Sensorized Workplaces for Monitoring Sedentary Behavior

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Abstract— **Workplace environments have been shown to be typical environments where high levels of sedentary behavior exist. In our current work we have aimed to develop a low cost and robust monitoring approach that can be used in conjunction with variable posture desks for the purposes of monitoring levels of activities. Measurements from sensor devices can subsequently be used as inputs to an intervention framework whereby, during periods of inactivity, users are encouraged to change their behavior.**

I. INTRODUCTION

A multitude of studies have demonstrated that sedentary behavior (SB) is highly correlated with our most common public health disorders; diabetes and heart failure. Aside from poor quality of life for the individual, poor health associated with SB at work can lead to increased costs for the employer due to reduced performance, loss of productivity, sick-leave and health care costs. It is therefore a necessity , to understand and mitigate unhealthy behaviors in the workplace and focus on maintaining and promoting healthy behavior. This work outlines efforts undertaken to establish innovative solutions for the monitoring of SB within the workplace and integrating these measurements into a larger behavior change paradigm.

II. RELATED WORK

To date, efforts have been made to produce solutions for both monitoring and feedback provision for the promotion of healthy behaviors within the workplace. Monitoring can be undertaken through self-assessment using for example self-reported questionnaires on a daily basis [1]. These approaches, however, suffer from issues associated with subjectivity of self-assessment. Recent advances in pervasive and mobile computing have facilitated the creation of technology-rich environments that can be used for the purpose of monitoring activity and behavior [2]. These range from wearable activity monitors and smart watches to the installation of sensors into furniture [3]. Although each of these approaches offer advantages and disadvantages, few of the solutions being offered have fully embraced behavior change strategies incorporating cognitive change therapy [4]. One potential solution is the use of standing desks. In our current work, we aimed to deliver an innovative approach to monitoring through a combination of low cost wireless sensor nodes and a mobile phone based solution to provide the necessary feedback to users, for the purposes of behavior change methods based on the COM-B method [5]. We have

created an innovative and non-obtrusive approach to monitor levels of SB within the work environment. The study has been based around usage of Ergotron WokrFit-T desks. Each desk is fitted with a wireless sensor node and base station (Figure 1). The on-board accelerometer is used to measure if the desk is in the sitting or standing position and if the user is typing or leaning on the desk. In addition, participants are asked to avail of a wearable activity monitor [6]. As a benchmark the participants self-report their own behaviors on a daily basis.
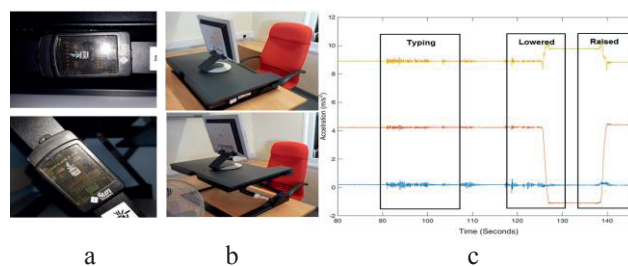

Figure 1. Wireless sensor network node (a), moveable desk used within study (b) to measure both oreintation and usage patterns (c).

III. CONCLUSION

This work presented a low cost and unobtrusive solution which can be used to assess levels of SB within the work place. Recordings from wireless sensor nodes have been shown to be able to differentiate between a user standing and sitting through desk orientation measurements. Measurements of desk usage can also differentiate typing and leaning. A framework has been created for evaluation purposes based on wearable activity monitors and self-assessment. The next stages of the work will involve an evaluation to determine the effectiveness of the approach in comparison to benchmark. techniques.

IV. REFERENCES

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