

# Workshop: Wearables for Personalised Posture

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**Abstract.** Bodily posture is representative of physical and mental health. Poor posture can lead to spinal complications, and the same can be said vice versa. Various wearable systems have recently been designed to detect spinal posture and provide live biofeedback when poor posture is sustained. This workshop will focus on combining expert's technical specialities with user-centred techniques in developing an inclusive personalised posture management intervention, including an exploration in wearable devices. Participants will be encouraged to react to various user scenarios and combine their expert knowledge to ideate solutions. Additionally, the research team will present a wearable prototype designed in house to foster exploratory discussions around its application to guide future development efforts.

**Keywords:** Posture, Wearable, Inclusive Design, Wellbeing.

## 1 Scope of the workshop

With the advancement of technology, the general population are now spending more hours craning their necks and slouching over smartphones, tablets and computers, et cetera. Furthermore, the pandemic's shift from face-to-face to teleworking has caused many workers to spend more time than usual in front of a computer; additionally, the sudden installation of workstations in homes means that not all of them meet the necessary characteristics for the worker to position themselves comfortably and correctly in front of their computer [1].

Poor posture can have detrimental effects on both the physical health and overall wellbeing of individuals. This can manifest in a range of symptoms such as musculoskeletal pain, decreased energy levels, and reduced productivity. Moreover, poor posture has been shown to have a direct impact on employee efficiency in the workplace. Thus, it is of utmost importance to address this issue in order to enhance the health and wellbeing of individuals [2].

Additionally, from the employer's perspective, it is essential to consider the various health and safety regulations that must be met in order to ensure the safety and well-being of employees [3].

To effectively address this issue, it is essential to develop solutions that are integrated into people's daily lives and provide accurate measurements of posture. Furthermore, the solution should provide feedback to the users, allowing them to make informed decisions about their posture and track their progress over time. Although this can be measured and communicated in multiple ways such as optical devices for tracking motion and evaluating spinal mobility, but they have certain limitations in clinical settings due to their high cost, indoor-only capabilities, and need for specific equipment and privacy conditions. In recent years, wearable technology has emerged as a promising approach to monitoring posture [4].

While considering the application of personalised intervention, one must consider different natural spinal geometry, as well as variations in different human body anatomy as a result of lifestyles. The solution we design must be customised to accommodate people's unique and natural geometry.

In conclusion, poor posture can have significant impacts on both individual health and productivity in the workplace. With recent advancements in technology, it is possible to develop effective solutions that are integrated into daily life, offer accurate measurements for a range of users, and provide appropriate feedback. Careful consideration of design decisions is necessary in order to develop a solution or suite of solutions such as our proposed wearable that effectively addresses the issue of poor posture and allow people to make informed decisions about how to approach back health.

## **2 Workshop overview**

The workshop is expected to last for 90 minutes, 15-30 minutes per block including breaks. with flexibility in each session and breaks planned throughout the workshop.

Block 1 Introduction	Block 2 Co-design activity	Block 3 Wearable prototype and discussion	Block 4 Summary and conclusion
The first 15 minutes	From minutes 15 to 45	From minutes 45 to 75	From 75 to 90
<ol style="list-style-type: none"> <li>1. Welcome of participants</li> <li>2. Briefing of workshop</li> <li>3. Facilitator introduction and topic presentation</li> </ol>	<ol style="list-style-type: none"> <li>1. Present user scenarios</li> <li>2. Group based co-design activity</li> <li>3. Presentation of design outcome and discussion</li> </ol>	<ol style="list-style-type: none"> <li>1. Presentation of a wearable prototype and its potential</li> <li>2. Discussion around application, marrying the themes from previous activity to explore integration.</li> </ol>	<ol style="list-style-type: none"> <li>1. Summary and reflection</li> </ol>

**Fig.1. Workshop Agenda**

### 3 Implementation and objectives

**Block 1 - Introduction:** Our solution must reflect the needs and wishes of the potential end users: people with back pain or working in a way that may cause back pain. To represent them fully and understand the full context we will employ inclusive design methods to capture information and communicate that to the workshop. Inclusive Design (ID) is defined as products, services and environments that include the needs of the widest number of consumers. Including people who are generally excluded can expand focus and increase the design's market potential [5]. The aim of this session is to enable the workshop participants to fully understand the whole context, the people we are designing for, the locations and the tasks. The facilitators will utilise various tools to effectively convey the information, context, and connect participants with end users. The participants will be introduced to the purpose of the project and inclusive tools and frameworks which they can apply at the workshop. This approach will help to engage the participants and provide a more in-depth understanding of the topic. In addition, the facilitator will encourage active participation by fostering an environment that facilitates open discussions and inclusive thinking.

**Block 2 - Co-design activity:** The second part of the workshop will centre around an exercise in which participants will be presented with a diverse portfolio of user scenarios, and to agree collectively on what are the most important themes and challenges. The participants will be asked to envision and describe user-centred solutions for posture monitoring based on the agreed themes and problems to solve from the previous block, taking an inclusive approach to react to a range of real user needs. They will be involved in an advisory manner, and encouraged to combine

their technical specialities with user-centred and inclusive design techniques.

**Block 3 - Wearable:** In the third section of the workshop, the facilitators will present a wearable prototype, explaining the use of technology in the context of posture and its potential application. The facilitators will facilitate discussion around sensor usage, introduce potential sensing technology and discuss best practices and opportunities for possible application and implementation.

The information gathered during this block of the workshop will be used to help guide the development of an effective technical solution. By incorporating the feedback of the workshop participants, the researchers can outline future research directions and utilise technologies in a way that achieves design inclusivity.

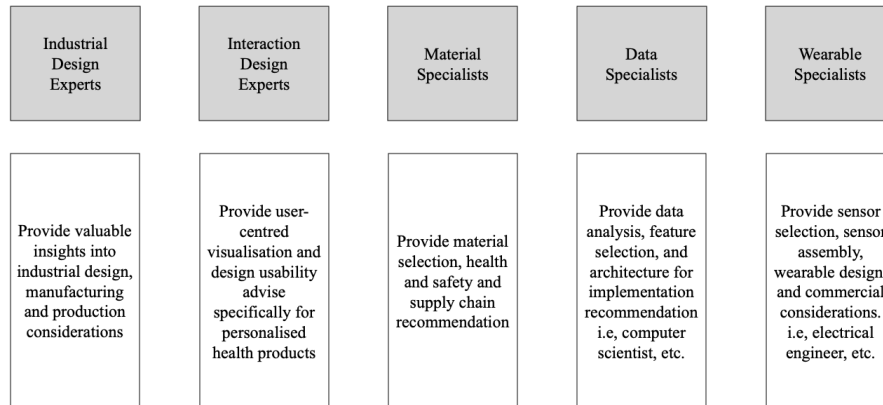
The feedback provided by participants during the third block of the workshop will be invaluable in further developing the wearable prototype.

**Block 4 - Summary:** The final block of the workshop will focus on summarising the key takeaways from the session and concluding the discussions. Participants will have the opportunity to share their thoughts and opinions about the topics covered and present their ideas on what they have learned throughout the workshop in groups.

The facilitators will lead the discussion, encouraging participants to reflect on their experiences and share any insights they have gained. The final block will also provide an opportunity for the facilitators to summarise the main outcomes of the workshop and highlight any key themes or trends that emerged from the discussions.

#### **4 Target Audience**

The workshop attendees will include a diverse range of professionals with specialised skills and expertise in different areas. These individuals will provide valuable feedback and insights to help guide the development of the wearable device. The ideal attendees are outlined in Fig.2.



**Fig. 2. Ideal participants**

The presence of these specialists will provide a comprehensive view of the various aspects involved in the development and implementation of wearable devices. The workshop will provide an opportunity for these individuals to collaborate, share knowledge and expertise, and help drive the development of the wearable device in a direction that benefits the end-user.

## 5 Outputs from workshop

The workshop is expected to produce the following key outputs:

- *Workshop materials*

All materials and resources from the workshop, such as sketches, writings, and physical prototypes, will be collected. The researchers will apply thematic and visual data analysis to consolidate the findings into a list of key actionable improvements for the existing wearable.

- *Recording of workshop*

Audio and video recording of the workshop is useful for documenting key behavioural observations, product demonstrations and extracting quotes. These feedback and ideas will be taken into consideration in our design, and inform future research directions.

- *Data related to wearable prototype*

The participants will be guided through a series of questions in the form of a bespoke questionnaire during the discussions. The questions are developed to explore attitudes, perceptions and opinions towards the

wearable prototype and its potential application and impact. The output of this questionnaire will be qualitative (e.g. quotes from participants) and quantitative (adapted based on tools such as the SUS [6]) The output of this questionnaire enables the research team to create engagement with the proposed wearable prototype and outline design strategies. The findings will be summarised into a framework highlighting key design and service features for effective personalised posture management.

## **6 Requirements for Workshop**

The ideal number of attendees for the workshop is 15, allowing for an interactive and collaborative learning environment. A projector or screen is necessary to display PowerPoint presentations, making it easier for the attendees to understand the information. The workshop requires materials such as post-it notes, Play-Doh/LEGO blocks, flipped charts, markers, paper, scissors, anatomical mannequins, and a printer. These materials will be used in hands-on activities and group exercises to reinforce the concepts being covered. All of these materials and resources are essential for creating an engaging and effective workshop experience.

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