

# MASKING OF INDIVIDUAL FACIAL FEATURES REVEALS THE USE OF



## HORIZONTAL STRUCTURE IN THE EYES



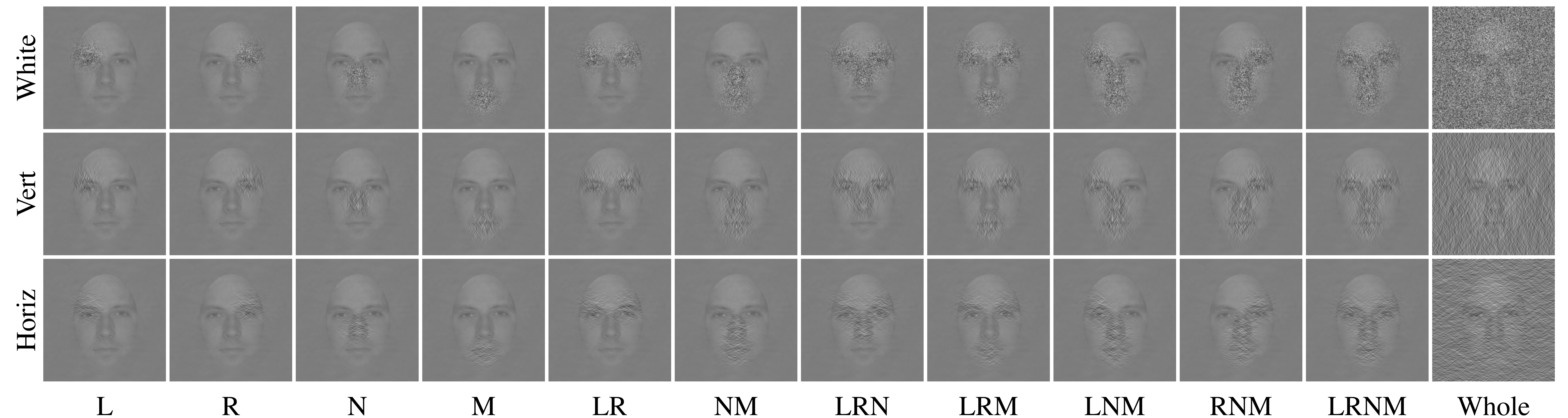
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### Introduction

- ❖ Face identification sensitivity can be described as a linear combination of individual feature sensitivities (Gold et al, 2012).
- ❖ Human observers preferentially sample information from the eyes and eyebrows when identifying faces (Sekuler et al, 2004).
- ❖ Selective use of horizontal structure, measured over the whole face, is correlated with face identification performance and the face inversion effect (Pachai et al, 2013; Goffaux & Dakin, 2010).
- ❖ Is the diagnostic horizontal structure for face identification localized primarily around the eyes and eyebrows?
- ❖ Is the correlation between horizontal tuning and identification based on efficient use of this diagnostic horizontal structure?

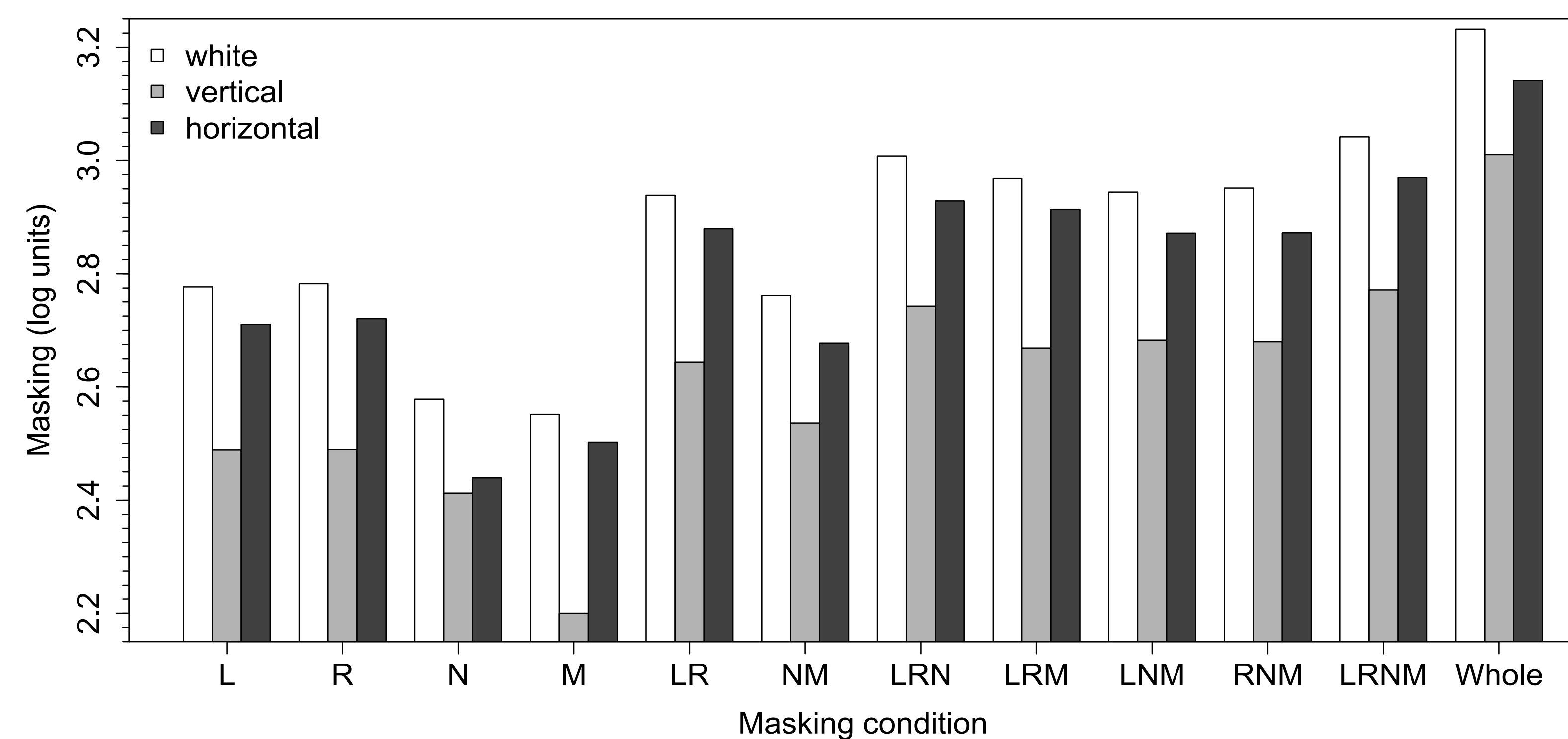
### Stimuli



### General methods

- ❖ N=13 (8 male)                      ❖ 250ms stimulus duration
- ❖ 10 AFC identification              ❖ Unlimited response time
- ❖ 3 (noise orientation) X 13 (noise location) within-subjects design.
- ❖ 2 sessions. Unmasked, Whole, Left Eye, Right Eye, Nose and Mouth conditions presented in the first session. Noise orientations and locations were intermixed within sessions.
- ❖ Preliminary experiment using multiple noise contrasts revealed significant orientation-selective masking only at high noise levels, so here we used a fixed noise RMS contrast of 0.2.
- ❖ RMS contrast thresholds measured using QUEST (50 trials/sc).

### Simulated observer



- ❖ Selects maximum cross-correlation from 10 template faces.

### Conclusions

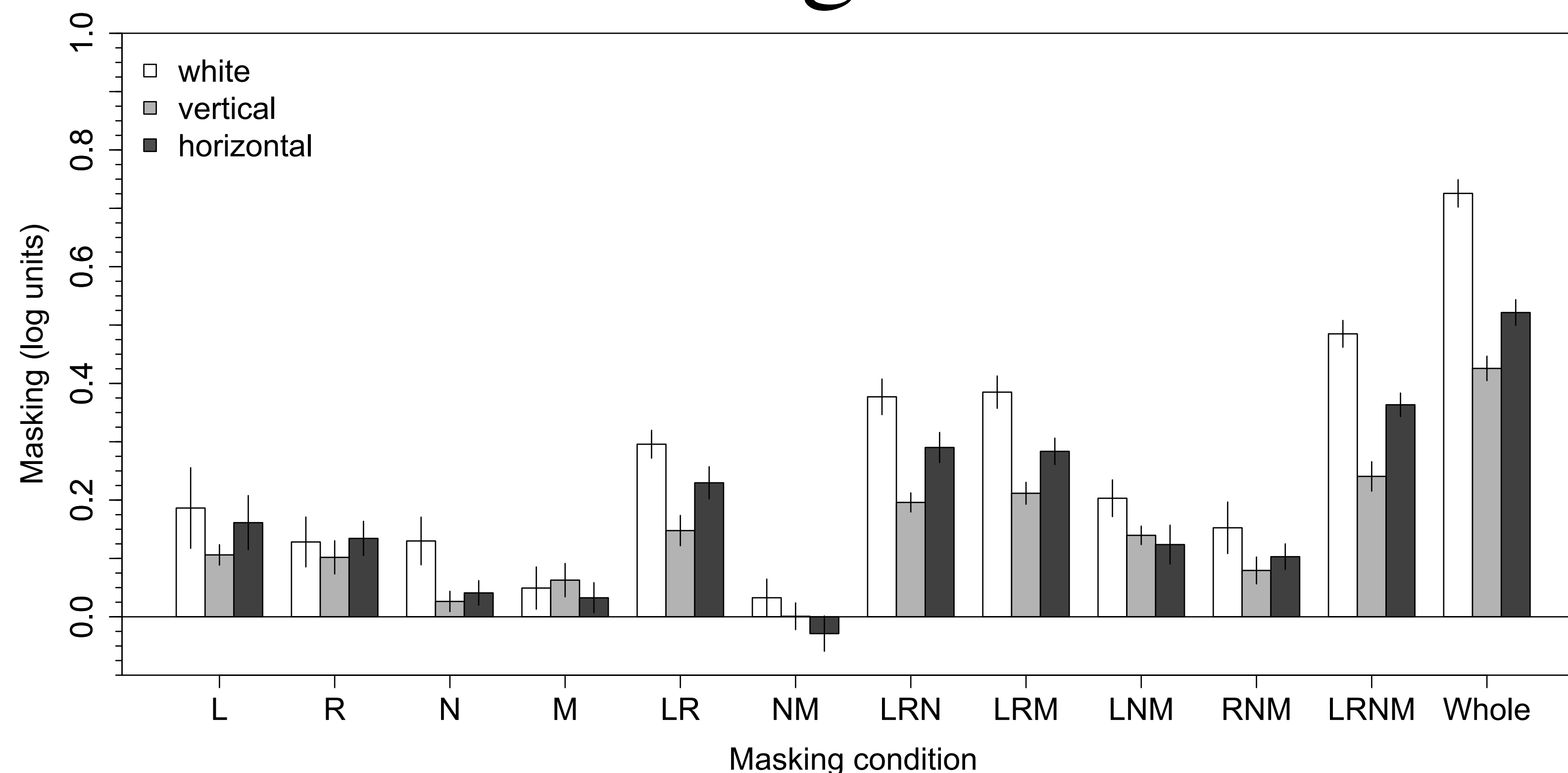
#### Simulated observer

- ❖ Higher overall masking for the eyes relative to the nose and mouth suggests these features are maximally diagnostic.
- ❖ Higher masking for horizontal relative to vertical suggests the eyes *and* mouth contain diagnostic horizontal structure.

#### Human observers

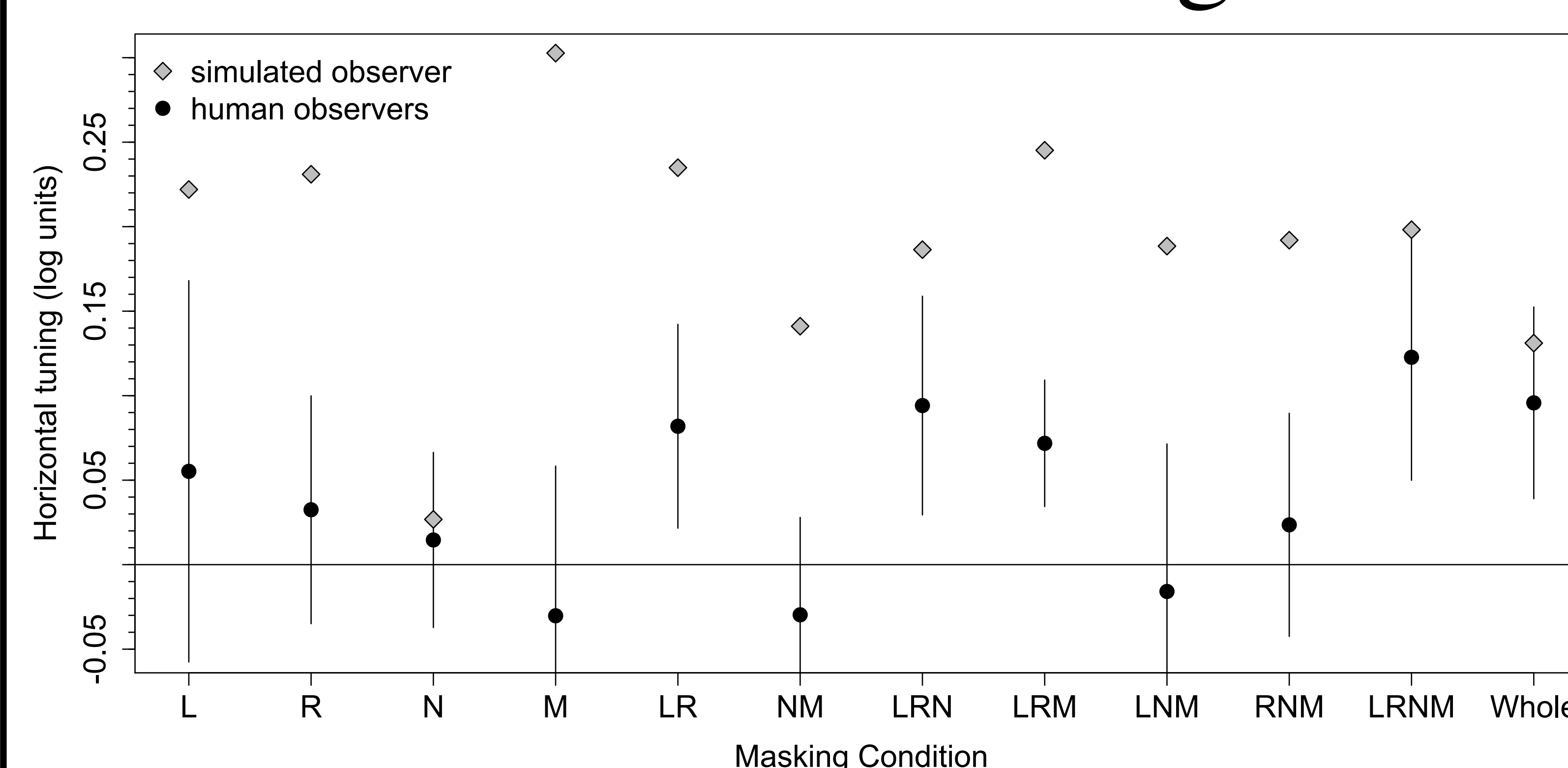
- ❖ Low overall masking when at least one eye is unmasked, suggesting preferential use of this feature.
- ❖ Horizontal tuning appears only when both eyes are masked.
- ❖ Despite higher overall masking when additional features are masked along with the eyes, horizontal tuning is unchanged.
- ❖ Together, these results suggest that diagnostic horizontal structure is extracted exclusively from the eyes.
- ❖ Correlation between horizontal tuning and identification may be based on differential use of information in the eyes.

### Masking effects



- ❖ Masking =  $\log(T_{\text{masked}}) - \log(T_{\text{unmasked}})$     ❖ Error bars =  $\pm 1$  SEM

### Horizontal tuning



- ❖ Tuning =  $\log(T_{\text{horiz}}) - \log(T_{\text{vert}})$     ❖ Error bars represent 95% CI

### Acknowledgements

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### References

- 1) Sekuler et al. (2004). *Curr Biol*, 5.
- 2) Gold et al. (2012). *Psych Sci*, 23.
- 3) Pachai et al. (2013). *Front Psych*, 4.
- 4) Goffaux & Dakin (2010). *Front Psych*, 1.