

# Towards Inclusive Multisensory Embodied Experiences for Affective and Cognitive Health

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This paper presents a brief overview of my work on disability focusing on affective and cognitive health for embodied and multisensory interactions. This body of work is used to reflect on how senses can be better leveraged to empower the changes experienced by the dynamic self, and to open up conversations on how to design for inclusive interoceptive interactions.

CCS CONCEPTS • Human-centered computing ~ Human computer interaction (HCI)

**Additional Keywords and Phrases:** Affective health, Cognitive health, Interactive technologies, Embodied experiences, Multisensory experiences, Interoceptive interaction

## 1 INTRODUCTION

Disability is a complex construct with physical, emotional and cognitive dimensions which has received growing HCI interest given its significant social and economic costs. In this position paper I provide a brief overview of my work in this space, focusing on affective and cognitive health for embodied and multisensory interactions. This body of work is used to reflect on how senses can be better leveraged to empower the changes experienced by the dynamic self, and to open up conversations on how to design for inclusive interoceptive interactions.

## 2 BACKGROUND

The last decade has shown increased HCI interest in embodied cognition and more broadly to the role of human body in design of interactive technologies, be it users' [2][4][5][17] or designers' bodies [27][37][38]. A range of methods from somaesthetics [1][14], sensory ethnography [20] and microphenomenology [21] to kinesthetic empathic design methods [30] emphasize the role of the body and awareness of its experience in interaction design.

Drawing from the importance of the human body, an important strand of HCI work has looked at affective interfaces [22][25] [41][42] and their value for emotional awareness [24][47] or regulation [6][45][46]. While most of these systems are mobile apps [2][18][23], there is a growing interest in technologies integrating biosensors with a range of visual, aural or haptic actuators providing real time awareness of physiological changes marking changes in emotional arousal [43][44] or meditative states [5][28]. In a recent work, we explored the value of interoceptive interaction, defines as interaction with data captured by biosensors involving however interoceptive senses such as those related to internal bodily states rather than external senses such as vision or hearing [5]. For

instance, we designed WarmMind by employing thermal actuation that was perceived as coming from inside the body for mapping meditative states, hence both subtle and embodied. Tangible technologies and the gesture involved in manipulating them have also been highlighted as important for managing emotional distress associated with grief [29][34][35].

In contrast to affective health interfaces, those focused on cognitive health such as those for aging or dementia have traditionally placed less emphasis on the body. Most of such technologies support reminiscing often through craft [26][33][36], small screens [14], and less so through large screens such as DementiaWall for both affective and cognitive health in dementia [31], or by integrating small and large screens [7][8][16].

A less explored modalities for supporting memories in old age is taste and value of personalized food-based cues for prompting memory recall [10] by leveraging 3D food printing technologies [9][11][12][13]. The emphasis on less explored modalities such as taste or olfaction are important as given their more embodied qualities, these senses bring to the foreground the role of body not only for affective but also cognitive health and in particular for supporting reminiscing in old age.

Apart from HCI work in affective health and that for cognitive health especially for aging and dementia, there has been a rather independent strand of HCI work focusing on multi-sensory experiences [3][19]. While most of these have focused on breaking down and reconstructing individual sensory experiences, the focus on the taste and olfaction has been yet limited [39].

### 3 DISCUSSION

I now reflect on this body of work focused on technologies for affective and cognitive health and how it can be leveraged for more embodied experiences of the dynamic self and for the design of inclusive interoceptive interactions.

Embodied experiences of the dynamic self can be supported through a range of technologies providing body-centric interactions and increased stimulation as people age. For instance, rich body-centric interactions can be designed for by integrating multimodal actuators such as those supporting different haptic submodalities such as vibration and thermal actuations, or across modalities such as integrating aural and haptic neurofeedback.

Designing such embodied experiences for the dynamic self should account for the increased need for stimulation that people can benefit for as they age. Indeed, DementiaWall was shown to support increased immersion, enjoyment and attachment by supporting sensory, cognitive and social stimulation through the large wall size displayed deployed in a residential care home [31]. This opens up an interesting design space for exploring how sensory stimulation can also be supported. Here we can draw from the growing interest in first person design methods leveraging senses such as somaesthetics [1][14], sensory ethnography [20] or microphenomenology [21].

Inclusive interoceptive interactions is a particularly interesting concept which we define as those interactions that provide information of bodily data through what can be perceived as interoceptive senses [5]. This is important since most physical disabilities often involve impairments of external senses such as vision or hearing, and less so of internal senses such as those involved in breathing, viscera, digestion or internal bodily temperature. The challenges here is how to complement the two sensory pathways for most effective communication of bodily experiences and support for their interoceptive awareness. The latter has been shown to be key for supporting emotional awareness and regulation, hence for contributing to affective health.

We know little however of how to design for such interoceptive awareness, leveraging current actuators, albeit it is expected that haptic actuators offer a promising starting point for such exploration. We can imagine novel forms of force haptic feedback, combined with thermal patterns and subtle vibrations to intuitively communicate a range of experiences to support both awareness and self regulation of bodily states. Another promising direction is the exploration of taste and olfaction as senses which have both external and internal qualities, In particular, the consumption of food is a rich multisensory experience that can be better leveraged in interaction design [9][10][11][12][39]. For increased expressivity, we can also consider the integration of feedback modalities for both external and internal senses, and of the design principles underpinning such integration.

While most of the research described here draws from three distinct research areas: affective interfaces, memory technologies for ageing and dementia, and multisensory interaction, we call of the need for a research agenda drawing from and contributing to all these areas.

#### 4 CONCLUSION

This paper offers a review of some of my work on affective and cognitive health that harnesses embodied and multisensory interactions. The insights across this body of work point to some novel design opportunities to support embodied experiences of the dynamic self and inclusive interoceptive interactions.

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