

# i\_mBODY Lab Demonstrates: Body Transformation Experiences with Multisensory Wearables

Elena Márquez Segura  
Department of Computer Science and  
Engineering  
Universidad Carlos III de Madrid  
Leganés, Madrid, Spain  
elena.marquez@uc3m.es

Inés Fernández Vallejo  
Department of Computer Science and  
Engineering  
Universidad Carlos III de Madrid  
Madrid, Spain  
ineferna@inf.uc3m.es

Karunya Srinivasan  
Department of Computer Science and  
Engineering  
Universidad Carlos III de Madrid  
Leganés, Madrid, Spain  
ksriniva@inf.uc3m.es

Marte Roel Lesur  
Department of Computer Science and  
Engineering  
Universidad Carlos III de Madrid  
Leganés, Madrid, Spain  
Department of Psychology  
University of Zurich  
Zurich, Switzerland  
mroel@inf.uc3m.es

Amar D'Adamo  
Department of Computer Science and  
Engineering  
Universidad Carlos III de Madrid  
Madrid, Madrid, Spain  
adadamo@inf.uc3m.es

Joaquin R. Diaz Duran  
Department of Computer Science and  
Engineering  
Universidad Carlos III de Madrid  
Leganés, Madrid, Spain  
jodiazd@pa.uc3m.es

José Manuel Vega-Cebrián  
Department of Computer Science and  
Engineering  
Universidad Carlos III de Madrid  
Leganés, Madrid, Spain  
jovegac@inf.uc3m.es

Ana Tajadura-Jiménez  
Department of Computer Science and  
Engineering  
Universidad Carlos III de Madrid  
Leganés, Madrid, Spain  
UCL Interaction Centre  
University College London  
London, United Kingdom  
atajadur@inf.uc3m.es

## Abstract

Body perception is plastic, continuously shaped by multisensory and sensorimotor cues that technology can leverage to influence body experience, behavior, and emotion. This demo presents Body Transformation Experiences (BTEs) enabled through multisensory wearables, supporting perceptual changes of body weight, size, boundaries, and movement qualities like effort. We bring four wearable prototypes from the i\_mBODY Lab: SoniWeight Shoes changes footsteps sounds to alter perceived weight; SoniBand sonifies exertion movements, modulating perceived weight and physical effort; SoniStretch produces a pitch glide when pulling a body part, creating elongation or shrinking sensations; and VibrOut uses targeted muscle vibration to create the illusion of movement while remaining still. This demo is relevant to researchers working on body-based and multisensory experiences. Our prototypes act as sensitizing artifacts leveraging body plasticity as a design material, prompting discussion on which BTEs are worth designing for,

and how to design/study them to shape future human–technology relationships.

## CCS Concepts

• **Human-centered computing** → **Interaction design**; *Human computer interaction (HCI)*; Interaction techniques; Interaction paradigms.

## Keywords

Body perception, Multisensory interaction, Embodied interaction, Embodied experience

## ACM Reference Format:

Elena Márquez Segura, Inés Fernández Vallejo, Karunya Srinivasan, Marte Roel Lesur, Amar D'Adamo, Joaquin R. Diaz Duran, José Manuel Vega-Cebrián, and Ana Tajadura-Jiménez. 2026. i\_mBODY Lab Demonstrates: Body Transformation Experiences with Multisensory Wearables. In *Extended Abstracts of the 2026 CHI Conference on Human Factors in Computing Systems (CHI EA '26)*, April 13–17, 2026, Barcelona, Spain. ACM, New York, NY, USA, 7 pages. <https://doi.org/10.1145/3772363.3799377>



This work is licensed under a Creative Commons Attribution 4.0 International License. *CHI EA '26, Barcelona, Spain*

© 2026 Copyright held by the owner/author(s).  
ACM ISBN 979-8-4007-2281-3/26/04  
<https://doi.org/10.1145/3772363.3799377>

## 1 Introduction

Body perception is not fixed but highly plastic, continuously shaped through the integration of proprioceptive, tactile, auditory, visual, olfactory, and motor cues [4, 14, 34, 45]. Cognitive neuroscience has

shown that body illusions in which perceptual changes related to size, weight, configuration, movement, and beyond, can be rapidly altered through multisensory manipulations [7, 15, 35, 52, 77]. These changes also influence cognition [24], action [8, 72], affect [42, 68], social functioning [36] and even identity [11, 53, 64, 73]. While much of this work has relied on visual dominance and has been tested in controlled laboratory paradigms [7, 27, 80], it has increasingly informed HCI design and research focusing on the lived experience of one's body, and on integration in situated everyday practices and contexts [12, 13, 32, 85].

In our work, we focus on multisensory technologies and how they can momentarily transform the way people experience their own bodies. Through targeted sensory cues, a person may momentarily feel lighter or heavier [12, 19, 68, 71], sense their limbs moving differently [30], perceive their body size or boundaries shifting [43, 46, 74, 76], or experience an exercise as more or less effortful [30, 32, 56]. We refer to those moments as Body Transformation Experiences (BTEs) [85]: experiential shifts in how one's body is felt, enacted, or understood, enabled by multisensory technologies and body illusions. These subtle—or sometimes striking—changes reveal how fluid and adaptable our bodily self-perception can be. We focus on wearables, which offer a particularly intimate site for such experiences given their proximal position to the body, and by that virtue may also be more comfortable for in-the-wild settings. Through sound, vibration, and other sensory feedback, they can transform how users attend and experience their body sensations, and capabilities.

Here, we are presenting a "Demo of Demos," featuring four different prototypes developed in the *i\_mBODY* Lab that facilitate, in seconds, a first person experience of the remarkable flexibility of body perception. Each prototype targets a different BTE, and explores a different pathway: *SoniWeight Shoes* manipulates the sound of footsteps to shift how heavy or light the body feels while walking [12, 19, 20, 66, 68, 71]; *SoniBand* produces sound during squatting exercises, reshaping one's experience of physical effort and body capabilities, as well as the perception of body lightness [30, 32, 56, 84]; *SoniStretch* uses sound coupled a pulling gesture applied to a body part to elicit an illusion of size transformation of that body part [37, 38, 43, 74]; *VibrOut* uses simultaneous vibration of multiple synergist muscles involved in a particular movement to induce illusions of such movement in static situations (See Figure 1, fourth prototype). Each of these prototypes has been previously evaluated—or are currently being evaluated—in controlled, and/or in-the-wild experiments [32, 84]. The novelty of this demo is that, for the first time, these prototypes are presented as a coherent experiential set in the context of a major international HCI and interaction design venue.

Bringing these prototypes into a shared demo space allows attendees to encounter multiple pathways to BTEs. These include alterations of self-generated sounds (*SoniWeight*), artificial sounds synchronized with action (*SoniBand* and *SoniStretch*), and vibrotactile stimulation of muscles (*VibrOut*). Participants may also compare, through first-hand experience, how different forms of sensory stimulation affect their bodies. For instance, the prototypes can lead to similar perceptual changes (e.g., body size), but also different ones (e.g. body weight in *SoniWeight*, and *SoniBand*; effort in *SoniWeight*, and *SoniBand*; and body position in *VibrOut*). At CHI,

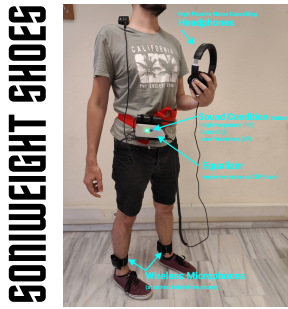
these prototypes will be used as experiential probes, anchoring reflections that will be shared in the demo space, and discussions within the CHI community about how present and future Body Transformation Experiences should be designed, interpreted, and valued.

## 2 Background

Auditory and tactile wearables are promising means for eliciting Body Transformation Experiences [65, 81, 85]. Sound and haptic feedback are particularly powerful modalities for designing technologies that engage with the moving and sensing body, and with the plasticity of body perception [33, 41, 56, 75, 77]. Unlike visual feedback, which has historically been the primary means in systems altering body perception [36, 44, 45], they can intervene directly in sensorimotor loops without requiring visual fixation, which allows users to remain engaged with their surroundings. Then, in the case of touch, it is a primarily proximal modality, which makes it particularly suitable for wearable systems that can be embedded into dynamic real-world contexts, which opens up the traditional highly controlled lab settings historically used for altering body perception [36, 44, 45]. Both modalities have a remarkable capacity to evoke sensations, meanings, and associations that operate across perceptual, emotional, and sociocultural dimensions [11, 12, 20, 32, 33, 75, 77, 84–86].

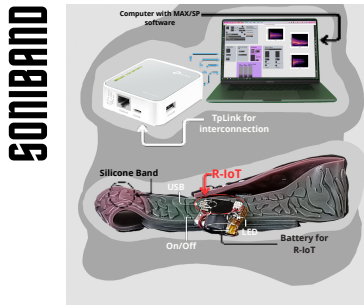
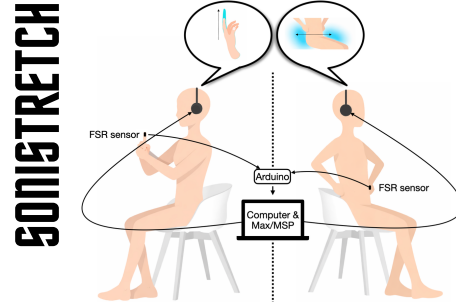
Sound-based feedback has been widely explored in HCI, sports science, and rehabilitation, particularly through movement sonification systems that map aspects of bodily movement to real-time auditory signals [9, 10, 25, 39, 47, 49, 50, 57]. Prior work has shown how such systems can support motor learning, enhance movement awareness, and shape movement qualities across domains such as physical exercise, dance, and clinical rehabilitation [6, 26, 40, 48, 63, 79].

Further, recent studies have shown that sound in conjunction with other sensory modalities can directly alter body perception, not merely inform movement execution [62]. E.g., manipulating self-generated footstep sounds can alter perceived body weight, gait, and emotion [19, 68], while auditory manipulations during upper-limb interaction can induce illusions of altered limb length, force, or stiffness [28, 51, 67, 69, 76]. This principle underpins the design of *SoniWeight Shoes* (See Figure 1, first prototype), which manipulates walking sounds to shift perceived body weight (more on this illusion on section 3.1). Similarly, coupling sound pitch and movement trajectories and/or touch can influence perceived strength/effort, perceived size of a body part, and overall experience quality [30, 38, 43, 56, 74], suggesting that directional or metaphorical sonifications [16] operate as more than "performance feedback," shaping instead how the body is felt while acting. This underpins the design of *SoniStretch* and *SoniBand* (See Figure 1, second and third prototypes respectively), coupling an ascending high-frequency tone with pinching and pulling a finger [74] or the hips [38] for *SoniStretch* (More on this illusion on section 3.2); and a movement (squat) for *SoniBand* (Section 3.3). Importantly, these effects are often shaped not only by acoustic parameters but by metaphorical sound qualities (e.g., mechanical, liquid, airy, elastic) that evoke culturally grounded associations (e.g. a "creaky" sound can make a person feel stiffer [61], and robotic sounds can make



**In a nutshell:** Alters frequency of self-generated footstep sounds.  
**Hardware:** Wireless microphones audio from the feet is sent to Bela.io board and then to cabled headphones.  
**Body location:** Microphones placed on ankles.  
**Body action:** Walking/Climbing Step.  
**Software:** SuperCollider code to filter the audio signal.  
**Interactivity:** Alters footstep sounds with low latency (1.6 ms) allowing the user to choose between three sound conditions: high frequency, amplifying 1–4 kHz components and attenuating 83–250 Hz by 12 dB; low frequency, amplifying 83–250 Hz and attenuating above 1 kHz by 12 dB; and Control, a flat frequency response maintaining natural footstep characteristics.

**In a nutshell:** Plays an upward or downward pitch glide when touching, stretching or pulling from a body part to result in a feeling of shrinking or elongation.  
**Hardware:** Force sensitive resistors (FSR) connected to an Arduino device which sends digital data to a computer. Sound is played via headphones.  
**Body location:** Finger/waist.  
**Body action:** Pressure on corresponding body part.  
**Software:** Max/MSP processes data to trigger a sound when the signal reaches a threshold  
**Interactivity:** Plays an upwards (700 to 1200 Hz) or downwards pitch (1200 to 700 Hz) glide upon pressure on the corresponding location.



**In a nutshell:** Couples ascending and descending movement with an ascending and descending sound pitch.  
**Hardware:** Battery-powered R-IoT module with 9-axis STMicromicro sensor (accel/gyro/mag, 16-bit res) and silicone band. Wireless WiFi transmission via TP-Link.  
**Body location:** On the thighs for squats.  
**Body action:** Squatting.  
**Software:** Max/MSP processing for motion sonification.  
**Interactivity:** Maps calibrated angle data to dynamic upwards (600 to 1200 Hz) or downwards (600 to 300 Hz) pitch glide.

**In a nutshell:** Supports a sensation of increased body volume through muscle vibrations.  
**Hardware:** 8 speaker driver exciters. (∅2.5 cm, 10 W) x 6 and (∅3.2 cm, 20 W) x 2 connected via audio cable to an amplifier and computer.  
**Body location:** Wrist flexors, biceps brachii, pectoralis major, trapezius inferior.  
**Body action:** Standing still.  
**Software:** Max/MSP processing to trigger vibration.  
**Interactivity:** Transmits a simultaneous vibration of all 8 vibrators at 70 Hz and 6 dB.

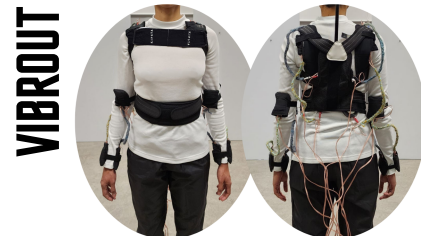


Figure 1: Overview of the four wearable prototypes presented in this demo, with images and technical specifications.

someone feel like having mechanical gears instead of human joints [28]. These sounds can guide how people sense and move while amplifying bodily illusions in ways that are situated and contingent rather than universal.

Haptic feedback has similarly expanded across applications in posture, physical training, guidance, and rehabilitation, with increasing attention to its capacity to influence bodily awareness and perception rather than solely convey corrective information

[3, 5, 23, 54, 58, 83, 89] (see overviews in [22, 55]). Vibrotactile stimulation, in particular, has been used to bias proprioceptive experience and movement perception, including modulating perceived motion direction, speed, or effort [56]. Tendon and muscle vibration are well established means for eliciting movement illusions in neuroscience. This foundation directly informs VibrOut (See Figure 1, fourth prototype), which uses localised muscle vibration to elicit illusions of movement along the direction of muscle lengthening,

such as sensing the arms opening while they remain still (more about this illusion on section 3.4).

### 3 BTEs – Prototypes and Illusions

The prototypes in this demo illustrate how auditory and haptic feedback can be strategically intertwined with movement and touch to elicit diverse Body Transformation Experiences, leveraging bodily plasticity as a core design material. Figure 1 features images and technical descriptions of the prototypes. Here, we first introduce them, and then focus on the body illusion they elicit.

**SoniWeight Shoes** (Figure 1, first prototype) is a wearable device featuring wireless microphones worn on the ankles that capture footstep sounds in real time, which are then manipulated and amplified enabling auditory feedback via headphones during walking. This is a novel prototype, wireless and more ergonomic than earlier versions [19, 20], to support long term in-the-wild studies. **SoniStretch** (Figure 1, second prototype) is a lightweight sound-based wearable that detects touch and pulling gestures applied to the body and triggers corresponding pitch-modulated sounds via headphones. **SoniBand** (Figure 1, third prototype) is a wearable audio interface designed to be worn anywhere in the body providing real-time sound feedback synchronized with movement. Currently, we are using them on the thighs to sonify squats. **VibrOut** (Figure 1, fourth prototype) is a new vibrotactile wearable in our lab. It delivers muscle stimulation through multiple actuators, designed to be worn on the upper body to support vibration-based interaction during static and dynamic postures.

#### 3.1 The Footstep Illusion by the SoniWeight Shoes

The Footsteps Illusion demonstrates that altering the frequency of footstep sounds can rapidly reshape how people perceive and move their bodies. Low-frequency (LF) feedback sounds induce sensations of increased body weight, greater masculinity/dominance, and a less dynamic gait, including reduced foot acceleration [11, 19, 66, 68]. In contrast, high-frequency (HF) feedback produces sensations of a lighter and slimmer body, greater femininity, and perceived weakness, while also enhancing positive mood (e.g., happiness) and promoting faster, more upright walking [11, 19, 66, 68]. HF feedback also generates measurable physiological and behavioural changes, including higher leg muscle activation, lower heart rate, and higher heart-rate variability [19, 68], which together suggest increased relaxation and positive affect [1, 17, 18]. These effects are not uniform across individuals: responses vary depending on factors such as eating-disorder symptomatology, physical activity level, pain condition, gender aspirations, body concerns, and sensory imagery, indicating that sound-based bodily illusions interact strongly with personal traits and baseline body representations [19, 20, 66, 70, 71]. Long term effects of the illusion are being tested in four-week studies involving participants with low levels of physical activity and high levels of symptomatology of eating disorders. Preliminary results suggest that core effects are consistent over time, opening to possible interventions for health, rehabilitation in everyday life contexts.

#### 3.2 The Auditory Pinocchio Illusion with SoniStretch

Hearing an upward or downward pitch glide together with tactile, kinaesthetic, or motor cues on a body part has been consistently shown to result in a perceived elongation or shrinking of the corresponding body part [37, 43, 74]. This phenomenon has been termed the Auditory Pinocchio Illusion [43]. Though this has been primarily tested on fingers changing their vertical but not horizontal elongation [37], recent studies have proposed performing the illusion on the waist to generate the experience of horizontal extension [38]. This phenomenon has been consistently tested according to explicit questionnaire measures and implicit behavioural measures in which participants must locate the limits of their visually occluded limbs [37, 43, 74]. The illusion arguably works due to a potentially cross-cultural [16] association between pitch and verticality, and cross-modal conceptual mappings [59, 60, 88] that link different sensory features for which the same conceptual labels exist (e.g., the relation between low and high pitch and the respective terms for visuospatial elevation).

#### 3.3 The "Pushed by Sound" Illusion by the SoniBand

The SoniBand has been studied with inactive population while walking, stretching and doing squatting exercises (e.g. [31, 32, 56]); also with the general population (e.g. [30, 32, 56]); and currently with a population with depressive symptomatology while doing squatting exercises. These studies show that high-frequency ascending tones make movements feel lighter and easier [30–32, 56]. Conversely, a descending tone when moving up, generates a sensation of heaviness and resistance, often described as the sound "pulling" the user down [30, 56]. Interestingly, this sense of burden can paradoxically cause participants to accelerate their movements to compensate for the perceived weight [56]. Prior results also show an association with positive emotions, such as happiness and confidence, with the sound acting as a reward that seemingly facilitates the movement [32, 56]. In particular, with ascending pitch sounds while moving up in a squat, participants consistently report feeling lighter, while descending pitch sound evoked feelings of heaviness and negative emotional valence.

Studies using metaphorical sounds instead of tonal sounds, like "wind," "water," and "mechanical" noises have shown they influence the experience creating interesting effects [31, 32, 84]: "wind" supported increased feelings of control and joy; "mechanical" sounds evoked visceral feelings of stiffness akin to "rusty gears" or broken bones; and "water" sounds gave feelings of fluidity and made people feel less tired. Furthermore, rich musical chords in contrast to simple tones, have been found to increase user confidence, yet they can sometimes cause proprioceptive interference that reduces accuracy [30].

Collectively, these results demonstrate that SoniBand is not just a feedback tool but a platform for shaping embodied perception, proving that sound can profoundly modulate the physical reality of effort, weight, and agency.

### 3.4 The Expanding Body Illusion by the VibrOut

VibrOut shows that the apparent position of our body can be altered using muscle vibration, which creates proprioceptive misinformation. In particular, the simultaneous vibration of synergist muscles involved in arm abduction creates the illusion that the arms are lifting laterally, moving away from the trunk.

This is due to the fact that vibration applied over the body or tendon of a muscle activates primary afferents (sensory nerve fibers that send information from your muscles to the central nervous system) in muscle spindles [78]. In response to the vibration, the muscle may reflexively contract. If its movement is inhibited or resisted (i.e. the body part is maintained stationary), the activity in the muscle spindles is perceived as movement in the opposite direction. This means that the direction of the illusory movement is consistent with the stretch or extension of the vibrated muscle.

Previous research in the 80's already demonstrated that illusory movement of a stationary limb can be experienced on vibrating the body or tendon of the muscle [29]; and that if the vibrated limb is in contact with another part of the body, there can be perceived changes in the dimensions of the touched body part, like a longer nose or finger in the Pinocchio Illusion [15, 29], and the perceived shrunk waist [21] explained before (section 3.2).

While most studies on this vibrate just one muscle, vibrating multiple synergist muscles that are involved in a movement can enhance the illusion (e.g. [87]). In VibrOut we design and test a novel prototype involving multiple muscles and both sides of the body, which leads to a novel illusion of arm abduction. Initial results from our studies show that participants experience themselves as occupying more space, for example judging that they need wider openings for their body to fit in, while standing still, and possibly during movement as well (studies ongoing). As far as we know, this is the first illusion with muscle vibration altering the perception of the body in relation to space.

### 3.5 Experiencing BTEs at CHI

At CHI, this "demo of demos" is conceived as a shared, experiential encounter. Attendees are invited to try one or more of the prototypes, and/or to watch other try them out; and to briefly reflect on how their bodily sensations, perceptions, and emotions shift while engaging with them. We will invite attendees to materialize their sensations and feelings using body maps [2, 13, 32, 82], which participants can choose to share with the rest of the CHI attendees and us by placing them on a shared whiteboards gradually forming a collective landscape of felt bodily experiences across the demo space. Alongside this, participants will be invited to anonymously contribute keywords capturing what stood out to them—actions, sensations, effects—which will be assembled on a separate board to surface resonances and contrasts across experiences. Additional whiteboards invite attendees to articulate questions and a BTE wishlist, imagining future body transformations they would want to explore, as well as open comments and questions. These shared surfaces will act as sounding walls, making visible the diversity of bodily experiences and perspectives within the CHI community, and create space for conversation, reflection, and critical dialogue around what Body Transformation Experiences (BTEs) might be, and what they could become.

### Acknowledgments

This work has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement No 101002711; project BODYinTRANSIT), and the project grant SENSEBEAT-DS (Ref: I+D+i / PID2023-150259OB-C21) funded by Agencia Estatal de Investigación (MICIU/AEI/10.13039/501100011033) and Cofunded by the European Union.

### References

- [1] John L. Andreassi. 2001. *Psychophysiology- Human Behavior and Physiological Response*. Cambridge University Press, Cambridge.
- [2] Karen Anne Cochrane, Kristina Mah, Anna Ståhl, Claudia Núñez-Pacheco, Madeleine Balaam, Naseem Ahmadpour, and Lian Loke. 2022. Body Maps: A Generative Tool for Soma-based Design. In *Sixteenth International Conference on Tangible, Embedded, and Embodied Interaction (TEI '22)*. Association for Computing Machinery, New York, NY, USA, 1–14. doi:10.1145/3490149.3502262
- [3] Simon Asplund and Martin Jonsson. 2018. SWAY - Designing for Balance and Posture Awareness. In *Proceedings of the Twelfth International Conference on Tangible, Embedded, and Embodied Interaction (Stockholm, Sweden) (TEI '18)*. Association for Computing Machinery, New York, NY, USA, 470–475. doi:10.1145/3173225.3173262
- [4] Elena Azañón, Luigi Tamè, Angelo Maravita, Sally A. Linkenauger, Elisa R. Ferrè, Ana Tajadura-Jiménez, and Matthew R Longo. 2016. Multimodal Contributions to Body Representation. *Multisensory Research* 29, 6-7 (jun 2016), 635–661. doi:10.1163/22134808-00002531
- [5] Mark J. Berentsen, Marit Bentvelzen, and Pawel W. Woźniak. 2021. MTBalance: Assisting Novice Mountain Bikers with Real-Time Proprioceptive Feedback. *Proc. ACM Hum.-Comput. Interact.* 5, ISS, Article 506 (nov 2021), 25 pages. doi:10.1145/3488551
- [6] Frédéric Bevilacqua, Eric O. Boyer, Jules Françoise, Olivier Houix, Patrick Susini, Agnès Roby-Brami, and Sylvain Hanneton. 2016. Sensori-Motor Learning with Movement Sonification: Perspectives from Recent Interdisciplinary Studies. *Frontiers in Neuroscience* 10 (2016). <https://www.frontiersin.org/articles/10.3389/fnins.2016.00385>
- [7] Matthew Botvinick and Jonathan Cohen. 1998. Rubber hands 'feel' touch that eyes see. *Nature* 391, 6669 (Feb. 1998), 756–756. doi:10.1038/35784
- [8] Lucilla Cardinali, Francesca Frassinetti, Claudio Brozzoli, Christian Urquizar, Alice C. Roy, and Alessandro Farnè. 2009. Tool-use induces morphological updating of the body schema (DOI:10.1016/j.cub.2009.05.009). *Current Biology* 19, 13 (2009), 1157. doi:10.1016/j.cub.2009.06.048 ISBN: 0960-9822.
- [9] Daniel Cesarini, Davide Calvaresi, Chiara Farnesi, Diego Taddei, Stefano Frediani, Bodo E. Ungerechts, and Thomas Hermann. 2016. MEDIATION: An eMBeddeD System for Auditory Feedback of Hand-water InterAcTION while Swimming. *Procedia Engineering* 147 (Jan. 2016), 324–329. doi:10.1016/j.proeng.2016.06.301
- [10] Matthew Clark and Afsaneh Doryab. 2023. Sounds of Health: Using Personalized Sonification Models to Communicate Health Information. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* 6, 4 (Jan. 2023), 206:1–206:31. doi:10.1145/3570346
- [11] Sunje Clausen, Ana Tajadura-Jiménez, Christian P. Janssen, and Nadia Bianchi-Berthouze. 2021. Action sounds informing own body perception influence gender identity and social cognition. *Frontiers in Human Neuroscience* (2021). doi:10.3389/fnhum.2021.688170
- [12] Amar D'Adamo, Karunya Srinivasan, Laia Turmo Vidal, Daniel De La Prida, Luis Antonio Azpicueta-Ruiz, Aleksander Väljamäe, and Ana Tajadura-Jiménez. 2026. Taking a Walk on the Wild Side: Effects of Walking in Synchrony with Pitch-Altered Footstep Sounds on Body Perception in Outside the Lab Contexts. In *Proceedings of the 2026 CHI Conference on Human Factors in Computing Systems (CHI '26)*. ACM, New York, NY, USA, 1–21. doi:10.1145/3772318.3793153
- [13] Amar D'Adamo, Laia Turmo Vidal, Karunya Srinivasan, Mohammad Mahdi Dehshibi, Daniel De La Prida, and Ana Tajadura-Jiménez. 2026. Mapping the Body: Developing Body Maps as Research Tool to Derive Quantifiable and Context-Sensitive Design Insights. In *Proceedings of the Twentieth International Conference on Tangible, Embedded, and Embodied Interaction (Chicago, IL, USA) (TEI '26)*. ACM, New York, NY, USA, 1–17. doi:10.1145/3731459.3773306
- [14] Frédérique De Vignemont. 2018. *Mind the body: An exploration of bodily self-awareness*. Oxford University Press (2018). doi:10.1093/oso/9780198735885.001.0001
- [15] Frédérique de Vignemont, Henrik H. Ehrsson, and Patrick Haggard. 2005. Bodily Illusions Modulate Tactile Perception. *Current Biology* 15, 14 (July 2005), 1286–1290. doi:10.1016/j.cub.2005.06.067
- [16] Ophelia Deroy, Irune Fernandez-Prieto, Jordi Navarra, and Charles Spence. 2018. *Unraveling the Paradox of Spatial Pitch* (1 ed.). Cambridge University Press, 77–93. doi:10.1017/9781316651247.006

- [17] Catherine Dillon, Ed Keogh, Jonathan Freeman, and Jules Davidoff. 2000. Aroused and immersed: The psychophysiology of presence. *Goldsmiths College* 01 (01 2000).
- [18] Joana Duarte and José Pinto-Gouveia. 2017. Positive affect and parasympathetic activity: Evidence for a quadratic relationship between feeling safe and content and heart rate variability. *Psychiatry Research* 257 (2017), 284–289. doi:10.1016/j.psychres.2017.07.077
- [19] Amar D'Adamo, Marte Roel Lesur, Laia Turmo Vidal, Mohammad Mahdi Dehshibi, Daniel De La Prida, Joaquín R. Diaz-Durán, Luis Antonio Azpicueta-Ruiz, Aleksander Våljamäe, and Ana Tajadura-Jiménez. 2024. SoniWeight Shoes: Investigating Effects and Personalization of a Wearable Sound Device for Altering Body Perception and Behavior. In *Proceedings of the CHI Conference on Human Factors in Computing Systems*. ACM, Honolulu HI USA, 1–20. doi:10.1145/3613904.3642651
- [20] Amar D'Adamo, Angel Sánchez, Lize De Coster, and Ana Tajadura-Jiménez. 2025. Sound effects on body perception vary with the social support network of individuals. *iScience* 28, 8 (2025), 113091. doi:10.1016/j.isci.2025.113091
- [21] H Henrik Ehrsson, Tomonori Kito, Norihiro Sadato, Richard E Passingham, and Eiichi Naito. 2005. Neural substrate of body size: illusory feeling of shrinking of the waist. *PLoS Biol.* 3, 12 (Dec. 2005), e412.
- [22] Hesham Elsayed, Martin Weigel, Florian Müller, Martin Schmitz, Karola Marky, Sebastian Günther, Jan Riemann, and Max Mühlhäuser. 2020. VibroMap: Understanding the Spacing of Vibrotactile Actuators across the Body. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* 4, 4 (Dec. 2020), 125:1–125:16. doi:10.1145/3432189
- [23] Emma Frid, Jonas Moll, Roberto Bresin, and Eva-Lotta Sallnäs Pysander. 2019. Haptic feedback combined with movement sonification using a friction sound improves task performance in a virtual throwing task. *Journal on Multimodal User Interfaces* 13, 4 (Dec. 2019), 279–290. doi:10.1007/s12193-018-0264-4
- [24] Shaun Gallagher. 2005. *How the Body Shapes the Mind*. Oxford University Press, Oxford, 294 pages. doi:10.1093/0199271941.001.0001
- [25] Tobias Großhauser, Bettina Bläsing, Corinna Spieth, and Thomas Hermann. 2012. Wearable Sensor-Based Real-Time Sonification of Motion and Foot Pressure in Dance Teaching and Training. *Journal of the Audio Engineering Society* 60, 7/8 (2012). <https://pub.uni-bielefeld.de/record/2528002>
- [26] Jakob Karolus, Felix Bachmann, Thomas Kosch, Albrecht Schmidt, and Pawel W. Woźniak. 2021. Facilitating Bodily Insights Using Electromyography-Based Biofeedback during Physical Activity. In *Proceedings of the 23rd International Conference on Mobile Human-Computer Interaction* (Toulouse & Virtual, France) (*MobileHCI '21*). Association for Computing Machinery, New York, NY, USA, Article 14, 15 pages. doi:10.1145/3447526.3472027
- [27] Konstantina Kilteni, Antonella Maselli, Konrad P Kording, and Mel Slater. 2015. Over my fake body: body ownership illusions for studying the multisensory basis of own-body perception. *Frontiers in human neuroscience* 9, March (2015), 141. doi:10.3389/fnhum.2015.00141
- [28] Yosuke Kurihara, Taku Hachisu, Katherine J. Kuchenbecker, and Hiroyuki Kajimoto. 2013. Virtual Robotization of the Human Body via Data-Driven Vibrotactile Feedback. In *Advances in Computer Entertainment (Lecture Notes in Computer Science)*, Dennis Reidsma, Haruhiko Katayose, and Anton Nijholt (Eds.). Springer International Publishing, Cham, 109–122. doi:10.1007/978-3-319-03161-3\_8
- [29] James R Lackner. 1988. Some proprioceptive influences on the perceptual representation of body shape and orientation. *Brain* 111, 2 (1988), 281–297.
- [30] Judith Ley-Flores, Eslam Alshami, Aneasha Singh, Frédéric Bevilacqua, Nadia Bianchi-Berthouze, Ophelia Deroy, and Ana Tajadura-Jiménez. 2022. Effects of pitch and musical sounds on body-representations when moving with sound. *Scientific Reports* 12, 1 (Feb. 2022), 2676. doi:10.1038/s41598-022-06210-x
- [31] Judith Ley-Flores, Frederic Bevilacqua, Nadia Bianchi-Berthouze, and Ana Tajadura-Jimenez. 2019. Altering body perception and emotion in physically inactive people through movement sonification. In *2019 8th International Conference on Affective Computing and Intelligent Interaction (ACII)*. IEEE, Cambridge, United Kingdom, 1–7. doi:10.1109/ACII.2019.8925432
- [32] Judith Ley-Flores, Laia Turmo Vidal, Nadia Berthouze, Aneasha Singh, Frédéric Bevilacqua, and Ana Tajadura-Jiménez. 2021. SoniBand: Understanding the Effects of Metaphorical Movement Sonifications on Body Perception and Physical Activity. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. ACM, New York, NY, USA, 1–16. doi:10.1145/3411764.3445558
- [33] Judith Ley-Flores, Laia Turmo Vidal, Elena Márquez Segura, Aneasha Singh, Frédéric Bevilacqua, Francisco Cuadrado, Joaquín Díaz Durán, Omar Valdiviezo-Hernández, Milagrosa Sánchez-Martín, and Ana Tajadura-Jiménez. 2024. Co-Designing Sensory Feedback for Wearables to Support Physical Activity through Body Sensations. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* 8 (03 2024), 1–31. doi:10.1145/3643499
- [34] Matthew R Longo. 2017. Body representations and the sense of self. *The subject's matter: Self-consciousness and the body* (2017), 75–96.
- [35] Matthew R. Longo and Patrick Haggard. 2012. What Is It Like to Have a Body? *Current Directions in Psychological Science* 21, 2 (April 2012), 140–145. doi:10.1177/0963721411434982
- [36] Lara Maister, Mel Slater, Maria V. Sanchez-Vives, and Manos Tsakiris. 2015. Changing bodies changes minds: owning another body affects social cognition. *Trends in Cognitive Sciences* 19, 1 (Jan. 2015), 6–12. doi:10.1016/j.tics.2014.11.001 ISBN: 13646613 (ISSN).
- [37] Elena Nava and Ana Tajadura-Jiménez. 2020. Auditory-induced body distortions in children and adults. *Scientific Reports* 10, 11 (Feb. 2020), 3024. doi:10.1038/s41598-020-59979-0
- [38] Sergio Navas-León, Luis Morales Márquez, Milagrosa Sánchez-Martín, Laura Crucianelli, Nadia Bianchi-Berthouze, Mercedes Borda-Mas, and Ana Tajadura-Jiménez. 2023. Exploring multisensory integration of non-naturalistic sounds on body perception in young females with eating disorders symptomatology: a study protocol. *Journal of Eating Disorders* 11, 1 (Feb. 2023), 28. doi:10.1186/s40337-023-00749-4
- [39] Joseph W. Newbold, Nadia Bianchi-Berthouze, Nicolas E. Gold, Ana Tajadura-Jiménez, and Amanda CdC Williams. 2016. Musically Informed Sonification for Chronic Pain Rehabilitation: Facilitating Progress & Avoiding Over-Doing. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16)*. Association for Computing Machinery, New York, NY, USA, 5698–5703. doi:10.1145/2858036.2858302
- [40] Stina Nylander, Alex Kent, and Jakob Tholander. 2014. Swing Sound: Experiencing the Golf Swing Through Sound. In *CHI '14 Extended Abstracts on Human Factors in Computing Systems (CHI EA '14)*. ACM, New York, NY, USA, 443–446. doi:10.1145/2559206.2574789
- [41] Alberto Pisoni, Carlotta Fossataro, Alice Rossi Sebastiano, Marcella Romeo, Eleonora Arrigoni, Leonor Josefina Romero Lauro, Nadia Bolognini, and Francesca Garbarini. 2025. Body ownership gates tactile awareness by reshaping the somatosensory functional connectivity. *Proceedings of the National Academy of Sciences* 122, 51 (Dec. 2025), e2513533122. doi:10.1073/pnas.2513533122
- [42] Catherine Preston and H Henrik Ehrsson. 2016. Illusory Obesity Triggers Dissatisfaction Responses in the Insula and Anterior Cingulate Cortex. *Cerebral Cortex* 26, 12 (Dec. 2016), 4450–4460. doi:10.1093/cercor/bhw313
- [43] Marte Roel Lesur, Matthew R. Longo, and Ana Tajadura-Jiménez. 2025. Linking spatial metaphors to body size perception: Different roles of top-down associations and multisensory contributions when mapping auditory cues to finger length. *Cortex* 190 (2025), 178–191. doi:10.1016/j.cortex.2025.06.014
- [44] Marte Roel Lesur, Sonia Lyn, and Bigna Lenggenhager. 2020. How Does Embodiment a Transgender Narrative Influence Social Bias? An Exploratory Study in an Artistic Context. *Frontiers in Psychology* 11 (2020). doi:10.3389/fpsyg.2020.01861
- [45] Marte Roel Lesur, Yoann Stussi, Philippe Bertrand, Sylvain Delplanque, and Bigna Lenggenhager. 2023. Different armpits under my new nose: Olfactory sex but not gender affects implicit measures of embodiment. *Biological Psychology* 176 (Jan. 2023), 108477. doi:10.1016/j.biopsycho.2022.108477
- [46] Marte Roel Lesur, Laia Turmo Vidal, Karunya Srinivasan, Pablo Palacio, Muriel Romero, and Ana Tajadura-Jimenez. 2024. Articulating body experiences in reaction to movement sonifications: A workshop strategy for early research inquiries. In *Proceedings of the 19th International Audio Mostly Conference: Explorations in Sonic Cultures* (Milan, Italy) (*AM '24*). Association for Computing Machinery, New York, NY, USA, 487–491. doi:10.1145/3678299.3678349
- [47] Giulio Rosati, Antonio Rodà, Federico Avanzini, and Stefano Masiero. 2013. On the role of auditory feedback in robot-assisted movement training after stroke: review of the literature. *Computational Intelligence and Neuroscience* 2013 (2013), 586138. doi:10.1155/2013/586138
- [48] Nina Schaffert, Thenille Braun Janzen, Klaus Mattes, and Michael H. Thaut. 2019. A Review on the Relationship Between Sound and Movement in Sports and Rehabilitation. *Frontiers in Psychology* 10 (2019). <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.00244>
- [49] Nina Schaffert and Klaus Mattes. 2015. Interactive Sonification in Rowing: Acoustic Feedback for On-Water Training. *IEEE MultiMedia* 22, 1 (Jan. 2015), 58–67. doi:10.1109/MMUL.2015.9 Conference Name: IEEE MultiMedia.
- [50] Daniel S. Scholz, Sönke Rhode, Michael Großbach, Jens Rollnik, and Eckart Altenmüller. 2015. Moving with music for stroke rehabilitation: a sonification feasibility study. *Annals of the New York Academy of Sciences* 1337 (March 2015), 69–76. doi:10.1111/nyas.12691
- [51] Irene Senna, Angelo Maravita, Nadia Bolognini, and Cesare V. Parise. 2014. The marble-hand illusion. *PLoS ONE* 9, 3 (2014), 1–6. doi:10.1371/journal.pone.0091688
- [52] Andrea Serino and Patrick Haggard. 2010. Touch and the body. *Neuroscience & Behavioral Reviews* 34, 2 (Feb. 2010), 224–236. doi:10.1016/j.neubiorev.2009.04.004
- [53] Kye Shimizu, Santa Naruse, Jun Nishida, and Shunichi Kasahara. 2023. Morphing Identity: Exploring Self-Other Identity Continuum through Interpersonal Facial Morphing Experience. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (Hamburg, Germany) (*CHI '23*). Association for Computing Machinery, New York, NY, USA, Article 500, 15 pages. doi:10.1145/3544548.3580853
- [54] Roland Sigrüst, Georg Rauter, Laura Marchal-Crespo, Robert Riener, and Peter Wolf. 2015. Sonification and haptic feedback in addition to visual feedback enhances complex motor task learning. *Experimental Brain Research* 233, 3 (March 2015), 909–925. doi:10.1007/s00221-014-4167-7
- [55] Roland Sigrüst, Georg Rauter, Robert Riener, and Peter Wolf. 2013. Augmented visual, auditory, haptic, and multimodal feedback in motor learning: A review.

- Psychonomic Bulletin & Review* 20, 1 (Feb. 2013), 21–53. doi:10.3758/s13423-012-0333-8
- [56] Aneasha Singh, Marusa Hrobat, Suxin Gui, Nadia Bianchi-Berthouze, Judith Ley-Flores, Frédéric Bevilacqua, Joaquín Díaz Durán, Elena Márquez Segura, and Ana Tajadura-Jiménez. 2024. Pushed by Sound: Effects of Sound and Movement Direction on Body Perception, Experience Quality, and Exercise Support. *ACM Transactions on Computer-Human Interaction* 31 (March 2024). doi:10.1145/3648616
- [57] Aneasha Singh, Stefano Piana, Davide Pollarolo, Gualtiero Volpe, Giovanna Varni, Ana Tajadura-Jiménez, Amanda CdeC Williams, Antonio Camurri, and Nadia Bianchi-Berthouze. 2016. Go-with-the-Flow: Tracking, Analysis and Sonification of Movement and Breathing to Build Confidence in Activity Despite Chronic Pain. *Human-Computer Interaction* 31, 3-4 (July 2016), 335–383. doi:10.1080/07370024.2015.1085310 Publisher: Taylor & Francis \_eprint: <https://doi.org/10.1080/07370024.2015.1085310>.
- [58] Daniel Spelmezan, Anke Hilgers, and Jan Borchers. 2009. A language of tactile motion instructions. In *Proceedings of the 11th International Conference on Human-Computer Interaction with Mobile Devices and Services (MobileHCI '09)*. Association for Computing Machinery, New York, NY, USA, 1–5. doi:10.1145/1613858.1613896
- [59] Charles Spence. 2011. Crossmodal correspondences: A tutorial review. *Attention, Perception, & Psychophysics* 73, 4 (May 2011), 971–995. doi:10.3758/s13414-010-0073-7
- [60] Charles Spence. 2019. On the Relative Nature of (Pitch-Based) Crossmodal Correspondences. *Multisensory Research* 32, 3 (Jan. 2019), 235–265. doi:10.1163/22134808-20191407
- [61] Tasha R. Stanton, G. Lorimer Moseley, Arnold Y. L. Wong, and Gregory N. Kawchuk. 2017. Feeling stiffness in the back: a protective perceptual inference in chronic back pain. *Scientific Reports* 7, 1 (Aug. 2017), 9681. doi:10.1038/s41598-017-09429-1 Number: 1 Publisher: Nature Publishing Group.
- [62] Tasha R Stanton and Charles Spence. 2020. The Influence of Auditory Cues on Bodily and Movement Perception. *Frontiers in Psychology* 10 (2020), 3001. doi:10.3389/fpsyg.2019.03001
- [63] Jelle Stienstra, Kees Overbeeke, and Stephan Wensveen. 2011. Embodying Complexity Through Movement Sonification: Case Study on Empowering the Speedskater. In *Proceedings of the 9th ACM SIGCHI Italian Chapter International Conference on Computer-Human Interaction: Facing Complexity (CHIItaly)*. ACM, New York, NY, USA, 39–44. doi:10.1145/2037296.2037310 event-place: Alghero, Italy.
- [64] Paweł Tacikowski, Marieke L Weijs, and H Henrik Ehrsson. 2020. Perception of Our Own Body Influences Self-Concept and Self-Incoherence Impairs Episodic Memory. *iScience* 23, 9 (2020), 101429. doi:10.1016/j.isci.2020.101429
- [65] Ana Tajadura-Jimenez, Judith Ley-Flores, Omar Valdiviezo, Aneasha Singh, Milagrosa Sanchez-Martin, Joaquín Díaz Durán, and Elena Márquez Segura. 2022. Exploring the Design Space for Body Transformation Wearables to Support Physical Activity through Sensitizing and Bodystorming. In *Proceedings of the 8th International Conference on Movement and Computing (MOCO '22)*. Association for Computing Machinery, New York, NY, USA, 1–9. doi:10.1145/3537972.3538001
- [66] A. Tajadura-Jiménez, J. Newbold, L. Zhang, P. Rick, and N. Bianchi-Berthouze. 2019. As Light as You Aspire to Be: Changing Body Perception with Sound to Support Physical Activity. In *CHI Conference on Human Factors in Computing Systems Proceedings*. 1–13. doi:10.1145/3290605.3300465
- [67] Ana Tajadura-Jiménez, Manos Tsakiris, Torsten Marquardt, and Bianchi Berthouze Nadia. 2015. Action sounds update the mental representation of arm dimension: Contributions of kinaesthesia and agency. *Frontiers in Psychology* 6, May (2015), 1–18. doi:10.3389/fpsyg.2015.00689
- [68] Ana Tajadura-Jiménez, Maria Basia, Ophelia Deroy, Merle Fairhurst, Nicolai Marquardt, and Nadia Bianchi-Berthouze. 2015. As Light As Your Footsteps: Altering Walking Sounds to Change Perceived Body Weight, Emotional State and Gait. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems (CHI '15)*. ACM, New York, NY, USA, 2943–2952. doi:10.1145/2702123.2702374
- [69] Ana. Tajadura-Jiménez, N. Bianchi-Berthouze, E. Furfaro, and F. Bevilacqua. 2015. Sonification of surface tapping changes behavior, surface perception, and emotion. *IEEE Multimedia* 22, 1 (2015). doi:10.1109/MMUL.2015.14
- [70] Ana Tajadura-Jiménez, Helen Cohen, and Nadia Bianchi-Berthouze. 2017. Bodily Sensory Inputs and Anomalous Bodily Experiences in Complex Regional Pain Syndrome: Evaluation of the Potential Effects of Sound Feedback. *Frontiers in Human Neuroscience* 11 (July 2017). doi:10.3389/fnhum.2017.00379
- [71] Ana Tajadura-Jiménez, Laura Crucianelli, Rebecca Zheng, Chloe Cheng, Judith Ley-Flores, Mercedes Borda-Más, Nadia Bianchi-Berthouze, and Aikaterini Fotopoulou. 2022. Body weight distortions in an auditory-driven body illusion in subclinical and clinical eating disorders. *Scientific Reports* 12, 11 (Nov. 2022), 20031. doi:10.1038/s41598-022-24452-7
- [72] Ana Tajadura-Jiménez, Torsten Marquardt, David Swapp, Norimichi Kitagawa, and Nadia Bianchi-Berthouze. 2016. Action Sounds Modulate Arm Reaching Movements. *Frontiers in Psychology* 7 (2016). doi:10.3389/fpsyg.2016.01391
- [73] A. Tajadura-Jiménez and M. Tsakiris. 2014. Balancing the “inner” and the “outer” self: Interoceptive sensitivity modulates self-other boundaries. *Journal of Experimental Psychology: General* 143, 2 (2014). doi:10.1037/a0033171
- [74] Ana Tajadura-Jiménez, Maria Vakali, Merle T. Fairhurst, Alisa Mandrigin, Nadia Bianchi-Berthouze, and Ophelia Deroy. 2017. Contingent sounds change the mental representation of one’s finger length. *Scientific Reports* 7, 11 (2017), 5748. doi:10.1038/s41598-017-05870-4
- [75] Ana Tajadura-Jiménez, Aleksander Valjamae, and Kristi Kuusk. 2020. Altering One’s Body-perception Through E-Textiles and Haptic Metaphors. *Frontiers in Robotics and AI* (2020). doi:10.3389/frobt.2020.00007
- [76] Ana Tajadura-Jiménez, Aleksander Väljamäe, Iwaki Toshima, Toshitaka Kimura, Manos Tsakiris, and Norimichi Kitagawa. 2012. Action sounds recalibrate perceived tactile distance. *Current Biology* 22, 13 (2012), R516–R517. doi:10.1016/j.cub.2012.04.028 ISBN: 1879-0445 (Electronic)r0960-9822 (Linking) Publisher: Elsevier.
- [77] Ana Tajadura-Jiménez, Merle T. Fairhurst, and Ophelia Deroy. 2022. Sensing the body through sound. In *The Routledge Handbook of Bodily Awareness* (routledge ed.), Adrian J.T. Alsmith and Matthew R. Longo (Eds.). Routledge, London. doi:10.4324/9780429321542
- [78] Mitchell W Taylor, Janet L Taylor, and Tatjana Seizova-Cajic. 2017. Muscle vibration-induced illusions: Review of contributing factors, taxonomy of illusions and User’s Guide. *Multisens. Res.* 30, 1 (2017), 25–63.
- [79] Paul Tenment, Joe Marshall, Vasiliki Tsaknaki, Charles Windlin, Kristina Höök, and Miquel Alfaras. 2020. Soma Design and Sensory Misalignment. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) (CHI '20). Association for Computing Machinery, New York, NY, USA, 1–12. doi:10.1145/3313831.3376812
- [80] Manos Tsakiris. 2010. My body in the brain: A neurocognitive model of body-ownership. *Neuropsychologia* 48, 3 (2010), 703–712. doi:10.1016/j.neuropsychologia.2009.09.034
- [81] Laia Turmo Vidal, Judith Ley-Flores, Elena Márquez Segura, and Ana Tajadura-Jimenez. 2023. Exploring Material Metaphors to Design Sensory Wearables for Body Transformation Experiences. In *Body x Materials: A Workshop Exploring the Role of Material-Enabled Body-Based Multisensory Experiences*.
- [82] Laia Turmo Vidal, Yinchu Li, Martin Stojanov, Karin B Johansson, Beatrice Tylsted, and Lina Eklund. 2023. Towards Advancing Body Maps as Research Tool for Interaction Design. In *Proceedings of the Seventeenth International Conference on Tangible, Embedded, and Embodied Interaction (TEI '23)*. Association for Computing Machinery, New York, NY, USA. doi:10.1145/3569009.3573838
- [83] Laia Turmo Vidal, Elena Márquez Segura, Luis Parrilla Bel, and Annika Waern. 2020. Training Technology Probes Across Fitness Practices: Yoga, Circus and Weightlifting. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems (CHI'20)*. ACM, New York, NY, USA. doi:10.1145/3334480.3382862
- [84] Laia Turmo Vidal, Ana Tajadura-Jiménez, and Judith Ley-Flores. 2025. Temporal Trajectories: Characterizing Somatic Experiences that Unfold Over Time. In *Proceedings of the 2025 ACM Designing Interactive Systems Conference (DIS '25)*. Association for Computing Machinery, New York, NY, USA, 2931–2949. doi:10.1145/3715336.3735777
- [85] Laia Turmo Vidal, Ana Tajadura-Jiménez, José Manuel Vega-Cebrián, Judith Ley-Flores, Joaquín R. Díaz-Durán, and Elena Márquez Segura. 2024. Body Transformation: An Experiential Quality of Sensory Feedback Wearables for Altering Body Perception. In *Proceedings of the Eighteenth International Conference on Tangible, Embedded, and Embodied Interaction (TEI '24)*. Association for Computing Machinery, New York, NY, USA, 1–19. doi:10.1145/3623509.3633373
- [86] Laia Turmo Vidal, José Manuel Vega-Cebrián, María Concepción Valdez Gastelum, Elena Márquez Segura, Judith Ley-Flores, Joaquín R. Díaz Durán, and Ana Tajadura-Jiménez. 2024. Body Sensations as Design Material: An Approach to Design Sensory Technology for Altering Body Perception. In *Proceedings of the 2024 ACM Designing Interactive Systems Conference (DIS '24)* (Copenhagen, Denmark). Association for Computing Machinery, New York, NY, USA, 2545–2561. doi:10.1145/3643834.3661649
- [87] Keigo Ushiyama, Satoshi Tanaka, Akifumi Takahashi, and Hiroyuki Kajimoto. 2020. The effects of simultaneous multi-point vibratory stimulation on kinesthetic illusion. In *Haptics: Science, Technology, Applications*. Springer International Publishing, Cham, 185–193.
- [88] Laura Walker and Peter Walker. 2016. Cross-sensory mapping of feature values in the size–brightness correspondence can be more relative than absolute. *Journal of Experimental Psychology: Human Perception and Performance* 42, 1 (2016), 138–150. doi:10.1037/xhp0000128
- [89] Mikoklaj P. Wozniak, Julia Dominiak, Michal Pieprzowski, Piotr Iadonski, Krzysztof Grudzien, Lars Lischke, Andrzej Romanowski, and Paweł W. Wozniak. 2020. Subtle: Augmenting Posture Awareness for Beginner Golfers. *Proc. ACM Hum.-Comput. Interact.* 4, ISS, Article 204 (nov 2020), 24 pages. doi:10.1145/3427332