

AS LIGHT OF YOUR FOOTSTEPS

Investigating individual differences in the perception of own-body weight through auditory illusions

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Introduction

People's body perceptions are highly malleable, as demonstrated by neuroscientific studies on sensory-driven illusions¹.

- Sounds in combination with tactile and/or proprioceptive cues, can change people's body perceptions, as seen in the footsteps illusion².

- There are **individual differences** in the effects, e.g. according to body ideals³ or symptomatology of eating disorders⁴

- We aimed to replicate and extend the previous findings by using an improved setup, including a highly portable digital audio system, a full-body motion capture suit, and physiological sensors.

Investigating individual differences in the effects of the footsteps illusion

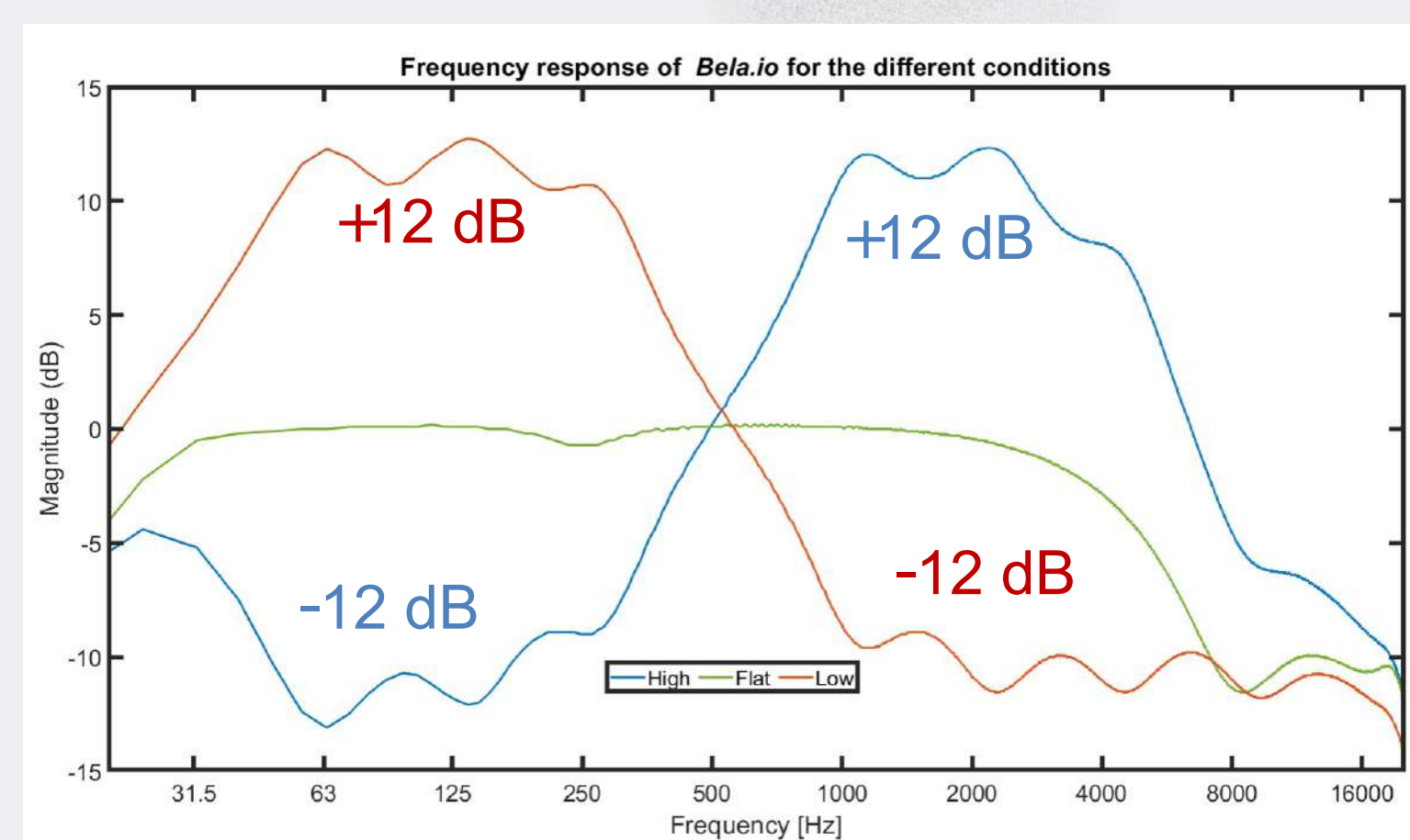
Our system^{2,5}

- Binaural microphones capture the footstep sounds.
- Bela.io device for real-time sound processing.



3 Sound Conditions:

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



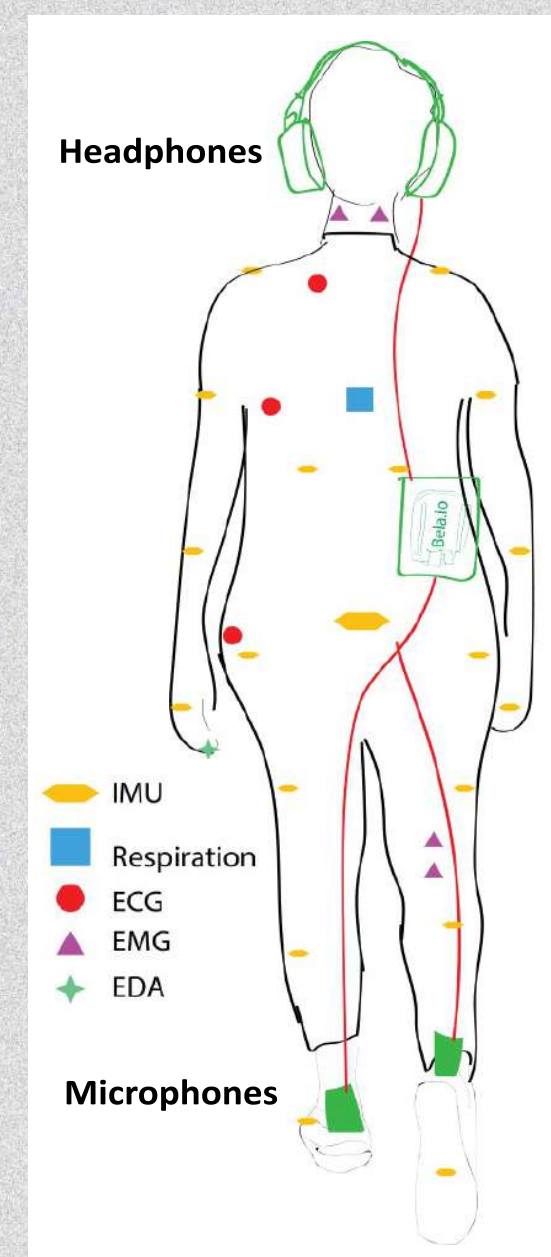
What is the footsteps illusion?²

Dynamic modification of footstep sounds can lead people to:

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

How do we measure this illusion?

- Body visualizer⁶
- Body behavior: IMUs (gait)
- Physiological sensors
 - EMG
 - ECG
 - EDA
 - Respiration
- Self reports



Which individual differences?

- Body concerns
- Eating disorder symptomatology⁴
- Levels of physical activity
- Sensory imagery
- Social support networks
- Body ideals related to gender³

Screening Questionnaires:

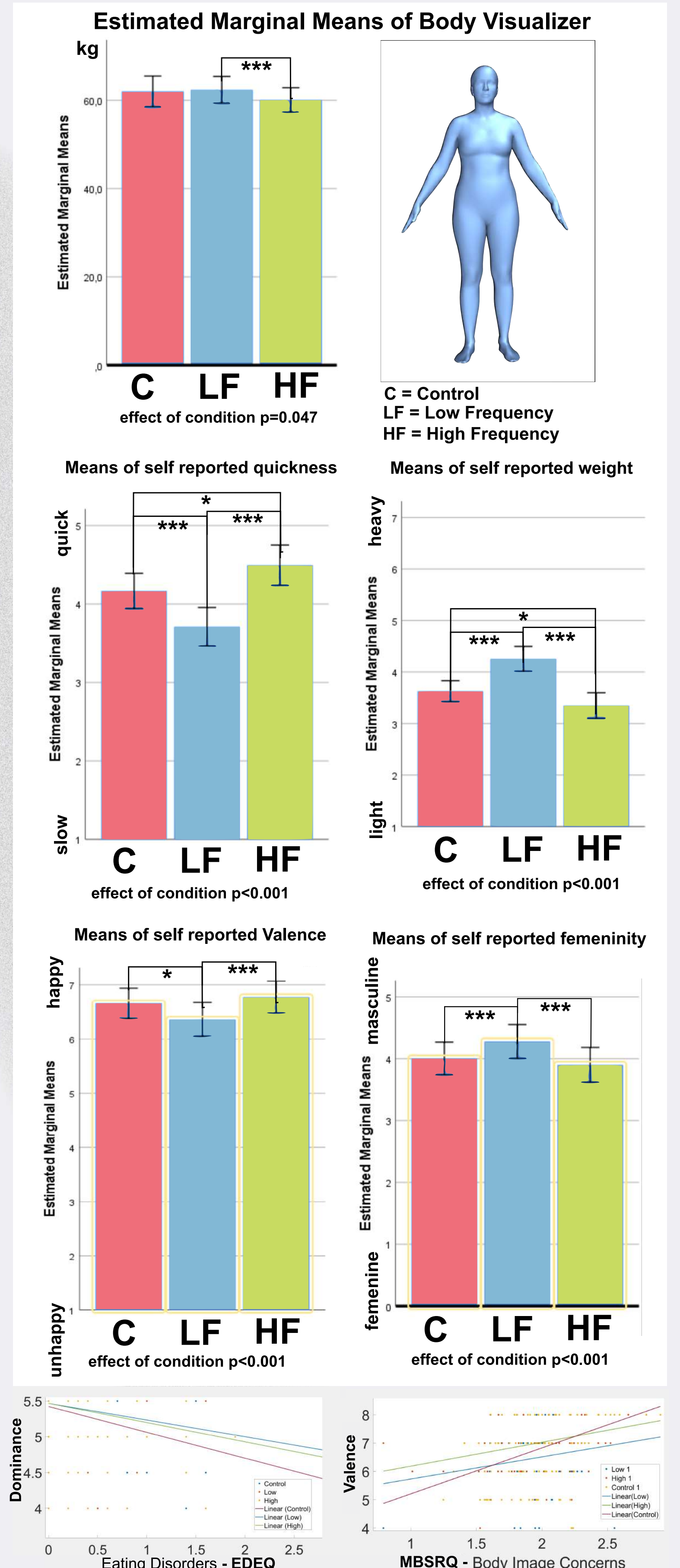
- Multidimensional Body Self Relations Questionnaire (MBSRQ)⁷
- Eating Disorder Examination Questionnaire (EDEQ)⁸
- International Questionnaire of Physical Activity (IPAQ)⁹
- Betts' Questionnaire Upon Mental Imagery¹⁰
- Social Support Networks Questionnaire¹¹

Data from General and Subclinical Population

Participants screened: N= 178 Participants selected: N = 104:
According to level of physical activity (PA) and symptomatology eating disorder (SED)

- LOW PA, LOW SED (M: EDEQ < 1.08, F: EDEQ < 1.90) : 26
- LOW PA, HIGH SED (M: EDEQ ≥ 1.08, F: EDEQ ≥ 1.90) : 18
- HIGH PA, LOW SED (M: EDEQ < 1.08, F: EDEQ < 1.90) : 38
- HIGH PA, HIGH SED (M: EDEQ ≥ 1.08, F: EDEQ ≥ 1.90) : 21

Effects on body perception



Our preliminary results replicate the overall effect of sound condition in perceived body weight. With high frequency sound participants visualized their body as **slimmer**, and self-report feeling **lighter, quicker, and happier**.

The effects on emotional valence differ to individuals body concerns, while **dominance** is influenced by symptomatology of eating disorders.

The created database will also allow to understand the relationship between sound, body perception, behavior and emotion through the implementation of ML algorithms.

Our research also opens opportunities for designing novel systems and therapies for people with negative body perceptions and to support physical activity.

- References:
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