Spatial frequency tuning of Body Inversion Effects

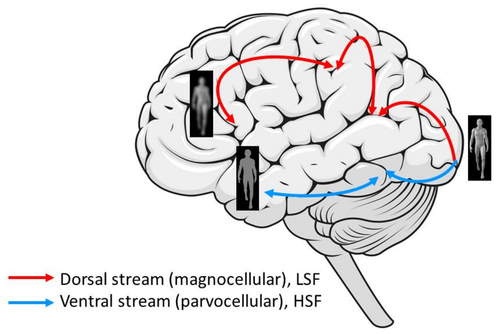
Giulia D'Argenio[1,2], Alessandra Finisguerra[3] and Cosimo Urgesi[2,3]

1. PhD Program in Neural and Cognitive Sciences, Department of Life Sciences, University of Trieste, Italy
2. Laboratory of Cognitive Neuroscience, Department of Languages and Literatures, Communication, Education and Society, University of Udine, Italy
3. Scientific Institute, IRCCS E. Medea, Pasian di Prato (Udine), Italy

INTRODUCTION

Upright bodies are recognized better than inverted bodies. This **Body Inversion Effect** (BIE) is held to reflect **configural processing** of body stimuli. The BIE modulates activity of body selective areas in both the **ventral** (occipito-temporal cortex) and **dorsal** (fronto-parietal areas; Urgesi et al., 2006) streams. The relative contribution of the two streams to the configural processing of different bodily cues (i.e. gender and posture), however, is unclear.

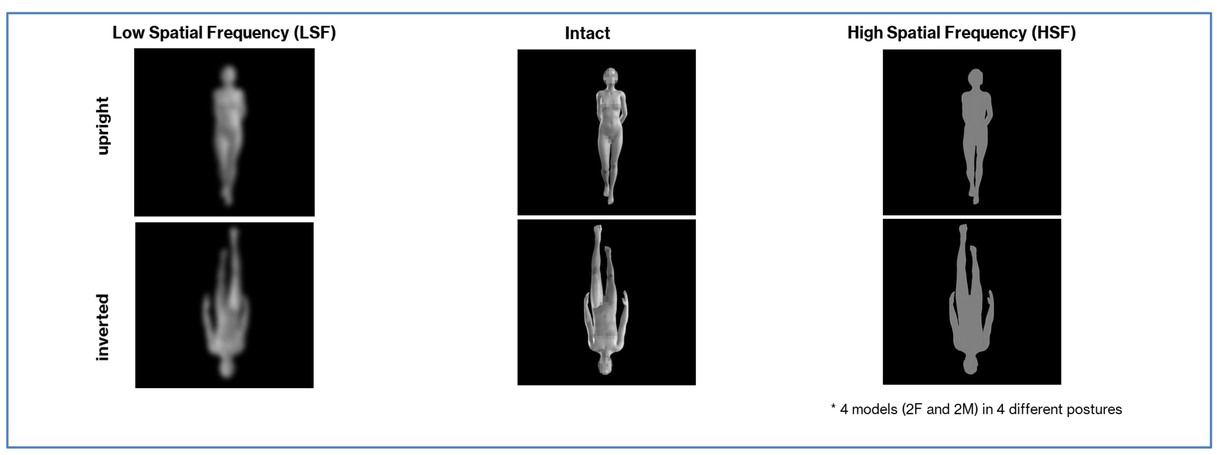
By exploiting the differential tuning of dorsal and ventral pathways, respectively, to **low- (LSF)** and **high-spatial frequencies (HSF)**, here we aimed to disentangle the contribution of the two streams to the configural-processing of **body gender** and **body posture**.



METHODS

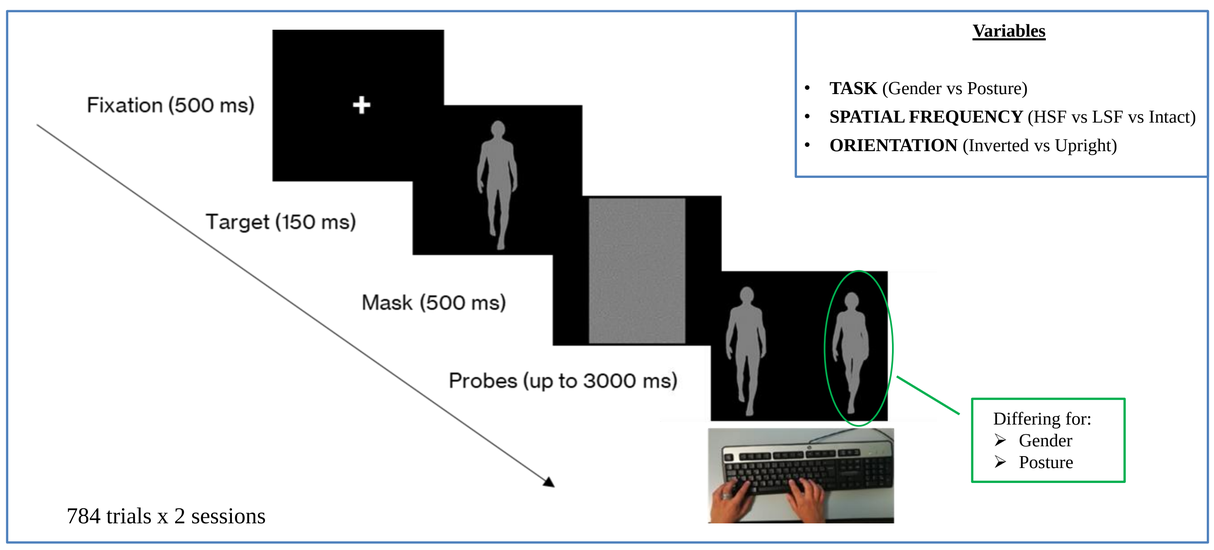
Stimuli

The body stimuli were constructed selecting four virtual-human models (2 females and 2 males) from the Character Creator 3.0 software default database. Each body was rendered in four different daily poses. Furthermore, images were imported into Adobe Photoshop CS6 to manipulate the spatial frequency content by using a Gaussian blur filter with a 6 pixels kernel for low-pass filtering and the high-pass filter application set to a radius of 0.9 pixels for the high-pass filtering.



Procedure

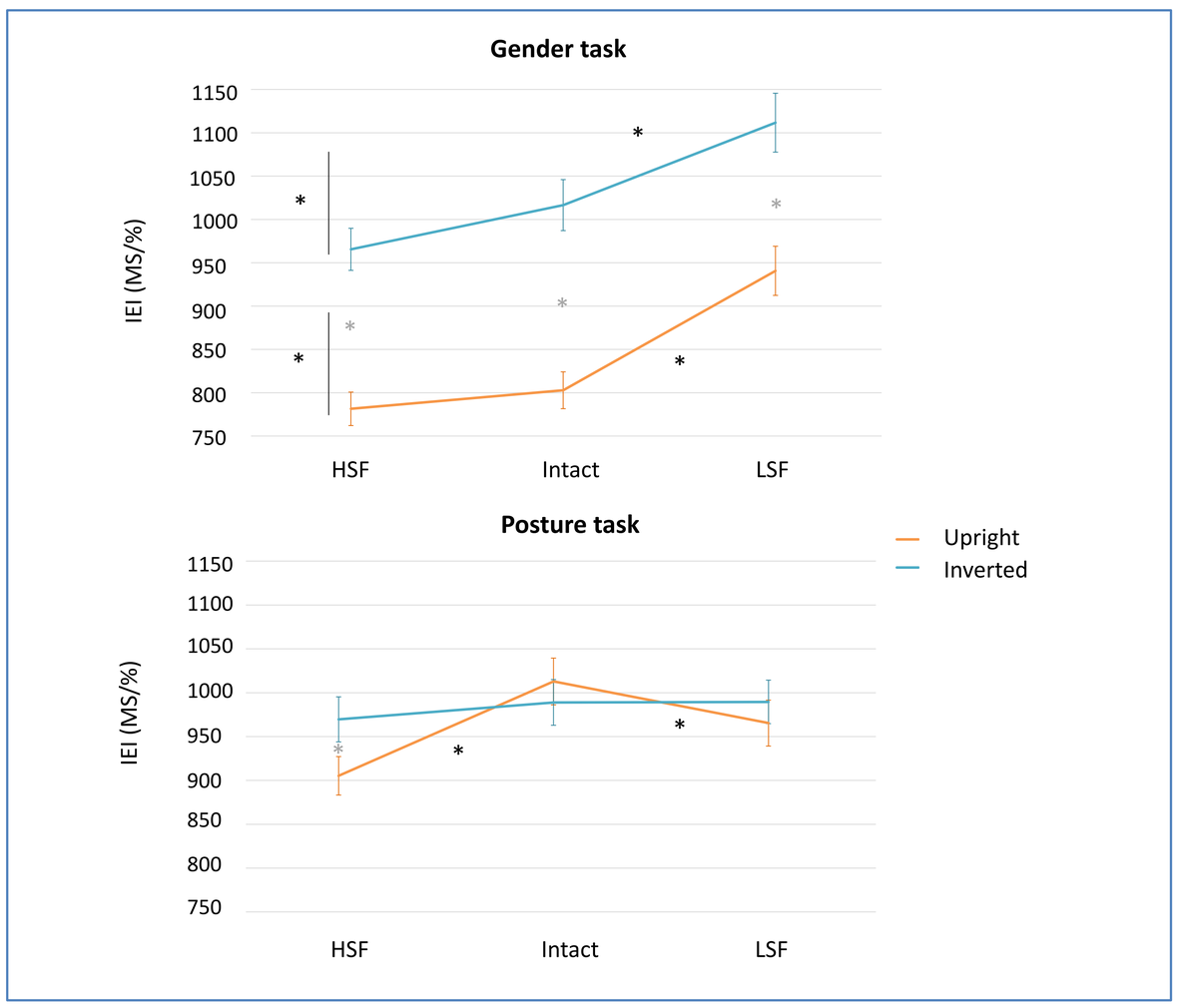
Sixty-seven participants (25 M; mean age 24.31) performed a matching-to-sample task in which they were asked to recognize which one of two probes, differing for gender or postures (Task), matched a previously presented target image. Importantly, the stimuli could be presented in their original intact form or containing only LSF or HSF information (Spatial frequency); also, they could be presented upright or inverted (Orientation).



RESULTS

The 3-way ANOVA performed on the **Inversed Efficiency Index** (Reaction Time/Accuracy) revealed a significant **Task x Spatial Frequency x Orientation** interaction [$F(2,132) = 16.78$; $p < 0.001$; $\eta p2 = 0.203$]. showing that, in the **gender task**, performance was significantly lower for LSF than HSF and intact images, independently from orientation. Also, upright bodies were matched better than inverted bodies in all spatial frequency conditions, even if a reduction of BIE was found for LSF images.

Concerning the **posture task**, upright bodies were matched better for HSF and LSF than for intact images. Furthermore, only for HSF upright bodies were matched better than inverted bodies.



CONCLUSIONS

Our results revealed that performance in the gender recognition task got worse for magno-biased stimuli (LSF). Further, the BIE for gender perception was reduced for LSF images, again supporting the role of the parvo-biased HSF information and, thus, of the ventral stream in the configural processing of body gender.
In the posture task, posture discrimination and BIE improved for both parvo- and magno-biased stimuli, suggesting that posture discrimination calls for an interaction between dorsal and ventral stream processing. However, eliminating the magno-biased information heightened the configural processing of body postures, since reliable BIE was obtained only for HSF. Overall, our data suggests that the configural processing of either body gender or body posture mainly involve parvo-biased information processed in the ventral stream.

giulia.d'argenio@phd.units.it
https://bodylabudine.uniud.it