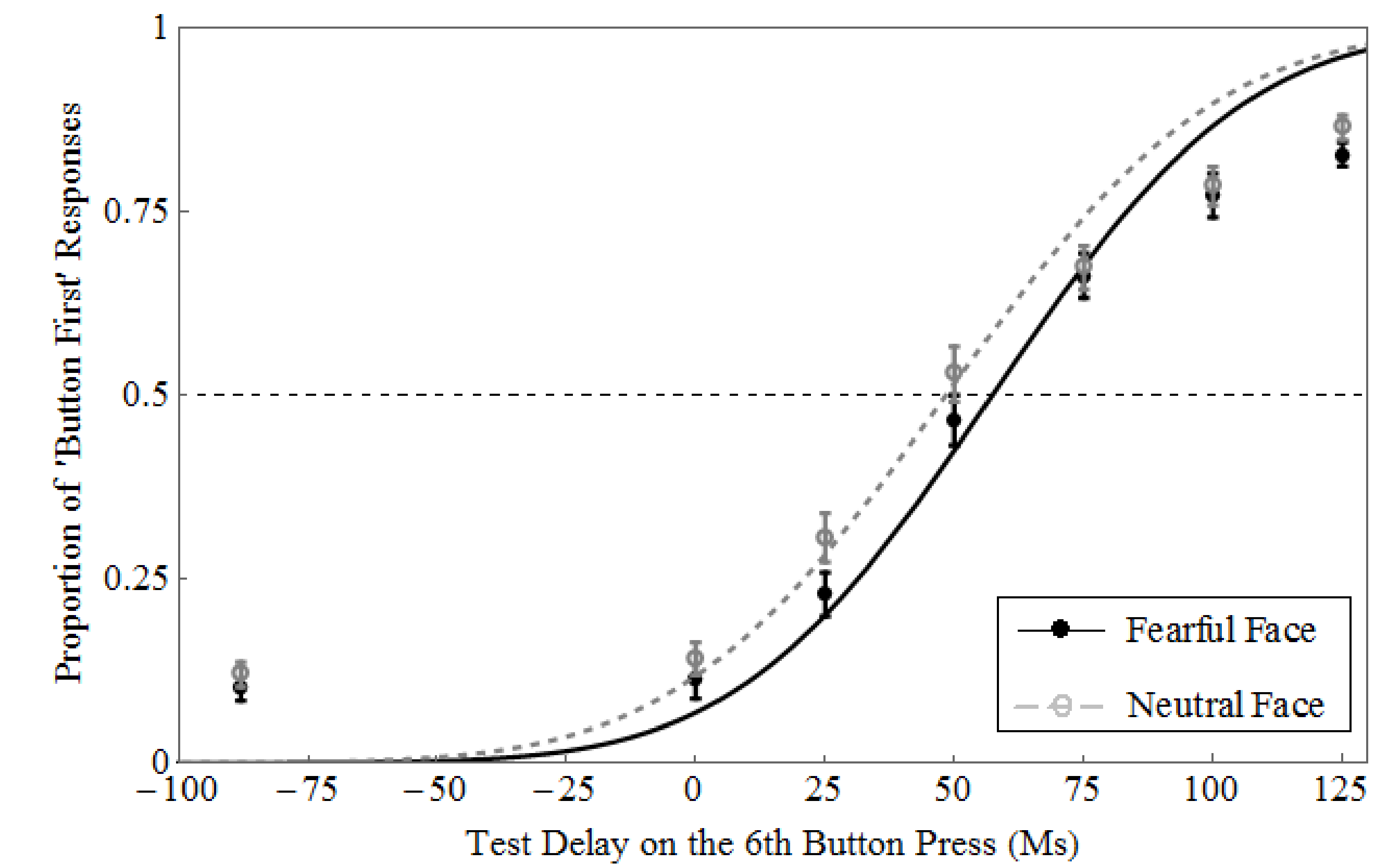


Figure 3: Presenting fearful faces at the 6th button press results in a greater rightward shift of the PSS ($p = .023$). Participants are more likely to state that the fearful face appeared before their button press, compared with neutral faces.

Conclusions

- Fearful faces can modulate the degree of temporal recalibration. Specifically, when an action leads to the presentation of a fearful face, the interval between the action and the face is perceived as shorter than when that action produces an oval or neutral face.
- Our findings suggest that the fearful facial expression leads to *prioritisation* of the stimuli, and plays a strong role in its enhanced processing.
- Further work is needed to understand what mediates this biased processing of threatening stimuli.

References

1. Titchener, E.B. (1908). *Lectures on the elementary psychology of feeling and attention*. New York: Macmillan.
2. West, G. L., Anderson, A. K., Bedwell, J. S., & Pratt, J. (2010). Red diffuse light suppresses the accelerated perception of fear. *Psychological science*, 21(7), 992-999.