The Design Journal
An International Journal for All Aspects of Design

ISSN: 1460-6925 (Print) 1756-3062 (Online) Journal homepage: www.tandfonline.com/journals/rfdj20

Exploring somatic awareness in product design education: A Feldenkrais-based workshop study

Dirk Loyens, Nicole Schumann-Sizaret & Shujoy Chakraborty

To cite this article: Dirk Loyens, Nicole Schumann-Sizaret & Shujoy Chakraborty (10 Jun 2026): Exploring somatic awareness in product design education: A Feldenkrais-based workshop study, The Design Journal, DOI: 10.1080/14606925.2026.2682357

To link to this article: https://doi.org/10.1080/14606925.2026.2682357

THE DESIGN JOURNAL
https://doi.org/10.1080/14606925.2026.2682357

Routledge
Taylor & Francis Group

Exploring somatic awareness in product design education: A Feldenkrais-based workshop study

Dirk Loyens[a], Nicole Schumann-Sizaret[b] and Shujoy Chakraborty[c,d]

[a]ID+, ESMAD, Polytechnic of Porto, Vila do Conde, Portugal; [b]Independent Researcher, Matosinhos, Portugal; [c]Department of Product Design, University of Madeira, Funchal, Portugal; [d]ESAD-IDEA, Matosinhos, Portugal

ABSTRACT

Traditional product design education emphasises visual and cognitive approaches, giving limited attention to embodied knowledge, despite the physical nature of human-product interactions. This exploratory research investigates how somatic awareness practices derived from the Feldenkrais method might complement design education. Through a five-session workshop with six master's design students, we documented how participants experienced and integrated somatic awareness into their design thinking. Data collection included body mapping, observations, and interviews. Students reported greater awareness and attention to bodily sensations and movement quality. They described starting to use their bodies as resources for testing ideas, drawing inspiration from principles of movement, and developing critical perspectives on aesthetically focused design. This research contributes empirical documentation of how design students experience somatic awareness practices, addressing a gap in soma design education literature. The findings suggest that structured somatic awareness practices can meaningfully complement traditional design education, offering valuable insights for educators.

ARTICLE HISTORY
Received 4 November 2025
Accepted 13 March 2026

KEYWORDS
Somatic awareness, somatic learning, Feldenkrais, design education, design methods, design process, movement

Introduction

Every interaction between a person and a product is a bodily experience, yet design education continues to privilege abstracted, cognitive approaches over embodied understanding. As a result, novice designers often design for hypothetical users rather than drawing on their own somatic expertise. A product design process, therefore, demands a holistic perspective on the interactions among human bodies, the product's physical form, the situated context of use, and the user's senses and emotional state.

CONTACT Dirk Loyens dgl@esmad.ipp.pt ID+, ESMAD, Polytechnic of Porto, Rua D. Sancho I, 4480-876 Vila do Conde, Portugal

Novice product designers (students) essentially design for an abstract person, which is, in reality, a hypothetical construct. Novice designers tend to over-reliance on references such as anthropometric tables and computer-aided visual representation, particularly during the concept development phase of the design process. Accordingly, there is a strong bias towards relying on secondary research sources, such as claims by other designers, published articles, and online resources, to validate their own design decisions. First-person knowledge is often set aside during the design process, as novice designers overlook the fact that they are also human beings with their own somatic expertise, experience, knowledge, and skills, which they can draw upon as essential input during the design process (Höök et al. 2018).

Body-Centred Design (BCD) is an approach to product design in which interaction with the user's body is crucial to both product creation and functional evaluation (Höök et al. 2018). This is a human-centred approach to designing. Human-centred design is oriented towards training the designer to gain a second-order understanding of how the other understands, the product being designed (Krippendorff 2005). As digital technology interfaces with the human body (Svanæs and Barkhuus 2020), BCD is receiving increasing research attention in the field of Human-Computer Interaction (HCI).

This research focuses on a first-person approach as a conscious action that uses all available combined input from proprioception and exteroception at the time of the experiment. Thereby, it presents the possibility of extending the arguments of design methods and design process theory beyond language, symbolic associations, and second-order understanding by introducing the designers' personal mind-body awareness in space into the equation.

Being more knowledgeable about the body in movement is critical for the design process of almost any artefact. Designers, in general, have become aware that they cannot design for the body from a disembodied viewpoint only (Tsaknaki et al. 2019). Designers must incorporate a living, moving body perspective and awareness into the design process.

This exploratory research is grounded in embodied cognition theory, which provides the conceptual foundation for understanding how bodily experience shapes design thinking. This perspective challenges Cartesian dualism, which has historically dominated design education, by privileging cognitive processes over bodily knowing. Embodied cognition theory argues that cognition emerges from bodily interactions with the environment (Kosmas and Zaphiris 2018). This theoretical framework suggests that sensorimotor experiences fundamentally shape abstract reasoning, metaphorical thinking, and creative problem-solving. For design education, this implies that developing bodily awareness may enhance rather than merely supplement cognitive design processes.

Soma

The authors support the following definitions for soma: 'the body perceived from within by first-person perception' (Hanna 1986, 341) and 'the living, feeling, sentient, purposive body that implies the essential union of body-mind' (Shusterman 2012, 188), highlighting the integrated nature of bodily and mental processes. This research focuses on the lived experience of the body. Exploring the soma from a first-person perspective offers valuable insights into the subjective dimensions of embodiment, including proprioception, interoception, and the sense of self. While external observation can yield measurable data, the first-person perspective reveals the individual's conscious awareness and interpretation of their personal-somatic experience.

Feldenkrais Method

The Feldenkrais Method, as defined by the International Feldenkrais Federation, is an educational system that utilises movement to teach self-awareness and improve function. It understands the human being as a singular, holistic, functional organism, the soma, which uses movement to evolve in its environment and to communicate with its nervous system. The Feldenkrais method enables an appreciation of the complexity of human movement and its fundamental role in the development of the nervous system, comparable to organic learning in early life (somatic learning).

Through first-person experience, often applied in a group environment, the Feldenkrais Method allows participants to witness the vast and profound variations in how human organisms, or somas, organise themselves for functional movement. This approach highlights the unique individual behaviours and personal life experiences that shape each person's somatic awareness and movement patterns.

Rationale for selecting the Feldenkrais Method

Several somatic modalities could inform design education, including the Alexander Technique, Body-Mind Centring, and various mindfulness-based approaches. We selected the Feldenkrais Method for this research on the basis of several pedagogical and practical considerations.

First, the Feldenkrais Method emphasises learning through self-discovery rather than prescriptive instruction. Unlike the Alexander Technique, which typically relies on hands-on guidance from a practitioner (Kinsey, Glover, and Wadephul 2021; Rechnitzer 2020), the Awareness Through Movement lessons (ATMs) used in this research are verbally guided, making them more

accessible for group educational settings without requiring individual practitioner intervention.

Second, the Feldenkrais Method focuses specifically on movement awareness and efficiency rather than therapeutic intervention, making it appropriate for an educational rather than clinical context.

Third, the second author's certification as a Feldenkrais practitioner provided methodological rigour and authenticity in implementing the workshop sessions. This practitioner's expertise was essential for adapting lessons to design education contexts while maintaining fidelity to the method's principles.

We acknowledge that other somatic modalities may offer complementary or alternative benefits for design education. Future research could systematically compare different approaches to identify which elements of somatic training most effectively transfer to design competencies.

Soma and design

Using one's own experiences and learning from them to improve the design process is not a new concept. Movement and breathing exercises were part of the designer's education during the early Bauhaus period. Later, this focus on the designer's own body was further developed by Moholy-Nagy, which now included visual, spatial, equilibrium, and tactile explorations (Sfligiotti 2021; Wick 2019). However, this early somatic training gradually disappeared from design education. It disconnected from a design process that required a rational and manageable structure. Recently, design researchers and educators in the United States and Scandinavia have renewed their focus on exploring the relationship between soma and design (Höök et al. 2018; Svanæs and Barkhuus 2020). They base their research on Richard Shusterman's concept of somaesthetics, which offers a holistic approach to aesthetics that rejects the separation of the body and mind (Favara-Kurkowski and Andrzejewski 2021), encouraging designers to understand better how the body interacts with an object and how small changes impact and correlate to emotional experiences (Höök et al. 2018).

Research questions and motivation

Building on their individual professional experience, the authors found that (product) designers can lack self-experience of bodily awareness of human movement in design interaction. Yet, this should be a fundamental skill for designers to develop human-centred design. Human motor-sensory and emotional uniqueness need not be a barrier for the designer, provided the designer is aware of their own idiosyncrasies. As Feldenkrais (2004, 3649) stated, 'If you know what you are doing, you can do what you want.'

This research employs *'Awareness Through Movement'* (Feldenkrais 1972) from the Feldenkrais method to demonstrate the perceivable variety of how individuals move, sense, and feel. Moreover, it trains participants to experiment and distinguish their habitual motor-sensory and emotional behaviours from different, unfamiliar sensations and emotions, as well as their origin from movement variations. The novelty of this exploratory research lies in asking students to employ their holistic self, their soma, and to execute movement with careful attention to the purposes of learning, thinking, and creativity in an academic context. This research also explores whether and how the Feldenkrais Method can convey 'feeling out of the box' to design students, and whether structured somatic awareness practices can help them access and articulate tacit bodily knowledge relevant to design practice.

The authors framed this research through two research questions oriented towards addressing soma-based learning, interdisciplinary university pedagogy, and product design methods:

- **Research Question 1**: What are the benefits of introducing somatic awareness to product design students? (first-person experience and empathy)
- **Research Question 2**: What is a suitable teaching strategy for integrating somatic learning with product design theory? (interdisciplinary design method).

Research methodology

Research design and context

This research employed an exploratory qualitative case study approach to investigate how somatic awareness practices can be integrated into product design education. The study was designed as a pedagogical intervention within an existing master's program, examining how students experienced and potentially integrated somatic awareness into their ongoing design education and practice.

The exploratory nature of this research reflects the need for a foundational understanding before more structured investigations can be conducted. A qualitative case study approach enabled in-depth observation of how a small group of students engaged with somatic awareness practices while acknowledging the limitations of generalisability inherent in such an approach. The workshop was conducted as part of an existing design studio course, enabling students to connect somatic awareness experiences to their ongoing design projects immediately. This curricular integration was essential for observing how somatic practices might complement rather than replace traditional approaches to design education. Students were concurrently working on

home-office equipment design projects, providing immediate context for applying bodily awareness to design challenges involving physical interaction.

Before conducting this study, the researchers held preparatory sessions with prior student cohorts and professional designers over three years to refine the pedagogical approach and assess its feasibility in an educational context, thereby informing the final workshop structure and data collection methods.

Researcher positionality and reflexivity

The research team brought distinct but complementary backgrounds that shaped both the study design and analytical lens. The first author is a product design educator with over thirty years of teaching experience, whose interest in somatic approaches emerged from observing students' disconnection from their own bodily experiences when designing products involving physical interaction. This perspective informed the study's focus on pedagogical applications and practical design outcomes. The second author is a certified Feldenkrais pedagogue and movement researcher with a confirmed interest in design. This dual role as workshop facilitator and researcher required careful management to ensure research rigour. The third author contributed analytical distance as a researcher experienced in qualitative methodology but without prior investment in somatic practices. This positioning enabled critical questioning of shared assumptions and helped distinguish practitioner enthusiasm from participants' actual reported experiences.

We acknowledge that our collective conviction about the value of embodied approaches likely influenced how we framed questions and interpreted responses. To address this, we actively sought disconfirming evidence during the analysis, paid particular attention to instances in which students expressed scepticism or difficulty, and included these instances in our findings.

Participants and workshop structure

Six second-year master's students in Product Design participated in the workshop series. The sample included two female and four male students, aged 23–28 years (mean age 25.3). None reported significant mobility limitations that would prevent full participation, though two students mentioned minor chronic conditions (mild asthma, occasional lower back tension) in pre-workshop interviews. All participants were Portuguese nationals conducting their studies in Portuguese, which was also the language of all workshop instructions and interviews. This purposive sample had already developed foundational design skills and was engaged in complex design projects involving bodily interaction. The small group size facilitated detailed observation

Table 1. Workshop session structure.

#	Title	Focus	Source material
1	Preparing Crawling	Basic body organisation	AY# 370, Feldenkrais (2000)
2	Turning on Floor	Spinal mobility and integration	Segal and Yaron (2013)
3	Turning on Chair	Seated movement quality	AY #469, Feldenkrais (2002)
4	Standing and Walking	Vertical organization	AY #501, Feldenkrais (2004)
5	Mobilising Pelvis	Core integration	AY #019, Feldenkrais (1994)

and individual attention while maintaining the social learning aspects that emerge when students observe variations in each other's movement patterns.

The workshop consisted of five 90-min sessions, conducted weekly over a five-week period. Each session differed in focus and was derived from established Feldenkrais materials (Table 1). Sessions were structured to gradually build students' somatic awareness while maintaining clear connections to their ongoing design work.

The session sequence progressed from more straightforward to more complex movements, incorporating positions such as lying, sitting, standing, and walking. Sessions 3 and 4 are directly connected to students' design projects through a focus on sitting and standing positions. Each session followed a consistent structure: initial body mapping to document baseline somatic awareness; verbal movement instructions provided by the certified Feldenkrais practitioner (second author) without demonstration; attention guiding through targeted questions; exploration of movement variations; reflection periods; and final body mapping to document changes in awareness and feeling. The practitioner emphasised that there was no single 'correct' way to move, highlighting the diversity of movement patterns that emerged from identical instructions. This approach encouraged students to notice both their own unique patterns and the diversity among their peers, potentially modelling design approaches that accommodate rather than standardise human differences.

Addressing observer effects

We recognise that participants' awareness of being observed might influence their behaviour and self-reports (Hawthorne effects). Several strategies were employed to mitigate these reactive effects. First, the workshop was integrated into the regular curriculum rather than presented as a special research intervention, normalising participation. Second, the Feldenkrais practitioner's role as movement instructor was emphasised over her research function during sessions; observational notes were made discreetly after sessions rather than during movement exercises. Third, the body mapping exercises, conducted individually and anonymously, provided a medium for expression less susceptible to social desirability bias than verbal reports. Fourth, the six-month follow-up interviews, conducted after course completion and

grading, reduced immediate performance pressures and allowed students to reflect with greater distance. We acknowledge that complete elimination of observer effects is impossible in qualitative research; rather, our goal was to minimise their impact while remaining transparent about this limitation.

Data collection and analysis

Complementary data collection methods were employed to capture students' experiences and potential changes in somatic awareness, as documenting subjective, embodied experiences requires diverse approaches.

Through Body Mapping (Cochrane et al. 2022), students recorded bodily sensations before and after each session. Students received simple outline drawings of non-gendered human figures on A4 paper and were asked to mark, write, or draw what they sensed and/or felt. This offered immediate documentation without requiring verbal articulation. Body maps were collected after each session, creating visual records over time. Students' anonymity was guaranteed, which provided space for honest expression.

Structured observation was conducted by the second author, a certified Feldenkrais practitioner trained in observing and interpreting human movement. Observations followed a protocol focusing on: (a) how students individually interpreted and executed movement instructions; (b) apparent comfort or difficulty with movements; (c) changes in movement quality over time; and (d) verbal expressions. The practitioner recorded brief field notes immediately following each session and elaborated them into detailed observation memos within 24 h, while impressions were still fresh. This approach balanced the need for unobtrusive observation during sessions with the need for systematic documentation.

Three rounds of individual interviews were conducted with each student: one week before the workshop to establish rapport and identify health considerations; one week after completion to gather immediate reflections; and six months later to assess longer-term integration into design practice. Pre-workshop interviews (approximately 20 min each) explored students' current relationships with their bodies, any physical limitations, expectations for the workshop, and baseline understandings of the role of bodily experience in design. Post-workshop interviews (approximately 45 min each) began with grand tour questions such as: What would you like to tell me before I ask you more specific questions?' and 'How would you describe what happened for you over these five weeks?' Follow-up probes explored specific experiences, perceived changes, and connections to design practice. Six-month interviews (approximately 30 min each) focused on whether and how students had applied learnings in their dissertation projects, using questions such as 'When you think back to the workshop, what stands out as most relevant to your current design work?'

Data analysis followed a qualitative, interpretive approach focused on understanding students' experiences and potential changes in somatic awareness and design thinking. Observational notes were reviewed in conjunction with body maps and interview data to identify consistencies and discrepancies across sources. Student projects were examined for evidence of how somatic awareness might have influenced their design decisions, notably how students articulated connections between bodily experiences and design choices. The analysis acknowledged the exploratory nature of the research and its limitations, particularly the small sample size and challenges of documenting subjective bodily experiences. Given the exploratory nature of this research, we employed interpretive analysis rather than systematic coding procedures; developing a formalised analytical framework remains a direction for future research

Ethical considerations guided all aspects of the research: respect for privacy and autonomy ensured students were never asked to perform uncomfortable movements or share experiences they preferred to keep private; informed consent was obtained after full explanation of research purposes and data collection methods; the Feldenkrais practitioner tailored movement instructions to accommodate individual differences in mobility and comfort; confidentiality was maintained for body maps and interview data, with student identities protected in research reporting. It is understood that working with bodily awareness requires particular sensitivity to individual boundaries and comfort levels.

Findings

This section presents key findings from the workshop series, drawing on body maps, interviews, and observations to document how students experienced somatic awareness practices and described their integration into design thinking. Findings are organised around the two research questions.

Changes in somatic awareness (RQ1)

The body maps collected before and after each session revealed consistent patterns of change in somatic awareness across all six participants. Initial body maps often highlighted areas of discomfort or tension, with students marking specific points of pain or pressure in regions such as the shoulders, lower back, and legs. Post-session body maps typically showed more distributed awareness across the body and frequently indicated reduced tension.

From localized to holistic awareness

A notable pattern was a shift from localised, often pain-focused, to more holistic bodily awareness (Figure 1). Pre-session body maps frequently

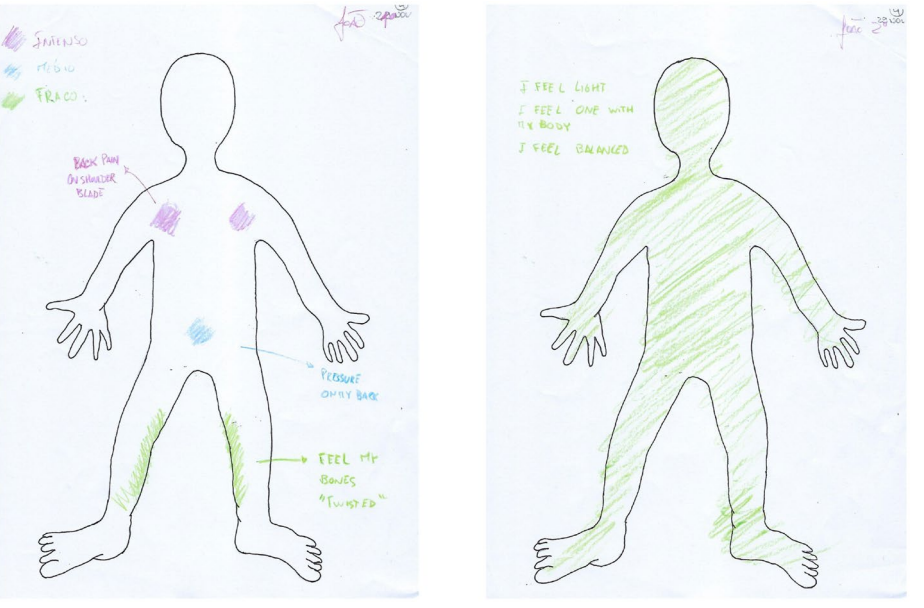

Figure 1. Before: pain focused (left) – After: holistic awareness (right).

featured specific pain. In contrast, post-session body maps showed greater emphasis on relationships between different body parts and overall bodily states. This pattern was evident in all six participants, though with varying intensity.

One student's pre-session body map highlighted sharp pain in the shoulder and pressure in the lumbar region, with minimal awareness of other body areas. Post-session, the same student mapped distributed awareness across their entire body with notes about balance and coordination rather than pain. This shift suggests the development of a more integrative understanding of the body as a coordinated system rather than a collection of problem areas.

From localised to holistic movement

A similar learning involved students recognising that human movement is holistic. In interviews, multiple students articulated this insight. One student described how revealing they found that *'the body is connected, everything moves together and not individually. Before, I had the impression that body parts moved individually.'* Another student reported: *'When I am walking, I notice where my body is connected and I feel everything, my neck, shoulders, waist, and head.'*

Comfort and discomfort spectrum

Students' body maps and interview comments revealed an increasing ability to discriminate between subtle sensations over time. Initial maps often emphasised discomfort (Figure 2), with pain or tension prominently marked.

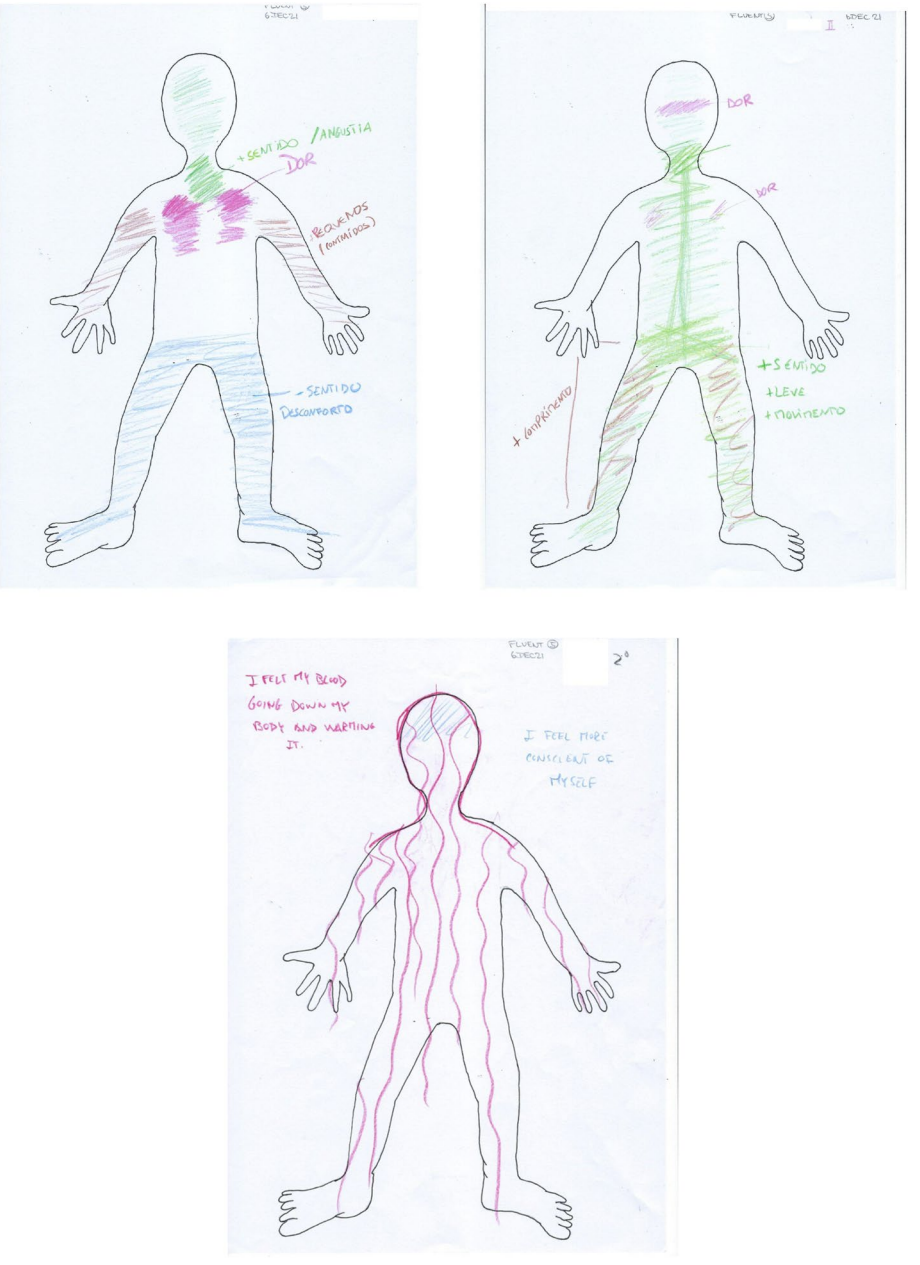

Figure 2. Before: discomfort (left) – After: pleasant sensations (right).

Subsequent maps showed both increased awareness of pleasant sensations and a more nuanced interpretation of previously uncomfortable sensations (Figure 2). Students' increasing ability to discern the spectrum between perceived comfort and discomfort offers potential insights for design processes, particularly for products in which physical comfort is primary, such as the home office equipment they were designing.

Student experiences and integration (RQ1 and RQ2)

The interviews conducted before, immediately after, and six months following the workshop revealed how students experienced the workshop and described the integration of their learning into their understanding of design.

Initial perceptions and challenges

In pre-workshop interviews, students often describe themselves in terms of physical limitations or challenges. One student mentioned, 'I do not have much flexibility in the legs; I am not very trained,' while another noted, 'I have asthma.' These self-descriptions primarily focused on perceived deficiencies or medically conditioned limitations. Students also expressed initial uncertainty about the role of somatic awareness in the design process. This initial framing of bodies as limited or deficient, rather than as resources for design knowledge, represented a starting point that the workshop sought to transform. Later, students acknowledged that 'A person looking from the outside will not understand what we are doing because they do not have our state of mind.' Somatic awareness practices may thus seem unusual or irrelevant to those who have not experienced them firsthand.

Emerging movement quality awareness

In post-workshop interviews, students frequently commented on newfound awareness of how they move and use their bodies in everyday activities. One student observed, 'We developed a notion of how we use ourselves, which I did not have before.' Another noted, 'I can do much more with less effort and in a more conscious way.'

This increased awareness extended beyond workshop sessions to everyday activities. As one student described, *'I was driving and touching the steering wheel, and I noticed how I touch, how I use the steering wheel. I observe now the shape of products, of objects, in a way I never did before.'*. These comments suggest students developed increased attention to the quality of their movements and interactions with objects. This attention to quality aligns with design approaches that consider not only what a product does but also how it feels to use.

Integration with design thinking

The six-month follow-up interviews revealed how students described integrating somatic awareness into their design thinking and practice. Students articulated specific connections between bodily awareness and design decisions, suggesting the workshop had influenced their approach to design problems.

One student described applying somatic awareness to a furniture design project: *'I had to do a project about a table which would adjust in height. I thought about my arms. Made the relation with the body. Open like the arms.*

Thinking about parts of my body that would go up and down. Find a relation with simplicity, my body does the same thing.' This comment suggests that the student used bodily awareness both as inspiration for mechanism design and as a criterion for evaluating simplicity. Rather than relying on conventional technical solutions, the student considered how the body's natural movements might inform a more elegant design.

Another student reflected on the relationship between bodily awareness and design purpose: *'It's interesting to use our bodies. Because in the end, we do things that are related to movement. We use objects with body movements. We need to understand first how the body moves, and then design the object.*' This statement reveals a shift in thinking about the design process, prioritising understanding bodily movement as a prerequisite for effective design.

Design process applications (RQ2)

Students described applying insights from the workshop to their ongoing design projects in several ways, demonstrating how somatic awareness might influence the design process.

Body as design resource

Several students described using their own bodies more consciously as resources for design decisions. One student explained, *'I am designing the interior (of an autonomous electric) car. I try out my design: I try with my height or the space for my arms.*' Rather than relying solely on anthropometric data or simulations, this student used their own body dimensions and movement capabilities to test design ideas. *'By starting with my own height (1.76 m) and the vehicle's height (2.065 m), I could find general measurements for all types of users, allowing different, feasible interactions between the user and the vehicle. The dimensions were also tested according to the degree of the student's own comfort perception in different types of interactions and movements.*'

While this approach still relied on conventional anthropometric considerations, the student's emphasis on testing 'according to the degree of comfort in different types of interactions and movements' suggests an attention to concrete, qualitative aspects of interaction beyond a theoretical dimensional fit. This approach does not replace actual product testing with diverse user bodies but provides an immediate, experiential reference point for design decisions. This strategy aligns with Svanæs and Barkhuus's (2020) advocacy for designers using their own bodies as resources, extending rather than replacing traditional user-centred methods.

Movement as design inspiration

Students described drawing inspiration from their awareness of movement experiences to solve mechanical design problems, such as arm flexion and

extension for a height-adjustable table mechanism. This approach suggests that understanding the principles of efficient human biomechanics may inform the functioning of simple mechanical systems.

Enhanced observational attention

Some students suggested that increased awareness of their own bodily experiences enhanced their ability to observe others' interactions. As one student explained in the six-month interview, *'Internalised the (learnings from the workshops), I can better observe others and feel this in others.'* This comment suggests that cultivating sensitivity to one's own somatic experiences may provide a foundation for empathy (Bennett and Rosner 2019). The workshop emphasised the diversity of bodily experiences and movement patterns, helping students recognise that others may experience interactions differently from how they do.

Another student's dissertation project focused on sports shoe design. They described how their workshop experience influenced their approach: *'I emphasised the crucial importance of observation for my dissertation project (shoe design). Better understanding of the body movements when putting on and taking off shoes profoundly influenced the outcome of my design creation.'*

This focus on detailed observation of the body's movement during the processes of putting on and removing shoes exemplifies an application of workshop principles, with particular attention to movement quality and the coordination of body parts during functional activities. For example, assess various users' hand-foot coordination skills. Instead of focusing exclusively on the shoe's appearance or materials, the student centred their design on understanding the bodily experience of interacting with the shoe.

Discussion

This research explored how somatic awareness practices derived from the Feldenkrais method might complement product design education.

Benefits of somatic awareness for design students (RQ1)

Our findings suggest three primary benefits of introducing somatic awareness practices to product design students: enhanced bodily awareness, development of first-person experiential knowledge, and foundations for design empathy.

Enhanced bodily awareness and somatic discrimination

The body maps documented a clear shift from localised, pain-focused awareness to holistic, distributed awareness. This finding suggests that the Feldenkrais-based workshops helped students develop more refined

self-understanding and enriched conscious body images. The students' increasing ability to perceive interconnections between body parts and to discriminate subtle sensations represents what Shusterman (2012) terms 'somaesthetic refinement' – enhanced capacity for experiential self-knowledge.

This enhanced discrimination has direct implications for design practice. The concept of comfort and pain (discomfort) is central to product design and HPI. Our findings indicate that students developed greater capacity to identify and differentiate sensations along the comfort-discomfort spectrum – a sensitivity directly applicable to evaluating and refining product interactions. This aligns with Höök's (2018) argument that soma design requires designers to develop 'somaesthetic appreciation skills' that enable them to notice and articulate subtle qualities of bodily experience.

Development of first-person experiential knowledge

The interview transcripts captured the significance of momentarily pausing and observing, which students reported as a new skill. Six months after the workshop, students reported that the training enhanced their sensitivity to sensations, emotions, and movement to a degree not previously observed. Students recognised that self-experience was necessary to tune and improve their sensitivity.

The student's 'aha' moment while grasping the steering wheel during their daily commute, suddenly comprehending its morphology through felt experience, exemplifies what can be described as 'enactive cognition' (Di Paolo and Thompson 2014), an understanding that emerges through embodied engagement rather than detached analysis. Such incidents demonstrate the practical benefits of training in first-person experience and sensory skills for design practice.

Foundations for design empathy

Since the workshop sessions were conducted socially, students could observe each other, witnessing the diversity of interpretations of identical instructions. Students reported that this experience helped them appreciate the uniqueness and diversity of individuals' bodily experiences. One student's realisation that they habitually sit diagonally at their desk led them to conclude that designers must consider their own habits before designing for others. This development of empathic capacity aligns with Bennett and Rosner's (2019) critical examination of empathy in design. They argue that claims to 'empathise' with users can mask power differentials and assumptions of knowability. Our findings suggest a more modest but potentially valuable contribution: developing awareness of one's own embodied particularity as a foundation for recognising – rather than presuming to fully understand – others' different

experiences. As one student observed, an outside observer would not understand the workshop exercises because they lack the experiential foundation; empathy requires first-person experience of the relevant domain.

Teaching strategies for integrating somatic learning (RQ2)

Our findings point to a practical framework for bringing somatic learning into product design education, including how to structure workshops, guide sessions, and connect somatic practices to design coursework. Our structured approach comprises four interrelated components:

- **Somatic awareness sessions:** Structured movement exploration sessions, derived from Feldenkrais Awareness Through Movement lessons, adapted for design education contexts. Sessions progress from simple to complex movements, with emphasis on self-discovery rather than prescribed 'correct' ways of moving. The practitioner guides attention through questions rather than demonstrations, encouraging individual exploration of movement possibilities.
- **Documentation practices:** Body mapping before and after each session provides students with tools for articulating embodied experiences that may be difficult to verbalise. These visual records also enable students to track changes in their awareness over time and provide evidence for reflective discussion.
- **Design integration:** Explicit connections between somatic awareness activities and concurrent design projects. Sessions are sequenced to address design challenges (e.g., sitting and standing awareness in furniture design projects), and reflection prompts encourage students to consider how bodily insights might inform their design decisions.
- **Social learning:** Group exploration that enables students to observe diversity in how peers execute identical movement instructions. This social dimension reinforces awareness that bodies differ and that products must be accommodated rather than standardise human variation.

Intended learning outcomes

The approach targets four learning outcomes: (1) enhanced somatic awareness – capacity to perceive and articulate bodily sensations, movement qualities, and comfort states; (2) first-person experiential knowledge – ability to use one's own body as a resource for testing and informing design decisions; (3) observation skills – refined attention to how bodies interact with objects and environments; and (4) empathic foundations – recognition of bodily diversity as a basis for designing for human variation.

Pedagogical principles

The workshop's strategy was to avoid prescriptive, classroom-based instruction. Instead, the students were encouraged to adopt an autonomous self-discovery-based problem-solving attitude. They deployed movement as it can occur in user-artefact interaction to examine its impact on sensation, emotion and thinking. The findings suggest a significant potential for integrating the Feldenkrais method as a fundamental complement to design education, highlighting the challenges of designing such a course curriculum.

Students appreciated the non-prescriptive, exploratory nature of the workshops because they learnt processes they can now apply in other situations. By becoming more aware of and attentive to themselves, the students learnt to appreciate their uniqueness and idiosyncrasies as personal strengths that they could build on. This approach aligns with constructivist learning theory and resonates with the Feldenkrais Method's emphasis on individual discovery rather than imitation of externally prescribed standards.

Individual applications

One student became aware of their body as an effective tool for research and testing during the design process to develop robust and straightforward solutions for lever mechanisms of a furniture and mobility design project. Such experiential knowledge adds value to design inputs beyond the use of tools such as ergonomic standards and methods such as user studies and user testing. Another student, who had described themselves as highly impressionable and sensitive, learnt to appreciate their perceptiveness as a valuable skill. Through the workshops, they developed acute observational skills, enabling them to design projects with fine adjustments that address specific user needs. Students also reported greater sensitivity to their own anatomy and to the relationship between sensory perception and emotional experience. They increased their awareness of physical articulation and of the joint geometry connecting their body parts. This awareness led the student to understand how specific articulations can involve multiple body parts, trigger or relieve pain, and carry emotional implications. This awareness helps the students fortify their comprehension of product form development, usability, and human-product interaction concepts.

Limitations and future directions

Several limitations of this research should be acknowledged. The small sample size ($n = 6$) and single institutional context limit generalisability; our findings should be understood as exploratory rather than definitive. The

participants were self-selected volunteers enrolled in a specific program. The researchers' involvement as both facilitators and analysts introduces potential bias, despite our reflexive strategies.

The reliance on self-report data, while appropriate for investigating subjective experience, cannot establish whether enhanced awareness translates into improved design outcomes. Additionally, the requirement for a certified Feldenkrais practitioner may present barriers to broader implementation. Future research should investigate whether trained design educators can effectively facilitate adapted versions of somatic awareness practices.

Cultural context may also influence how students engage with somatic practices. Our Portuguese participants brought particular cultural relationships to embodiment that may not transfer to other contexts. Research in diverse cultural settings would strengthen the understanding of the approach's broader applicability. Following this initial study, additional, shorter workshops were conducted in the Netherlands and Germany. The more workshops were conducted, the more evident it became that every student brings their own history and personality, which the Feldenkrais method's somatic practice acknowledges and values. Group workshops in the appropriate environment, as they were carried out in this research, not only reveal these natural, personal strengths, but also allow safe sharing within the student group, enriching each student's own, intimate personal experience and preparing them for sensorial and emotional diversity.

Impact on student projects

Six months after the workshop, short, informal interviews were conducted while the students were developing their dissertation projects. Student one shared that during their Master's degree project, they aimed to explore different dimensions and locations to design an interface on the side of an urban logistics vehicle (Figure 3). By using their own measurements, such as height (1.76 m) and the vehicle's height (2.065 m), the student could find

Figure 3. Dissertation project student one: urban logistics vehicle interface design.

Figure 4. Dissertation project student two: sport shoe design.

general measurements for all types of users, allowing for feasible interaction between the user and the vehicle, capable of offering comfort to various types of interaction and movements, which are unlike their own were also tested in terms of comfort during various types of interactions and movements. The student was sensitised to the body, and variations in body movement patterns and generally carried more mindfulness to a sense of harmony and comfort between the artefact and the human body.

Student two emphasised the crucial importance of observation for their dissertation project on a shoe design (Figure 4). The student elaborated on how a deeper understanding of body movements during shoe put-on and take-off profoundly influenced the design outcome.

Conclusion

This exploratory research contributes to the emerging field of soma design education by providing empirical documentation of how design students experience and integrate somatic awareness practices. The findings offer several insights for both design education and soma design theory.

The study reveals that structured somatic awareness practices can enhance design education in concrete ways. Students progressed from a fragmented, pain-focused understanding of their bodies to a more holistic appreciation of their bodies as coordinated systems. They developed greater sensory discrimination, moving from broad descriptions of discomfort to nuanced articulation of sensory qualities and intensities. Most significantly, students began applying somatic insights directly to design challenges – using their bodies as testing resources, drawing mechanical inspiration from movement

principles, and questioning design approaches that prioritise aesthetics over embodied experience.

The longitudinal interviews demonstrated a lasting impact. Six months after the workshop, students continued referencing somatic awareness in their design projects, suggesting that even brief exposure to structured bodily awareness practices can influence design thinking over time. This finding indicates the potential for meaningful integration within existing curricula without necessitating a fundamental restructuring of design education.

Future work should focus on developing methods to assess how somatic awareness influences design outcomes and user experiences. Additionally, investigating how these approaches function across diverse cultural contexts and student populations will support broader implementation.

Acknowledgements

Feldenkrais Method is a registered trademark of the International Feldenkrais Federation (IFF). This research represents a collaborative effort between Author a) and Author b), who jointly developed the conceptual framework and conducted the study. Author c) contributed to the scientific analysis and writing of this paper.

Authors contributions

CRediT: **Dirk Loyens**: Conceptualisation, Investigation, Methodology, Writing – original draft; **Nicole Schumann-Sizaret**: Conceptualisation, Data curation, Methodology, Resources, Validation, Writing – original draft, Writing – review & editing; **Shujoy Chakraborty**: Formal analysis, Supervision, Writing – original draft, Writing – review & editing.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Use of AI statement

GenAI tools, including Gemini-2.5-Pro and Claude-Sonnet-4.5, were utilised to assist in drafting and refining the text presented in this research work. The authors have reviewed and edited the content to ensure accuracy and originality to the best of their ability.

Funding

This work was supported by FCT – Foundation for Science and Technology, I.P., by project reference [UID/05237/Esad Idea] – Association for the Promotion of Research in Design [doi.org/10.54499/UID/PRR2/05237/2025] and Art, and project reference [UID/04057/ID+], Research Institute for Design, Media and Culture [doi.org/10.54499/UID/04057/2025].

Notes on contributors

Dirk Loyens is an Assistant Professor of Product Design at ESMAD, Porto Polytechnic (Portugal). He is a senior researcher at ID+ Research Institute for Design, Media, and Culture, where he is currently developing research on design process theory. Cienciavitae CE17-42ED-94FC.

Nicole Schumann-Sizaret is an independent movement researcher with a background in marketing. She is a certified Feldenkrais practitioner with experience in applying this method in the context of design and architecture.

Shujoy Chakraborty is an Assistant Professor of Product Design at the University of Madeira. He is senior researcher at ESAD-IDEA, developing research on product semantics, shape coding, drawing theory, and design process. Cienciavitae 441E-E0A0-B685.

ORCID

Dirk Loyens http://orcid.org/0000-0001-5999-7093
Shujoy Chakraborty http://orcid.org/0000-0001-6099-6012

References

Bennett, Cynthia L., and Daniela K. Rosner. 2019. "The Promise of Empathy: Design, Disability, and Knowing the 'Other'." In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, 1–13. New York, USA: ACM. https://doi.org/10.1145/3290605.3300528.

Cochrane, Karen A., Kristina Mah, Anna Ståhl, Claudia Núñez-Pacheco, Madeline Balaam, Naseem Ahmadpour, and Lian Loke. 2022. "Body Maps: A Generative Tool for Soma-Based Design." In *Proceedings of the Sixteenth International Conference on Tangible, Embedded, and Embodied Interaction*, 1–14. New York, USA: ACM. https://doi.org/10.1145/3490149.3502262.

Di Paolo, A. Ezequiel, and Evan Thompson. 2014. "The Enactive Approach." In *The Routledge Handbook of Embodied Cognition*, 85–97. Boca Raton, FL: Routledge.

Favara-Kurkowski, Monika, and Adam Andrzejewski. 2021. "Object and Soma: Remarks on Aesthetic Appreciation of Design." *Journal of Somaesthetics* 7 (2): 72–83.

Feldenkrais, Moshe. 1972. *Awareness through Movement*. New York: Harper & Row.

Feldenkrais, Moshe. 1994. *The Feldenkrais Method. Awareness through Movement, Volume One, Part A - AY # 019*. Translated by A. Baniel. Paris: International Feldenkrais® Federation.

Feldenkrais, Moshe. 2000. *The Feldenkrais Method. Awareness through Movement, Volume Eight, Part A - AY # 370*. Translated by J. Krauss. Paris: International Feldenkrais® Federation.

Feldenkrais, Moshe. 2002. *The Feldenkrais Method. Awareness through Movement, Volume Ten, Part A - AY # 496*. Translated by J. Krauss. Paris: International Feldenkrais® Federation.

Feldenkrais, Moshe. 2004. *The Feldenkrais Method: Awareness through Movement, Volume Eleven*. Translated by J. Krauss. Amsterdam: International Feldenkrais® Federation.

Hanna, Thomas. 1986. "What is Somatics." *Somatics: Magazine-Journal of the Bodily Arts and Sciences* 5 (4): 4–8.

Höök, Kristina. 2018. *Designing with the Body: Somaesthetic Interaction Design*. Cambridge, MA: MIT Press. https://doi.org/10.7551/mitpress/11481.001.0001.

Höök, Kristina, Baptiste Caramiaux, Cumhur Erkut, Jodi Forlizzi, Nassrin Hajinejad, Michael Haller, Caroline C. M. Hummels, et al. 2018. "Embracing First-Person Perspectives in Soma-Based Design." *Informatics* 5 (1): 8. https://doi.org/10.3390/informatics5010008.

Kinsey, Debbie, Lesley Glover, and Franziska Wadephul. 2021. "How Does the Alexander Technique Lead to Psychological and Non-Physical Outcomes? A Realist Review." *European Journal of Integrative Medicine* 46: 101371. https://doi.org/10.1016/j.eujim.2021.101371.

Kosmas, Panagiotis, and Panayiotis Zaphiris. 2018. "Embodied Cognition and Its Implications in Education: An Overview of Recent Literature." *International Journal of Educational and Pedagogical Sciences* 12 (7): 970–976.

Krippendorff, Klaus. 2005. *The Semantic Turn: A New Foundation for Design*. Boca Raton: CRC Press.

Rechnitzer, Claire. 2020. "The Beauty of 'Hands-On' (or Even Hooves-On) Guidance." Alexander Technique Cincinnati (Blog), January 5.

Segal, Mia, and Gaby Yaron. 2013. *Aufzeichnungen der Abendklassen 1977–1978, San Francisco Evening Class Notes 1977–1978*. Edited by R. Ehrman. Self-published.

Sfligiotti, Silvia. 2021. "Why We Need More Somatic Culture in Design." *Design and Culture(s): Cumulus Conference Proceedings Roma 2021* 2: 4370–4382.

Shusterman, Richard. 2012. *Thinking through the Body: Essays in Somaesthetics*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9781139094030.

Svanæs, Dag, and Louise Barkhuus. 2020. "The Designer's Body as Resource in Design: Exploring Combinations of Point-of-View and Tense." In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, 1–13. New York, USA: ACM. https://doi.org/10.1145/3313831.3376430.

Tsaknaki, Vasiliki, Madeline Balaam, Anna Ståhl, Pedro Sanches, Charles Windlin, Pavel Karpashevich, and Kristina Höök. 2019. "Teaching Soma Design." In *Proceedings of the 2019 on Designing Interactive Systems Conference*, 1237–1249. New York, USA: ACM. https://doi.org/10.1145/3322276.3322327.

Wick, Rainer K. 2019. "Three Preliminary Courses: Itten, Moholy-Nagy, Albers." *Bauhaus Imaginista Journal*. http://www.bauhaus-imaginista.org/articles/5176/three-preliminary-courses-itten-moholy-nagy-albers