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Attuned Design Practice: a design vocabulary for embodied knowing

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Attuned Design Practice: a design vocabulary for embodied knowing

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This poster introduces Attuned Design Practice (ADP), a concept that examines how design practice can be used to interpret and articulate alternative understandings of studying human-computer relationships, by prioritising 'embodied knowing' as an alternative design vocabulary. We shortly introduce the current state of scientific research in general, explain the notion of 'attunement', and show an existing framework that has inspired us to start an eighteen-months field study of body-based inquiry in the domains of Design, Art and Technology. In our field study, we have explored developmental paths of scientific and artistic inquiry towards constructing embodied knowledge, and have employed performative techniques to examine affective, temporal, and somatic qualities in human-computer relationships. As a follow-up to our field study, we propose an Open Rehearsal framework that integrates (1) the preparation of design tools and instruments, (2) the enactment of performative techniques at the intersection of artistic-scientific inquiry, and (3) the development of notation methods that attract, respond, and release compositional or performative activity. Through a dynamic interplay of human intentionality, algorithmic responsiveness, and material agency, we investigate how embodied knowledge can be produced and mediated through Attuned Design Practice. We conclude by outlining our future research to produce alternative ways of understanding the body in human-computer relationships.

Keywords: attuned design practice; embodied knowing; design vocabulary; human-computer interaction

1 Introduction

Body-based experiences have always been part of our cultural, religious, and healing traditions (Babikian, et.al., 2013), yet have developed largely outside of academia. The 'somatic turn in Human-Computer Interaction' (Loke & Schiphorst, 2018) has ignited non-dualistic understandings in soma-oriented research endeavours (Höök et.al., 2021) in the HCI-scientific community, which have further been aligned with integrative approaches in Human-Computer Integration (HInt) (Li et.al., 2023;

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Mueller, et.al., 2021). Performative research endeavours in HCI show the employment of movement-based practice (Fdili Alaoui, 2023), and body-instrument examinations (Bang & Fdili Alaoui, 2023; Palacio & Bisig, 2017). In Human-Robot Interaction (HRI), scholars have examined somatic and choreographic approaches for the development of expressive robotic systems (LaViers et al., 2018), whilst engaging with artistic practice, such as theatrical experimentation and dance (Gemeinboeck et.al., 2025; Jochum and Derks, 2019). Artistic explorations in Explainable AI (Hemment et.al., 2024; 2022) show how aesthetic, somatic, and performative methods have provoke new ways of interpreting explainability and AI through body-based research.

In Attuned Design Practice (ADP), we study embodied 'attunement', as a design vocabulary that consists of material agency, and uses body-based techniques to explore affective, temporal, and somatic qualities in human- computer relationships. We investigate how design practice can be used to interpret and articulate the tuning, trembling and returning of emotional undertones in the embodied relationships with computing technology. Therefore, we try to refrain from using keywords, such as robot, assistant, agent, tool, teammate, or model, machine, algorithm, and prioritise intangible and impalpable layers of embodied reality. We study how somatic patterns develop in the body, through bodily inscriptions that are dynamically engraving, thriving and resonating into emotional bondings and connections over time. We approach the existence of scars, limits and fractures as a form of complex embodiment (Siebers, 2015) and highly productive ways for learning (Shildrick & Söffner, 2017; 2022). We engage with a complexity of phenomena, relationships and patterns, that inherently exist in human-computer relationships, and which originate from conflicting, inflicting tensions that challenge these sensitive connections of body and technology.

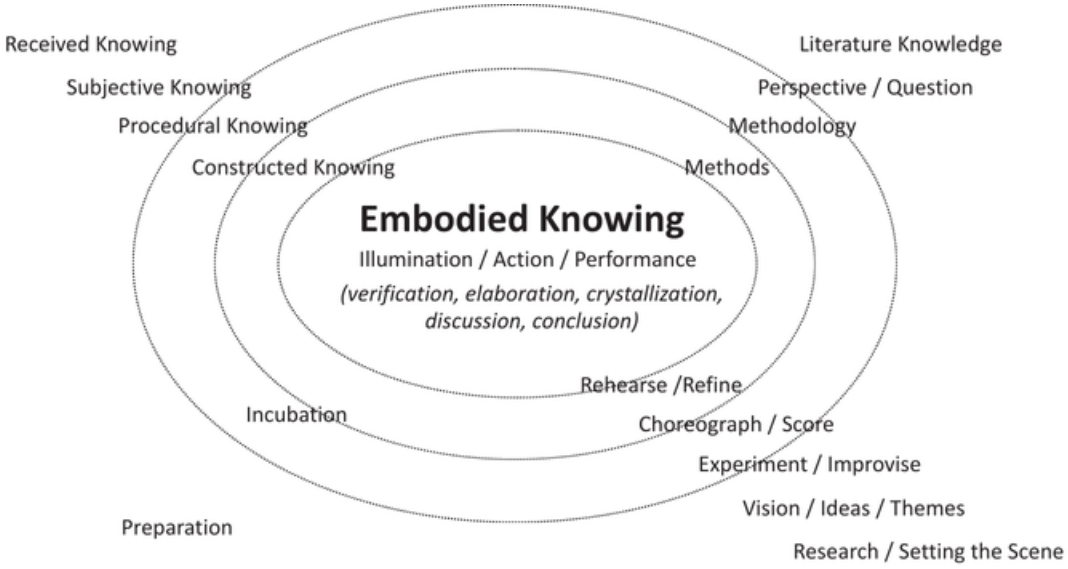

Fig. 1. Embodied Ways of Knowing (Barbour, 2011).

In figure 1 (Barbour, 2011; Belenky, 1986), a framework on studying 'Embodied Knowing' shows an integrated orientation towards knowledge production, such as (a) developmental paths to knowledge construction, ranging from 'received to constructed knowing', (b) a continuum of scientific methodology translating from 'theory to practice', and (c) performative inquiry, from 'staging to rehearsing', which displays the artistic inquiry for embodied knowledge production. These different

orientations come together in the middle, at the center stage, wherein the body itself is studied as a site for knowing. The interplay between bodily engagement, through illuminations, actions, and performances, and reflective understanding generates embodied knowledge, which is further crystallized through discussion and elaboration.

This framework serves as a testbed for developing knowledge production through an alternative epistemology that integrates scientific and artistic inquiry, thereby transcending its traditional separation. We recognise the intrinsic interconnectedness of scientific and artistic inquiry and seek to explore the latent potentials that emerge through their interplay, both within and between artistic and scientific practices. We position embodied knowing as a central site of investigation, proposing the development of a specialised vocabulary that is capable of articulating, interpreting, and deepening the understanding of the affective, temporal, and somatic dimensions in human-computer relationships.

2. Overview of creative practices in Design, Art and Engineering

2.1 Background

Our field study was set up through a customised set of student modules, masterclasses, and summerschools in educational institutes at various European locations, such as a Dutch dance organisation, inclusive dance symposium, and two departments of a Universities of Applied Sciences in The Netherlands. International exploratory field studies took place at a Flemish Conservatory, a dance company in the United Kingdom, and Austrian University of Applied Sciences in Engineering. Private classes in operatic singing were undertaken in The Netherlands, as well as an operatic masterclass in Austria. During the field study, experimental and interdisciplinary collaborations were undertaken together with disabled and non-disabled designers, artists and engineering students, amateurs and professionals. In these collaborations, the first author acted in several positions and dispositions within a continuum, continuously shifting perspective between ‘teacher-learner’, ‘spectator-actor, ‘observer-performer’, ‘designer-artist’, ‘engineer-maker’. The outcomes of the field study were digital-physical design concepts, interactive performances with computing technology, or working prototypes. The insights that have been gained from this field study are explained in the sections below. These reflections amplify only the most important characteristics that stood out during the employment of body-based techniques into the domains of Art, Design and Engineering.

2.2 Setup

In these collaborations, the first author acted in several positions and dispositions within a continuum, continuously shifting perspective between ‘teacher-learner’, ‘spectator-actor, ‘observer-performer’, ‘designer-artist’, ‘engineer-maker’. The outcomes of the field study were digital-physical design concepts, interactive performances with computing technology, or working prototypes. The insights that have been gained from this field study is explained in the sections below. These reflections amplify the most relevant characteristics that stood out during the employment of body-centered techniques into the domains of Art, Design and Engineering.

2.3 Overview of creative practices

Design practice	Embodied learning	Embodied orientation

Creative Research module (The Netherlands)	*embodied ideation* and *demonstrators*	In-body, on-body and out-of-body experience
Multi Modal Design module (The Netherlands)	*mixed reality low-fi prototyping with physical props*	aesthetic signature
Artistic practice	**Embodied learning**	**Embodied orientation**
Danceable, inclusive & integrative dance classes (The Netherlands)	*contact improvisation*, *movement translation, open language*	body-to-body relationships, body-instrument relationships,
Artist-in-residence inclusive performance (The Netherlands)	*contact improvisation, choreographic reflections*	body-to-body relationships, open language
Masterclass Inclusive Dance Education (The Netherlands)	*dancing in a wheelchair by the first author, movement translation, open language*	body-instrument relationships,
Masterclass Isadora Duncan dance, featuring Delsarte technique (Greece)	*focus on self-expression, within choreography, barre workout*	articulation and interpretatoin of self-expression
Operatic singing classes (The Netherlands)	*vocal technique and interpretation of composition*	vocal strength and stamina, breathwork and interpretation of musical score
Engineering	**Embodied learning**	**Embodied orientation**
Virtual/Augmented Reality atelier module (The Netherlands)	*mixed reality prototyping with working high-fidelity prototypes*	body balance & playfulness in embodied experience
Virtual/Augmented Reality atelier module (Austria)	*mixed reality prototyping with working high-fidelity prototypes*	Body balance & playfulness in embodied experience

Table 1. Overview of Creative Practices in Design, Art and Engineering

2.4 Results

Methodologically informed by autoethnographic approaches (Ademowo, 2023), the contextualization of this eighteen-month field study is presented through the first author's reflections, which are articulated by means of the first-person narrative, employing the pronoun 'I' and 'We'.

2.4.1 Domain of Art

Fig 2. Results from the domain of Art.

In the Artistic domain, fig. 2 and 3, the field study included practices in expressive dance, inclusive dance, operatic interpretation, and hybrid performances that *intertwined traditional performative techniques with computational technology*. I immersed myself into performative cultures which value affective, and movement-based explorations, trial-and-error- experimentation, learning-by-doing, and direct implementation of technology. All activities took place on theater stages, thereby enabling *full-body and collective explorations in an open physical space*. Daily warmups (Karampoula & Panhofer, 2018) in a circle with warm-ups involved bodily sensing, breathwork, and movement-based exercises. This fostered an *open attitude towards expression and bonding within the interdisciplinary groups*. The performances employed meaning-making towards the audience, by using storytelling techniques*, compositional and choreographical structures to build expressive tension, sense of pulse and momentum* in the pieces that were created. Inclusive dance practices require specific techniques that create an opportunity for every body to join the creative practice. Examples are: open language, movement translation, surface work, audio description.

Key insights from the domain of Art:

- In performative cultures, the day begins with full-body warm-ups to open up a heightened state of bodily awareness and collective movement-based bonding. All practices take place on a *theater stage / dance space*, which is an open physical space. Body-based techniques amplify a *spectrum of affective, somatic and movement quality*, to establish attunement from macro to micro dynamics in the Self and Others.
- The intertwinement of traditional performative techniques with computational technology results in technology *acting as a medium for expression as well as a dialectic communicator*.
- *Compositional and choreographical structures* are used to build expressive tension, sense of pulse and momentum, which support and assist the progress of creation.
- *Inclusive dance practices require specific techniques*: open language, movement translation, surface work, audio description.

2.4.2 Domain of Design

Fig 3. Results from the domain of Design.

In the Design domain, fig. 4, I navigated the cultural connotations of two modules in the department of Digital Design, which means that in these departments, the focus on *human experience is usually shaped by user-centered methodology, emphasising behavioural, and multi-modal approaches*. To explore basic affective, temporal, or somatic body qualities, I transformed traditional classrooms into

sites for body-based practice, which allowed for gestural explorations, walking and moving around freely. I asked design teams to engage with existing *methodological approaches for bodily explorations*, such as bodily explorations using props and low-fi prototypes to develop interactive artefacts. These approaches supported and assisted the design process of navigating complex, sensitive and intimate relationships of the human body with technology. I provided *a container for the design students*, to guide, assist, or navigate the pathway towards integrative orientations of body-based practice with technology, such as the concept of *designing for an interactive performance*, which emphasised the communication of complex ideas by means of artefacts. The concept of an *aesthetic signature* was explored through designing multimodal codes-of-conduct with digital-physical devices.

Key insights from the domain of Design:

- Design practice significantly requires somatic and affective attention and *instructional guidance* to invite designers to their *personal depths of engagement with human sensing*, because design practice is usually shaped by user-centered methodology, emphasising behavioural, and multi-modal approaches.
- *Design classrooms can be transformed into open physical spaces*, which allowed for moving around freely. *Circular formations and warmups* are critical in facilitating embodied thinking and doing.
- Performative inquiry works well with employing existing or *evidence-based approaches for bodily explorations*, such as embodied ideation, using props and low-fi prototypes.
- Design students like to be handed *a container that guides, assists or navigates the pathway* towards integrative orientations of body-based practice with computing technology.

2.4.3 Domain of Engineering

Fig 4. Results from the domain of Engineering.

In Engineering, fig. 5, my work centered on facilitating the design of high-fidelity XR prototypes. I employed *body-based techniques in a pragmatic way*, often reducing the explorations of affectivity, somatics and movement to functional tasks, such as fitness or physiotherapy exercises, rather than expressive exploration. However, the process of iteration through making, testing, and evaluating the prototypes resulted in dedicated learning-by-doing and an *intrusive application of workflows, pipelines and coding reviews* which supported the quality of body-based integration, such as polishing details,

and interaction techniques (locomotion, navigation, wayfinding, feedback, and system control). The development teams individually and collaboratively worked at the intersections of user experience, architecture, physiotherapy, somatic sensing, and performative inquiry, which required decision-making by means of employing design tools, such as floorplans, mood boards, and storyboards (Olthof, et.a.l., 2023).

Key insights from the domain of Engineering:

- In Engineering, opportunities emerge when performative inquiry and body-based techniques are *embedded into the process of rapid prototyping*, or when envisioned as a *contribution to the development of high-end results*.
- Body-based techniques can be employed in a pragmatic way, *by means of functional tasks*, that support an integration with technical performance, such as code reviews, pipelines, and guidelines.
- Explorations of affectivity, somatics and movement can be *prototyped and tested with experts and novice users*, to create a continuous feedback loop into the process of designing game aesthetics, such as polishing details, and interaction techniques (locomotion, navigation, wayfinding, feedback, and system control).

3. Towards Embodied Attunement in Open Rehearsals

In Attuned Design Practice (ADP), 'embodied attunement' serves as a design vocabulary for advancing body-based research in the context of Design, Art and Technology. Attunement refers to embodied felt sensing experiences that resonate in psychological, emotional, and somatic states of consciousness, which facilitate kinaesthetic empathy (Kossak, 2021). It involves the affective, emotional and kinaesthetic sensing of others, by being responsive to their timing and natural coordination, range of connection, and harmonic balance. In the context of our research, we focus on the deeper layered emotional undertones in the body and how somatic emotional patterns and inscriptions are dynamically engraving, thriving and resonating over time. Attunement can be individualistic as well as communal, and fosters intersubjective connectedness through kinaesthetic encounters.

3.1 Open Rehearsals

In Attuned Design Practice (ADP), 'embodied attunement' serves as a design vocabulary for advancing body- based research in the context of Design, Art and Technology. Attunement refers to embodied felt sensing experiences that resonate in psychological, emotional, and somatic states of consciousness, which facilitate kinaesthetic empathy (Kossak, 2021). It involves the affective, emotional and kinaesthetic sensing of others, by being responsive to their timing and natural coordination, range of connection, and harmonic balance. In the context of our research, we focus on the deeper layered emotional undertones in the body and how somatic emotional patterns and inscriptions are dynamically engraving, thriving and resonating over time. Attunement can be individualistic as well as communal and fosters intersubjective connectedness through kinaesthetic encounters.

We propose open rehearsals as a methodological framework for investigating embodied attunement across humans, non-human agents, materiality, tools, and systems. These open rehearsals thrive in

inclusive co-creation in interdisciplinary teams of disabled and non-disabled designers, artists and engineering students, amateurs and professionals, who together explore how 'embodied attunement' works as somatic emotional patterns and inscriptions that dynamically evolve, thrive, and resonate over time. The rehearsal framework highlights three interrelated domains of expertise that will employ their influence on embodied attunement:

First, preparing tools and instruments studies how artefacts mediate experience.

- How can tools and instruments act in *multiple roles at once* (for instance being observer, being the observed as well as the observation)?
- How do tools and instruments act whilst facilitating *multiple representations at once* (such as being a notation, an instruction, or a performative seed)?
- How do tools and instruments exist in *multiple orientations or perspectives in identity* (such as being both a part and a whole at once)?

Second, performative activity emphasises how embodied attunement emerges and ignites in practice.

- How can a deep empathetic resonance and reciprocal affect be *activated and ground* the performer's heightened state of awareness towards the sensory nervous system of the self and the other(s)?
- How can rhythmic and choreographic interpretations *scaffold and unfold* expressive articulation that form signatures of aesthetic mutuality?
- How can body-to-body and body-instrument dynamics *morph and iterate* assemblages of intersubjective and intrapersonal attunement, using props, demonstrators and open designs & prototypes?

Third, composition and notation methods addresses the translation of embodied experience.

- How can the experience of embodied attunement be *scribed, marked, transmitted, captured or codified* through real-time computational compositions and data embodied representations?
- How can the experience of embodied attunement be *performed, mapped and composed*, when bodies are in a constant state of becoming, through real-time co-constitutive exchanges and constant negotiations?

4. Conclusion

This article has presented Attuned Design Practice (ADP) as a concept that foregrounds embodied attunement as both a design vocabulary and methodological framework. By positioning the body as a site of knowing, ADP integrates affective, temporal, and somatic qualities into design practice, advancing body-based research the domains of Design, Art and Technology. Our eighteen-month field study has presented the most important insights that we encountered during our practices in different creative domains. We proposed an Open Rehearsal framework, that highlights three domains of expertise: the preparing of tools and instruments, the performative practice, and the compositional and choreographical methods to translate embodied attunement to notation. Attuned Design Practice invites a collaborative investigation on the verge of artistic and scientific inquiry, working with disabled and non-disabled designers, artists, and engineers, to foster a further integration of artistic and

scientific exploration. Our research emphasises the articulation and interpretation of deeper layered emotional undertones in the body, to study how somatic emotional patterns work and how bodily inscriptions are interrelated with somatic values, sensitivities and preferences. Further research involves in-depth interviews with a variety of somatic-oriented practitioners, such as disabled dance artists and musicians, expressive dance artists, and dance movement therapists, to enhance our understandings for the concept of Attuned Design Practice..

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