Reframing Body Transformation Experiences through Sensory and Playful Design in Care and Education

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Abstract: This proposal positions haptics as a core design material for Body Transformation Experiences (BTEs) and presents two practice-based research prototypes that explore how multisensory, AI-mediated environments can shape lived, embodied experience. Grounded in prior work on multisensory design, embodied cognition, and playful care-oriented interaction, we argue that touch, movement, and sensory feedback can actively transform how people remember, learn, and relate to their bodies. We present *Memory Garden*, a mixed reality prototype for dementia and Alzheimer's care, where personal memories are encountered as graspable spatial elements navigated through gesture, voice, and vibrotactile feedback. Remembering is treated as an embodied, relational process rather than cognitive recall. We also present *LexiLearn*, an AI-enhanced immersive literacy learning environment using wearable haptic gloves, where children learn through movement, phonetics, and tactile-visual association. Here, literacy acquisition becomes a body-grounded activity shaped by adaptive feedback. Together, these projects suggest that BTEs unfold through multisensory, embodied, and playful interaction, where touch and haptics serve as central channels for shaping immersive experiences. At the workshop, we will bring research perspectives grounded in haptic design, playful care and educational psychology, along with hands-on prototypes that open space for discussion, reflection, and shared inquiry in the academic community.

CCS CONCEPTS • Human-centred computing → Interaction design • Human-centred computing → Mixed / Virtual Reality • Human-centred computing → Accessibility design and evaluation methods

Additional Keywords and Phrases: Body Transformation Experiences, Multisensory Design, Embodied Interaction, Mixed Reality, Virtual Reality, Dementia and Alzheimer's, Care-Oriented Design, Haptic Interaction, Education, Literacy Acquisition, Immersive Learning Environments

1 BACKGROUND AND CONCEPTUAL FRAMING

Research highlights that multisensory environments can meaningfully enhance wellbeing and emotional responsiveness for people with dementia, provided that sensory experiences are carefully designed and accessible [1]. Building on these insights, we present a research-through-design project exploring how Mixed Reality (MR) in combination with vibrotactile feedback delivered via haptic gloves can be designed to foster playful engagement between people living with dementia and their relatives. By foregrounding body transformation experiences (BTE's) the project extends the relational dimensions of immersive technologies. We explore how altered bodily perception can open new modes of interaction and meaning-making by addressing a user group often positioned at the margin of digital culture and consequently excluded from the affordances of emergent technology [2]. At the same time, this work aligns with research demonstrating the potential of immersive and interactive systems to support spatial memory and stimulation among older adults with dementia [3]. Moving beyond therapeutic and clinical orientations, recent design research emphasises the role of sensory and embodied approaches to an "aged culture" by linking people, disciplines, and practices to co-create and design more holistic ways of engaging with ageing-related matters [4]. This perspective situates the present research within broader efforts to explore how the design of BTE's can support dignity and agency for people living with dementia and their relatives.

Complementing this care-oriented perspective, we also examine how BTEs can be designed in educational contexts through multisensory and playful learning environments. The second project we would like to bring to this workshop is *LexiLearn*. an AI-enhanced immersive virtual environment (IVE) with wearable haptic gloves. This project explores how to support literacy acquisition through embodied interaction, phonetics, and tactile-visual association. This builds on research showing that multisensory and embodied learning can enhance cognitive processing, memory, and engagement [5][6][7] and that haptic feedback can convey information and support learning in virtual environments [8][9]. While situated in a different domain, *LexiLearn* similarly positions the body, and particularly the hands, as active sites of cognition and meaning-making, aligning with embodied cognition perspectives that link sensory–motor activity to learning processes [6]. Vibrotactile feedback is also used here as a sensory cue to link movement, sound, and symbolic representation, supporting phoneme–grapheme associations through synchronised multisensory input, drawing on evidence that the brain integrates visual and haptic information in statistically optimal ways [10]. By engaging learners in playful, movement-based spelling activities, the project investigates how touch and embodied action can scaffold foundational literacy skills [5]. Together, these two design cases extend the discussion of BTEs across both care and education, showing how haptics and multisensory design can support transformation in how we remember, learn, and relate to our environments.

2 DESIGN CASE 1: MEMORY GARDEN

Referencing the *Open Dementia Project* [4], *Memory Garden* extends ongoing investigations into how empathic design approaches can foster embodied, participatory engagement with dementia as a lived and relational condition. Both projects avoid deficit-oriented or purely representational models of dementia. Instead, they leverage situated encounters and multisensory tools to support shared understanding, reflection, and connection. While the *Open Dementia Project* collaborated with people living with dementia to create empathic experiences that helped orient members of the public who were new to the condition, *Memory Garden* aims to redirect these experiences back to people living with dementia—offering multisensory prompts to stimulate memory and support connection. Building on these foundations, the project explores how playful, multisensory, and embodied interaction design can open spaces for reminiscence and bodily awareness, particularly in relation to ageing and memory-related change.

Rather than treating memory as a purely cognitive construct, *Memory Garden* explores how spatial immersion, personalised sound recordings, intuitive hand-based interaction and the ongoing integration of haptic feedback can act as sensory anchors that enable embodied engagement with personal memory. In this way, the project extends evidence from multisensory and embodied learning contexts, as also explored in *LexiLearn*, to care-oriented MR design, proposing that engaging the sensing body through multiple modalities may contribute to meaningful, first-person BTEs even when individuals no longer recognise their life stories or factual memories in conventional ways. These potential moments of sensory resonance and tacit understanding and associations underscore the value of designing digital experiences that support emotional connection and invite meaning-making beyond narrative coherence.

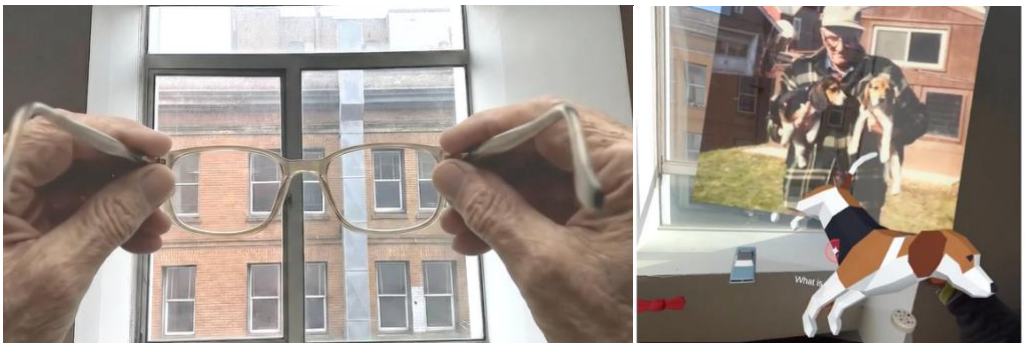

Figure 1: *Memory Garden* Mixed Reality experience designed for AR display glasses. Link to video trailer of *Memory Garden* prototype (https://youtu.be/qveLRDvn6sY?si=rRqoYqHQpHQxG1zE)

Currently, the project is being further developed with an emphasis on methodological sensitivity, particularly when working with individuals whose sensory expressions may be diminished, fleeting, or difficult to articulate. To meet this challenge, the project adopts a play-theoretical approach [11][12][13], emphasising relational and collective activity over the technology or object-centric orientations that frequently dominate HCI. Additionally, this is in line with calls within HCI design perspectives to foreground social and embodied dynamics as key sites of meaning-making. Through this approach, the project aims to explore how MR-enabled BTEs might foster shared playfulness, presence, and connection within care contexts.

3 DESIGN CASE 2: LEXILEARN

The research project *LexiLearn* investigates how haptic and multisensory interaction can be designed as central modalities for early literacy acquisition rather than as supplementary features. While literacy is widely recognised as a prerequisite for equitable participation in society [14], digital literacy tools still predominantly rely on visual and auditory modalities [15]. In contrast, research in embodied learning shows that coupling cognition with sensory and embodied engagement can enhance memory, attention, and learning processes [5][6][7]. Haptic feedback has further been shown to convey information, support task performance, and complement other sensory channels in virtual environments [8], with demonstrated learning benefits in educational settings [9].

In response, the *LexiLearn* prototype proposes a literacy-focused immersive virtual environment (IVE) in which vibrotactile feedback delivered through wearable haptic gloves is synchronised with phonetic audio and visual cues. Haptic feedback is treated not as realism but as a sensory cue that scaffolds symbolic understanding and attention. This approach draws on principles of multisensory integration, suggesting that coordinated sensory input can strengthen perceptual and cognitive associations [10]. The system is structured around a multisensory literacy framework comprising four pillars: lexical development, creative visual association, phonetic–embodied learning, and a collaborative learning ecology. Learners engage in playful spelling activities where body movement, sound, and tactile cues work together to support letter–sound mapping. By integrating haptics and adaptive and generative AI, *LexiLearn* positions literacy acquisition as a multisensory and embodied learning experience. In doing so, the project explores how learning to read and spell can become a multisensory, body-grounded experience in which the sensing body actively participates in meaning-making.

Figure 1: Photos of *LexiLearn* VR multisensory experience for literacy education. Link to video trailer of *LexiLearn* prototype (https://www.youtube.com/shorts/j29-6Xuvc5c)

4 POSITIONING DESIGN CASE 1 & 2 WITHIN BTES

In dialogue with each other, *Memory Garden* and *LexiLearn* approach BTEs as sensory, and relational processes that unfold through multisensory engagement rather than spectacle or illusion. Across both care and learning contexts, both projects treat the body as an active site of perception, memory, and learning, where transformation emerges through how people sense and relate to their environments. In *Memory Garden*, multisensory interaction supports reminiscence and bodily awareness in the context of ageing and memory-related change, where transformation may appear as moments of connection, recognition, or felt presence. In *LexiLearn*, haptic and embodied interaction reshapes how written language is encountered, turning literacy acquisition into a body-grounded and playful process. In both instances, transformation is not framed as correction or enhancement, but as shifts in how individuals sense, participate, and make meaning. By working with populations often positioned at the margins of technological design—children developing literacy skills and people

experiencing memory-related change— both these projects extend BTE discourse beyond high-intensity immersive scenarios. Instead, they highlight how haptic and multisensory design can support forms of transformation that are gradual, relational, and embedded in our everyday life.

5 WORKSHOP CONTRIBUTION AND DISCUSSION POINTS

At the workshop, we will present both *Memory Garden* and *LexiLearn* as ongoing design concepts and interactive prototypes. Attendees will be invited to engage hands-on with the two prototypes, positioned as experiential provocations to support discussion on multisensory care and learning-oriented design, and the ethical considerations that arise when designing for diverse sensory and cognitive experiences. At the workshop, we would like to focus on the following discussion points:

Multisensory Anchoring and Embodied Memory

We will invite you for a conversation on how tactile, auditory, and spatial cues may function as embodied anchors in situations where autobiographical memory is fragile. What design strategies enable sensory resonance and affective engagement beyond factual recall?

Playfulness as a Relational and Social Design Strategy

The project raises questions about how play and social design theory can guide relational and shared interaction across care and learning environments, especially where the communication unfolds through sensory and embodied expression. Can sensory play be a method for designing relational experiences in contexts of care and learning, or does it risk trivialising lived realities?

Learning through Touch and Haptics

As multisensory technologies enter educational spaces, the project invites discussion on whether learning can be designed as a felt, bodily experience rather than a primarily visual or cognitive task. If haptic feedback is treated as a core design material in BTEs, how might touch reshape how people connect, care, and learn together?

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