

# Wearable smartwatch technology to assess pain in palliative care

Quinn C<sup>1</sup>, Samuels J<sup>1</sup>, Payne TR<sup>1</sup>, Nwosu AC<sup>2</sup>

<sup>1</sup>Department of Computer Science, University of Liverpool, UK

<sup>2</sup>Marie Curie Palliative Care Institute Liverpool, University of Liverpool, UK



## Background

The continuous advancement of wearable sensor-based systems has the potential to transform the future of healthcare by enabling proactive personal health management and ongoing clinical monitoring of a patient's health condition. These systems can comprise various types of small physiological sensors, transmission modules and processing capabilities, and can thus facilitate low-cost wearable unobtrusive solutions for continuous all-day and any-place health, mental and activity status monitoring.<sup>1</sup> Previous studies have established the potential of sensors in the internet connected home (the Internet of Things) to support the care of adults with long term care needs.<sup>2</sup> However, despite large commercial interest and use of this technology, the potential of wearable sensor based technology to provide on-going pain and symptom monitoring of patients with chronic illness has not been fully explored.

## Aims

This collaborative project between Computer Science and Palliative Care aimed to develop a smartwatch app to assess pain.

## Methods

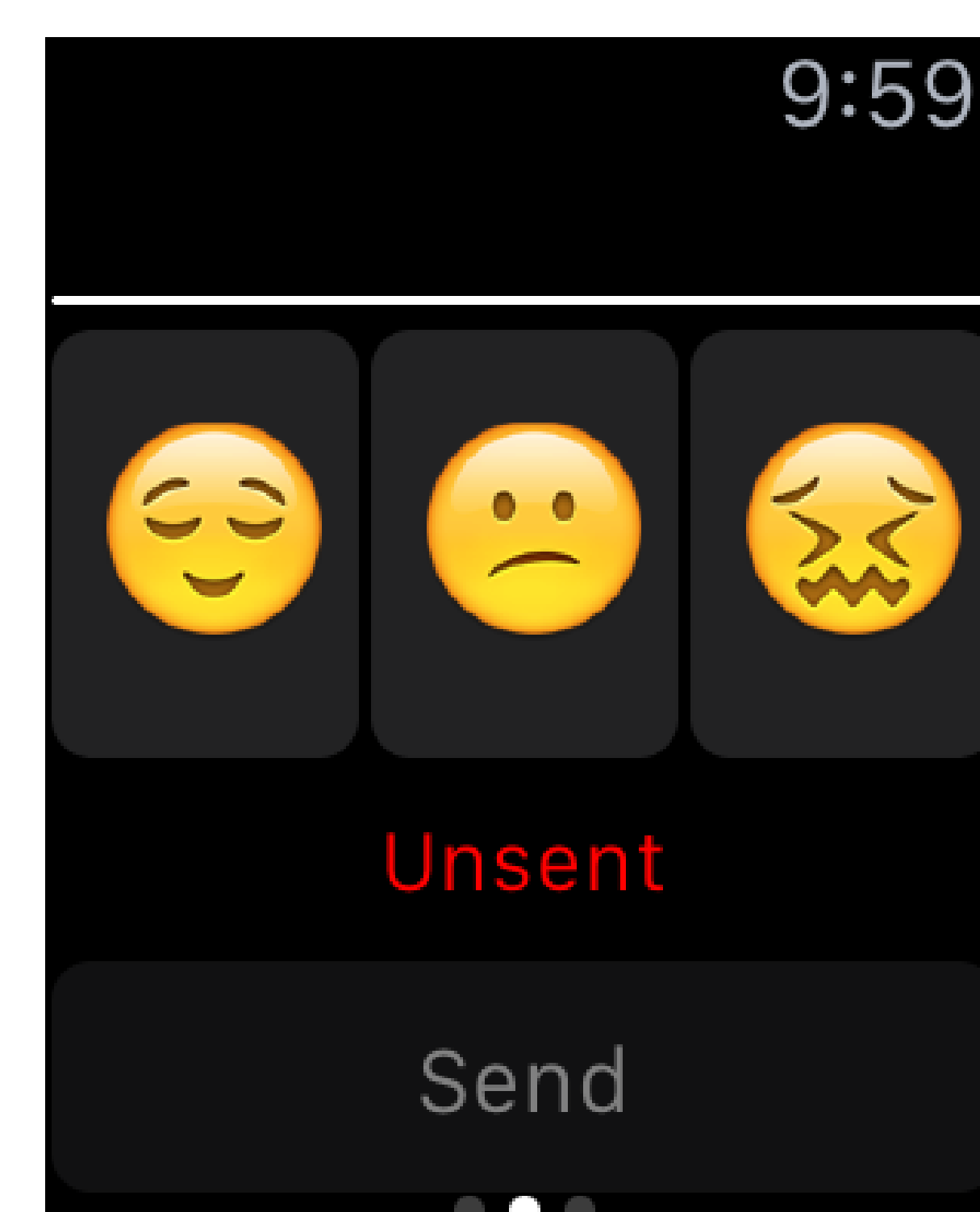
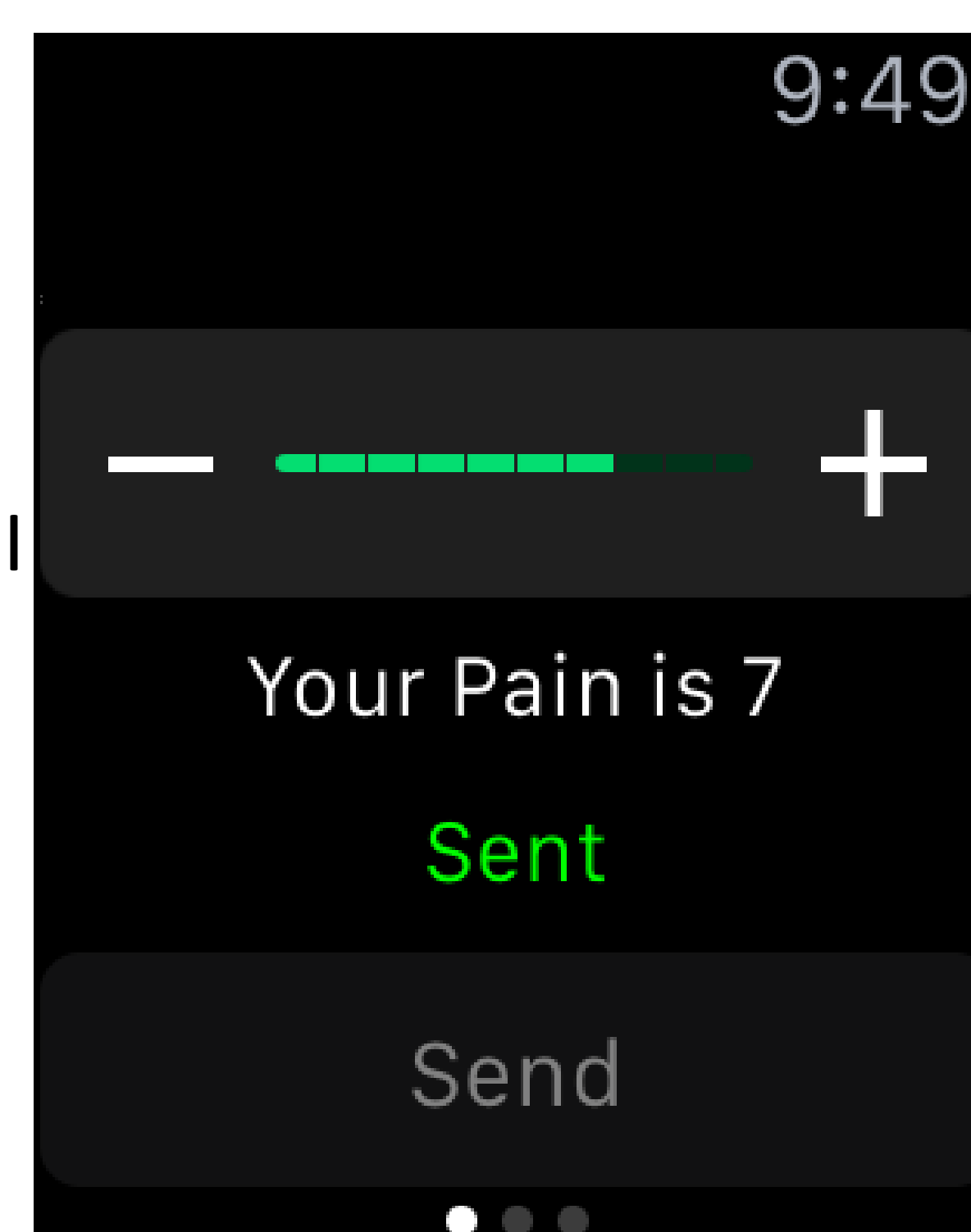
The app was coded for the 'Apple Watch' using the Apple Xcode developer program. A numerical rating scale (0 – 10) and a descriptive pain assessment scale were used to record pain. The ability to sync, tabulate and share pain scores with a paired mobile device was tested.

## Results

The developed app facilitates pain assessment and syncs data with a mobile (smartphone and/or tablet). Collated aggregated symptom scores were generated to provide historical pain assessments. The app facilitated 'push notifications', which asked the user to rate their symptom intensity at specified time intervals (e.g. four times a day, pre-meals etc.).



## Screenshots



Your Entries	
10/6/2016, 12:22	Pain of: 8
30/08/2016, 9:45 am	Pain of: 7

## Conclusion

We have successfully developed a smartwatch app that facilitates on-going symptom assessment. This may potentially be useful to patients and healthcare professionals to facilitate personalised on-going assessment of pain in a dynamic, digital, sync-able format. Further work will potentially involve data linkage of 'symptoms' with 'patient activity' (via the activity-tracker capabilities of wearable devices) in order to explore associations between pain and activity. This may potentially facilitate the development of predictive algorithms to predict symptom burden (and the need for specific interventions) according to the daily routine of individuals.

## References

1. Pantelopoulous A, Bourbakis N. A Survey on Wearable Sensor-Based Systems for Health Monitoring and Prognosis. IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS—PART C: APPLICATIONS AND REVIEWS 2010; 40 (1) JANUARY.
2. Riazul-Islam SM, Kwak D, Human-Kabir MD, Hossain M, Kwak KS. The Internet of Things for Health Care: A Comprehensive Survey. National Institute for Health and Clinical effectiveness. IEEE Access 2015; 3:678 - 708.
3. Nwosu AC, Mason S. Palliative medicine and smartphones: an opportunity for innovation. BMJ Support Palliat Care 2012;2:75-77.

