

# Move more

Investigating the impact of behaviour change techniques on break taking behaviour at work

Report submitted to the IOSH Research Committee

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research report

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## Abstract

Musculoskeletal disorders (MSDs) remain a major health problem, with insufficient postural change at work implicated in their prevalence. Self-report data suggest that office workers sit for long periods without getting up.

The Theory of Planned Behaviour (TPB) outlines a number of factors thought to impact on intention to behave in a certain way, highlighting (though not addressing) a gap between intention and behaviour. External prompts or reminders, and the writing of Implementation Intentions (*if-then* plans) have been used to close this gap for other behaviours in office environments.

This study investigated whether these plans and prompts increased the number of short (30 second) postural breaks taken by 'desk-bound' office staff. The reasons behind success or failure were examined via focus groups ( $n= 31$ ).

Objective postural break data ( $n=195$ ) were collected using waist-mounted, BACK-TRACK™ data loggers at 3 time points; before, immediately after and several months after intervention. All groups, including the control, were given written encouragement to take more, 30 second postural breaks. One group wrote *if-then* plans about postural changes; one received an external prompt to move, provided by the BACK-TRACK™ device; one combined intervention group wrote *if-then* plans and received the external prompt.

Data reveal this population take regular postural breaks, even at baseline ( $\bar{x}=3.34$  postural breaks per hour). Writing *if-then* plans were effective in doubling the odds that a meaningful increase in postural breaks would be achieved. External buzzing prompts did not affect the number of breaks taken and no intervention effect on pain was found.

Participants reported a number of factors that influenced their break taking; these have been classified using the TPB, to which a number of additional factors have been integrated. A list of recommendations describing how to incorporate all the findings from this study into health and safety practice are outlined.

# Executive Summary

## Introduction

This report outlines the findings of a mixed methods study into the break taking behavior of desk-bound, office-based staff. In particular, it details objective data on the extent of break taking in this population, and the efficacy of different interventions in supporting an increase in postural break taking behaviours (defined as changing the loading on the body from a sitting to a standing position, for a minimum of 30 seconds). The Theory of Planned Behaviour (TPB) outlines a number of factors thought to impact on the intention to behave in a certain way, highlighting though not addressing the gap between intention and behaviour. External prompts or reminders, and the writing of Implementation Intentions (*if-then* plans) have been used to close this gap for other behaviours in office environments. The study tests the proposition that interventions such as these, designed to convert break-taking intentions into behaviours, should support the taking of more postural breaks.

## Methodology

A Cluster Randomised Control Trial was undertaken in six different organisations (n = 195). Objective postural break data were collected using waist-mounted, BACK-TRACK™ data loggers at 3 time points; before, immediately after and several months after intervention. All groups, including the control, were given written encouragement to take more postural breaks. There were three intervention groups in addition to the control. One group wrote *if-then* plans about postural changes; one received an external prompt to move, provided by the BACK-TRACK™ device after 60 minutes of sitting; one combined intervention group wrote *if-then* plans and received the external prompt. These data were analysed to see if the interventions affected the number of breaks taken, and whether this impacted on reported pain levels. The constructs from the TPB were also measured, as potential predictors of change.

In addition to these quantitative investigations, qualitative data were also collected, with a view to shedding light on the reasons behind the break taking behaviours which were recorded. Four focus groups were undertaken in four different organisations (n = 31) which sought views from participants about the interventions and also about the blockers and enablers for behaviour change.

## Main Findings

### Objective Break Taking Data

- At an average of over three, 30 second or longer postural changes an hour, the level of break taking exhibited by participants in this study is surprisingly high. Even the lowest recorded figures of 0.82 breaks/hr would not cause major concern in the context of typical DSE guidelines.
- Exposure to static posture is a risk factors for the development of MSDs and lack of breaks form part of the picture. This study suggests that these office workers interrupted that exposure frequently and that prolonged static postures in the typical office are perhaps less of an issue for MSDs than previously thought.

### Implementation Intentions (If-then plans)

- Our results demonstrate that writing *if-then* statements doubles the odds of making a *meaningful* increase in postural break changes over a day, compared to not writing them. For an effectively 'free' intervention, this is an important finding.
- This indicates it is worth incorporating the writing of these plans into initiatives to increase postural breaks and considering their use in other health and safety initiatives aimed at changing behaviours.

### External Prompts and Impact on Pain

- Buzzing reminders set every hour did not significantly increase postural break taking in this instance.

- The interventions did not lead to a significant reduction in pain

### **Focus Group Findings**

- Focus groups with participants provided a number of insights for encouraging behaviour change. Issues identified include:
  - Discrepancies between an individual's perception of their own behaviour and their actual measured behaviour.
  - Problems with competing beliefs – a strong work ethic, or a perceived need to demonstrate a strong work ethic could easily override the belief about the healthy behaviour.
  - The need for choice to personalise/interpret an intervention and in terms of a range of methods related to the same goal behaviour.
  - The desire for an external prompt or reminder for the behaviour, even though our quantitative data suggest this was not useful on this occasion.
  - Physical elements like the built environment and work systems within the workplace can create barriers to behaviour change.
  - Management and peer support, workload and feedback about behavioural performance are all important in supporting behaviour change.
- Six intervention principles have been synthesised from the qualitative findings to support practitioners in implementing behaviour change interventions.

### **Development of the BACK-TRACK™**

- BACK-TRACK™ devices, currently used in a manual handling context, show some promise for office break taking behaviour change.
- Participants reported that simply wearing the BACK-TRACK™ encouraged them to get up more; that an external prompt such as that provided by the BACK -TRACK™ would be useful; and that feedback about performance (which is possible via the reporting database at BACK-TRACK™ Ltd) would also aid change.

### **Applications and Conclusions**

This study has given us a better understanding of break taking behaviour at work. It has indicated that in fact, office workers even in 'desk-bound' settings get up more than we expected. This knowledge should encourage practitioners to focus attention on the other risk factors for MSDs, such as overall workload, poor posture and psychosocial factors.

This work has provided good evidence that implementation intentions can help engender behaviour change in an occupational setting. In IOSH's publication 'Workplace health issues' (2008), knowledge of behaviour change techniques is cited as an important practitioner training need. This study has demonstrated that *if-then* plans should be part of the behaviour change armoury for health and safety practitioners, and has outlined how and where they could be used.

The analysis of focus group data has reinforced the usefulness of the Theory of Planned Behaviour as a model for understanding behaviour in this workplace, and has presented further understanding of potential blockers and enablers for behaviour change at work. The analysis supported the synthesis of six 'Intervention Principles', useful for health and safety practitioners.

Data from this project supports the diversification of the BACK-TRACK™ product range to support healthy break taking behaviours by DSE users. This could be used generally, across the population, or specifically in a rehabilitation setting to support people back to work.

# 1 Introduction

Musculoskeletal Disorders (MSDs) are still the most common occupational ill health condition in the UK<sup>1</sup>. Though MSD aetiology is often complex and multifactorial, adequate postural rest breaks have been shown to impact on some of the symptoms identified as pre-cursors, such as fatigue and discomfort<sup>2,3</sup>.

Barriers to break taking can clearly be linked to organisational and job design issues such as management regimes and shift patterns<sup>4</sup>. However, studies have also shown that individual behaviours play a role in break taking<sup>4,5</sup>, with workers not necessarily taking the opportunities afforded to them for breaks. As such, one of the most commonly used control measures in relation to MSDs (break taking) may prove ineffective unless these individual behaviours can be adequately addressed.

Understanding the drivers behind health-related behaviours has been a challenge for many decades and a number of explanatory models have been developed. The Theory of Planned Behaviour (TPB)<sup>6,7</sup> is one of the most widely used models and whilst the majority of studies fall within the field of 'health', it has been used within 'health & safety' in relation to driver behaviour<sup>8</sup>, wearing of protective equipment<sup>9</sup>, food hygiene<sup>10</sup>, and manual handling<sup>11</sup>. A fairly simple model, it suggests that intention to undertake a particular behaviour is influenced by three main issues, namely: attitude towards that behaviour; the subjective norms (pervading culture) in relation to the behaviour; and the degree to which an individual feels able to exert control over their behaviours.

It follows, therefore, that if we can influence behavioural intention, we can influence behaviour, and many studies have shown a link between the two. However, the intention to undertake a particular action does not always lead to action<sup>12</sup> - this is the so-called 'intention-behaviour gap'. This 'gap' is a key focus of this research. In the context of this study, the intention to take a break does not always lead to the taking of a break. Therefore, it is proposed that strategies which 'close the gap' and support the conversion of that intention into action will be useful in changing behaviours and ultimately reaping the rewards associated with the behaviour - in this case improved musculoskeletal health.

One such strategy is encapsulated in Gollwitzer's implementation intentions, whereby an individual makes a specific plan to enact a behaviour in a defined manner, specifying both time and location information<sup>13</sup>. In the break taking context, rather than simply declaring 'I will take more breaks', an implementation intention may be 'I will take a break after the final call of each hour and will collect a drink of water'. Often 'if-then' strategies are used (if situation y arises, then I will initiate goal-directed behaviour z.)

Implementation intentions have previously been used in the promotion of general health behaviours, such as breast self examination<sup>14,15</sup> and healthy eating<sup>16,17</sup> but have rarely been applied in relation to health & safety in an occupational setting, with Sheeran & Silverman<sup>18</sup> perhaps the only clear example. They have, however, been successfully used to influence driver behaviour<sup>19</sup> and to influence recycling behaviour in the workplace<sup>20</sup>, so their potential utility in an occupational setting appears promising. No previous studies outlining the use of implementation intentions to promote postural break taking have been located in the literature.

The need for regular postural breaks for DSE staff has been part of the guidance to the DSE regulations since their inception, and was re-iterated in a 2007 HSE study<sup>21</sup>. These authors further established high prevalence rates of MSDs and other symptoms in DSE workers (particularly those who reported working longer without a break) and proposed that further work should be undertaken to investigate the impact of improved break taking on these symptoms.

Initial work at the University of Derby<sup>22</sup>, obtaining objective break taking data (using BACK-TRACK™ data logging devices) provided protocols for objectively measuring break taking activity in office based staff and began to study interventions aimed at changing break taking behaviours. However, the sample used for this pilot study was relatively small (n=45) and took frequent postural breaks at baseline, so did not afford the opportunity to test the effectiveness of the behaviour change techniques.

A larger sample of staff, working in environments with less freedom to take postural breaks, such as call centres and control rooms, would be better suited to test the effectiveness of the proposed interventions. Achieving such a sample to test this effectiveness was the goal of this study.

### **Summary Aim**

This project aimed to investigate the impact of behaviour change techniques on postural break taking behaviour, within a constrained office-type environment (e.g. call centres/control rooms).

The objectives were to:

- Establish objective (rather than self report) break taking behaviour in the call centre/control room environment using the BACK-TRACK™ devices at 3 time points.
- Investigate the usefulness of implementation intentions for changing postural break taking behaviour by measuring breaks taken before and after intervention and at 6 month follow-up.
- Explore the usefulness of non-software based external prompts provided by the BACK-TRACK™ devices in supporting a change in postural break taking behaviour.
- Use qualitative research in the form of focus groups, post-intervention, to understand the reasons for the usefulness (or otherwise) of implementation intentions and the BACK-TRACK™ devices in supporting behaviour change.
- Propose mechanisms for including these behaviour change techniques (if successful) into training and information materials provided by health and safety practitioners.
- Influence the development of the BACK-TRACK™ data logging devices to include uses for staff using DSE as well as the current provision for staff undertaking manual handling.

## 2 Literature Overview

### 2.1. MSDs and Office Work

Musculoskeletal disorders (MSDs) remain a major health problem across the globe in a wide variety of environments, including today's IT focussed offices. Dr Bruntland, Director General of the World Health Organisation, suggested that back pain had reached "epidemic" proportions as we moved into the new millennium, with 80% of people experiencing the condition at some point in their lives<sup>23</sup>. Similarly emotive language was used by renowned orthopaedic consultant Gordon Waddell, when he described back pain as a "20<sup>th</sup> Century medical disaster"<sup>24</sup>. Whilst these comments focus on back pain, we can see a similar outlook in relation to upper limb pain and increasingly we are seeing concerns raised over lower limb symptoms<sup>25</sup>.

Within Europe, as much as 40% of workers compensation has been attributed to musculoskeletal problems and costs have been calculated to be as much as 1.6% of a country's gross domestic product<sup>26</sup>. To put this in perspective in relation to other health problems, MSDs have a societal cost greater than that of cancer, coronary artery disease and AIDS combined<sup>27</sup>. In the UK, the Health & Safety Executive report a drop in both new cases and total cases in their most recent statistics<sup>1</sup>, but this still equates to around 440,000 cases and 7.5 million lost days<sup>1</sup>.

The size of the problem is compounded by the fact that MSDs are typically far from straightforward 'injuries'. Most people will experience back pain at some point in their lives but only about 15% can be given a positive diagnosis<sup>28</sup>. Increasingly, it appears that there is a similar picture for upper limb problems, with only about 20% fitting a specific diagnosis<sup>29</sup>. This makes it difficult to simply 'design out' musculoskeletal disorders, as we are typically dealing with associations rather than clear-cut causes.

Nevertheless, risk factors for certain symptoms have been known for some time, albeit without clear-cut, dose-response relationships. An extensive review of the epidemiological evidence commissioned by NIOSH, indicated evidence for 'awkward posture' as a risk factor for both back and upper limb problems and strong evidence in relation to posture and upper limb problems when combined with force and repetition<sup>30</sup>. Further reviews of the evidence also implicated static posture as a risk factor, alongside poor posture<sup>31</sup>.

Many saw the root cause of poor postures as being inadequate furniture and equipment, and much effort has been made to improve these issues. It is undoubtedly the case that furniture provision has improved since the introduction of the Health & Safety (Display Screen Equipment) Regulations 1992 and its associated schedule of minimum requirements. However, the evidence base for improvements associated with better equipment and set-up alone is not promising<sup>32,33</sup>. This has led to an increasing focus not simply on what a job contains or what an individual has to work with, but rather *how* the individual works. So, effective approaches to MSDs must focus not just on provision or job design, but also on an individual's behaviour.

Part of that behaviour is the 'correct' use of furniture and other equipment, but there is increasing support within the scientific community for the heuristic "the best posture is your next one"; an acknowledgement. The American Medical Association in 2013, formally recognised the health risks of sitting, saying "prolonged sitting, particularly in work settings, can cause health problems and encouraging workplaces to offer employees alternatives to sitting all day will help to create a healthier workforce"<sup>34</sup>. This follows publication of evidence such as the review undertaken by Dunstan et al<sup>35</sup> which concluded that too much sitting should now be considered a risk factor for cardiac ill-health and diabetes.

Developing interest in these behavioural/individual factors led to the development of the concept of "workstyle". Feuerstein introduced the concept of workstyle as far back as the mid-90s, defining it as a behavioural, psychosocial, and physiological response, adopted by individuals in

response to high work demands<sup>36</sup>. More recently the concept has seen renewed interest, helped by the introduction of workstyle measures<sup>37,38</sup>.

A study by Meijer et al<sup>39</sup> compared those with 'good' and 'adverse' workstyle in relation to upper limb symptoms. At baseline, those with adverse workstyle were almost twice as likely to report symptoms and at 12 month follow-up, this had increased to a threefold relative risk. Workstyle could therefore be said to mediate MSD symptoms.

Fundamental to the concept of workstyle is the issue of breaks and the negative consequences of insufficient breaks. One of the subscales of the workstyle measures is defined as the Breaks subscale and a large study by Sharan et al<sup>40</sup> showed this subscale to be correlated with both reporting of symptoms and loss of productivity. Findings from the Sharan et al<sup>40</sup> study reinforce the widely held belief that breaks are a fundamental tool to be used in ensuring employee health. This belief is enshrined in the guidance to the DSE Regulations<sup>41</sup> and is echoed by similar bodies around the world.

The evidence base relating to studies looking solely at breaks remains weak, however, with little clear evidence from which to draw conclusions. Systematic reviews, such as the previously mentioned Kennedy et al<sup>33</sup>, conclude that there is limited evidence in relation to breaks, but several of the studies considered did show positive impacts. The overall findings in relation to breaks are echoed by a recent Cochrane review<sup>42</sup>, but the potential methodological issues associated with studying such an issue are noted.

The study of breaks can also be impacted by the fact that user preference and optimum health outcomes are not always aligned – for example, workers can have a distinct preference for fewer longer breaks, rather than more frequent 'fragmented' breaks<sup>43</sup>. Given the complex, multi-factorial nature of MSD symptom reporting, such preferences have the ability to impact upon key outcome variables. Breaks remain an important area for study, however.

## **2.2. Breaks and MSDs**

### **2.2.1 What is a break?**

The risk factors for MSDs have been outlined above, one of which is the duration of exposure to the other work risk factors (such as repetition or static postures). It follows then, that in its simplest form, a break is an interruption to these exposures; a reduction in the continuous duration of work. In musculoskeletal terms this interruption can provide any and all of: a passive period for recovery<sup>2</sup>; the chance for gross postural change (e.g. from sitting to standing)<sup>44,45</sup>; the targeted resting of specific muscles (e.g. by change of activity from typing to speaking on the phone)<sup>46</sup>; and the opportunity for stretches and light exercises<sup>2,44,47,46</sup>.

### **2.2.2 How long and how frequent should breaks be?**

As described above, reasons for taking breaks in an office environment are many. Recommendations for their frequency and duration depends on their purpose<sup>45</sup> with some examples being:

- 30 – 60 seconds every 10- 15 minutes<sup>48,3</sup> to reduce discomfort and improve productivity;
- every 20 minutes<sup>49</sup>; and 30 seconds<sup>50,51</sup> to reduce discomfort;
- every 30 – 35 minutes<sup>52</sup> as advice to those with acute low back pain; as achievable advice in an office setting<sup>2</sup>;
- and a few minutes every hour<sup>53</sup> with metabolic health being the driver; for comfort and efficiency impacts<sup>51</sup>, Chartered Society of Physiotherapy<sup>54</sup> as part of the Fit-for-Work initiative.

Approaching this from the standpoint of symptom development, Melrose et al, 2007<sup>21</sup> identified a higher prevalence of musculoskeletal symptoms amongst those who worked for more than an hour without a break. This, like the break regimes above, indicates that as an upper limit, no more than hour between breaks is desirable. In terms of duration, a minimum of 30 seconds up to a maximum of a few minutes, are the boundaries.

### 2.3. Encouraging optimal Break Taking

Whatever the optimum break-taking schedule is, assuring that office workers adhere to such a schedule is not simple. The following sections review literature broadly from health psychology and measuring behaviour change, as well as studies specifically related to changing break taking behaviours.

#### 2.3.1 Changing Behaviours

Understanding the drivers behind health-related behaviours has been a challenge for many decades and a number of explanatory models have been developed. The Theory of Planned Behaviour (TPB)<sup>6,7</sup> is one of the most widely used. A fairly simple model, it suggests that intention to undertake a particular behaviour is influenced by three main sets of beliefs:

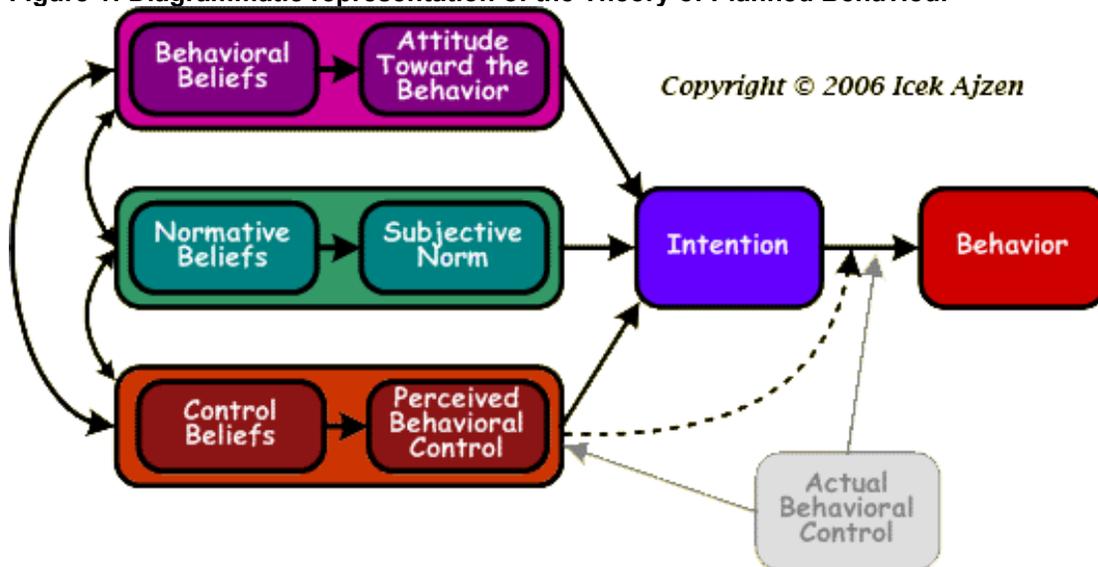
- Behavioural - beliefs about the likely consequences of a given behaviour
- Normative – beliefs about the normative beliefs of others
- Control – beliefs about the presence or absence of factors which may support or present barriers to performance of a behaviour.

In turn each of these three sets of beliefs produces an outcome as follows

- Behavioural beliefs → An attitude towards the behaviour (positive or negative)
- Normative beliefs → Perceived social pressure (subjective norm)
- Control beliefs → Perceived behavioural control

The model proposes that the combination of these three leads to the formation of a behavioural intention (Fig 1). The behaviour itself results when the opportunity arises and when an individual has a sufficient degree of actual behavioural control.

Figure 1: Diagrammatic representation of the Theory of Planned Behaviour



Ogden<sup>55</sup> provides the following scenarios around alcohol consumption and exercise to demonstrate the predictions of the TPB. If an individual believed reducing their intake of alcohol would:

- lead to better health and more productivity (attitude towards the behaviour)
- be what important people in their life wanted (subjective norm)
- be within their capability (perceived behavioural control)

then, this would predict high intention to cut down alcohol consumption (behavioural intention). In addition, perceived behavioural control can impact directly on behaviour, irrespective of intention in certain situations. So for example, even if an individual had extremely high intentions to exercise, if they believed they could not physically do so, those strong intentions would be circumvented by that lack of perceived behavioural control.

The TPB has been used as a model to assess a wide range behaviours<sup>56</sup>. Whilst the majority of studies fall within the field of 'health', it has been used within 'health & safety' in relation to driver behaviour<sup>8</sup>, wearing of protective equipment<sup>9</sup>, food hygiene<sup>10</sup> and manual handling<sup>11</sup>. It has not, to date, been used in the context of postural break taking.

### 2.3.2 Assessing the Major Constructs of the TPB

In order to understand the impact of the various factors of the TPB model, Ajzen<sup>57</sup> has provided questionnaire construction advice. The formulation of items to assess attitude, perceived norm, perceived behavioural control and intention are included and have been used in a broad range of settings<sup>58</sup>. Understanding the levels of each of these constructs helps inform interventions, and can help explain their success or failure.

Even having measured these upstream constructs, however, it is a recognised fact that the intention to undertake a particular behaviour does not always lead to action<sup>12</sup>. Indeed, in one review of health behaviours, Sheeran<sup>59</sup> determined that only around half of people with positive intentions to engage in specific health behaviours successfully enact those intentions. This is the so-called 'intention-behaviour gap' and the lack of attention to the processes which translate intentions into actions is a recognised limitation of the TPB<sup>56</sup>.

### 2.3.3 Closing the Intention-Behaviour Gap; 'If-then' plans

Whilst various strategies exist to help close the intention-behaviour gap, Gollwitzer's implementation intentions<sup>13</sup> is perhaps the most ubiquitous. Implementation intentions are volitional strategies which help translate motivation into action. In outline, an individual makes a specific plan to enact a behaviour in a defined manner, specifying both time and location information. Often 'if-then' strategies are used to make the plan ( e.g. *if* situation y arises, *then* I will initiate goal-directed behaviour z.)

Implementation intentions have previously been used in the promotion of general health behaviours, such as breast self-examination<sup>14,15</sup> and healthy eating<sup>16,17</sup> but have rarely been applied in relation to health & safety in an occupational setting.

Sheeran & Silverman<sup>18</sup> is perhaps the only clear example of an occupational setting for implementation intentions, with their study on attendance at health and safety training. In this study, participants were encouraged to attend the training in a variety of ways. Where implementation intentions were used, attendance increased to 39% compared to the control (12%) or simple motivational intervention group (16%).

In further work, Sheeran et al<sup>60</sup> found that where an individual has strong goal intentions, implementation intentions are more effective in supporting that intention into action, than when individuals have only weak intentions. Measuring this goal intention is therefore an important aspect of studying behaviour.

Implementation intentions have also been successfully used to increase compliance with speed limits in drivers<sup>19</sup> and to increase the frequency of recycling in the workplace<sup>20</sup>. No previous studies outlining the use of implementation intentions to promote break taking have been located in the literature.

## **2.4. Changing Break Taking Behaviours**

Having examined MSDs, defined breaks and explored the behaviour change literature, the next section will bring all these aspects together by reviewing the extant literature around changing break-taking behaviours.

### **2.4.1 Factors affecting break taking behaviour**

Barriers to break taking can be linked to organisational and job design issues such as management regimes and shift patterns<sup>4</sup>. Studies have also shown that individual behaviours play a role in break taking<sup>4,5</sup> with workers not necessarily taking the opportunities afforded to them for breaks.

In their study looking at software prompts for break taking, van den Heuvel et al<sup>2</sup> recorded concern over reduced productivity as one of the more common impeding factors for participants, preventing them following the break regime. Similarly, Ryan et al<sup>45</sup> demonstrated that only around 8% of participants in their study took a break of 5 minutes every hour. They posited that this might be because they were unaware that this was good advice or that this was unachievable in today's hard-pressed workplace. They go on to argue, however, that given some could manage the regime, it was not unachievable.

### **2.4.2 Prompting break taking**

A number of methods for prompting break taking (including stretching and exercises) have been reported. Monsey et al<sup>47</sup> describe a software program which presented a one-minute guided exercise programme, every 45 minutes to computer users, though the group given the prompts did not show a statistically significant increase in breaks taken.

Van den Heuvel et al<sup>2</sup> similarly used software to prompt breaks in one group and prompt exercises during breaks in another. In this study, the computer became inactive for the duration of the break thereby forcing a break from computer work. The analysis therefore focussed on impacts on musculoskeletal complaints, recovery, sick leave and productivity, rather than number of breaks taken. These interventions had some positive impacts on musculoskeletal health and productivity.

A slightly different approach has been reported by Hedge and Evans<sup>46</sup> who used a software programme which individually tailored break prompts, depending on workload data. So rather than a set break every 45 minutes, for example, different individuals were prompted to take a break in line with the intensity of their work. The software also provided stretching advice after 60 consecutive minutes of working. Error rates decreased as a result of the intervention.

Bernaards et al<sup>44</sup> describe a more involved approach, dealing with break taking as well as a number of other workplace issues which go to make up a person's 'workstyle'. This study assessed participants for their readiness to change<sup>61,62</sup> and tailored interventions accordingly. The impact of the intervention on participants' self-reported break taking behaviour was mixed. They were more likely to choose to use break/exercise reminder software which was available to them, but not more likely to act upon it than the usual care group. However, it was effective in reducing the number of participants who worked for one or more hours without a break, compared to the usual care group.

So the literature suggests that external prompts (e.g. from software) as well as interventions designed with past behaviour and plans for future action<sup>44</sup> may have some success in amending break-taking behaviours. It also suggests that the breaks may improve musculoskeletal health, productivity and errors.

## **2.5. Conclusions from the Literature**

The literature indicates that MSDs remain a major medical, social and financial burden, globally. In office environments, interrupting extended exposure to static and sometimes awkward

postures, via breaks, is one intervention with the potential to help. This requires a change in behaviour.

The TPB provides one model of the factors which affect behaviour, all of which may have relevance in an intervention to increase postural break taking. That there is a gap between intention and behaviour is evident in the TPB, and previous studies have used external prompts and implementation intentions (*if-then* plans) to support the translation of intention into behaviour. These may also prove useful, therefore in the postural break taking context.

There are no published studies examining these interventions specifically for postural breaks. This gap in the literature, therefore, supports the undertaking of a study to examine the impact of external prompts and implementation intentions on postural break taking.

## 3 Method

### 3.1 Study design

This research study employed a mixed methods approach to investigate postural break taking behaviour at work. A field study was undertaken that recorded how regularly staff got up from their desks before, immediately following and several months after the introduction of behaviour change interventions. The quantitative aspect of the research was designed as a cluster randomised controlled trial, with no blinding.

The interventions were as follows:-

- Group A (control or usual care group) were asked to try and take more postural breaks.
- Group B were asked to formulate a break taking implementation intention.
- Group C were asked to formulate a break taking implementation intention linked to vibration prompts delivered by the BACK-TRACK™ device after a one hour period of inactivity.
- Group D were encouraged to respond to vibration prompts from the BACK-TRACK™ device after a one hour period of inactivity with no if-then statement.

For the purposes of this study, break taking was described as making a meaningful postural change. It was defined as changing the loading on the body from a sitting to a standing position, for a minimum of 30 seconds. The aim was to do this at least once every hour during the course of the working day. As outlined in the literature review, a “break” can mean a number of things. Therefore, to avoid any confusion or potential concern over reduced productivity amongst the participants, or companies, the words “postural change” were used rather than “break”. The four interventions were designed so that participants could incorporate the postural changes into their working day.

The quantitative data were then supported with qualitative focus group data designed to explore the attitudes and motivations underpinning the break taking behaviours.

### 3.2 Sample

The aim was to recruit “desk-bound” staff (staff working for a minimum of 5 hours per day on a PC) typically working in constrained office-type environments, such as call centres. Ideally this would be from a number of different organisations. The literature suggested a medium effect size ( $f = 0.2$ ) can be expected with implementation intention interventions<sup>63</sup>. Based on a power of 0.9, an alpha of 0.05, assuming a 0.3 correlation between variables and epsilon of 0.8, a target four groups sample of 179 (238) was required, allowing for a possible 33% attrition at six month follow up.

### 3.3 Recruitment

#### 3.3.1 Recruitment of organisations

An opportunity sampling approach was initially used which resulted in the recruitment of five participant companies. Strategies included:-

- Approaching suitable business contacts from the database of University of Derby Corporate (UDC) and BACK-TRACK™ Europe Ltd.
- Approaching personal business contacts of the research team.
- Publicising the study through the University’s press office via a press release in the Derby Evening Telegraph.
- Advertising the study on the MSc Ergonomics online forum.

To boost participant numbers, a snowball sampling strategy was adopted. Members of the Steering Group Committee were asked to publicise details of the study amongst their various

contacts. Consequently, a further three companies were recruited. However, two of the contacts that agreed to take part subsequently withdrew due to changes within their respective organisations.

### 3.3.2 Recruitment of participants

#### **Main study**

Contacts within each organisation took on the task of recruiting staff for the main project. A purposive sampling approach was used to identify prospective participants within each company by using the “desk-bound” inclusion criteria (see Appendix 1 for selection questions). Staff were recruited by the use of email and a face-to-face approach. To encourage participation, entry into a prize draw was offered to all participants. Names and email addresses of interested parties were passed to the research team to follow up.

#### **Focus Groups**

To recruit participants for the focus groups, a request for volunteers was included in a follow-up questionnaire. In addition, an email was also circulated to all participants within each company inviting them to take part. Participants were offered a voucher by way of a thank you. Due to a higher than expected uptake for the focus groups, participants were separated into their intervention groups then picked at random to provide two from each intervention group.

## 3.4 Materials and apparatus

### 3.4.1 BACK-TRACK™ devices

**Figure 2: A BACK-TRACK™ device**



BACK-TRACK™ movement sensors were used in this study. BACK-TRACK™ devices are matchbox sized, sophisticated motion sensing and data collection units, used primarily in manual handling contexts<sup>64</sup>. As well as data collection, it has a vibration facility which can be programmed to respond to various conditions; for example inactivity of a certain duration; stooping etc.

For the purposes of this study, the default settings on the devices were changed slightly so that they would record movement activity only, rather than other measures required for manual handling interventions. The devices had a start threshold set at 2 seconds which meant that participants would need to walk for 2 seconds before the device would record activity. Similarly, the stop threshold was also set at 2 seconds meaning that participants would need to stop for 2 seconds before the device would stop recording movement data. The stop threshold allows for momentary pauses in activity, e.g., stopping briefly to open a door.

A 30 second filter was applied so that only breaks of 30 seconds or more would be recorded. The vibrate facility was deactivated on the database for all participants, however, it was reactivated for participants in groups C and D during their intervention week, to vibrate after 60 minutes of inactivity.

The devices are worn inside a pouch, which is attached to the outermost part of the participant's right hip using a waistband, or belt. Every time the participants moved within the parameters described above, the BACK-TRACK™ device records the date, time and length of this period of activity. Each device was labelled with the participant's unique identifier and assigned to that individual on the BACK-TRACK™ database.

To upload the data stored on the devices to the BACK-TRACK™ database, two options were available. Option one involved downloading specialist data transfer software from the BACK-TRACK™ website directly onto the participant's PC. This enabled participants to upload data, and charge the device, by plugging the BACK-TRACK™ into one of the USB ports using a small connecting cable.

Alternatively, option two involved using a centrally located recharging rack containing either 28, or 56 USB style connecting cables. The rack was connected to an external PC which uploaded data via a 3G dongle. This method avoided any concerns over security as it completely bypassed the individual company's computer systems. This was the preferred method for five of the participant companies, with one opting to use the specialist software for practical reasons.

Daily break taking data including the date, time and length of each period of activity in seconds for each participant was available to download from the BACK-TRACK™ database in Excel format.

#### **3.4.2 Start up information questionnaire**

The initial questionnaire (see Appendix 1) invited participants to take part in the study and stated the rationale for the research. In addition, details of the incentives being offered, what taking part entailed, rights regarding withdrawal and an informed consent form were included.

Participants were asked to state their gender, smoking habit and age band (ranging from 18-24 to 55 plus years). Age bands were chosen to match the SF-36v2 Health Survey to facilitate norm-based scoring. The SF-36 Health Survey is one of the most widely used health and quality of life measures<sup>65</sup>. In its complete form its thirty six items measure eight multi-item scales: physical functioning (PF); role limitation due to physical problems (RP); bodily pain (BP); general health (GH); vitality (VT); social functioning (SF); role limitation due to emotional problems (RE); and mental health (MH). The scales are very robust however, so it is common for subscales of SF-36 to be used in isolation. Version 2 of the SF-36 has been designed to facilitate norm-based scoring for all scales. Raw scores are first transformed into 0-100 scores before being further transformed in to T-scores where the mean is fixed as 50 (the population norm) and the standard deviation is 10. This allows a given sample population to be compared to the norms for that population thereby providing an illustration of how representative the sample population is. In this case, the degree to which the sample could be said to be representative of the UK population on the Bodily Pain scale was assessed by generating T-scores for each of the eight SF-36 scales using UK norm data produced by Jenkinson et al. in 1999<sup>104</sup>.

Additional information was requested regarding participants' work pattern (full/part time), contractual and average hours worked per week, job title and job category within the organisation (e.g., admin). Participants' office location/room number was also noted to assist with set up.

Pain was measured using the two item bodily pain scale from the SF-36v2 Health Survey<sup>65</sup>. The final section of this questionnaire contained the screening questions which covered the inclusion/exclusion criteria for the study, e.g., "are you a desk based employee working at least 3 days per week in the office?"

#### **3.4.3 Intervention questionnaires**

Four intervention questionnaires (one for each of groups A-D) (see Appendices 2-5) were devised, which were identical apart from the intervention wording. Each questionnaire contained

a brief reminder about the need to make frequent postural changes. Participants were asked to aim to make more daily postural changes over the coming months and a definition clarifying exactly what was meant by a postural change was provided. Examples of how participants could incorporate more postural changes into their daily routine were given.

All participants were given the following instruction: “whatever your job, you should aim to make postural changes at least once an hour. For example, if you made a postural change at 9.15 then you would need to make another no later than 10.15, and so on.”

Participants in groups A and D were presented with this statement. However, those in group D were also told: “to support you in your goal of making more postural changes the BACK-TRACK™ device you are wearing will be set to vibrate if no postural changes have been made for an hour, to prompt you to make a postural change.”

Those in group B were instructed to write an “if-then” statement in the space provided on the questionnaire. This instruction read: “to help you, we would like you to write an “if...then” statement, where the “then” is the goal of making a postural change, and the “if” is a cue to remind you to make the postural change. Writing more than one statement can help to support you in achieving this goal.”

Example statements were provided, e.g., “if” I need to speak to a colleague “then” I will make a postural change by walking to their office.” In the space allocated for the writing of the statements, specific instructions and examples were given regarding the format of the “if-then” statements<sup>19,66,67,68</sup>.

Participants in group C received exactly the same instructions as group B. However, in addition, they were told that: “to support you in your particular “if-then” statement, the BACK-TRACK™ device you are wearing will be set to vibrate if no postural changes have been made for an hour. You might like to incorporate this into one of the “if-then” statements that you will write.” An example statement was then given.

The final section of the questionnaire required participants to answer the theory of planned behaviour based questions. Based on the approach described by Ajzen<sup>57</sup>, items were presented using seven point bipolar adjective rating scales.

#### **3.4.4 Follow up questionnaire**

In this questionnaire (see Appendix 6) participants were asked if any health or organisational changes had occurred since the intervention phase of the study, e.g., had they developed any neck, back or shoulder problems, or changed job. A second measure of pain was taken using the SF-36 V2 bodily pain sub-scale. Similarly, participants were also asked to complete a second set of TPB questions. These were identical to the first set of questions except for reference to timescale in that they related to the forthcoming 2 weeks of the study. This questionnaire also contained a request for volunteers for the focus groups.

#### **3.4.5 Participant information sheet**

A comprehensive instruction sheet was compiled explaining what the participants needed to do. It also explained how to wear, upload data from and charge the BACK-TRACK™ device.

#### **3.4.6 Daily work diary**

To help explain any anomalies in the data, participants were given a daily work diary. This asked participants to state whether the day in question was a normal day or not. If not, they were asked to explain why, e.g., fire drill, power cut.

### **3.4.7 Focus group interview schedule**

The interview schedule (see Appendix 7) consisted of six questions/probes designed to clarify the reasons behind the behaviours observed and elicit from the participants why the behaviour change techniques did, or did not work.

## **3.5 Procedure**

### **3.5.1 Baseline and intervention**

Participants were emailed the web-link to the start up questionnaire and asked to complete and return this. Reminder emails were sent to participants who failed to return the questionnaire. Participants were notified by email whether or not they met the study criteria. Eligible participants were advised that further instructions would follow. For those unable to take part, an explanation was offered as to why they did not meet the study criteria and they were thanked for showing an interest in the study.

Dates were arranged with the various companies to start collection of the baseline and intervention data. Participants were advised of the start date by email. Start dates for the various companies were staggered due to the following reasons:-

- The research team only had access to a certain number of BACK-TRACK™ devices and equipment at any one time.
- Negotiations with the participant companies were not all at the same stage due to four of the organisations being recruited at a later date.

Set up sessions to brief the participants in groups were arranged at each company. To minimise disruption to the individual businesses, small to medium sized group sessions were deemed more practical. However, a number of staff were unable to attend these sessions due to meetings, holidays or sickness. Therefore, alternative set up arrangements were made to brief absent participants.

During the set up sessions, the research team briefly recapped the rationale and aims of the study. Participants were told that musculoskeletal disorders were not uncommon amongst desk based staff and that this study would use a number of interventions to encourage them to make more regular postural changes. Participants were handed an instruction sheet and a daily work diary.

All participants were given a pouch and their individually labelled BACK-TRACK™ device. The researcher demonstrated how the BACK-TRACK™ worked and explained how to upload data and charge the device. The team checked that all the participants understood how to use the device.

Participants were told that the device was a movement sensor and would record how often they got up and moved about. For companies using the centrally located rack, participants were told where this was situated and how it should be used.

Participants were asked to wear the device each day whilst at work, for a total of ten consecutive days and to charge/upload their data on a daily basis. They were told that they would be sent daily reminder emails to upload their data, and that further instructions would be emailed to them at some point over the ten day period. To allow the participants time to familiarise themselves with the devices, they were informed that data collection “proper” would start the following day.

As this was a field study, the research team had to fit data collection around the participants’ pre-existing holiday commitments. As a consequence, data collection was not always consecutive, or concurrent with fellow participants.

On a daily basis, data uploads for each company were checked on the BACK-TRACK™ database and a log was kept of how many baseline days of data each participant had. Once

each participant had five days worth of data, the web-link for their particular intervention was emailed to them. Participants were asked to read and follow the instructions, complete the questionnaire and notified of their data collection finish date. Reminder emails were sent to participants who had not returned their questionnaires.

As at baseline, the researcher kept a log of intervention days of data and notified the participants by email when their data collection had finished. Participants were asked to return the equipment to the company contact and were told that the research team would be in touch again within a few months to start the second phase of the project (follow up).

### **3.5.2 Follow up**

Arrangements were made with each company to start collecting the follow up data (phase two). As before, participants were advised of the start date by email. As the participants had worn the devices previously, set up sessions were deemed unnecessary. However, instruction sheets were provided again as a reminder.

Instructions were emailed to all participants asking them to wear the device for ten days, to charge/upload their data on a daily basis, complete a work diary for non-normal days and notifying them from where to collect their devices. As before, participants were asked to start data collection “proper” from the following day. The email contained the web-link for the follow up questionnaire and participants were asked to complete and return this. As previously, reminder emails to return the follow up questionnaire were sent to some participants. Daily reminder emails were also sent to prompt participants to upload their data.

A data log was kept, and once participants had ten days worth of data they were notified by email that they had finished and asked to return the equipment. At this point, participants were emailed the debrief document and asked not to discuss the contents with their colleagues who were still collecting data.

### **3.5.3 Focus groups**

The focus groups were conducted by two members of the research team at the participants' place of work. Upon arrival, informed consent was obtained and each participant was asked to read a brief recap of the project to refresh their memory, reminded which intervention group they were in and asked to think back to when they did phase one of the study. After having asked their views about whether the intervention worked or not, participants were presented with their baseline and intervention data and given the opportunity to explain it. To facilitate transcription, participants were asked questions in group order and asked to state which intervention they did for the tape. Two voice recorders were used to record the sessions to ensure that data would not be lost in the event of equipment failure. At the end of the session participants were thanked, debriefed and handed their voucher.

## **3.6 Ethics**

Ethical approval for the research was granted by the University's Psychology Research Ethics Committee. Informed consent was obtained online from participants in the main study and paper copies were completed by those attending the focus groups. To ensure anonymity, each participant was asked to create a unique identifier code which was used on the consent forms, questionnaires and in the SPSS dataset.

## 4 Quantitative analysis and findings

### 4.1 Baseline Descriptives

#### Sample

The participants were recruited from 6 different organisations. Two of the locations were call centres and the other four were administration offices where participants met the inclusion criteria for being classed 'desk-bound'. Break taking data were collected at baseline (5 days); intervention (5 days immediately following baseline); and follow-up (5 days between 8 and 20 weeks following intervention). The final sample was made up from 195 desk-based participants with complete data at baseline and follow-up.

Participant data is summarised in Tables 1-5 below. Pain scores are the Bodily Pain Scale from SF-36 (see section 3.4.2) the scores for which fall within normal, non-clinical range. Break taking is the mean hourly breaks; Attitude, Social Norm, Perceived Behavioural Control and Intention are TPB subscales (see Appendices 2 - 6).

Tests of normality using the Kolmogorov-Smirnov test showed that within the intervention groups, the break taking data was normally distributed, and that there were no violations of homogeneity of variance. Accordingly, parametric tests were permissible and used for analysis of break-taking changes<sup>69</sup>.

As is the case with many health scales, the scores on the bodily pain and TPB variable scales are not normally distributed. Whilst it is not uncommon for studies addressing such variables to describe analysis with parametric statistics<sup>70</sup>, it has been argued that non-parametric tests should be used as the distributions tend to be skewed. In reality, the use of parametric tests is unlikely to produce misleading results provided samples are not small<sup>70,71</sup>. When distributions are skewed however, non-parametric methods can provide greater statistical power than parametric equivalents<sup>72,73,74</sup>. For this reason, between groups differences were assessed using the appropriate non-parametric tests where normality could not be assumed.

**Table 1: Population Descriptives**

Organisations	All	1	2	3	4	5	6
<b>n</b>	195	40	33	43	41	18	20
<b>Male</b>	73	16	17	14	11	5	10
<b>Smokers</b>	30	2	16	3	1	3	5
<b>Full time</b>	181	38	30	37	39	18	19
<b>Baseline Pain</b>	47.67 (9.57)	47.54 (9.59)	47.03 (8.53)	48.91 (7.71)	48.01 (11.33)	44.42 (9.85)	44.37 (10.00)
<b>Baseline break taking</b>	3.34 (1.23)	3.33 (1.17)	3.22 (1.20)	3.59 (1.33)	3.34 (0.89)	3.29 (1.56)	3.01 (1.46)
<b>Break taking range</b>	0.82- 8.41	0.95- 6.59	0.82- 6.17	1.19- 7.04	1.52- 5.05	1.67- 6.16	1.60- 8.41
<b>Attitude</b>	6.16 (1.01)	6.14 (1.11)	6.18 (1.10)	6.33 (0.94)	6.09 (0.96)	6.33 (0.94)	5.78 (0.92)
<b>Social Norm</b>	4.76 (1.37)	4.86 (1.15)	4.45 (1.67)	5.30 (1.20)	4.38 (1.51)	4.83 (0.91)	4.63 (1.38)
<b>Perceived Control</b>	6.10	5.88	6.30	6.43	5.95	6.11	5.66

Organisations	All	1	2	3	4	5	6
	(1.00)	(1.28)	(0.89)	(0.72)	(1.04)	(1.08)	(0.65)
<b>Intention</b>	6.35 (0.92)	6.24 (0.92)	6.51 (0.84)	6.51 (0.89)	6.34 (0.84)	6.61 (0.57)	5.71 (1.26)

There were no significant differences between the organisations in terms of sex split, work pattern, baseline pain, baseline break taking or TPB attitude. However, differences were evident for TPB social norm ( $p < 0.05$ ), TPB perceived control ( $p < 0.01$ ) and TPB intention ( $p < 0.05$ ).

**Table 2: Descriptive data by Intervention Group**

	Intervention Group				Test of baseline difference
	Control	Implementation Intentions	Implementation Intentions + buzzing prompt	Buzzing prompt	
<b>n</b>	45	48	51	51	
<b>Male</b>	19	21	18	15	$p > 0.05$
<b>Smokers</b>	6	7	7	10	$p > 0.05$
<b>Full time</b>	43	47	45	46	$p > 0.05$
<b>Baseline Pain</b>	48.01 (10.04)	47.64 (9.34)	48.32 (9.98)	46.72 (9.18)	$p > 0.05$
<b>Baseline break taking</b>	3.68 (1.36)	3.30 (1.08)	3.01 (1.27)	3.40 (1.14)	$p > 0.05$
<b>Attitude</b>	6.23 (1.00)	6.06 (1.04)	6.15 (1.00)	6.19 (1.02)	$p > 0.05$
<b>Social Norm</b>	4.87 (1.62)	4.80 (1.04)	4.48 (0.99)	4.91 (1.42)	$p > 0.05$
<b>Perceived Behavioural Control</b>	6.13 (0.89)	6.09 (1.02)	6.11 (0.83)	6.02 (1.08)	$p > 0.05$
<b>Intention</b>	6.33 (0.95)	6.38 (0.90)	6.28 (0.98)	6.40 (0.88)	$p > 0.05$

No significant differences between the groups were evident at baseline. Frequencies were assessed using  $\chi^2$ , differences in pain and TPB variables were assessed using Kruskal Wallis and differences in baseline breaks were assessed using one-way ANOVA.

**Table 3: Allocation to Group by Organisation**

Organisation (Follow up interval)	Intervention Group				TOTAL
	Control	Implementation Intentions	Implementation Intentions + buzzing prompt	Buzzing prompt	
1	9	11	10	10	40
2	7	8	8	10	33
3	12	10	10	11	43
4	10	10	12	9	41
5	4	4	5	5	18
6	3	5	6	6	20
<b>TOTAL</b>	<b>45</b>	<b>48</b>	<b>51</b>	<b>51</b>	195

The 'job type' variable was collapsed from nine to five groups for ease of reporting.

**Table 4: Job Type by Intervention Group**

Job type	Intervention Group			
	Control	Implementation Intentions	Implementation Intentions + buzzing prompt	Buzzing prompt
Management	8	7	13	12
Professional	10	19	7	5
Admin	18	16	24	21
Tech & Op Support	5	4	6	7
Other	4	2	1	6

<sup>2</sup> > 0.05 indicating that the distribution of job types does not differ significantly by group. There were no significant differences between job types on baseline measures of breaks or pain.

**Table 5: Age by Intervention Group**

Age band	Intervention Group			
	Control	Implementation Intentions	Implementation Intentions + buzzing prompt	Buzzing prompt
18-24	5	6	6	5
25-34	13	12	12	13
35-44	5	12	19	12
45-54	17	13	14	17
55+	5	5	4	4

<sup>2</sup> > 0.05 indicating that the distribution of age groups does not differ significantly by intervention group. There were no significant differences between job types on baseline measures of breaks or pain.

### Scale Reliability

The questionnaire devised for the study utilised 5 scales – 4 covering the elements of the Theory of Planned Behaviour and one covering bodily pain. The reliability of the scales was assessed using Cronbach's alpha and the findings are summarised in Table 6.

**Table 6: Reliability of Questionnaire Scales**

Scale	Cronbach's alpha
Attitude	0.57
Social Norm	0.35
Perceived Control	0.37
Intention	0.76
Bodily Pain	0.83

### 4.2 Impact of Interventions on Postural Break Taking

In order to test whether the interventions increased the number of postural breaks taken, change scores in mean break taking were computed for each participant; for baseline to intervention and baseline to follow-up. These mean change scores with standard deviations are represented in Table 7 below.

**Table 7: Changes in Break taking by Intervention Group**

Change in break taking scores	Intervention Group			
	Control	Implementation Intentions	Implementation Intentions + buzzing prompt	Buzzing prompt
Baseline to intervention	-0.14 (0.74)	0.28 (1.06)	0.14 (0.56)	-0.06 (0.64)
Baseline to follow-up	-0.01 (0.99)	0.16 (1.03)	0.03 (0.70)	-0.23 (0.87)

One Way ANOVAs were undertaken for both sets of change scores. There was significant difference between the four intervention groups for the baseline-intervention mean break taking change;  $F(3, 191) = 2.83, p = 0.04$ . Tukey's post-hoc comparisons were run with the only significant difference between the Implementation Intention condition (mean change = 0.27; 95% CI: -0.03 – 0.58) and Control (mean change = 0.14; 95% CI: -0.36 – 0.85);  $p < 0.05$ . The effect size was moderate:  $d = 0.46$ .

### 4.3 Impact of Interventions on Pain

Overall, pain scores across the whole population improved between the two time points where they were collected (baseline and follow-up). Table 8 presents the two sets of scores.

At baseline, there were no significant differences in bodily pain scores by age, sex, smoking behaviour, work patterns or job type.

**Table 8: Pain Scores; baseline, follow-up and mean change by Intervention Group**

Pain scores	Intervention Group			
	Control	Implementation Intentions	Implementation Intentions + buzzing prompt	Buzzing prompt
<b>Baseline</b>	48.01 (10.04)	47.65 (9.34)	48.32 (9.98)	46.72 (9.14)
<b>Follow-up</b>	49.24 (10.15)	49.56 (11.31)	48.78 (11.20)	48.75 (8.31)
<b>Mean Change</b>	1.22 (8.69)	1.92 (11.98)	0.45 (10.34)	2.03 (9.00)

There were no significant differences between groups at base line or follow-up. However, a Wilcoxon signed ranks test on the whole population pain scores showed a significant difference between baseline and follow-up ( $Z = -2.079$ ;  $p < 0.05$ ;  $d: -0.144$ ) i.e. there is an effect of time, but not of intervention. The effect is positive – pain scores improved. The effect size is small.

There was no correlation between change in breaks and change in pain scores.

#### 4.4 Relationship of TPB factors and changes in postural break taking

Due to the non-normal distribution of TPB factors, non-parametric Spearman's rho correlation coefficients were calculated between the TPB factors and break taking at baseline and follow-up. These are presented in Tables 9 and 10.

**Table 9: Relationship between baseline TPB measures and initial change in break taking**

	Number of breaks (baseline)	Attitude	Social Norm	Perceived Behavioural Control	Intention
<b>Breaks</b>	-	0.01	0.04	0.16*	0.10
<b>Attitude</b>	0.01	-	0.39**	0.41**	0.51**
<b>Social Norm</b>	0.04	0.39**	-	0.43**	0.34**
<b>Control</b>	0.16*	0.41**	0.43**	-	0.58**
<b>Intention</b>	0.10	0.15**	0.34**	0.58**	-

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\*. Correlation is significant at the 0.01 level (2-tailed).

The TPB factors were all correlated with each other and intention. There was a weak correlation between perceived control of the behaviour and the behaviour itself (break taking). There were no significant relationships between attitudes, social norms or intention relating and the behaviour itself.

**Table 10: Relationship between follow-up TPB measures and overall change in break taking**

	Number of breaks (follow-up)	Attitude	Social Norm	Perceived Behavioural Control	Intention
Breaks	-	0.03	0.02	0.07	0.03
Attitude	0.03	-	0.38**	0.47**	0.53**
Social Norm	0.02	0.38**	-	0.28**	0.31**
Control	0.07	0.47**	0.28**	-	0.61**
Intention	0.03	0.53**	0.31**	0.61**	-

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\* . Correlation is significant at the 0.01 level (2-tailed).

At follow-up, there were no significant relationships between elements of the theory of planned behaviour and the behaviour in question.

#### 4.5 Meaningful change in break taking

The data were further analysed to see whether interventions were associated with a meaningful change. A meaningful change was defined, *a priori*, as an increase of 2 postural breaks per work day or 0.25 postural breaks per hour – see Table 11.

**Table 11: Meaningful Change in Break Taking by Intervention group**

	Meaningful	Not meaningful	Total
Control	12 (27%)	33 (73%)	<b>45</b>
Implementation Intentions	22 (46%)	26 (54%)	<b>48</b>
Imp Int & buzzing	19 (37%)	32 (63%)	<b>51</b>
Buzzing	13 (25%)	38 (75%)	<b>51</b>

As the implementation intention group were the only significantly different group when looking at statistical change, further analysis was only undertaken for this group. This further analysis assessed the difference between the implementation intention group and the control by generating an odds ratio. 12/45 made a meaningful change in the control group compared with 22/48 in the Implementation Intention group. Therefore, the odds of making a meaningful change when writing implementation intentions are 2.3 times that of the control group (95% CI: 0.98-5.6).

## 5 Qualitative Analysis and Findings

### 5.1. Background

Focus groups were run in four of the eight participating organisations. The overarching aim for this element of the study was to supplement the quantitative findings by bringing additional understanding about the 'why' in terms of behaviour change. This in turn would help develop the key principles for undertaking health & safety behaviour change interventions within workplaces.

Background to the Theory of Planned Behaviour is covered elsewhere in the report, but the elements within it - *Behavioural beliefs/Attitudes; Normative beliefs/subjective norms; & Control beliefs/perceived behavioural control* – are key to this study as they form the basis of an initial template (a series of *a priori* themes) which helped guide the analysis. The process also provided an insight in to what these psychological constructs mean to people in practice. In other words – is there any evidence of these constructs in 'everyday speech'? From this it was anticipated that there could be a meaningful representation of the data which could guide practical intervention principles.

### 5.2. Methodology

#### 5.2.1 Focus Groups

Focus groups were selected as the appropriate methodology for this study because, as Kitzinger<sup>75</sup> argues, they can be used to examine what and how people think, why they think in particular ways and their understandings and priorities in a given area. These attributes of the focus group methodology reflected the aims of this study with the 'given area' being the behaviour change intervention.

#### 5.2.2 Participants

A total of 31 participants were involved across four groups as 7-8 participants per group was considered an appropriate number given the context of the discussion. Multiple groups were used to enhance the ability to detect emergent themes and to enhance the reliability of the findings<sup>76</sup>. The participants were volunteers from the study and as such this represents opportunistic sampling which is pragmatic, but has the potential for bias. However, it was ensured that participants from each intervention group were present in each focus group.

The participants are described in Table 12 in terms of their intervention group, their perceived response to the intervention and the measured change in behaviour. A significant change (increase or decrease) was taken to be a change exceeding 0.25 breaks per hour – i.e. a change of two meaningful breaks over the course of a work day.

**Table 12: Participants, study group and their perceived v actual break taking**

Focus Group	Participant number	Group	Perceived impact of intervention (baseline mean breaks/hr)	Actual impact of intervention (intervention mean breaks/hr)	Follow-up change from baseline (follow-up mean breaks/hr)
1	1	A	Increase (4.41)	Decrease (4.10)	None (4.54)
	2	A	None (4.13)	Decrease (3.24)	None (4.04)
	3	B	None (2.78)	None (2.90)	Decrease (2.23)
	4	B	Increase (3.34)	Decrease (3.00)	Increase (4.03)
	5	C	None (2.60)	None (2.45)	Decrease (2.18)
	6	D	None (2.73)	Decrease (2.32)	None (2.87)
	7	D	Increase (2.52)	None (2.41)	Increase (3.35)
2	8	A	Increase (2.26)	None (2.08)	Decrease (1.72)
	9	A	None (2.16)	Decrease (1.49)	Decrease (1.58)
	10	B	Increase (3.56)	None (3.54)	None (3.75)
	11	B	None (2.42)	Decrease (2.06)	Decrease (1.58)
	12	C	Increase (3.90)	None (3.99)	Decrease (3.64)
	13	C	Increase (3.78)	Increase (4.51)	Increase (4.29)
	14	D	Increase (0.82)	Increase (1.06)	None (0.92)
	15	D	None (6.17)	Decrease (5.56)	Decrease (5.83)
3	16	A	Increase (6.44)	Increase (6.87)	Decrease (5.60)
	17	A	Increase (4.82)	Decrease (4.46)	Decrease (4.42)
	18	B	Increase (3.03)	Increase (5.17)	Increase (3.56)
	19	B	None (2.18)	Increase (3.40)	Increase (2.68)
	20	C	None (3.66)	Increase (4.43)	Increase (4.57)
	21	C	Increase (2.90)	None (2.86)	Increase (3.25)
	22	D	None (4.21)	Increase (4.51)	None (4.38)
	23	D	None (2.62)	Increase (3.32)	None (2.58)
4	24	A	None (4.94)	Increase (5.81)	Decrease (3.95)
	25	A	None (4.71)	Increase (5.24)	Decrease (3.55)
	26	B	Increase (3.53)	Decrease (2.71)	Decrease (2.83)
	27	B	None (2.02)	None (2.22)	Increase (2.28)
	28	C	None (3.78)	None (3.54)	Decrease (3.03)
	29	C	Increase (4.19)	Decrease (3.42)	Decrease (3.61)
	30	D	Increase (4.28)	None (4.18)	Decrease (3.85)
	31	D	None (3.68)	None (3.83)	None (3.57)

Study Groups: A = try and take more breaks B= write an implementation intention C= write an implementation intention linked to prompts by the BACK-TRACK™ device D= respond to vibration prompts from the BACK-TRACK™ device.

### 5.2.3 Procedure

Four focus groups were held within four separate organisations. They were undertaken with organisational consent and support, so participants were able to give their time freely. The groups lasted approximately 1 hour 30 minutes and involved between 7 and 8 participants. Each focus group was recorded to allow for verbatim transcription for later analysis. A 'validator' was also present at each session to take contemporaneous notes.

In addition to utilising questions and associated prompts, feedback was gained by asking individuals how they thought they had behaved before presenting them with the study data to indicate their actual behaviour.

### 5.2.4 Analysis

Template analysis is a pragmatic form of thematic analysis which recognises the potential for existing knowledge, models and theories within an area and consequently allows for the production of *a priori* themes which can be used to produce an initial coding structure. These initial codes are not restrictive however and can be developed (added to, redefined, sub-divided or omitted) as the analysis progresses, if for example, themes which were not predicted become apparent<sup>77</sup>.

Codes in template analysis tend to be arranged hierarchically, with groups of similar codes being organised under a common thematic heading<sup>78</sup>. The initial template was devised so as to be broad and unrestrictive and was generated from a combination of an interpretation of the TPB and a recognition of study issues which had been fed back to the research team. The initial outline template is shown in Figure 3.

#### Figure 3: Initial Template

1. Elements of Theory of Planned Behaviour
  - 1.1 Behavioural beliefs/Attitudes
  - 1.2 Normative beliefs/subjective norms
    - 1.2.1 Workplace Norms/Culture
    - 1.2.2 External Norms – home and social context
  - 1.3 Control beliefs/perceived behavioural control
  - 1.4 Intentions
2. Study Issues
  - 2.1 Compliance
  - 2.2 Technical Issues

### 5.2.5 External validation

An external validator was present in each focus group to take notes of the key themes discussed. These notes, along with the transcripts, were then used by another member of the research team when gauging the trustworthiness of the findings represented here. Indicative quotations are used to illustrate the themes and related sub-themes alongside certain contextual descriptions which allow the quotations to be put in context.

## 5.3. Findings

Findings are reported hierarchically to reflect the final template which is shown in Figure 4 and to aid clarity of reporting. However, it should be recognised that despite the presentation format, the themes are not all independent but are interlinked; this is better represented in Figure 5 – a model of the thematic data.

Having represented the data in both these ways, a further representation is provided, with the practitioner in mind. A list of principles for behaviour change interventions has been synthesised from the data and is presented in section 5.5.

#### Figure 4: Final Template

1. Elements of workplace behaviour change
  - 1.1 Individual beliefs/attitudes & perception
    - 1.1.1 Recognition
    - 1.1.1 Resonance
    - 1.1.2 Perception v Reality
      - 1.1.2.1 Symptom Perception
    - 1.1.3 Work ethic
  - 1.2 Subjective norms and Organisational Culture
    - 1.2.1 Workplace Norms/Culture
      - 1.2.1.1 Management Support
      - 1.2.1.2 Peer Support
    - 1.2.2 External Norms – home and social context
  - 1.3 Control beliefs/perceived behavioural control
    - 1.3.1 Ability to personalise
    - 1.3.2 Multiple Methods
  - 1.4 Intention-Behaviour Gap
    - 1.4.1 Mindfulness/Situational Awareness
    - 1.4.2 Reinforcement
    - 1.4.3 Planning
2. Barriers/Facilitators
  - 2.1 Built Environment
  - 2.2 Work systems
  - 2.3 Workload
  - 2.4 Feedback
3. Study/Intervention Issues
  - 3.1 Clarity
  - 3.2 Compliance
  - 3.3 'Hawthorne Effects'
    - 3.3.1 Intervention at Baseline
  - 3.4 Technical Issues
    - 3.4.1 Usability
    - 3.4.2 Reliability

#### 5.3.1 Elements of Workplace Behaviour Change

This first order code represents an adaptation and elaboration of the elements of the TPB as they were evident in the focus group responses and relevant to workplace interventions.

##### Individual beliefs/attitudes & perception

A number of themes emerged which could be grouped around the idea of the individual's attitude towards the behaviour in question and/or the broader context (health) of the behaviour.

##### a. Recognition

A key element is the recognition that the activity in question has some merit and is worthy of attention. Some had developed that recognition into a behaviour change:

FG 1 – P4: *“... I used to be a bugger for sitting there and doing all my work... so I've made myself think, right well once I've got a couple of letters to collect off the printer, I'll make sure I walk to the other end of the office and pick them up...”*

Others had not quite managed to make meaningful changes to behaviour, but had recognised that there was both a need and a potential benefit:

FG 2 – P8: *“I know I need to get up more... sometimes you just can’t...physically get up and go for a walk. I suppose I can stand up though, so it’s me, I need to make myself aware that I need to make those changes.”*

### **b. Resonance**

This could perhaps be conceptualised in relation to an absence of recognition, but it was deemed beneficial to treat the findings as a discreet issue. There was an element within some responses which indicated that key information had ‘fallen on deaf ears’:

FG 4 – P27: *“I completely forgot all about doing that ...”*

It appears that unless all aspects of an intervention appear pertinent to an individual, some may simply be lost amongst the wide variety of elements competing for attention in a modern workplace. A further aspect of resonance relates to the ‘fit’ between the individual and the type of intervention as P28 added:

FG 4 – P28: *“The statement wouldn’t work for me, but that’s my personality...I’m not very good at following that kind of rule...”*

### **c. Perception v Reality**

Interventions designed to change behaviour may stumble if there is a significant difference between how an individual perceives their behaviour and the actual pattern of behaviour. For example, when P20 was asked about how they thought the intervention had impacted upon him said:

FG 3 – P20 *“I don’t [think it worked] it’ll be interesting to see the results, but I am not sure there was a big difference between the two weeks”*

This was despite showing a clear increase in breaks taken. Conversely P26 felt that the intervention had increased her break taking, in part due to a conscious change in work organisation, when the data suggests that her actual break taking went down:

FG 4 – P26 *“Yeah, I do tend to sit down more... which is why I started to do the paper thing as well”*

Taking the focus group participants as a sub-set (see Table 12) this study illustrated how inaccurate peoples’ perceptions of their break taking behaviour can be. Over 20% of the focus group participants felt that the study had helped them to take more breaks when in fact their break-taking had reduced. Conversely more than 10% suggested that the study had made no difference to their behaviour when the data shows a meaningful increase in breaks.

### **d. Symptom Perception**

A further element of perception v reality related to issues around symptom perception. One participant suggested that simply thinking about breaks had changed her perception of her physical symptoms:

FG 2 – P11: *“I don’t know if it’s me being a hypochondriac, but since I’ve had it on, my back I think, gosh this chair is killing, even though I’ve got one of the comfier chairs, I’ve not got a standard one. My back kills.”*

It is noticeable however that P11 took relatively few breaks compared to others in the study and her break taking had reduced at intervention and again at follow-up. Conversely, two participants in focus group 4 felt that the study had had such positive effect that they were able to be discharged from physiotherapy which they were receiving for musculoskeletal symptoms:

FG 4 - P 26: *'I'd been having it a year before that. And you've (P 27) been going a long time haven't you?'*

This was despite the fact that P26's break taking actually reduced over the course of the study.

#### **e. Work Ethic**

For a number of workers, an intervention which apparently detracted from work was difficult to take on, even when it was accepted that the change wouldn't actually affect performance. This led to issues with guilt which needed to be addressed:

FG 2 - P13 *"I think because it was supported, I felt better about standing up, like I didn't feel guilty standing up and taking a moment..."*

This quote also touches on the issue of management support which is defined elsewhere within the template. Similarly, P4 commented:

FG 1 – P4 *"I always feel that there's always that perception that you know, unless you're there staring at your screen, you're not doing your job, why are you wandering about doing that or you know!..."*

#### **Subjective Norms and Organisational Culture**

Many participants made comments relating to the context of the behaviour, particularly in relation to support (or the lack of it) within the workplace.

##### **a. Workplace Norms/Culture**

Comments were made around both management support and peer support with both appearing influential in relation to an individual's readiness to change behaviour.

##### **b. Management Support**

The comment for P13 above shows the positive side of management support and P12, who had responsibility for a team, talked about actions they could take such as switching meetings to another floor *"... to make them move around a bit more..."*.

P4 added to the comment noted above to say:

FG 1 – P4: *...and that's where a steer from management I think would help to say that it is OK to get up and have a break and make a drink or you know, wander round.* '

Not all comments indicated support from management however, with P24 commenting:

FG 4 - P24 *"...I think that's been a little bit of a stigma thinking management are going to tell me off if I get up again.."*

##### **c. Peer Support**

As with management support, this theme was identified with both positive and negative comments. From a negative perspective, P14 commented:

FG 2 – P14 *"...I was sort of stretching like this and the team are looking at me like 'what you doing'?".."*

However, P29 recognised that peer support could be used to reinforce the intervention:

FG 4 – P29 *"...if you buddied up with somebody else between the two of you, you would remember for each other.."*

A general sense of camaraderie appeared to be a positive influence with studies like this as P31 quipped:

FG 4 – P31 “...*At my age I have to keep moving in case my colleagues think I’ve passed over!* (laughter)..”

#### **d. External Norms**

Discussions within the focus groups tended to be centred around work, but issues around broader support were mentioned and the interaction with family:

FG 4 – P26: “*Yeah it’s made a big difference to me, so it’s been worthwhile. I knew it would be anyway. It’s made a difference away from work, as well...Even on holiday we’ve walked...I think it’s conscious generally now.*”

The implication being that the family had supported and got involved with the new behaviours.

#### **Control beliefs/perceived behavioural control**

The degree to which participants felt in control of enacting more postural changes varied from person to person. The issue came up on a number of occasions in the context of how other factors, particularly workload and prevailing culture (covered as separate themes), remove the possibility of individual control. One participant explained, however, that it was down to him to take control and that he could enact a change for the better by starting with a small change:

FG 3 -P20 “*you know it’s that point of when you realise that actually you need to change things...by doing very little you can make a difference*”

One exchange between two participants illustrated how one took control of moving more by setting himself a routine which was paramount; whilst his colleague indicated that such a routine wasn’t possible though breaks could be introduced by enacting another behaviour (getting a drink):

FG 4- P 27: “*I think it helps if you’re in a routine, as well, like I say 9.00 go for a cup of coffee or whatever. 10.00 go for your breakfast, if you get into a routine.*”

P 30: “*But I can’t always.*”

P 27: “*No, but within five or ten minutes.*”

P 30: “*I’ve often gone for a drink when I didn’t really want a drink, I just consciously move and get away from the phone or whatever*”

#### **a. Ability to Personalise**

A number of participants discussed ‘doing their own thing’ in relation to the study aims, reflecting that they needed to tailor the intervention to suit them. This indicates an active ability to take control. Both high tech and low tech approaches were proposed, with P26 utilising the PC-based calendar functions whereas P29 used post-it notes and ticked off her breaks as she went through the day:

FG 4 - P26 “*What I did was I set up on my calendar a reminder. Which is more our responsibility*”

FG 4 - P29 “*The notes I said I’d do didn’t work for me, so what I did was I got a post-it note... I’d tick them off each time as I’d make sure I’d got rid of them that way and that worked for me*”

This tailoring also relates to the 'resonance' theme mentioned earlier.

### **b. Multiple Methods**

The participants in the focus groups differed widely in their view about which type of intervention did, or could work for them and this was discussed independently of whether or not they had been in a group with that specific type.

Some clearly felt the *if-then* plans worked, for example, P26 commented:

FG 4 – P26 *“obviously when we had written the statement, what we were going to do, you did think about it a little bit more... because you think well I've written it down and I've got to be conscious of it, therefore whatever I wrote down I thought about it at the time”*

But this comment was alongside a recognition of the need for additional prompts (in her case via the calendar -see above). Similarly, some felt the buzzing prompt was particularly useful. For example P14 said:

FG 2 – P14 *“I think I relied on... the device really...when it buzzed, knowing that I needed to sort of get up and move about a bit, yeah...., that worked for me, yeah. Definitely.”*

Others were much less positive about particular interventions. For example P28 (mentioned previously under 'Resonance' above) felt the *if-then* statement didn't fit with her personality, but they later made the point that:

FG 4 – P28 *“if there was an alarm and everybody got up and danced around that would be useful”*

Something of a consensus could be drawn from the discussions, which effectively suggests that one size cannot fit all, but some interventions will work for different people and having multiple methods could provide an additive effect.

### **Intention-Behaviour Gap**

It was evident within the focus group discussions that a number of participants felt that their intentions had changed, but that change didn't manifest itself in meaningful behavioural change either because awareness was affected by other workplace factors or because an additional 'nudge' was required to bridge the intention-behaviour gap.

### **a. Mindfulness/Situational Awareness**

Many of the participants alluded to the fact that, in spite of their intentions, the awareness of how long they had been sitting and the need to move more would be pushed from their mind once they were engrossed in their work:

FG 3- P19 *“And I ended up sat there and then it like, phone would ring and I'd think ooh I'm meant to be moving when the phone rings and then I'm on the phone and then by the time I've put the phone down and I'm typing again I've not actually done anything.”*

Effectively the demands of work had resulted in something of a loss of situational awareness in respect of their posture. Many used this fact to indicate that they would value an external prompt to keep them mindful of the need to move, as the plans in their head were often overtaken by the busyness of the workday.

### **b. Reinforcement**

To some extent this theme has already been touched upon under multiple methods, where individuals took it upon themselves to provide reinforcement to their intervention. It warrants consideration as an independent theme however, because it can be impacted upon from a variety of levels. P23 made the point that despite recognising that the change would be useful, they felt an additional prompt was required:

FG 3- P23 *"...it would be nice to be able to do it... it would be virtually impossible without setting some sort of an alarm to make you do it, to make sure you did it all the time"*

Similarly P7 discussed a PC based prompt (perhaps influenced by her role in IT):

FG 1 – P7 *"...It would be good to have a bit of software on your computer, like a little pop up that said 'Reminder, move somewhere'. That would be handy; something that you haven't got to remember to put on or remember... that would be useful."*

### **c. Planning**

The idea of planning increased movement into daily activities was mentioned at the individual and organisational level. At the individual level, it was suggested that movement could be planned in to work, rather than simply relying on an individual's memory. For example, P16 said:

FG 3 – P16 *"...but I was also trying to instead of calling someone or emailing someone about an issue actually going to see them."*

At the organisational level, potential changes were noted that could both help and hinder increased movement. In terms of aiding with a transition from intention to behaviour, P18 raised the issue of centralising printers:

FG 3 – P18 *"...I mean they are centralising erm like printers as well I believe, instead of there being like one per office and in xxxx's case next to her desk, there might be one or two per floor in which case it would be a physical exercise to get up and go to the printer."*

However, a move to an 'all electronic' environment, without proper planning could impede the transition to healthier behaviours:

FG 3 – P18 *"...we're going to be electronic, so there'll be no filing cabinets to get up to or anything"*

### **5.3.2 Barriers & Facilitators**

It became evident within the groups that irrespective of individual buy-in or managerial support, there were certain factors that could act as barriers or be designed to act as facilitators.

#### **The Built Environment**

The nature of the work environment was perceived to both create barriers and potentially facilitate change. In any form of call centre environment, acoustics will be important and P18 noted this in relation to standing when taking a call:

FG 3 – P18 *"...there was a colleague of mine that used to do that but he kind of got politely bullied... because it distracted people because he was quite loud as well (Laughter)...So in the end he stopped answering the call and standing up"*

The issue of distraction wasn't always seen the same way, however, and some potential benefits associated with observable movement were noted:

FG 2 – P10: *'I like to see people standing when they're on the phone though. There gets to be a real buzz on the floor I think, when people are moving.'*

Facilitating movement in modern offices can be done in a number of ways and a discussion between P19 and P18 developed around providing spaces away from desks where conversations could take place:

FG 3 – P18 *"So it could be that when colleagues come to speak to me instead of doing it at your desk especially if you go down to lower desk space, you actually have somewhere to go to and everybody gets up at least once to speak to each other and go somewhere ... I know in a lot of the modern offices that's – they do have like break out spaces like that"*

P19 went on to comment about plans to remove local kettles, such that individuals would need to go to a kitchen area to make hot drinks:

FG 3 – P19 *"There is one good thing what they're doing because they've got one kitchen now on the third floor and I don't know if it's still going to happen but they're going to put kitchens, main kitchens on each floor or something and stop you having kettles in your own, in your own office. So that will make you walk to the kitchen to get a cup of tea and yeah it might only be three times a day but it's another..."*

### **Work Systems**

The issue of work systems has already been touched upon in relation to planning, but it appeared that across the focus groups the impact of an apparently inevitable drive towards electronic document storage and management, alongside communications focussed on e-mails, was likely to lead to a reduction in natural job variety. P3 had already associated the change with her musculoskeletal symptoms:

FG 1– P3 *"I knew I already had problems because my job's become far more sedentary than it used to be and that's coincident with back pain and I know that within a couple of days of starting the week, that if I've been at my desk a lot, my back will be sore and I know that after a weekend I'm fine"*

P23 also spoke quite strongly about the changes and the impact of that in relation to her perceived ability (behavioural control) to take breaks:

FG 3 – P23 *"so ninety per cent of it was email because nobody answered the phone when you rung so the things that would automatically take you away from your desk like going to a filing cabinet or going to a printer or going to speak to a colleague, if they're not there then you do, it is frowned upon if you just sort of get up and wander away from your desk once an hour, twice an hour"*

### **Workload**

This was a theme which came out strongly within the groups and which could be seen to interact with organisational support, perceived control and the intention-behaviour gap. The issue of workload was captured most vividly by P10 who explained the pressure people were under:

FG 2 – P10 *"people were working so hard it was literally seconds between each call...they didn't have time to catch their breath, to go for a drink to go to the toilet or anything..."*

P17 picked up upon the issue of covering sickness absence and the impact that had on the rest of the team:

FG 3 – P17 *“I think the situation was that there’s a small team of us, and one person was off sick, and another one was on leave so basically whoever is in the office has to stay answering the phone, so there is less scope for roaming about basically.”*

### **Feedback**

In essence this theme revolved around the recognition that to manage something effectively, you need reliable information about it. As P22 put it:

FG 3 – P22 *“I think that if you’d got some kind of immediate feedback maybe at the end of the day, and you’d had a particularly bad day where you’d know yourself, ooh it’s gone wrong today you know, what can I do tomorrow to put that right to make sure that I don’t get stuck in that rut? ... but if there was a simple way that erm you maybe could plug the thing back in the computer ... it enables you then to manage your activity I think, I think that would be very useful”*

This also relates to *perception v reality* discussed earlier – individuals are often not well placed to monitor their own behaviour without external input.

### **5.3.3 Study/Intervention Issues**

The focus groups elicited important data in relation to the study itself. Whilst these themes emanate from this particular research project, it can be seen that some have the potential to affect any intervention project.

#### **Clarity**

The main issue which evidently needed better re-enforcement and clarification for participants, was the precise nature of the study. Two key themes emerged which hadn’t been anticipated. The first was around what the intervention actually was, as some appeared to think that the study was about wearing the data logging device rather than about moving more. As P11 put it:

FG 2 – P11 *“my main thing was in the morning to remember to put it on, not... on what I had to do...I had my work to focus on and thought I’ve got it on, I’ve done my remembering in the morning to put it on, you know and that’s truthful.”*

The other element of the study which apparently caused confusion was around what constituted a ‘meaningful’ break i.e. that movements of *30 seconds* duration or more were required. P7 was one of a number of participants who hadn’t grasped this:

FG 1 – P7 *“...if you stand up for less than 30 seconds, does it not count that?...Because I know it will not take me 30 seconds to get to that printer and back so I may well be moving more but it’s not a long enough period.”*

#### **Compliance**

For any participants in real-world, occupational research, competing requirements from their day job can make compliance with the research protocol difficult. This was highlighted by some participants only sporadically remembering to put their data logging device on. For example, P9 reported repeatedly forgetting to wear the device and needing e-mail reminders:

FG 2 – P9 *“that’s probably why that’s so poor in the second week, because the second week you were sending me a lot of emails to say ‘are you wearing your device?’ and I was like ‘No I’m really sorry I forgot to put it on again’ (laughs) erm... you did send me a lot of emails in week two saying ‘we’ve not got any data for you today, have you plugged it in alright?’ ‘I’ve not worn it, I’m sorry’ (laughs) erm but yeah I think it was just a little bit disjointed and I kind of lost my momentum with it this time”*

### **'Hawthorne Effects'**

In any intervention study, it is well documented that there can be an impact on participants stemming simply from the fact they are being studied, rather than from any experimental manipulation which is taking place. This is often referred to as the 'Hawthorne Effect'<sup>79</sup>. As P28 explained:

FG 4 – P28 *"Generally being in the whole process makes you a more conscious of your movement I think, without actually prompting you to do anything. It was a general awareness more than anything"*.

#### **a. Intervention at Baseline**

Issues around the Hawthorne Effect<sup>79</sup> were compounded in this study by the fact that even before any experimental manipulations took place, the process of gathering baseline data required participants to utilise a novel technology. Within the focus groups it soon became apparent that simply wearing the device was seen as the most influential aspect of the study by a number of participants. This was highlighted clearly in Focus Group 3 with a dialogue between 3 participants:

FG 3 – P16 *"Yeah it was just being there, just reminded me yeah..."*

P17: *"Well I'd agree with P 16 that the device is a reminder in itself..."*

P18: *"I think there's quite a likelihood that just because we were wearing the thing in the first place and made much more moves in that [FIRST] week ... I was surprised when the figures came out that I was sort of maybe making a postural change every fifteen minutes.."*

As there was no deception involved in the study, all participants were aware that the study was about break taking and that the devices were there to measure these behaviours.

### **Technical Issues**

Issues relating to the data logging system were clustered around two emergent themes – the usability of the device and some minor, but noticeable, reliability issues. In order to overcome certain IT barriers (individuals having to have software installed on their PC, etc.) a standalone PC and large 'docking station' were provided to participant sites. This ensured that data up-loading and device charging could be done at a single site and independent of any organisational network, but it did introduce another IT link in to the chain, with an associated potential for problems (this is not how the BACK-TRACK™ devices are routinely deployed).

#### **a. Usability**

Usability issues were highlighted in relation to two themes – one relating to the wearing of the BACK-TRACK™ device and the other to do with the location of the rack in terms of its convenience and its ability to act as a visual reminder.

The BACK-TRACK™ devices are fairly small and present few problems when worn with typical male clothing, but are potentially more problematic with typical female clothing. P10 and P13 discussed the clothing issues:

FG 2 – P13 *"They were a bit heavy on our leggings (laughs). They don't always sit right, so that's the other thing is you wonder if it's actually picking anything up"*.

P10 *"That's what I – it made me realise I wear a lot of dresses"*

P13: *"I think that was all it was, was that concern is you know, you get in the morning you want to... dependent on what you're wearing, you don't know if it's in the right place."*

P15 and P11 discussed the location of the rack, which wasn't convenient for all participants with certain organisations:

FG 2 – P15 *“I don't know whether you could actually do this system-wise, but if it was on our desk, and ... when we came in and it was in front of you, you'd remember to just put it on straight away. Because bearing in mind how big the floor actually is...for people that were in that corner.”*

P11: *“I was the opposite end of the room.”*

P15: *“Yeah, they don't remember.”*

P11: *“If you walked past it.”*

P15: *“Yeah, walked past it so it, you walk in, oh yeah I need to put that on, sort of – you're getting a whole day's data every day.”*

P11: *“Yeah, in the morning I never seen it.”*

### b. Reliability

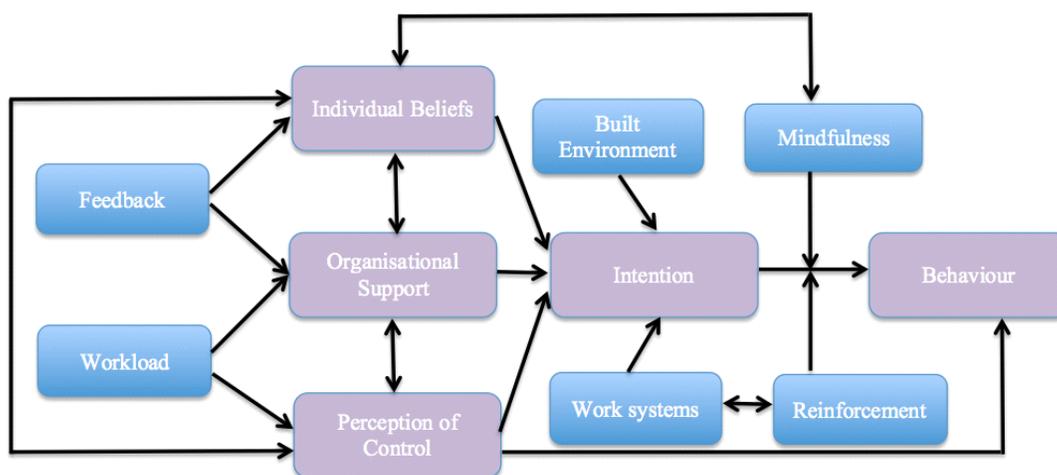
Whilst the BACK-TRACK™ devices themselves proved reliable, there were some issues with the data handling system, particularly in relation to the rack (docking station):

Focus Group 2 – Participant 9: *“Erm because this time seemed to be a little bit disjointed with stop-starting because the rack broke, didn't it?...So because the rack broke...I lost my rhythm with it.”*

## 5.4 Graphical Representation of Qualitative Findings

Figure 5 displays the inter-relationships between the themes which emerged from the focus groups, and indicates their relationship with the TPB constructs<sup>6,7</sup>.

Figure 5: Graphical Representation of Qualitative Findings



## 5.5 Key Considerations for Workplace Behaviour Change Interventions

Applying a practitioner's perspective to the qualitative findings allows for the generation of a pragmatic set of principles for practitioners considering behaviour change interventions within the workplace. Whilst intervention is possible in relation to every theme and sub-theme within the final template, its presentation is perhaps unwieldy. Therefore the following six principles offer a more practical - but still evidence-based – approach to guide interventions:

- **Ensure the goal behaviour is clear and its benefit understood** – the specifics of the goal behaviour need to be clearly explained, and potentially revisited and re-enforced.
- **Secure demonstrable management commitment** – participants need to know and have demonstrated to them that the goal behaviour is fully endorsed by management. Workload must not be allowed to override healthy behaviours.
- **Provide multiple methods for goal achievement** – a variety of different approaches to support the achievement of the goal behaviour should be proposed, to suit different individuals, with the ability to personalise them.
- **Adapt the built environment and work systems to support the goal behaviour** – wherever possible, changes should be made to the physical work environment and work systems to support the goal behaviour.
- **Set-up two-way feedback** – this should inform participants about their performance and provide understanding of the blockers and enablers for the goal behaviour. It should also provide the opportunity for success to be re-enforced and shared.
- **Support participants to deal with barriers** – having identified any barriers for the goal behaviour, such as poor understanding or technical issues, there must be a clear mechanism through which such barriers can be removed/ameliorated

## 6 Discussion

### Overview

This project set out to investigate the impact of behaviour change techniques on postural break taking behaviour, within a constrained office-type environment. The aim was to recruit sufficient participants in desk-bound environments to have data from 168 participants at three time points. This was achieved, resulting in a well-powered set of analyses which detected a significant and meaningful change in the target behaviour.

Recruitment was achieved from a spread of organisations with an even distribution of almost all variables across the intervention groups and locations (the exception being theory of planned behaviour variables - see specific section on TPB below). In addition to the quantitative aspect of the work, the four focus groups including just over 15% of the participants provided useful insight into the reasons for success and failure in behaviour change.

The aims at the outset were to:

- Record *objective* break taking behaviour
- Investigate the usefulness of implementation intentions for changing postural break taking behaviour
- Explore the usefulness of non-software based external prompts provided by the BACK-TRACK™ devices in supporting a change in postural break taking behaviour
- Use qualitative research to understand the reasons for the usefulness (or otherwise) of these interventions
- Propose mechanisms for including these behaviour change techniques (if successful) into training and information materials provided by health and safety practitioners.
- Influence the development of the BACK-TRACK™ data logging devices to include staff using DSE

The following discussions will be organised under these six headings. The limitations of this current study will then be considered and then finally the discussions will be drawn together into a conclusions section at the end.

### 6.1 Objective break taking behaviour

At an average of over three, 30 second or longer postural changes an hour, the level of break taking exhibited by participants in this study is surprisingly high. Evidence from the focus groups suggested that this might even be a conservative estimate, as a number felt they regularly got up for shorter than 30 second periods; for example to walk to the printer. These data contrast with the average reported by call centre workers in, for example Sprigg et al<sup>80</sup>, who sat for an average of two and half hours at a time before getting up. Whilst there was a wide range of behaviour, even the lowest figures recorded of 0.82 breaks/hour would not cause major concerns in the context of guidance on DSE activities.

The Sprigg et al<sup>80</sup> data were self-report, however, as are the data in many other studies in this field<sup>44, 81, 82</sup>. A noteworthy exception are the objective data collected using activPAL™<sup>45, 83</sup>. These authors reported objectively measured sitting. Their focus was not on breaks, however, but rather, sitting time, and it is impossible to compare their data exactly with that of this study.

As far as we can ascertain, this study is the first time that objective, occupational break-taking data have been reported in this way. The fact that participants took more breaks than expected, compared to the self-report literature and compared to the assumptions of many of the participants themselves makes these data important. However, this needs to be viewed in the

context of the 'observer effect' potentially provided by the BACK-TRACK™ device (see below 6.6.4 'Hawthorne effects' and 6.9.1 'Technology' sections below).

Exposure to static posture is a risk factor for the development of MSDs<sup>31</sup> and lack of breaks form part of the picture<sup>40,41</sup>. This study suggests that these office workers interrupted that exposure frequently and that prolonged static postures in the office are perhaps less of an issue for MSDs than previously thought. This was certainly the case for the study population but further research in other populations would give a clearer picture. It is important to note, however, that the other important public health issues associated with extended sitting<sup>45,83</sup>, such as cardio-vascular ill-health and diabetes, are likely to require more than 30 second interruptions to sitting.

## 6.2 Implementation Intentions and break taking behaviour

Our results demonstrate that writing *if-then* statements doubles the odds of making a *meaningful* increase in postural break taking over a day, compared to not writing them. For an effectively 'free' intervention, this is an important finding. Furthermore, in parallel with Elliott & Armitage<sup>19</sup>, the fact that writing implementation intentions increased behaviour over an already high baseline level, attests to the usefulness of implementation intentions in the current setting. This indicates it is worth incorporating the writing of these plans into initiatives to increase postural breaks and considering their use in other health and safety initiatives aimed at changing behaviours (see 'Using the Findings' section 6.7 below).

However, it is important to note that these changes were not maintained at follow-up. This suggests that it may be worth revisiting the intervention and effectiveness could be improved by assuring clarity around the goal behaviour<sup>45,84</sup>. This is supported by the focus group findings and is represented in the consequent principles which outline the need for feedback, multiple interventions and reinforcement of the goal behaviour.

## 6.3 External prompts and break taking behaviour

In spite of the fact that a number of participants in the focus groups expressed their desire for an external prompt to help them get up more, our data do not support their use in this instance. This concurs with Monsey et al<sup>47</sup>, who found no statistically significant impact of their software prompts on breaks. It runs contrary to the findings of other studies, however, where external prompts have increased the amount participants get up<sup>83</sup>.

The BACK-TRACK™ devices were set to buzz after 60 minutes of inactivity, which may well be the wrong duration for this participant population. Given the baseline average of over three breaks an hour, it is likely many of those in a 'buzzing' intervention group rarely, if ever, received that prompt. This was confirmed by some of the participants in the focus groups. Further work could be carried out with participants who get up less frequently to test whether the buzzing prompt provides a useful reminder.

## 6.4 TPB constructs from the Quantitative data

The TPB constructs of Attitude, Social Norms, Perceived Behavioural Control (pre-cursors) and Intention were measured using items derived as directed by Ajzen<sup>57</sup>. The scales these produced had much lower reliability than is desirable<sup>85,86</sup>. Consequently, the findings associated with the TPB scales should be treated cautiously. Encouragingly, each of the pre-cursors correlated significantly with intention, which supports their use as a starting point for analysing the qualitative data. However, they did not, for the most part, correlate with break taking.

The only exception to this was the weak correlation between Perceived Behavioural Control and Baseline break taking. Given that this factor is proposed as a direct actor on Behaviour (as well as being mediated through intention) this finding is of interest<sup>87</sup>. However, the weak nature of the correlation and the lack of scale reliability prohibits any real conclusion being drawn.

## 6.5 Break taking and the impact on Pain

It is notable that at the whole sample level, pain improved from Baseline to Follow-up. This was not related to intervention but only to time. However, the effect size was small and certainly not clinically meaningful. The rationale in this study for increasing the number of postural breaks was to improve musculoskeletal health. Pain is a known precursor to and symptom of musculoskeletal disorders<sup>88</sup>, so it was posited as a useful variable to examine.

There are a number of explanations for the lack of meaningful change in pain, given the change in break taking. It may be that insufficient time had elapsed to produce measurable change within large samples. On a case basis, benefits were noted and at least two of the focus group participants indicated they had been discharged from physiotherapy, they felt, as a result of the changes from this study. When looking at pain issues, taking an individual perspective can provide a useful alternative view to traditional population based studies<sup>89</sup>. It is also possible, that the level of break taking in this sample was already sufficiently high so as not to be a significant impact upon pain.

## 6.6 Qualitative Findings on the usefulness of the interventions

The qualitative element of the study was undertaken to shed light on the reasons behind the quantitative findings.

Analysing the focus groups with an initial template<sup>77,78</sup> generated from the TPB was useful in understanding a behavioural intervention in the workplace, and in highlighting some key principles for future behaviour change interventions.

The final template (Fig 4) and model (Fig 5) could be seen to be a development of elements present within the TPB, alongside some additional, but independent, factors likely to influence intervention outcomes. The following discussion sections will consider the initial TPB themes and those which emerged.

### 6.6.1 Main TPB constructs

The individual beliefs element of the final template stayed fairly true to the corresponding element of the TPB, but with a couple of important additional considerations. The first was that an individual's perception of their own behaviour, or any change in it, may differ significantly from their measured behaviour. This makes self-management and/or line management of such behaviours difficult in the absence of objective measures but underlines the need for feedback (see 'additional factors' below). The second issue was around competing beliefs – a strong work ethic, or a perceived need to demonstrate a strong work ethic could easily override the belief about the healthy behaviour. Indeed other authors have noted the concern over lost productivity interfering with individuals taking breaks<sup>2</sup>.

The subjective norms element of the template was unsurprisingly dominated by workplace norms, particularly in the form of management and peer support. The concepts of management and peer support are often combined to provide a measure of 'organisational support' and there is good evidence to suggest that organisational support is a predictor of positive workplace behaviours; including safety-related behaviours<sup>90</sup> and development activities<sup>91</sup>. When looking at measures of organisational support alongside measures of subjective norms, Sheeran & Silverman<sup>18</sup> found the measures to be unifactorial, so the predominance of workplace issues does not compromise the underlying theory in this case.

Perceived behavioural control again held true to the underlying theory. As the TPB model suggests (see Fig 1) perceptions of control are closely linked with both individual beliefs and subjective norms and this was evident in the focus group discussions. Key sub-themes to emerge in relation to control centered around issues of choice – choice in the ability to personalise/interpret an intervention and choice in terms of a range of methods related to the same goal behaviour.

### 6.6.2 Intention-Behaviour gap

The developed theme of Intention-Behaviour Gap was something evident within the transcripts and has clear real-world significance. Bridging this gap remains a priority in a range of health interventions and the two aspects of mindfulness and reinforcement may be important ways of supporting that bridge.

Whilst mindfulness is perhaps not an immediately obvious adjunct to the TPB, in line with this study, Suhalia et al<sup>92</sup> suggest that mindfulness may have explanatory value, alongside the TPB, in predicting speeding behaviour. Additionally, the idea of reinforcement could be said to relate to the popular concept of 'nudge' coined by Thaler & Sunstein<sup>93</sup>. In reality the evidence-base for the 'nudge' construct is weak<sup>94</sup>, but in practical terms the idea of not simply relying on an individual to remember to change their behavior is sound. The desire for an external prompt, even though our data suggest this was not useful on this occasion, was evident.

The sub-theme of planning relates to reinforcement in some ways but warrants its own mention as it is pertinent at individual and organisational level. It also relates to a number of the potential barriers/facilitators identified.

### 6.6.3 Additional Factors to the TPB

It became very clear within the focus groups that even were all the elements of the TPB favourable for modified intention (and hopefully behaviour), there were elements within the workplace that could create major barriers to an effective behavioural outcome. These themes were conceptually independent of the classical depiction of TPB, albeit there are some clear interactions.

The first related to the physical work environment. If a proposed behaviour change would have the knock-on effect of creating auditory and/or visual distraction then support for that behaviour will naturally be reduced, as performance will suffer. This may well be due to deficiencies in workplace design rather than inherent problems in the behaviour. Work systems were also seen as potential barriers. In these office environments, it was the increasing move towards electronic documentation management and communication that created most concern. Effectively the work systems are reducing job variety and with it the natural breaks in a job, which runs counter to the goal behaviour of increased break taking.

Issues around workload were voiced strongly within the focus groups. It might be argued that high workloads are not compatible with management support, but workloads may not be driven by local management decisions. Fogarty & Shaw<sup>95</sup> describe work pressures as being influenced by an overarching 'management attitude' that also fed directly into both individual beliefs and normative values when they re-interpreted the TPB in terms of safety climate. It is perhaps this higher level organisational commitment which is sometimes lacking when it comes to healthy behaviours. Issues around workload can also be driven by temporary effects such as short-staffing, but even these short-term effects could be enough to undo changes in perceived behavioural control, which are so important to behavioural intentions.

Completely separate to the other barriers, but nonetheless important, is the issue of feedback. This study has reinforced the view that individuals themselves are poor judges of certain behaviours like break taking. Given this and the fact that accurate management evaluation of break taking is difficult to achieve with conventional measures without apparently snooping on employees, objective measures of break taking may be required (albeit the data suggest that for this study, participants numbers of breaks were not actually at problematic levels).

### 6.6.4 Intervention issues

#### **Clarity**

Lack of clarity in relation to aims and objectives of health interventions is recognised as a barrier to success<sup>96</sup>. This study had two notable issues that impacted upon clarity for a few participants. The first related to the title of the study – to try to encourage uptake, a simple and 'catchy' title was devised – the 'Move More Study'. It became apparent in the focus groups that despite clear

instruction within the participant information, a few participants focussed more on the simple idea of increased movement without recognising the need for a change of 30 seconds duration to be considered a meaningful postural change. The other issue, which relates also to the 'Hawthorne Effects' discussed below, was the fact that for some participants, the need to remember to wear the data logging device 'overwhelmed' the requirements of the intervention itself.

### **Compliance**

Ensuring compliance with study protocols creates challenges for researchers in many fields, but is particularly difficult in field research such as this. Indeed, in the systematic review of the effectiveness of ergonomics interventions in addressing low back and neck pain, Driessen et al<sup>97</sup> suggest that studies had either insufficient levels of compliance or did not report on compliance at all. The qualitative data showed that compliance was an issue for a number of participants, but the objective data recording allowed for this to be recognised and addressed, limiting its impact upon the overall study findings. Driessen and colleagues<sup>97</sup> note the need for effective implementation strategies to aid compliance, as the costs of non-compliance can be so high<sup>98</sup>. However, this study also highlights the need for effective feedback, in ensuring compliance where individuals are a poor judge of their own behaviour and managers find monitoring of the behaviour difficult.

### **'Hawthorne Effects'**

The phrase 'Hawthorne Effect' has drifted into the lexicon of everyday language although many textbook and lay media reports of the 'Hawthorne studies' undertaken at the Western Electric Company between 1924 and 1933 are overly simplistic, misleading or inaccurate<sup>99</sup>. Nevertheless, the fact that overtly observing behaviour may, in and of itself, change that behaviour, remains a potential problem in any behavioural research (e.g. Eckmann's et al<sup>100</sup>). It is also the case that participants can be influenced by the perceived characteristics of the researchers<sup>101</sup>. In relatively simplistic terms – participants can wish to 'please' the researchers. Within the focus group discussions it became clear that participants were very aware of the process of observation, as the study required participants to wear a novel device.

### **Technology**

Whilst the undeniable benefit of having the BACK-TRACK™ data logging devices was the collection of objective break taking data, their use did introduce some problems on occasions. In part these were discussed in previous sections, such as the clothing issues covered in the 'Usability' section. In addition, the failure of the rack in one location interrupted the study for a short period; and a small number of devices were reported as faulty, or not working correctly - again only briefly. Given the large scale nature of this field study, with nearly 200 participants based in six organisations, any technological failings were relatively minor.

A more important issue with the technology was the fact that the wearing of the device, in and of itself, affected the participants; providing an 'observer' effect. For the makers of the device, this is perhaps a useful attribute, but within this study it is acknowledged that the device itself may have increased the postural break taking at baseline and is an acknowledged limitation. The impact was at least true for the control group as well as the intervention groups, but it needs to be considered when looking at overall postural break taking levels.

### **Recruitment issues**

Recruitment of participant companies was slower than expected, with some dropping out after having agreed to take part. Consequently, four of the six companies were not recruited in time to allow six months of elapsed time between intervention and follow-up. Follow-up with the companies therefore occurred between 8 and 20 weeks following intervention. Whilst these two durations fall within the range of many other studies looking at implementation intentions<sup>102</sup> the inconsistency in follow-up between the different locations is an acknowledged limitation of this study.

### **Research protocol**

In spite of carefully designing the research protocol, it did suffer from some limitations. This was a convenience sample, largely self-selected, making it prone to bias. Furthermore, though the participants were assigned to intervention groups randomly, by cluster, the researcher was not blinded to the groups because each group needed to be emailed a different intervention instruction. Care was taken to use standardised emails as much as possible during correspondence however.

### **6.7 Using the Findings**

The quantitative findings indicate that writing *if-then* plans to support behaviour change is a worthwhile intervention. If it is part of a training or awareness session which is already costed, then it may in fact also have the benefit of being free, as it only costs the time it takes to explain and then write the plans. This *if-then* plan approach could be incorporated into training and information for postural change interventions as well as other workplace health and safety issues; such as the attendance at training; the wearing of PPE; and adherence with safe systems of work.

In addition, the six evidence-based ‘principles’ outlined from the focus group data (see section 5.5) provide a useful guide for workplace behaviour change interventions. Though they have been generated following this postural change study, it is likely that they will have currency more broadly.

### **6.8 Developing BACK-TRACK™**

The focus groups shed light on the fact that for many, simply the wearing of the BACK-TRACK™ device acted as a reminder to get up more. This should be an encouragement for its producers, as with no additional technical developments, it is viewed as a useful intervention for DSE users. This should be tempered only by the need for office clothing to be taken into account; the need for a waistband is not readily met by dresses for example.

The fact that it can provide a buzzing prompt was also seen as desirable, though these prompts did not provide statistically significant gains in break taking. As discussed above, however, this may, in part, be down to the mis-setting of the duration between prompts for this group.

The ability for individuals to receive feedback about their behaviour by wearing the device was seen as a useful feature by focus group participants. The reports currently generated via the BACK-TRACK™ website for break taking are not easily interpreted but their development in line with those currently produced for manual handling behaviour would be a worthwhile investment.

Finally, in terms of developing BACK-TRACK™, this study has developed and tested a protocol for measuring break taking in an occupational setting. Following only minor development from BACK-TRACK™ this protocol and these devices could be used by organisations to collect break taking data before and after intervention (e.g. training) to enhance their health and safety training and provide an objective measure of its efficacy.

### **6.9 Application and Conclusions**

This study has given us a better understanding of break taking behaviour at work; suggesting that in fact, office workers even in ‘desk-bound’ settings get up more than we expected. This knowledge should encourage us to focus attention on the other risk factors for MSDs, such as overall physical workload, poor posture and psychosocial factors.

This work has provided good evidence that implementation intentions can help engender behaviour change in an occupational setting. In IOSH’s publication ‘Workplace health issues’<sup>103</sup>, knowledge of behaviour change techniques is cited as an important practitioner training need. This study has demonstrated that *if-then* plans should be part of the behaviour change armoury for health and safety practitioners, and has outlined how and where they could be used.

The analysis of focus group data has reinforced the usefulness of the TPB as a model for understanding behaviour in this workplace setting, and has presented further understanding of potential blockers and enablers for behaviour change at work. The analysis supported the generation of six 'Intervention Principles', useful for health and safety practitioners.

Data from this project supports the diversification of the BACK-TRACK™ product range to support healthy break taking behaviours by DSE users. This could be used generally, across the population or specifically in a rehabilitation setting to support people back to work. Furthermore, this study has developed and tested a protocol for measuring break taking in an occupational setting. With some minor development from BACK-TRACK™ this protocol and these devices could be used by organisations to collect break taking data before and after intervention (e.g. training) to enhance their health and safety training and measure its impact.

Further research studies could extend this work in a number of ways. For example it could

- examine whether the buzzing prompt provides a useful reminder for participants who get up less frequently than this sample
- examine whether an optimal duration for buzzing reminders could be defined and/or whether personalised reminders could prove effective
- investigate whether increased postural break taking could result in a reduction in pain or other musculoskeletal symptoms in a more sedentary sample
- extend the examination of implementation intentions to other occupational health and safety behaviours, particularly around 'workstyle'<sup>36,37,38</sup>
- re-visit the TPB constructs in this break taking setting to see if more reliable measures can be established.

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# **Appendix 1: Start up information questionnaire**

## **Move More Study - Start-Up Information – Information for Participants**

### **INTRODUCTION**

We would like to invite you to take part in a research study which aims to investigate whether or not different approaches can encourage desk-based staff to make more frequent changes to their posture. We know that spending too long sitting at a desk is not the best thing for our bodies, but it is very easy to become engrossed in work and forget to move.

Getting up regularly to give our backs, necks and arms a postural change has been recommended for a long time, with benefits like increased energy levels and reduced fatigue often reported. However, for various reasons, desk based staff are typically not changing posture as often as they might. We are interested in whether the use of different techniques can encourage people to make more frequent postural changes at work in order to see the benefits this can bring.

This research is being undertaken by Dr Claire Williams (Principal Investigator and Registered Ergonomist) and Elaine Denning (Research Assistant) from the University of Derby see contact details at the end of this page. This research has been approved by a University of Derby Ethics Committee.

### **WHY HAVE YOU BEEN INVITED TO PARTICIPATE?**

You have been invited to take part as you are a member of staff working in an office type environment who uses a computer for the majority of your work. It is important to state that all data from this study is completely confidential the information about your individual behaviours will NOT be made available to your manager.

### **PRIZE DRAW**

Everyone who takes part in the research has the option to be entered into a prize draw to win a “Love to Shop” voucher – prizes are available for each participating company with a first prize of £100.00, second prize of £50.00 and 5 runner up prizes of £10.00 each. The winners from each company will be drawn by an independent person, at random, from a hat containing the unique participant codes of all the participants who complete the study. All participants will be informed when the prize draw has taken place.

### **WHAT DOES TAKING PART IN THE RESEARCH INVOLVE?**

Taking part in this research involves agreeing to wear a small movement sensor, called a BACK-TRACK device, which clips easily and discretely onto your waist band, or belt. The BACK-TRACK device is a sophisticated, motion sensing and data collection unit that will record the date, time and number of postural changes that you make throughout the day.

We would like you to wear the device each day for a couple of weeks at two different time points during the study. This means putting it on when you arrive at work and taking it off before you go home. We would also like you to upload the data from the device, usually at the end of each working day the data it collects can easily be uploaded in around 3 minutes.

In addition to wearing the BACK-TRACK device you will be asked to provide answers to some simple demographic questions (e.g. age, sex, job description), and a small number of other questions about yourself. These questions only need to be answered at the project set up and are included below – they should take around 5 minutes to complete. We will also ask you a few

other questions at weeks 2 and 14, which should not take you any more than about 5 minutes to complete at each time.

All information provided will be kept confidential and anonymity is guaranteed as each participant's data will be identified only by their unique, self generated participant code.

### **WHAT HAPPENS IF YOU DECIDE NOT TO TAKE PART OR CHANGE YOUR MIND?**

Although your input to this research will be extremely valuable, it is your choice whether you take part or not as participation is entirely voluntary. Should you decide you no longer want to take part, you are free to withdraw from the study at any time, before, during or after you have started. To withdraw from the study all you need do is contact the project team and provide your unique identifier.

However, if you do change your mind about having taken part, you can only withdraw from the study for up to 2 weeks after it has finished and no data which has been collected on you will be used by the research team. After this period, your data will have been incorporated into the main data set and you will have been entered into the prize draw.

You do not have to provide a reason for your decision to withdraw, participation is entirely voluntary and it is fine to change your mind. Electing not to complete the study or withdrawing from the study will have no consequences other than withdrawal from the research and the prize draw.

### **WHAT WILL HAPPEN TO THE INFORMATION THAT YOU GIVE?**

The information will be encrypted and stored securely in a database held offsite at BACK-TRACK. Only Dr Williams, Elaine Denning and the BACK-TRACK team will have access to it. The database is password protected and all data treated with strictest confidence in accordance with the Data Protection Act. The data will be kept indefinitely, and used solely for research purposes in that the results may be presented at conferences and used in academic publications.

### **WHERE CAN I GET MORE INFORMATION ABOUT THIS RESEARCH?**

If you would like more information about this research, please contact either Elaine Denning by email on E.Denning1@derby.ac.uk, or Dr Claire Williams on C.Williams3@derby.ac.uk, or by telephone on 01332 592124. You can also contact the project team via the Centre for Psychological Research, School of Science, University of Derby, Kedleston Road, Derby, DE22 1GB.

### **WHAT DO I DO IF I AM INTERESTED IN TAKING PART IN THE RESEARCH?**

You now need to create a participant code. This is done by using:

the first initial of your last name

followed by the last two digits of your year of birth

and then, the last two letters of your first name.

For example, if your name was Joe Bloggs and your year of birth was 1967, your participant code would be B67OE.

Please enter your participant code:

Please enter your name:

### **Statement of Informed Consent**

Please check each box to indicate you have read the statement.

I understand that I have agreed to participate in a research study investigating the impact of behaviour change techniques on the making of postural changes at work.

I have read the project information page and have been given an opportunity to ask questions via email and telephone about my participation in the study.

I understand that my participation in the study is entirely voluntary and I can withdraw at any time up to 2 weeks after data collection, and may do so without giving any reasons or explanations for doing so.

I understand that my personal data will be kept confidential and that all information collected for the research will be stored securely at BACK-TRACK on a password protected database and may be used in relevant academic publications and conference presentations.

I understand I will be entered into a prize draw in recognition of my participation. The prize draw will take place at the end of the study and I understand that the winners of the prize draw will be contacted directly.

I have read and understood this information and consent to take part in the study.

Email address to enable us to contact you with the study details:

Email address

Confirm email address

### **Entry into the prize draw**

I would like to be entered into the Love to Shop voucher prize draw      Yes      No

### **Preliminary Questions**

1. Gender

Male

Female

2. Are you a smoker?

Yes

No

3. Please indicate your age band

18-24

25-34

35-44

45-54

55-64

65-74

75+

4. Work pattern

Full time  
Part time

5. Contractual hours per week

6. Average hours worked per week

7. Please state your job title

8. Please state your job category

Executive  
Director  
Senior Management  
Management  
Professional & Specialist  
Administrative  
Technical Support  
Operational Support  
Other

If other (please specify)

9. Office location (Room number)

10. Pain

How much bodily pain have you had during the past 4 weeks?

None      Very mild      Mild      Moderate      Severe      Very severe

11. Pain 2

During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

Not at all      A little bit      Moderately      Quite a bit      Extremely

**Screening Questionnaire**

To ensure that you meet the study criteria, we need to know a little bit more about you with regard to some specific work and health related matters. Please could you provide answers to the following questions to enable us to confirm this. Any answers you give will be completely confidential and anonymous as this form will only be identifiable by your own unique participant number.

Please check the relevant box YES    NO

1. Are you a desk based employee working at least 3 days per week in the office?

2. Do you spend at least 5 hours per day using a computer at work?

3. Are you a permanent member of staff, or contracted for at least the next 6 months?
4. Do you anticipate that your job role will change within the next 6 months?
5. Have you recently returned to work following physical health problems, e.g., back pain?
6. Do you currently have modified work due to health problems?
7. Are you currently receiving any form of treatment in relation to any musculoskeletal problem, e.g., neck/shoulder pain, back pain?
8. Do you have a pacemaker fitted?
9. Are you aware of anything that might prevent you from wearing the BACK-TRACK device on your waistband? For example, if you were pregnant you might find it difficult to attach the device.

If yes to question 9 above please provide brief details below.

Thank you very much for completing this questionnaire and agreeing to take part. One of the research team will be in touch with you shortly to confirm whether or not you are eligible to take part in the study. Eligibility is based purely on your answers to the questions above. If you are not able to take part an explanation for the reason why will be given.

## Appendix 2: Intervention A questionnaire

Move More Study Intervention A

### Instructions for Participants

#### POSTURAL CHANGE BEHAVIOUR

##### Background Information

It is widely accepted that spending too long sitting at a desk is not the best thing for our bodies. Getting up regularly to give our backs, necks and arms a postural change has been recommended for a long time.

These postural changes don't need to be long (30 seconds can be long enough) and they don't need to be out of the office – you can simply get up and move where you are at your desk so as not to interrupt your work. They do need to give us the chance to change the loading on our bodies from a sitting position to a standing position, at least once every hour.

Generally, people are bad at ensuring they make sufficient postural changes in a day as it is very easy to become engrossed in work and forget to move. Making more frequent postural changes should be an important goal for desk-based staff.

##### WHAT ACTION WOULD WE LIKE YOU TO TAKE?

**Please aim to make more daily postural changes over the coming months.**

Just to clarify exactly what we mean by a postural change, this simply involves changing the loading on your body from a sitting position to a standing position, for a minimum of 30 seconds, at least once every hour during the course of your working day. In other words, whilst you're working you need to stand up and move a bit more often.

Ultimately, the demands of your job will dictate how you incorporate more postural changes into your daily work routine. For example, if you are a call centre worker you could stand up when talking on the phone whilst moving from foot to foot, and/or walking the area near your desk.

Alternatively, if you are a manager and need to discuss something with a colleague, or go to a meeting the walk will count as a postural change.

Whatever your job, you should aim to make postural changes at least once an hour. For example, if you made a postural change at 9.15 then you would need to make another no later than 10.15, and so on.

##### WHAT SHOULD YOU DO NOW?

1. Please tick the box below to confirm that you understand what you need to do.
2. Please complete the following one page questionnaire and submit it by pressing "done" at the end.
3. Try to make more postural changes over the coming months.
4. Continue to wear your device and upload your data regularly.

Many thanks.

Please check the box to confirm you understand what you need to do.

Yes I understand what I am being asked to do.

### Questionnaire

Please read each statement carefully and answer by checking the response that most accurately describes what you think. There are no right or wrong answers we are simply interested in your personal thoughts.

1. Please rate the question below based on a 1-7 scale where 1 is Bad and 7 is Good.

My making regular postural changes at least once every hour whilst at work during the next six months would be

Bad    1 2 3 4 5 6 7    Good

2. Please rate the question below based on a 1-7 scale where 1 is Pleasant and 7 is Unpleasant.

My making regular postural changes at least once every hour whilst at work during the next six months would be

Pleasant    1 2 3 4 5 6 7    Unpleasant

3. Please rate the question below based on a 1-7 scale where 1 is Agree and 7 is Disagree.

Most people who are important to me approve of my making regular postural changes at least once every hour whilst at work during the next six months

Agree    1 2 3 4 5 6 7    Disagree

4. Please rate the question below based on a 1-7 scale where 1 is Unlikely and 7 is Likely.

Most people like me make regular postural changes at least once every hour whilst at work

Unlikely    1 2 3 4 5 6 7    Likely

5. Please rate the question below based on a 1-7 scale where 1 is True and 7 is False.

I am confident that I can make regular postural changes at least once every hour whilst at work during the next six months

True    1 2 3 4 5 6 7    False

6. Please rate the question below based on a 1-7 scale where 1 is Disagree and 7 is Agree.

Making regular postural changes at least once every hour whilst at work during the next six months is up to me

Disagree 1 2 3 4 5 6 7 Agree

7. Please rate the question below based on a 1-7 scale where 1 is Definitely do and 7 is Definitely do not.

I intend to make regular postural changes at least once every hour whilst at work during the next six months

Definitely Do 1 2 3 4 5 6 7 Definitely Do Not

8. Please rate the question below based on a 1-7 scale where 1 is Definitely False and 7 is Definitely True.

I will make an effort to make regular postural changes at least once every hour whilst at work during the next six months

Definitely False 1 2 3 4 5 6 7 Definitely True

9. Please rate the question below based on a 1-7 scale where 1 is Definitely will not and 7 is Definitely will.

I will try to make regular postural changes at least once every hour whilst at work during the next six months

Definitely Will Not 1 2 3 4 5 6 7 Definitely Will

Thank you for completing this questionnaire.

If you have any queries, or are still unsure about what you should be doing please contact Elaine Denning either by email or telephone (E.Denning1@derby.ac.uk 01332 592124) and she will advise you.

## Appendix 3: Intervention B questionnaire

Move More Study Intervention B

### Instructions for Participants

#### POSTURAL CHANGE BEHAVIOUR

##### Background Information

It is widely accepted that spending too long sitting at a desk is not the best thing for our bodies. Getting up regularly to give our backs, necks and arms a postural change has been recommended for a long time.

These postural changes don't need to be long (30 seconds can be long enough) and they don't need to be out of the office – you can simply get up and move where you are at your desk so as not to interrupt your work. They do need to give us the chance to change the loading on our bodies from a sitting position to a standing position, at least once every hour.

Generally, people are bad at ensuring they make sufficient postural changes in a day as it is very easy to become engrossed in work and forget to move. Making more frequent postural changes should be an important goal for desk-based staff.

##### WHAT ACTION WOULD WE LIKE YOU TO TAKE?

**Please aim to make more daily postural changes over the coming months.**

Just to clarify exactly what we mean by a postural change, this simply involves changing the loading on your body from a sitting position to a standing position, for a minimum of 30 seconds, at least once every hour during the course of your working day. In other words, whilst you're working you need to stand up and move a bit more often.

Ultimately, the demands of your job will dictate how you incorporate more postural changes into your daily work routine. For example, if you are a call centre worker you could stand up when talking on the phone whilst moving from foot to foot, and/or walking the area near your desk.

Alternatively, if you are a manager and need to discuss something with a colleague, or go to a meeting the walk will count as a postural change.

Whatever your job, you should aim to make postural changes at least once an hour. For example, if you made a postural change at 9.15 then you would need to make another no later than 10.15, and so on.

To help you, we would like you to write an "if...then"... statement, where the "then" is the goal of making a postural change, and the "if" is a cue to remind you to make the postural change. Writing more than one statement can help to support you in achieving this goal.

Some examples might be

"If" the clock reaches the hour "then" I will make a postural change by standing up to do some filing/admin duties/make a phone call.

"If" my phone rings "then" I will make a postural change by standing up whilst I'm talking.

"If" I need to speak to a colleague "then" I will make a postural change by walking to their office.

To support you in your particular "if-then" statement, the BACK-TRACK device you are wearing will be set to vibrate if no postural changes have been made for an hour. You might like to incorporate this into one of the "if-then" statements that you will write.

For example

"If" the BACK-TRACK device vibrates "then" I will make a postural change by standing up to make a phone call.

### **WHAT SHOULD YOU DO NOW?**

1. Please tick the box below to confirm that you understand what you need to do.
2. Please complete the following one page questionnaire.
3. In the space provided please write the "if-then" statements that you will aim to implement over the coming months and then submit the whole questionnaire by pressing "done" at the end.
4. Continue to wear your device and upload your data regularly.

Many thanks.

Please check the box to confirm you understand what you need to do.

Yes I understand what I am being asked to do.

### **Questionnaire**

Please read each statement carefully and answer by checking the response that most accurately describes what you think. There are no right or wrong answers we are simply interested in your personal thoughts.

1. Please rate the question below based on a 1-7 scale where 1 is Bad and 7 is Good.

My making regular postural changes at least once every hour whilst at work during the next six months would be

Bad      1 2 3 4 5 6 7      Good

2. Please rate the question below based on a 1-7 scale where 1 is Pleasant and 7 is Unpleasant.

My making regular postural changes at least once every hour whilst at work during the next six months would be

Pleasant      1 2 3 4 5 6 7      Unpleasant

3. Please rate the question below based on a 1-7 scale where 1 is Agree and 7 is Disagree.

Most people who are important to me approve of my making regular postural changes at least once every

Agree      1 2 3 4 5 6 7      Disagree

hour whilst at work during the next six months

4. Please rate the question below based on a 1-7 scale where 1 is Unlikely and 7 is Likely.

Most people like me make regular postural changes at least once every hour whilst at work

Unlikely    1   2   3   4   5   6   7    Likely

5. Please rate the question below based on a 1-7 scale where 1 is True and 7 is False.

I am confident that I can make regular postural changes at least once every hour whilst at work during the next six months

True    1   2   3   4   5   6   7    False

6. Please rate the question below based on a 1-7 scale where 1 is Disagree and 7 is Agree.

Making regular postural changes at least once every hour whilst at work during the next six months is up to me

Disagree    1   2   3   4   5   6   7    Agree

7. Please rate the question below based on a 1-7 scale where 1 is Definitely do and 7 is Definitely do not.

I intend to make regular postural changes at least once every hour whilst at work during the next six months

Definitely Do    1   2   3   4   5   6   7    Definitely Do Not

8. Please rate the question below based on a 1-7 scale where 1 is Definitely False and 7 is Definitely True.

I will make an effort to make regular postural changes at least once every hour whilst at work during the next six months

Definitely False    1   2   3   4   5   6   7    Definitely True

9. Please rate the question below based on a 1-7 scale where 1 is Definitely will not and 7 is Definitely will.

I will try to make regular postural changes at least once every hour whilst at work during the next six months

Definitely Will Not    1   2   3   4   5   6   7    Definitely Will

In the space provided please write the "if-then" statements that you will aim to implement over the coming months to help you achieve your goal of making more daily postural changes. Ideally, writing more than one statement can help to support you in achieving this goal.

Please write your "if-then" statements using the format shown in the examples below ("if"... "then"... ) by specifying the situation (the "if" bit) and then how you will make the postural change in that situation (the "then" bit).

You can use the examples shown, or create your own. Please also make sure you familiarise yourself with your "if-then" plans before submitting them.

#### Examples

"if" the phone rings "then" I will stand up whilst I'm talking

"if" the clock reaches the hour "then" I will stand up to do some filing/admin duties/make a phone call

"If" I need to speak to a colleague "then" I will walk to their office

Thank you for completing this questionnaire.

If you have any queries, or are still unsure about what you should be doing please contact Elaine Denning either by email or telephone (E.Denning1@derby.ac.uk 01332 592124) and she will advise you.

## Appendix 4: Intervention C questionnaire

Move More Study Intervention C

### Instructions for Participants

#### POSTURAL CHANGE BEHAVIOUR

##### Background Information

It is widely accepted that spending too long sitting at a desk is not the best thing for our bodies. Getting up regularly to give our backs, necks and arms a postural change has been recommended for a long time.

These postural changes don't need to be long (30 seconds can be long enough) and they don't need to be out of the office – you can simply get up and move where you are at your desk so as not to interrupt your work. They do need to give us the chance to change the loading on our bodies from a sitting position to a standing position, at least once every hour.

Generally, people are bad at ensuring they make sufficient postural changes in a day as it is very easy to become engrossed in work and forget to move. Making more frequent postural changes should be an important goal for desk-based staff.

##### WHAT ACTION WOULD WE LIKE YOU TO TAKE?

**Please aim to make more daily postural changes over the coming months.**

Just to clarify exactly what we mean by a postural change, this simply involves changing the loading on your body from a sitting position to a standing position, for a minimum of 30 seconds, at least once every hour during the course of your working day. In other words, whilst you're working you need to stand up and move a bit more often.

Ultimately, the demands of your job will dictate how you incorporate more postural changes into your daily work routine. For example, if you are a call centre worker you could stand up when talking on the phone whilst moving from foot to foot, and/or walking the area near your desk.

Alternatively, if you are a manager and need to discuss something with a colleague, or go to a meeting the walk will count as a postural change.

Whatever your job, you should aim to make postural changes at least once an hour. For example, if you made a postural change at 9.15 then you would need to make another no later than 10.15, and so on.

To help you, we would like you to write an "if...then"... statement, where the "then" is the goal of making a postural change, and the "if" is a cue to remind you to make the postural change. Writing more than one statement can help to support you in achieving this goal.

Some examples might be

"If" the clock reaches the hour "then" I will make a postural change by standing up to do some filing/admin duties/make a phone call.

"If" my phone rings "then" I will make a postural change by standing up whilst I'm talking.

"If" I need to speak to a colleague "then" I will make a postural change by walking to their office.

To support you in your particular "if-then" statement, the BACK-TRACK device you are wearing will be set to vibrate if no postural changes have been made for an hour. You might like to incorporate this into one of the "if-then" statements that you will write.

For example

"If" the BACK-TRACK device vibrates "then" I will make a postural change by standing up to make a phone call.

### **WHAT SHOULD YOU DO NOW?**

1. Please tick the box below to confirm that you understand what you need to do.
2. Please complete the following one page questionnaire.
3. In the space provided please write the "if-then" statements that you will aim to implement over the coming months and then submit the whole questionnaire by pressing "done" at the end.
4. Continue to wear your device and upload your data regularly.

Many thanks.

Please check the box to confirm you understand what you need to do.

Yes I understand what I am being asked to do.

### **Questionnaire**

Please read each statement carefully and answer by checking the response that most accurately describes what you think. There are no right or wrong answers we are simply interested in your personal thoughts.

1. Please rate the question below based on a 1-7 scale where 1 is Bad and 7 is Good.

My making regular postural changes at least once every hour whilst at work during the next six months would be

Bad    1 2 3 4 5 6 7    Good

2. Please rate the question below based on a 1-7 scale where 1 is Pleasant and 7 is Unpleasant.

My making regular postural changes at least once every hour whilst at work during the next six months would be

Pleasant    1 2 3 4 5 6 7    Unpleasant

3. Please rate the question below based on a 1-7 scale where 1 is Agree and 7 is Disagree.

Most people who are important to me approve of my making regular postural changes at least once every

Agree    1 2 3 4 5 6 7    Disagree

hour whilst at work during the next six months

4. Please rate the question below based on a 1-7 scale where 1 is Unlikely and 7 is Likely.

Most people like me make regular postural changes at least once every hour whilst at work

Unlikely    1   2   3   4   5   6   7    Likely

5. Please rate the question below based on a 1-7 scale where 1 is True and 7 is False.

I am confident that I can make regular postural changes at least once every hour whilst at work during the next six months

True    1   2   3   4   5   6   7    False

6. Please rate the question below based on a 1-7 scale where 1 is Disagree and 7 is Agree.

Making regular postural changes at least once every hour whilst at work during the next six months is up to me

Disagree    1   2   3   4   5   6   7    Agree

7. Please rate the question below based on a 1-7 scale where 1 is Definitely do and 7 is Definitely do not.

I intend to make regular postural changes at least once every hour whilst at work during the next six months

Definitely Do    1   2   3   4   5   6   7    Definitely Do Not

8. Please rate the question below based on a 1-7 scale where 1 is Definitely False and 7 is Definitely True.

I will make an effort to make regular postural changes at least once every hour whilst at work during the next six months

Definitely False    1   2   3   4   5   6   7    Definitely True

9. Please rate the question below based on a 1-7 scale where 1 is Definitely will not and 7 is Definitely will.

I will try to make regular postural changes at least once every hour whilst at work during the next six months

Definitely Will Not    1   2   3   4   5   6   7    Definitely Will

In the space provided please write the "if-then" statements that you will aim to implement over the coming months to help you achieve your goal of making more daily postural changes. Ideally, writing more than one statement can help to support you in achieving this goal.

Please write your "if-then" statements using the format shown in the examples below ("if"... "then"... ) by specifying the situation (the "if" bit) and then how you will make the postural change in that situation (the "then" bit).

You can use the examples shown, or create your own. Please also make sure you familiarise yourself with your "if-then" plans before submitting them.

#### Examples

"if" the phone rings "then" I will stand up whilst I'm talking

"if" the clock reaches the hour "then" I will stand up to do some filing/admin duties/make a phone call

"If" I need to speak to a colleague "then" I will walk to their office

"If" the BACK-TRACK device vibrates "then" I will stand up to make a phone call

Thank you for completing this questionnaire.

If you have any queries, or are still unsure about what you should be doing please contact Elaine Denning either by email or telephone (E.Denning1@derby.ac.uk 01332 592124) and she will advise you.

## Appendix 5: Intervention D questionnaire

Move More Study Intervention D

### Instructions for Participants

#### POSTURAL CHANGE BEHAVIOUR

##### Background Information

It is widely accepted that spending too long sitting at a desk is not the best thing for our bodies. Getting up regularly to give our backs, necks and arms a postural change has been recommended for a long time.

These postural changes don't need to be long (30 seconds can be long enough) and they don't need to be out of the office – you can simply get up and move where you are at your desk so as not to interrupt your work. They do need to give us the chance to change the loading on our bodies from a sitting position to a standing position, at least once every hour.

Generally, people are bad at ensuring they make sufficient postural changes in a day as it is very easy to become engrossed in work and forget to move. Making more frequent postural changes should be an important goal for desk-based staff.

##### WHAT ACTION WOULD WE LIKE YOU TO TAKE?

**Please aim to make more daily postural changes over the coming months.**

Just to clarify exactly what we mean by a postural change, this simply involves changing the loading on your body from a sitting position to a standing position, for a minimum of 30 seconds, at least once every hour during the course of your working day. In other words, whilst you're working you need to stand up and move a bit more often.

Ultimately, the demands of your job will dictate how you incorporate more postural changes into your daily work routine. For example, if you are a call centre worker you could stand up when talking on the phone whilst moving from foot to foot, and/or walking the area near your desk.

Alternatively, if you are a manager and need to discuss something with a colleague, or go to a meeting the walk will count as a postural change.

Whatever your job, you should aim to make postural changes at least once an hour. For example, if you made a postural change at 9.15 then you would need to make another no later than 10.15, and so on.

To support you in your goal of making more postural changes the BACK-TRACK device you are wearing will be set to vibrate if no postural changes have been made for an hour to prompt you to make a postural change.

##### WHAT SHOULD YOU DO NOW?

1. Please tick the box below to confirm that you understand what you need to do.
2. Please complete the following one page questionnaire and submit it by pressing "done" at the end.
3. Try to make more postural changes over the coming months.

4. Continue to wear your device and upload your data regularly.  
Many thanks.

Please check the box to confirm you understand what you need to do.

Yes I understand what I am being asked to do.

### Questionnaire

Please read each statement carefully and answer by checking the response that most accurately describes what you think. There are no right or wrong answers we are simply interested in your personal thoughts.

1. Please rate the question below based on a 1-7 scale where 1 is Bad and 7 is Good.

My making regular postural changes at least once every hour whilst at work during the next six months would be

Bad	1	2	3	4	5	6	7	Good
-----	---	---	---	---	---	---	---	------

2. Please rate the question below based on a 1-7 scale where 1 is Pleasant and 7 is Unpleasant.

My making regular postural changes at least once every hour whilst at work during the next six months would be

Pleasant	1	2	3	4	5	6	7	Unpleasant
----------	---	---	---	---	---	---	---	------------

3. Please rate the question below based on a 1-7 scale where 1 is Agree and 7 is Disagree.

Most people who are important to me approve of my making regular postural changes at least once every hour whilst at work during the next six months

Agree	1	2	3	4	5	6	7	Disagree
-------	---	---	---	---	---	---	---	----------

4. Please rate the question below based on a 1-7 scale where 1 is Unlikely and 7 is Likely.

Most people like me make regular postural changes at least once every hour whilst at work

Unlikely	1	2	3	4	5	6	7	Likely
----------	---	---	---	---	---	---	---	--------

5. Please rate the question below based on a 1-7 scale where 1 is True and 7 is False.

I am confident that I can make regular postural changes at least once every hour whilst at work during the next six months

True	1	2	3	4	5	6	7	False
------	---	---	---	---	---	---	---	-------

6. Please rate the question below based on a 1-7 scale where 1 is Disagree and 7 is Agree.

Making regular postural changes at least once every hour whilst at work during the next six months is up to me

Disagree    1   2   3   4   5   6   7    Agree

7. Please rate the question below based on a 1-7 scale where 1 is Definitely do and 7 is Definitely do not.

I intend to make regular postural changes at least once every hour whilst at work during the next six months

Definitely Do    1   2   3   4   5   6   7    Definitely Do Not

8. Please rate the question below based on a 1-7 scale where 1 is Definitely False and 7 is Definitely True.

I will make an effort to make regular postural changes at least once every hour whilst at work during the next six months

Definitely False    1   2   3   4   5   6   7    Definitely True

9. Please rate the question below based on a 1-7 scale where 1 is Definitely will not and 7 is Definitely will.

I will try to make regular postural changes at least once every hour whilst at work during the next six months

Definitely Will Not    1   2   3   4   5   6   7    Definitely Will

Thank you for completing this questionnaire.

If you have any queries, or are still unsure about what you should be doing please contact Elaine Denning either by email or telephone (E.Denning1@derby.ac.uk 01332 592124) and she will advise you.

## Appendix 6: Follow up questionnaire

### Move More Study - Follow Up Questionnaire

#### Final Questionnaire

1. Have you developed any type of musculoskeletal condition since you started the study? For example, neck, back, or shoulder problems.

Yes  
No

2. If yes, please provide brief details below.

3. Have there been any organisational changes since you started the study? For example, have you moved offices, changed desks or changed job?

Yes  
No

4. If yes, please provide brief details below.

5. Are you aware of anything else that might prevent you from wearing the BACK-TRACK device? For example, if you were heavily pregnant you may not be able to attach the device to your waistband.

Yes  
No

6. If yes, please provide brief details below.

7. Pain

How much bodily pain have you had during the past 4 weeks?

None      Very mild      Mild      Moderate      Severe      Very severe

8. Pain 2

During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

Not at all      A little bit      Moderately      Quite a bit      Extremely

Please read each statement below carefully and answer by checking the response that most accurately describes what you think. There are no right or wrong answers - we are simply interested in your personal thoughts.

9. Please rate the question below based on a 1-7 scale where 1 is Bad and 7 is Good.

My making regular postural changes at least once every      Bad      1      2      3      4      5      6      7      Good

hour whilst at work during the next two weeks would be

10. Please rate the question below based on a 1-7 scale where 1 is Pleasant and 7 is Unpleasant.

My making regular postural changes at least once every hour whilst at work during the next two weeks would be

Pleasant    1 2 3 4 5 6 7    Unpleasant

11. Please rate the question below based on a 1-7 scale where 1 is Agree and 7 is Disagree.

Most people who are important to me approve of my making regular postural changes at least once every hour whilst at work during the next two weeks

Agree    1 2 3 4 5 6 7    Disagree

12. Please rate the question below based on a 1-7 scale where 1 is Unlikely and 7 is Likely.

Most people like me make regular postural changes at least once every hour whilst at work

Unlikely    1 2 3 4 5 6 7    Likely

13. Please rate the question below based on a 1-7 scale where 1 is True and 7 is False.

I am confident that I can make regular postural changes at least once every hour whilst at work during the next two weeks

True    1 2 3 4 5 6 7    False

14. Please rate the question below based on a 1-7 scale where 1 is Disagree and 7 is Agree.

Making regular postural changes at least once every hour whilst at work during the next two weeks is up to me

Disagree    1 2 3 4 5 6 7    Agree

15. Please rate the question below based on a 1-7 scale where 1 is Definitely do and 7 is Definitely do not.

I intend to make regular postural changes at least once every hour whilst at work during the next two weeks

Definitely Do    1 2 3 4 5 6 7    Definitely Do Not

16. Please rate the question below based on a 1-7 scale where 1 is Definitely False and 7 is Definitely True.

I will make an effort to make regular postural changes at least once every hour whilst at work during the next two weeks

Definitely False    1   2   3   4   5   6   7    Definitely True

17. Please rate the question below based on a 1-7 scale where 1 is Definitely will not and 7 is Definitely will.

I will try to make regular postural changes at least once every hour whilst at work during the next two weeks

Definitely Will Not    1   2   3   4   5   6   7    Definitely Will

18. Please indicate below whether or not you would like to take part in a Focus Group Session. You will receive a £10.00 'Love to Shop' voucher in addition to entry into the main prize draw.

Yes I am interested in taking part in a Focus Group Session.

No I am not interested in taking part in a Focus Group Session.

Thank you for completing this questionnaire.

## Appendix 7: Focus group interview schedule

### Focus Group Interview Schedule

1. Did you find that the intervention encouraged you to make more postural changes, and if so please explain why?
  - Do you think the intervention aided you in some way, and if so please explain why?
2. In the light of what your individual data shows:-  
  
If you were/were not making more regular postural changes, please could you explain why you think that might be?
  - Did something hinder you, or make it more difficult to make regular postural changes?
  - Do you think the interventions were practical for your type of job?
3. Have you any suggestions as to how the interventions could be improved in relation to your job?
4. Has this project made you think differently about your body at work?
  - In what way?
5. Have you any other comments to make generally about this research project?
  - How did you find taking part in the research study?
  - Did you find it useful/helpful in any way?
  - Or did you think it was pointless/not very worthwhile?
6. Do you think these interventions would be a useful addition to the company's health and safety training and information materials?
  - What would be the best way for the company to make staff aware of these interventions?

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IOSH is the Chartered body for health and safety professionals. With around 44,000 members in 100 countries, we're the world's largest professional health and safety organisation.

We set standards, and support, develop and connect our members with resources, guidance, events and training. We're the voice of the profession, and campaign on issues that affect millions of working people.

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