

# EXPLORING THE BEHAVIORAL AND AFFECTIVE CHANGES IN BODY PERCEPTION

## IN FEMALES WITH OBESITY THROUGH THE ALTERATION OF FOOTSTEP SOUNDS

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### Introduction

Auditory cues contribute to body representations, influencing behavior and bodily sensations. **Manipulating the footstep sounds** can induce the experience of having a lighter or heavier body, and alter perceived weight, gait speed, and gender association. **Eating disorders** are often matching altered body representation: the possibility of an intentional re-shaping seems crucial. It was suggested that high eating disorder levels may alter **multisensory integration**, **interoception**[1] and **body-size estimation**[2], likely related to body dissatisfaction and potentially reducing sensitivity to effects of sound on body perception. Research is needed on body concerns in obesity, improving interventions. We explored sound impact on body perception and its link to interoceptive sensitivity in obesity.

### What is the footsteps illusion?

**Dynamic modification of footstep sounds** can lead people to:

- Perceive their body as thinner/lighter
- Walk more dynamically
- Feel happier

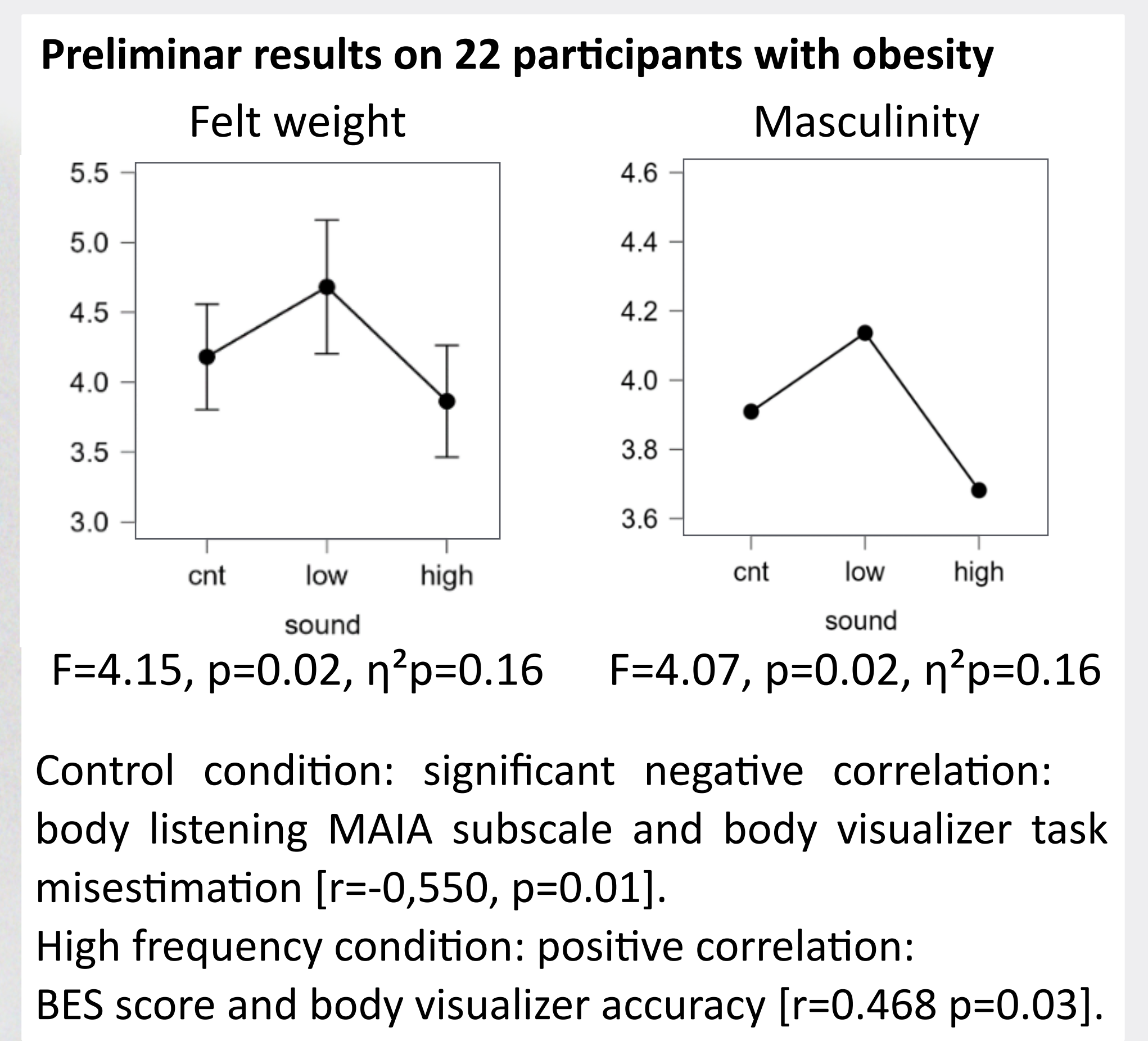
### Our Participants

- OB: **25 women with obesity** (BMI>30kg/m<sup>2</sup>)
- HC: **25 healthy women** (results pending)

### Our System

- Binaural microphones capture the footstep sounds, produced by walking at natural speed.
- Bela.io device for real-time sound processing.

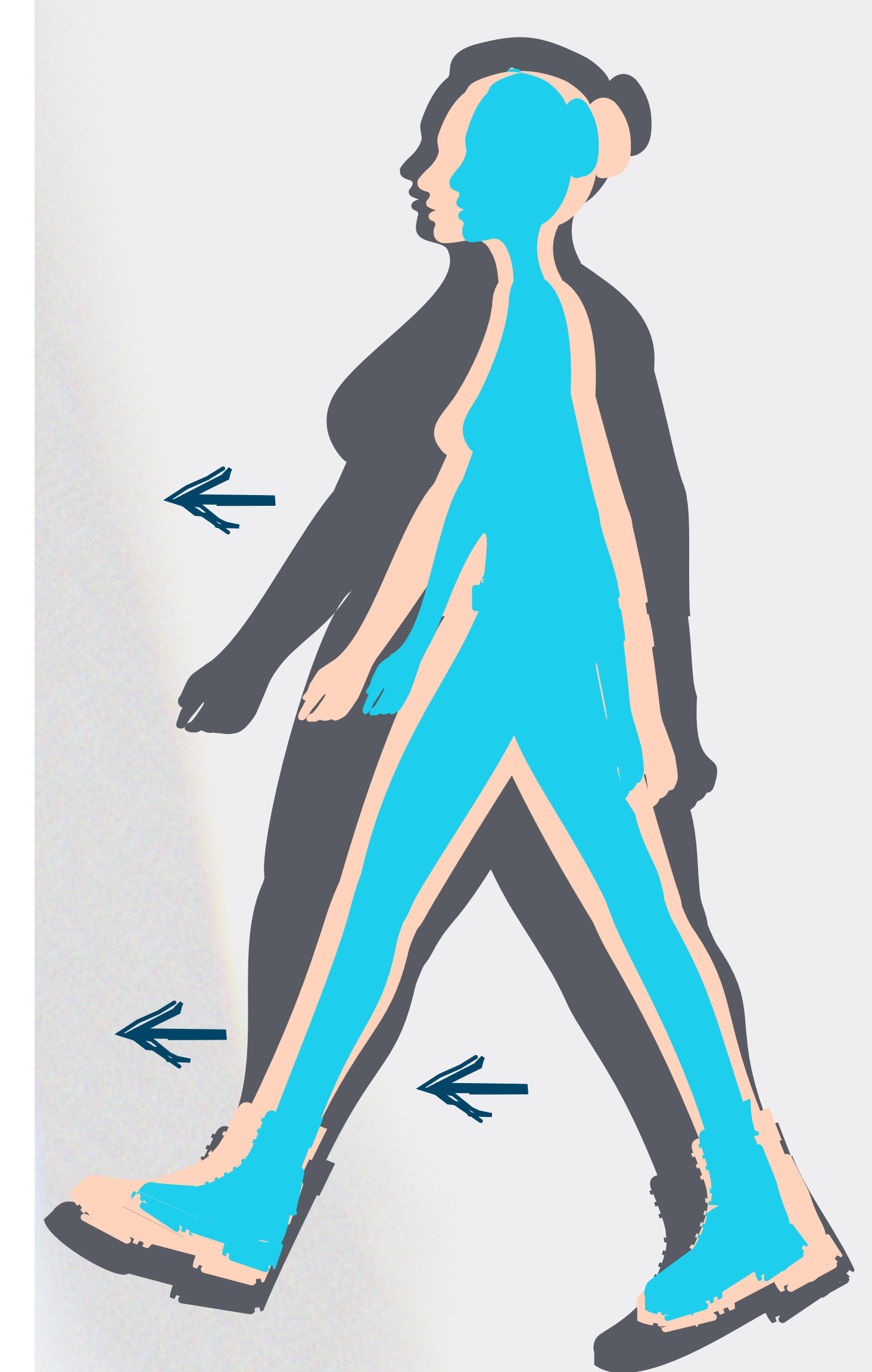
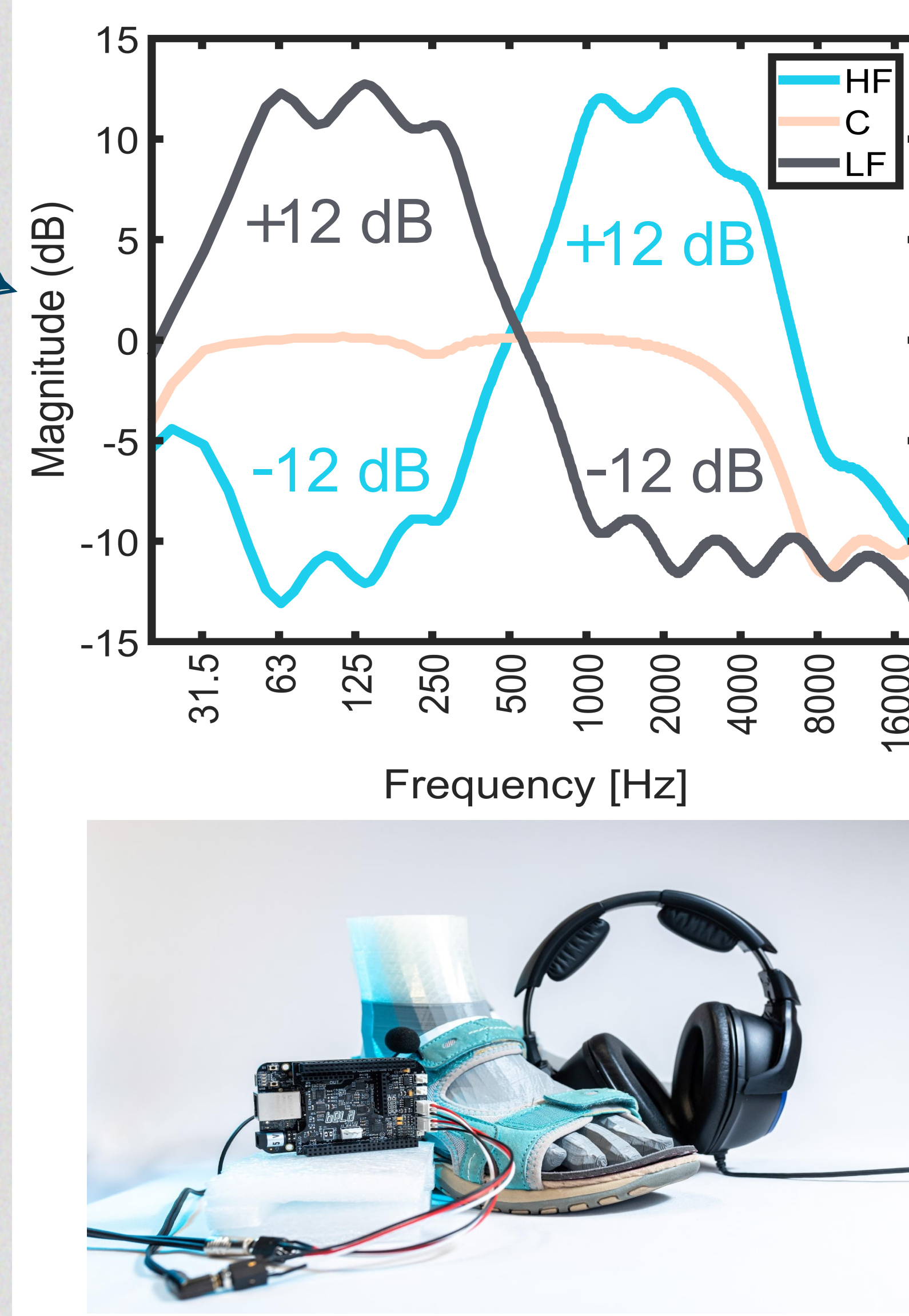
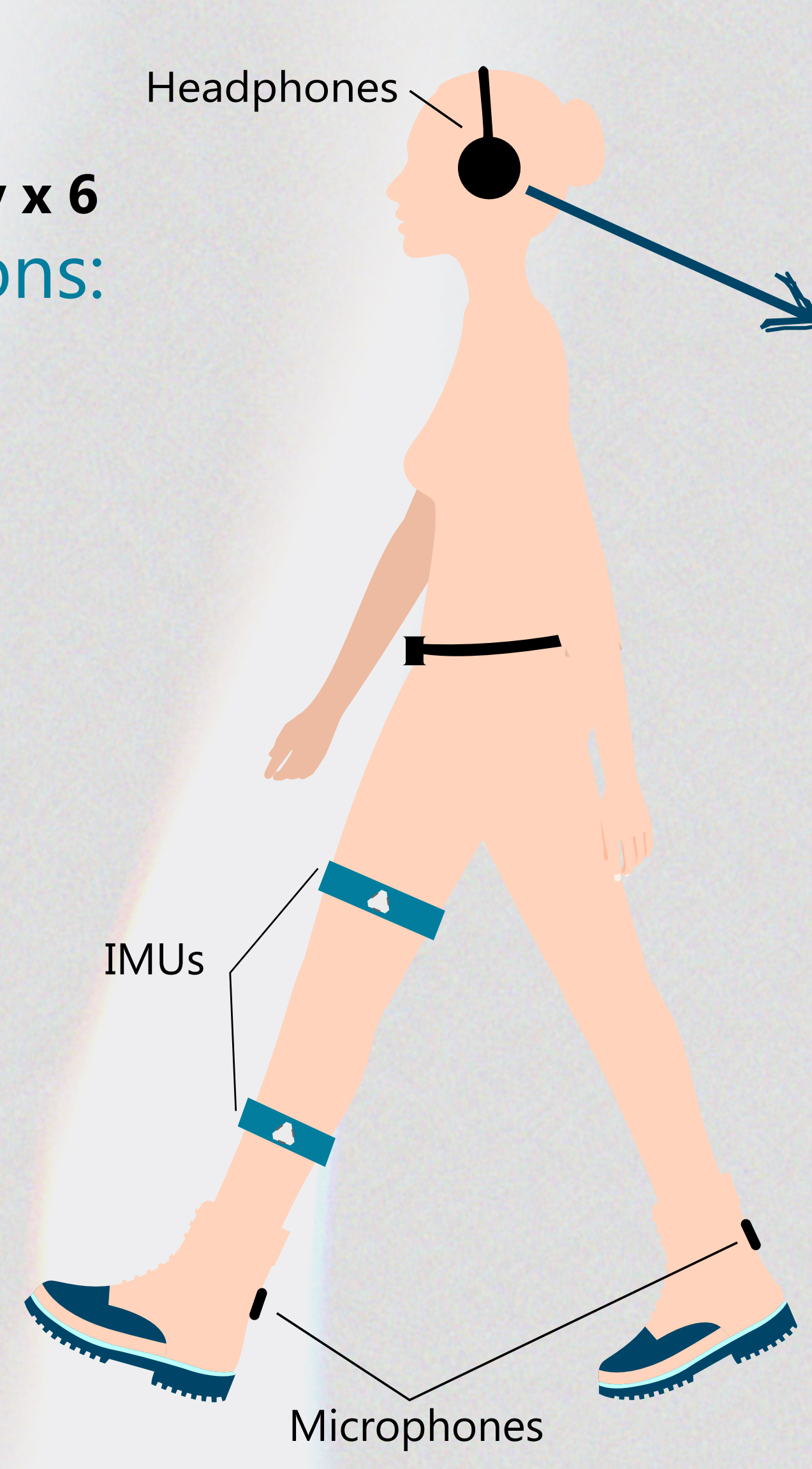
### Results



### Methods

**Walking on a 10 meter runway x 6 each of 3 Sound Conditions:**

- **High Frequency:**  
(83-250Hz) -12dB,  
(1-4kHz) +12 dB
- **Low Frequency:**  
(83-250Hz) +12 dB,  
(1-4kHz) -12 dB
- **Control:**  
no modification of sound spectra



### Measures

- Interoceptive awareness: **MAIA** questionnaire
- Eating disorders: **BES** questionnaire
- Questionnaire on **body feelings**
- **Body visualizer** task (visualized body weight)
- Body behavior: **IMUs** (gait)



- Our results support the effective **modulation of bodily perceptions**, i.e. one's weight and masculinity, in people with obesity through the alteration of footstep sounds.
- The more participants felt confident in recognizing emotions by listening to bodily signals, the more their body weight reporting was accurate.
- Gait parameters seemed not affected by the auditory manipulation, possibly because of altered multisensory audio-proprioceptive integration process.
- Our results suggest that auditory manipulation might shape explicit cognitions and beliefs about one's body (i.e., body image) in obesity.

References:  
[1] Robinson, E., Foote, G., Smith, J. et al. Interoception and obesity: a systematic review and meta-analysis of the relationship between interoception and BMI. <https://doi.org/10.1038/s41366-021-00950-y>  
[2] Tagini S, Scarpina F, Scacchi M, Mauro A, Zampini M. The self-perceived body size in obesity: Evidence from the implicit representation of the hand. doi: 10.1177/1747021820985441.  
[3] Amar D'Adamo, Marte Roel, Laia Turmo-Vidal, Dehshibi Mohammad M., Daniel De La Prida, Joaquín R. Díaz-Durán, Luis Antonio Azpicueta-Ruiz, Aleksander Våljamæ, and Ana Tajadura-Jiménez. 2024. SoniWeight Shoes: Investigating Effects and Personalization of a Wearable Sound Device for Altering Body Perception and Behavior. <https://doi.org/10.1145/3613904.3642651>

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