# The end of the active work break? Remote work, sedentariness and the role of technology in creating active break-taking norms

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Excessive sedentariness can impair workers' health and productivity. The move to working from home as a result of the Covid-19 pandemic eliminated many workday opportunities for physical activity. This, coupled with a blurring of boundaries between work and non-work periods, put many at risk of overwork and musculoskeletal issues. We examined how the sudden transition to working from home influenced people's ability to take physically active work breaks. We found that the absence of social norms associated with the presence of colleagues in the work environment left workers uncertain about whether and when it is appropriate to take breaks. The pressure to demonstrate productivity while working asynchronously led to increased sedentariness and decreased break-taking. We propose that online tools that promote flexible social norms around break-taking could empower remote workers to incorporate regular physical activity into their days, without compromising the beneficial aspects of asynchronous working.

CCS Concepts: • **Human-centered computing → Empirical studies in HCI**.

Additional Key Words and Phrases: Sedentariness, active breaks, break-taking, remote work, working from home, Covid-19, pandemic

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## 1 INTRODUCTION

In addition to the abundance of studies exploring the importance and efficacy of post-work recovery [11, 12, 56, 57], there has recently been an increased interest in the impact of breaks during the workday [22, 63]. Such breaks are beneficial for both mental recovery and physical health. Work breaks that incorporate physical activity can be particularly helpful in preventing the negative health consequences associated with prolonged sedentariness [21] that office workers are at risk of [49].

Having rapidly transitioned to working from home because of the Covid-19 pandemic, millions of workers had to adjust to a wholly different work environment [45, 54]. Research has documented the impact that this had on workers' ability to feel in control of their working days and successfully complete tasks. For many people, transitioning away from their physical office put a strain on their ability to maintain a good work-life balance [47].

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During the Covid-19 pandemic, many people experienced a reduction in their overall activity levels [40]. The loss of the commute and migration of leisure activities to screens, as a result of restrictions related to the pandemic, presents a challenge to maintaining a healthy balance between movement and sedentariness. This paper details how the shift to working from home affected people's ability to incorporate movement into their workdays and as a result avoid long periods of sedentariness. This account is not meant to negate the benefits of working from home, of which many are well documented, but rather to emphasise what needs to done to facilitate a smoother transition to home working and promote home workers' well-being. We also make suggestions about how future research needs to consider the new ways of working that people are adopting now. This will be of paramount importance as we move to a hybrid working model [45].

We set out to understand the role of physically active breaks in the working lives of people who had previously worked in offices but transitioned to working from home during the Covid-19 pandemic. We analysed data collected through an online survey to understand how the sudden transition to remote working impacted workers' needs and opportunities to take physically active breaks. We found that the social norms created by a shared office environment supported a balance between periods of work and periods of rest, and that the office environment itself afforded many opportunities for movement. We argue that the way remote workers use and interact with technology to accomplish work tasks while working from home shifts the responsibility for break-taking —a responsibility that, in the office, tends to be mediated collectively— to the individual. Participants in our study, having experienced a sudden shift to remote working, struggled with break-taking in the absence of cues, habits and social norms. This resulted in excessive sedentariness and overwork. Based on these findings, we suggest tools and design guidelines to promote flexible social norms and the social acceptability of break-taking during the workday. Such tools would promote healthier habits among remote workers.

## 2 TOO LITTLE MOVEMENT, TOO MUCH SITTING

### 2.1 Risks associated with sedentariness

Much research has linked excessive sedentary behaviour with negative health outcomes. There is variation in how researchers define sedentary behaviour, with some focusing solely on low-intensity activity, and others emphasising the importance of a sitting or reclining component [25]. However, a meta-analysis of studies has shown that, irrespective of how sedentary behaviour is measured, it is linked to a 73% increase in the odds of developing a metabolic syndrome [20], a combination of diabetes, high blood pressure and obesity. All these conditions, in isolation, can damage the circulatory system, however, they are particularly dangerous when combined [46]. An overview of 27 systematic reviews of the impact of sedentary behaviour concluded that there is strong evidence for a relationship between sedentariness and obesity in children as well as between sedentary behaviour and all-cause mortality, fatal and non-fatal cardiovascular disease, type 2 diabetes and metabolic syndrome in adults [53]. Being sedentary is bad for people's physical health.

### 2.2 The benefits of physical activity

Physical activity has been consistently linked with positive mental health outcomes [19]. Exercise can effectively diminish symptoms of depression and anxiety in non-clinical populations [51], as well as being a viable treatment for depression and panic attacks [59]. Exercising is equally important for physical health. Regular physical activity supports multiple positive physical health outcomes. Research has also demonstrated that exercise can lead to an improvement in sleep quality [71]. This is of particular importance for workers as research shows that the impact of exercise on

sleep patterns could also indirectly support work productivity, with a recent diary study demonstrating that short self-initiated breaks were only associated with improved well-being and productivity for workers who slept well, and not for those who were sleep-deprived [34].

### 2.3 The trap of prolonged sitting

Despite many health benefits of exercise, exercising during leisure time alone cannot always counteract the negative health impact of an otherwise sedentary lifestyle. Excessive sitting can result in an increase in all-cause mortality and, while this can be counteracted with high levels of physical activity (60-75 minutes per day), the risk stemming from TV-viewing can only be attenuated [21]. Uninterrupted sitting is also associated with musculoskeletal pain [43]. In a study conducted by Womersley and May [70], participants with back pain reported significantly longer periods of uninterrupted sitting, and in more relaxed and flexed positions, than individuals without back pain; these findings may suggest the role of bad habits for the development of back pain as a result of sitting. However, there is a lack of consensus about what constitutes an optimal sitting position, as this may differ across individuals [10]. On the other hand, interruptions to prolonged sitting have been effective in decreasing the incidence of back pain [31], suggesting that preventing long periods of uninterrupted sedentary behaviour is key in counteracting back issues. The UK's National Health Service advises that adults aged 19 to 64 should try to spend less time sitting during the day and set a reminder to get up every 30 minutes [46].

## 3 STEPPING AWAY FROM THE DESK

### 3.1 A need for active breaks during the workday

Despite the time taken out of the workday, workers who take breaks have been found to complete more tasks than those who do not take breaks [22]. Physical activity during the workday has been shown to aid productivity. In a randomised cross-over trial among a group of white-collar workers, studying the impact of exercising during the workday, researchers found that on days when workers exercised during work hours, they reported improved mood and productivity [17]. Moreover, taking physically active breaks can help workers manage fatigue and sustain optimal energy levels [4]. It has been suggested that breaks from work should be utilised as an opportunity to exercise, possibly as a way of replacing some of the less positive behaviours prevalent during work breaks, such as smoking cigarettes or excessive snacking [61].

Encouraging physical activity during the workday and counteracting prolonged sedentary behaviour is especially important for office workers, a population that spends 80 per cent of their workday sitting [49]. Many office workers suffer from back pain — according to reports from the Labour Force Survey, in the survey year 2018/19, work-related musculoskeletal disorders resulted in 6.9 million of lost working days in the UK. Waongenngarm et al. [68] conducted a systematic review of interventions addressing back pain in office workers. They found that active breaks that incorporate postural change can be effective not only in managing discomfort for people with existing back pain, but also in preventing pain. Researcher have found that although sedentariness can be successfully tacked via smartphone apps, smartphone reminders can be context insensitive [52].

### 3.2 Barriers to active breaks at work

Several factors have been identified as barriers to taking physically active breaks during the workday in offices. For example, a recent qualitative study found that the structure of the working day, workplace culture and concerns

about lost time stopped people from participating in exercise during the workday [55]. Planchard et al. [50] group barriers to physical activity at work into three categories, physical, psychological and environmental, with the latter two more commonly reported by the participants. Oliver et al. [48] argue that research looking at the effectiveness of different strategies to encourage health-enhancing breaks at work does not sufficiently engage with workers' views and perceptions. Koehne et al. [33] have previously demonstrated the way remote workers need to establish their own rhythms and routines when working with a co-located team; such issues are now very different, with some workers remaining remote, and many others returning to offices.

## 4 BREAK-TAKING TECHNOLOGIES

Prior HCI work has demonstrated a number of workplace technologies aimed at supporting break-taking. Broadly they make use of three key elements: break prompting, creating awareness and leveraging social elements.

### 4.1 Break prompting

Stephenson *et al.* presented a meta analysis on computer and mobile interventions designed to combat sedentary behaviour. They found that most interventions use a combination of tracking sedentary time and a variety of prompts to encourage regular breaks [58]. For example, presenting timed prompts to workers can result in shorter sessions of extended sitting [23]. In previous research, many variations of this kind of system have been explored, including balancing longer breaks and microbreaks [42], using ambient progress monitors [67] or design for autonomy and minimal distraction [38]. Time For Break used timed breaks set by the individual workers and then offered minimal visual notifications suggesting that the worker took a break from their work [38]. Overall, these systems can be effective in improving break-taking, however presenting additional distractions to workers can lead to disrupted flow and lessen productivity.

### 4.2 Sedentary awareness

Other systems aim to help workers form a habit of staying physically active by increasing their awareness of their inactivity and offering active break advice. For example, by addressing "cyber-slacking" through website blocking and using a chatbot interface to navigate such a tool has been shown to help workers reflect on how they spend their breaks [64]. Furthermore, BreakSense could sense when a worker was taking a break and would give suggestions and challenges to encourage a more active break [8]. Finally, ambient glanceable displays have been shown to be effective at encouraging more activity during the day [15]. However, while such interfaces can help increase people's awareness of their inactivity, they offer no in-the-moment support for deciding when to take a break.

### 4.3 Use of social elements

Finally, a key element used in workplace settings to encourage activity are the inherent social elements embedded in the work environment. Social step goal challenges are frequently used and can help build accountability and become a kind of social currency [27]. More directly, the activity of others in the workplace can be displayed to an individual worker, to encourage them to be more active themselves [7], or even direct messages can be sent to workers, encouraging them to join their colleagues currently on a break [32].

## 5 PHYSICAL ACTIVITY DURING THE COVID-19 PANDEMIC

The introduction of lockdowns in Spring 2020 not only caused people's activity levels to decrease during the lockdown itself; reduced activity levels persisted even after lockdowns were, to a degree, lifted. McCarthy, Potts and Fisher [40] studied a sample of 5395 individuals who used a tracking app *BetterPoints*. Comparing physical activity before lockdown and in the first week of Covid-19 restrictions, they identified a significant decrease in the levels of physical activity among 63% of their participants. The drop in physical activity was particularly salient among younger people who were more active than older adults before the lockdown, but least active after the lockdown. Meanwhile, scientists argued for a heightened need to support physical activity during the Covid-19 pandemic, warning against the negative cardiovascular consequences of a sudden decrease in physical activity as a result of lockdown restrictions [37]. Researchers also highlighted the importance of physical activity during lockdown periods as a protective factor for mental health; a study conducted during lockdown in France and Switzerland demonstrated that, between weeks 2 and 4 of lockdown, an increase in sedentary behaviour during leisure time was linked to a decrease in physical and mental health, and a subjective reporting of a reduction in vitality [9].

## 6 CURRENT RESEARCH

As multiple companies consider retaining at least some of their remote work practices in the aftermath of Covid-19, identifying practical steps that can support employees' health while working from home will be crucial for protecting not only the economy but also the healthcare system, already strained by the pandemic. To help protect home workers from the negative health impact of excessive sedentary behaviour, it is important to examine whether and how transitioning away from the office and to working from home, influenced people's ability to interrupt sitting with bouts of activity. It should be noted that this paper does not aim to discount the benefits of working from home, but rather investigate specifically the changes in sedentary behaviour and workers' habits associated with taking active breaks, which can help attenuate that sedentariness. In this study, we set out to achieve a contextualised understanding of how the shift to working from home affected people's needs and opportunities to take physically active breaks during the workday. This contextualised understanding then gave us a basis for hypothesising about the kinds of digital tools that might be more or less effective in establishing active break-taking norms in remote work.

## 7 METHOD

### 7.1 Participants

Survey respondents were recruited through social media (Twitter, where we used paid advertisements, and Reddit), through word of mouth and via university newsletters, from among people who transitioned to working from home as a result of the Covid-19 pandemic. The recruitment opened on the 20th April 2020, approximately 4 weeks into the nationwide lockdown in the UK. We continued recruiting respondents for the current study through the 1st of September 2020. With the beginning of lockdown, people in the UK were subject to several restrictions: people were only allowed to exercise outdoors once per day until 11 May, schools did not begin reopening until 1 June, and pubs were closed until 4 July. Outdoor gyms reopened from 11 July and indoor gyms reopened from 25 July. A sample of n=426 participants (mean age = 40, 302 female, 106 male, 4 non-binary, 5 preferred to self-describe, and 9 undisclosed) completed the survey. The majority of our participants were employed (n=297 in full-time employment, n=47 in part-time employment, and n=13 self-employed). Sixty-three participants were in education, 5 were unemployed and seeking work, and 1 was retired. As our survey offered personalised advice on work-life balance and well-being while working from home, and

was advertised as such, our participant sample was likely to be skewed towards individuals who experienced difficulties as a result of the sudden shift to home-working during the pandemic.

### 7.2 Materials

The online survey consisted of a Participant Information Sheet, consent form compliant with the General Data Protection Regulation 2016 and the Data Protection Act 2018, 11 open-ended questions enquiring into the issues and strategies related to working from home during lockdown, and a Demographics section. It also included several scales (which fall outside the scope of this paper) and personalised productivity and digital work-life balance recommendations provided to the participants at the end of the survey.

Below, we list the 11 open-ended questions that elicited the data analysed in this study. We also list associated participant instructions, and the 3 yes/no questions that determined whether a particular open-ended question was displayed to a participant:

**Instructions:** To start we are going to ask you to reflect on some of the issues you are currently facing while working remotely. The goal of this exercise is to help you better understand some of difficulties you are facing, the reasons behind them and how this may effect your on-going work.

**Question 1 (open-ended):** Firstly, think about a situation in recent weeks where you have struggled with your work while working from home. Please describe this situation and what the cause of the disruption was. Perhaps it was related to your physical environment, or related to working online, or to being able to switch off from work at the end of the day, or any other issues you have experienced. Please describe in 1-4 sentences.

**Question 2 (yes/no):** Has your new working situation impacted the boundary you feel between your work life and you personal life?

**Question 3 (open-ended):** Think of an example of how your new working situation has impacted the boundary you feel between your work life and you personal life. (This question was displayed if participant responded yes to Question 2)

**Question 4 (yes/no):** Has your new working situation impacted your ability to focus on your work?

**Question 5 (open-ended):** Think of an example of how your new working situation impacted has your ability to focus on your work. (This question was displayed if participant responded yes to Question 4)

**Question 6 (yes/no):** Has your new working situation has made it difficult for you to switch off?

**Question 7 (open-ended):** Think of an example of how your new working situation has made it difficult for you to switch off. (This question was displayed if participant responded yes to Question 6)

**Instructions:** Now, think about how you have dealt with issues in the past, what about the change in circumstance has made it more difficult.

**Question 8 (open-ended):** How would you usually create and maintain work life boundaries? Can you think of an example solution you have used in the past? (This question was displayed if participant responded yes to Question 2)

**Question 9 (open-ended):** What is it you think makes this difficult or more difficult than it was before? (This question was displayed if participant responded yes to Question 2)

**Question 10 (open-ended):** How would you usually stay focused on your work? Can you think of an example solution you have used in the past? (This question was displayed if participant responded yes to Question 4)

**Question 11 (open-ended):** What is it you think makes this difficult or more difficult than it was before? (This question was displayed if participant responded yes to Question 4)

**Question 12 (open-ended):** How would you usually relax and recover after work? Can you think of an example solution you have used in the past? (This question was displayed if participant responded yes to Question 6)

**Question 13 (open-ended):** What is it you think makes this difficult or more difficult than it was before? (This question was displayed if participant responded yes to Question 6)

**Question 14 (open-ended):** What, if any, tools have you tried in the past to support your self control around focusing on work? How have they helped or not helped you address these issues?

### 7.3 Procedure

The advertised link allowed participants to access the online survey, hosted on the Qualtrics platform[1]. Following the Participant Information Sheet and consent form, participants were guided through a maximum of 11 open-ended questions (with yes/no guidance questions that determined whether a particular direction of enquiry was relevant to them). They then answered questions related to working style, which facilitated the provision of personalised advice, completed several scales outside of the scope of this paper, and answered demographic questions. Debriefing messages including personalised advice were provided both in the browser and via email.

### 7.4 Analysis

We set out to clarify whether and how transitioning to remote work as a result of the Covid-19 pandemic has influenced workers' needs and opportunities to take physically active breaks during the workday. The survey questions that facilitated the collection of qualitative data did not ask specifically about break-taking, but rather about the challenges and changes resulting from the transition to remote working. Therefore, to support this analysis, qualitative responses from 426 survey respondents were collated and reviewed for relevance to the current research aim. For the purpose of this analysis, we isolated data that pertained to physical activity, sedentariness, and taking breaks during the workday, as well as the nature of the workday itself both before and after the start of lockdown. These data were then analysed, using an inductive thematic analysis approach [6], following the steps recommended by Braun and Clarke: familiarisation with the data, generation of initial codes, searching for themes, reviewing themes, defining and naming themes, producing the report [5]. We identified 4 key themes and a total of 12 sub-themes:

Theme 1: The extended workday (sub-themes: Working more due to increased expectations; Working longer to compensate for procrastination and loss of focus; Working longer to accommodate childcare during the day; Working longer because I'm stuck at home; Working longer in absence of set office hours);

Theme 2: Taking a break became more difficult (sub-themes: Taking a break but feeling guilty; Workers felt digitally tethered; In-person signals in the office supported breaks);

Theme 3: When sitting becomes a problem (sub-themes: Sitting in pain);

Theme 4: A dramatic reduction in physical breaks (sub-themes: Loss of physical breaks; Difficulties in taking active breaks exacerbates anxiety; An active is not always a mental break).

## 8 RESULTS

We identified four key themes and a total of 12 sub-themes in the data we collected.

[1]https://www.qualtrics.com/support/survey-platform/distributions-module/collecting-responses/

### 8.1 Theme 1: The extended workday

This theme provides context on how the nature and length of the workday have changed as a result of the Covid-19 lockdown. Having transitioned to working from home, many people reported working extended hours, with work 'leaking' into early mornings, evenings, weekends and even what would normally be sick leave. We identified five reasons why, when working from home, people's workdays extended beyond their typical working hours.

*8.1.1 Working more due to increased expectations.* During the lockdown, the presence of work in people's lives grew. For some, this was due to increased responsibilities, as a result of the disruptions caused by lockdown. As one participant shared, '*Directly resulting from disruptions, there has been an increase in additional and urgent work with tight deadlines. Whilst pressure and uncertainty, including in processes, increase, the support that other teams provide decreases and so the reliance and expectations on me has continued to grow*' **P187**. These increased expectations took different forms, sometimes pertaining to outcomes, with one participant noticing '*People's expectations of my productivity because I'm at home*' **P223**. Increased expectations could also pertain to after-hours availability, with participants being contacted outside of their contracted hours. One participant described '*heads of department texting beyond normal working hours and expecting immediate answer*' **P21**, with another pointing to the same issue even at the weekends, '*The time of work is any time regardless working hour even weekend. People's tendency to forget the time of work especially superior*' **P206**. The ability to be available and working, despite being outside the office, resulted in one participant working when ill; while normally they would be off sick at home, now with the ability to work remotely they still took part in work activities. This participant said: '*I have a thyroid illness and usually when I have a bad day I have to stay at home and on those days I don't work (although I am set up to work from home once a week anyway). When I had a bout this week, I continued to be in attendance at the meetings I would normally not have attended if I were ill*' **P121**.

*8.1.2 Working longer to compensate for procrastination and loss of focus.* For some workers, the lack of social accountability from colleagues, made it easier to procrastinate, which inevitably led to an extended workday in order to complete tasks. As one participant said: '*I feel I need to work later to accommodate the time I've spent procrastinating/not being at work and because of that the issue has become cyclical and each day the same thing happens again.*' **P315**. Working longer hours to compensate for lost productivity did not always bring good results, with one participant sharing that they '*sometimes would be tempted to work in bed especially when I felt I haven't been as productive as I would like to be during the day, and ended up staying late without getting much extra quality work done*' **P351**.

*8.1.3 Working longer to accommodate childcare during the day.* Many people with childcare responsibilities had to rearrange their working days in order to accommodate the time needed for childcare-related tasks such as meal preparation, homeschooling or playtime. As one participant noted, they were '*trying to work, home school 2 children at different levels, look after mother-in-law and a dog.* **P125**. As they explained, this resulted in a later end to the workday: '*My work day lasts from 8am - 9pm depending on how much time I have in a day*' **P125**. For many, it also meant that work leaked into weekends, with one participant saying, '*Before I could, at least, plan to take a break on one day of the weekend. Now there are no weekends because I need to work on the weekends (to allow my partner to work on weekdays)*' **P116**.

*8.1.4 Working longer because I'm stuck at home.* Losing the ability to leave the house and engage in their typical hobbies such as socialising or exercising at the gym led some people to work more. This could lead to a feeling that it is hard to protect time off. As one participant said, they were '*working 6-7 days a week because I can't escape my office.*

*Where I would normally be going to the gym, cafés or walking around, I'm now inside. Because I don't have other things to do, rather than feel like evening or weekend time is for rest, I just feel like I'm putting off working*' **P7**.

*8.1.5 Working longer in the absence of set office hours.* Many workers struggled with the increased flexibility of working from home, and in particular with setting their own work hours. While before, physically leaving the office meant the end of work tasks, now incoming emails could still be checked in the same environment. One participant was '*Re-checking emails after I've logged off. Working later because there's no 'leave the office' prompts*' **P61**. Prompts to stop working, available before the lockdown, were now absent from people's work lives. This included social accountability, with one participant noting that '*Being home alone there is no one to tell me when to stop working*' **P24**. Lack of change in surroundings also had an impact on ability to separate work from personal life, with another participant sharing, '*I do not have the option to change building at the end of my working day. I do not have the option to avoid the room that I work in either.*' **P408**.

### 8.2 Theme 2: Taking a break became more difficult

*8.2.1 Taking a break but feeling guilty.* Some workers recognised the necessity and were able, to take breaks, however, this was followed by a sense of guilt and compensating through working longer hours. One participant shared, '*Sometimes I'm tempted to run errands during the "work day" and then feel guilty so I work later at night or earlier in the morning and work weird hours. I start work almost immediately after getting out of bed*' **P95**. Breaks were seen as impacting productivity even when taken to alleviate pain caused by sub-optimal work conditions. A participant affected by this said, '*I am finding it difficult to work on a laptop on a long-term basis. I feel physical discomfort which has led to tension which interferes with the task I am doing. I am therefore taking frequent breaks and continuity is lost in concentrating on the tasks which therefore take longer to do and I feel more frustrated that I am not meeting my objectives*' **P91**. Similarly, another participant who experienced worsening health issues as a result of working from home, felt the need to compensate for the breaks they took to manage the pain. They noted that they needed '*breaks during the day, to manage the pain, means working later to make up time, which eats in to downtime*' **P144**.

*8.2.2 Workers felt digitally tethered.* Working from home provided some participants with more privacy, as they were able to work without the presence of colleagues in their physical environment. However, for others, the tools used to connect with co-workers remotely created new forms of monitoring. As one participant noted, '*I feel I have less privacy because there are no long stretches of time when people I am in contact with are unaware of what I am doing*' **P139**. Digital over-connectedness made it harder for some workers to take breaks away from the computer, as described by a participant, '*Colleagues are not always available and are also very busy. I try to take a walk if possible, but stepping away for a full lunch hour leads to a significant backlog of queries that just causes more stress*' **P187**. The lack of physical presence in a shared office placed the burden on the worker to 'prove' that they were present and productive. One participant said, '*I can't see anyone else. I have my conversations online, but when I do that, I'm also being talked to in different ways - I can't do anything without the computer, and the computer is constantly messaging me*' **P402**. This could cause workers to feel that they cannot disconnect. The constant connectivity associated with remote working could then make employees feel like their work overtakes their whole life. One participant felt a lack of control over their time, saying '*My lunch time controlled. My exercise time also effected My praying time too affected*' **P173**.

*8.2.3 In-person signals in the office supported breaks.* Having transitioned to working from home, many participants reflected on the role that physical in-person routines and prompts embedded into their working days played in facilitating

regular breaks. Before the lockdown, people tended to take breaks with their colleagues, benefiting from the social accountability and planning that this entailed. As one participant reported, they used to '*Schedule coffee with others so I had set breaks and accountability*' **P92**.

Similarly, the coffee breaks which used to happen naturally in the office and act as a way of informal contact with co-workers, were no longer there, and new break habits were not established. One participant described this by saying, '*There is no longer the rhythm of a normal working day caused by interacting with people through physically going to meetings, talking informally to people during a coffee break.*' **P22**. It is clear that many workers require physical prompts in order to take a break from home; as one participant shared '*Normally I don't work when I get home, now that I am working from home I often don't stop working until something comes up (need to eat, sleep, etc)*' **P99**.

### 8.3 Theme 3: When sitting becomes a problem

*8.3.1 Sitting in pain.* Many participants reported that their work-spaces at home were sub-optimal. One participant mentioned having '*Home furniture not suitable for extended periods of sitting*' **P363**. Some participants managed to implement creative solutions within the space available to them. As one participant shared, '*It took me a while to even set up a usable work-space because there was so little room to put the entire desktop I had to bring home, and I was tethered to an ethernet cable. I experienced a lot of discomfort from originally sitting on a stool on an island and was only able to move by setting up a foldable table and purchasing an extra long cable*' **P416**. However, for others, limitations of their home environment had a marked impact on their ability to work. '*My flat is both small and cold. This meant for large of portions of time during lockdown I was working in bed which was hard both mentally and physically*' **P401**, shared one home worker.

Issues caused by unsuitable work-stations went beyond discomfort. Home workers experienced back, shoulder, and/or neck pain as a result of an inappropriate sitting position. As one participant shared, they have '*struggled a lot with back and shoulder pain from the new "setup"*' **P63**, with another stating that they '*don't have appropriate chair / table - very cramped, resulting in back and neck aches*' **P296**.

These issues were particularly challenging for those who had already been experiencing problems with their health. One participant noted this, saying, '*I don't have a proper deskspace at home and have pre-existing health conditions that make this very challenging in terms of working as the lack of a proper set up leads to a lot of pain and discomfort*' **P346**. As was the case with uncomfortable sitting, prolonged sitting was particularly problematic for those with existing health problems, and it was seen as a cause for worsening of the symptoms. As one home worker observed, '*Sitting at the computer all day exacerbates my frozen shoulder and means I have to set more time aside to stretch and strengthen it as well as time to rest it*' **P119**, with another participant reporting '*Aggravation of prolapsed disc due to sitting more than usual*' **P64**.

Dealing with unsuitable work-stations drew attention away from work by disrupting focus, with one participant noting the '*Physical discomfort from my seating arrangement causing pain in my neck and shoulders and making it hard to concentrate*' **P372**

### 8.4 Theme 4: A dramatic reduction in physical breaks

*8.4.1 Loss of physical breaks.* Many participants mentioned the opportunities for short active breaks that were previously afforded by working in an office environment. As one worker said, at home, physically active breaks were shortened, '*walking upstairs or downstairs versus to another building* **P411**. Another worker noted how other active breaks were lost altogether when working from home, '*There is no walking to a meeting, no casual interactions in the*

*kitchen or lift or entrance to the building*' **P80**. As emphasised by this participant, these active breaks used to play an important role for workers, helping them rest and disconnect from their work: '*My office-based routine provided opportunities for short breaks - to go for lunch, to go elsewhere for a meeting, this allowed me to recharge*' **P80**. Without that schedule, taking a physically active break now required additional motivation, with another participant sharing that '*I still want to make sure I walk or run most days, but now I need to factor that in to my timetable along with when I am working, and thinking about that takes extra energy. When I am not working from home, my job automatically involves several brisk walks per day, so I automatically used to get some activity*' **P138**.

For several participants, the ability to physically move away from the work-station appeared to be a determining factor for whether a work break provides respite. As one participant reported, '*It's harder at lunchtime to take a break as nowhere to go. Easier at the end of the day as I can physically leave the desk and room for the evening*' **P171**. In line with this, when workers reminisced about what used to help them focus when working form the office, they often mentioned physical activity. One participant remembered that they used to '*walk round the office block*' **P131** to focus. Similarly, another participant would '*Get up and move around. Maybe go to another space to write a list, chat to a colleague*' **P144**. However, it appears that for physically active breaks to feel restful, they should also afford people the opportunity to disconnect mentally. As one participant noted, '*Taking a walk is an ordeal now, and pacing in my (small) apartment offers plentiful distractions*' **P343**, with another participant having a similar experience, '*If I walk round the house there are more distractions and other people to talk to rather than switching off*" **P131**.

*8.4.2 Difficulties in taking active breaks exacerbates anxiety.* Walking was a tool that home workers could use to manage negative emotions. For example, one participant took a walk after receiving unwelcome news during a video-conference, having been told that '*it might be years before we can go back to the office. I had to mute and cry, and then go for a work [walk] to calm down*' **P318**. However, even walking helped manage negative emotions, this could still be perceived as a distraction, with one participant stating: '*I have dedicated a workroom to myself outside of the bedroom, but this does not help much since I kept restlessly walking between the bedroom and the workroom trying to control the stress, anxiety and restlessness*' **P301**. Furthermore, some workers were not able to use this tool due to the rigid availability expectations from employers. As one participant shared: '*Walking has been great, but with work sometime. I just cannot do it. I try to walk in a afternoon but it has to be in work time, as as soon as worktime is over I have to cook dinner, and then have to participate in family time. Even if that is me working in front of the TV. I find the fact we have to keep to our strict work hours very difficult as it has meant I have had to abandon every tool I have*' **P318**. Many others did not try to incorporate physical activity into their new workdays, or felt that this was not feasible, due to the reasons outlined in the 'Loss of physical breaks' sub-theme.

*8.4.3 An active break is not always a mental break.* While, as discussed previously, home workers struggled with taking breaks, many had multiple opportunities to step away from their work-stations. While these unplanned interruptions provided a respite from prolonged sedentariness, they were not perceived as a break but rather as a source of distraction. The key concern voiced by home workers was that attending to chores delayed completion of work tasks. As one participant reported, it was '*Easy to walk out of the room I'm working in and get distracted by projects at home - then the work isn't always done in time*' **P146**. In line with this, another participant noted that they '*sometimes find it difficult to focus on my work and keep getting distracted and doing a household task or making a phone call instead of starting on a work task*' **P142**.

Participants who were often interrupted saw prolonged sedentariness as an unreachable goal. One home worker said, '*I struggle to sit at my computer for extended periods of time because I have to stop and care for my 3 year old daughter.*

*She will call for me and need attention. When I give her that attention, I struggle to return to the task I was doing before the interruption*' **P349**. Similarly, for participants who struggled with finding uninterrupted periods of time, taking a walk was seen as a distraction, rather than a break, with another participant saying, '*While I finally succeed to get into my work. My partner will come to do some homework-related (I am working in the kitchen and he is working in the living room) and it will disturb me. Same as if we were supposed to go for a walk or else when I finally can get some work done*' **P316**. Here we can see how encountering frequent interruptions could lead workers to adopt a negative attitude toward breaks. This could then lead to workers perceiving stepping away from their desks to take an active break as negative and inappropriate, and an obstacle to completing a task. For many of our participants, working from home, and in particular, the frequent interruptions that break the flow of concentration, resulted in a negative attitude towards taking physically active breaks. It also created a sense of confusion about what is a break and what is an interruption.

## 9 DISCUSSION

### 9.1 Theme 1: The extended workday

With increased expectations of availability and productivity, people's ability to take time off from work was affected. For many participants, this translated into longer work hours. Indeed, one study has suggested that, during the pandemic, the average workday has increased in length by 48 minutes [18]. For some, working longer or logging back into work email became habitual, especially when colleagues appeared available at all hours. Some participants found themselves in a vicious circle of procrastination and compensation, effectively providing little to no planned rest. Simultaneously, participants reported sitting more and for longer periods of time. Research suggests that the two are connected, as an association between work fatigue and physical activity has been demonstrated [35]. The working day was also disrupted due to caring responsibilities. While childcare could potentially provide opportunities for active breaks, for example taking a walk or playing, working longer hours into the evening to compensate for time spent on childcare could be problematic, for example by taking away leisure time. Research suggests that much of this additional burden rested on women [36].

Even for those without caring responsibilities, the lack of set hours and increased temporal flexibility created avenues for work to encroach into personal time. This was particularly salient when it came to answering emails, with workers feeling obliged to keep responding throughout the evening, leading to additional, often sedentary, screen time. Moreover, for some, additional work replaced walking, gym or other activities that require leaving home. This builds on the finding which is increasingly being made by academics, that there is often an inverse relationship between flexibility, technology and work-life balance (e.g., [16, 39, 66]).

### 9.2 Theme 2: Taking a break became more difficult

Most of our respondents took breaks less frequently at home than they would have at the office, with some struggling to find time to rest at all. The overwhelmingly common reason that home workers struggled to take work breaks was the loss of routines and associated prompts that previously signalled to them when a break should take place. In addition, for some home workers, taking work breaks at home resulted in a feeling of guilt. Social norms and social accountability played an important part in supporting work breaks before lockdown. As people planned breaks together or saw colleagues leaving for lunch, it not only signalled to them that it was time for a break, but also that taking a break was socially acceptable. In line with this, several of the home workers we surveyed felt that the constant digital connectedness, coupled with the inability to physically see their colleagues, further complicated their ability to seek

respite. This is consistent with research conducted by Oliver et al. [48] who highlight the importance of understanding work as a social activity. The findings from their study illustrate the different ways that the social environment of the office can influence whether and how people decide to take breaks; this can include arranging to take a break with a co-worker or coordinating breaks with colleagues using a rota system. An overall sense of getting along with teammates seemed to translate into confidence to take breaks – with participants referring to the existence of unspoken rules of break-taking in the office [48]. It seems that the sudden transition to working remotely can cause such norms to break down; in the current study, we found that without the norms that seamlessly regulated break-taking at the office —with one person's respite legitimising another's— home workers struggled to identify whether and when they were 'allowed' a break. What worked well when managed collectively, became a recurring problem when the responsibility was shifted to each worker individually - profoundly showing that home working still requires collaboration, not only in terms of accomplishing tasks but also in terms of taking breaks.

### 9.3 Theme 3: When sitting becomes a problem

During lockdown, many participants had to work in unsuitable work-spaces, without appropriate desks, chairs, or screens, or sufficient physical space around them. While this caused home workers physical discomfort, only a handful of workers were able to make adjustments, such as setting up a foldable table to accommodate a desktop computer brought from the office. Many others had limited ability to create work-stations, due to a lack of space at home or the expense associated with purchasing furniture. This points to a need for researchers to explore whether home workers living in crowded homes are at a higher risk of adverse health outcomes related to sedentariness. Such research could be especially important in the case of youngest and oldest workers, as these groups have experienced the biggest pay swings during the pandemic [28].

Some participants reported that the inappropriate posture caused by sub-optimal working spaces translated into back and neck pain. Participants were able to pinpoint the aspects of their work-stations that caused them pain. They also dedicated much of their energy to trying to manage the pain, for example by correcting their posture. This was frustrating and also diminished focus on work. Researchers have warned that even where an appropriate work-space setup is provided, many workers still experience pain, and physical activity breaks may be needed to both alleviate pain and protect from long-term physical damage and chronic health issues such as musculoskeletal pain or even nerve compression syndromes [41]. Strikingly, while some of our participants reported taking work breaks to cope with neck or back pain, there was an absence of preventive breaks, suggesting that people who transition to working from home are not sufficiently aware of risks associated with prolonged sitting. This is in line with research reporting that workers may fail to recognise when a break is needed [65]. Moreover, active breaks could help facilitate focus. This is particularly important when working remotely during a pandemic (or during other stressful world events) as research shows that workers can lose focus, distracted by news and media [2]. Our findings suggest that the loss of focus is a factor in the breaking down of barriers between work and personal time among home workers. As people find themselves working longer hours to compensate for the loss of focus, the introduction of physical activity and time away form the desk into the workday could help them restore balance between work and rest. By eliminating disruptions to focus resulting from back pain, active breaks might help people finish work within contracted hours, bringing back a sense of work-life balance and boundaries between professional and personal life.

### 9.4 Theme 4: A dramatic reduction in physical breaks

Multiple opportunities for active breaks throughout the working day were eliminated after people transitioned to working from home. This included physical activity that was no longer necessary (such as walking to meetings), but also activity that was shortened (such as having lunch in one's kitchen instead of going to a coffee shop). Workers saw these as lost opportunities to rest and disconnect, regain focus and improve concentration. While, when working from home, people could potentially replicate such active breaks by taking a walk or exercising outside, the absence of routines and social accountability meant that few managed to do so. Some participants were able to create new opportunities for breaks that incorporated physical activity. Walking was described as useful for disconnecting from work, managing negative emotion and supporting productivity. However, the loss of habits and routines around active break-taking, as well as an increased sense of needing to be connected and productive at all times, prevented most remote workers from replicating active breaks at home.

Many people struggled with planning and executing work breaks while working from home. Simultaneously, many home workers experienced active distractions – these were however not seen as restful breaks but rather as a sign of inability to focus. Workers seemed to feel obliged to not leave their work-stations for long periods of time. While there is limited research exploring the connection between sedentariness and mental states, a systematic review conducted by Teychenne et al. [62] suggests the existence of a positive association between sedentary time and anxiety risk, especially when sedentary time is spent sitting. It is possible that the lowered prevalence of active breaks when working from home, as opposed to from the office, could make workers anxious and restless. In the absence of social norms around break-taking at home, workers inevitably stood up from their work-stations to relieve restlessness and ease physical symptoms associated with sedentariness (for example, back and neck pain) - however, they felt guilty for doing so. Effectively, breaks from work took place but were not restful. It appears that the lack of planned work breaks is a lost opportunity that leads to greater feelings of stress.

We found that many participants stood up from their work-stations to tend to chores or fulfil caring duties throughout their workdays. It is striking that the only types of physical activity our participants reported undertaking regularly and without fail were prompted by environmental cues: unwashed dishes, a doorbell, children waiting to go for a walk. However, these activities, despite involving movement, were not perceived as breaks from work but rather as distractions. They were, therefore, often associated with negative feelings. This suggests that, even when effective environmental cues for physical activity exist, they may need to be coupled with an awareness of the need for, and benefits of, regular physical activity during the workday. Research suggests that while people can be far from accurate when assessing their levels of activity, technology-mediated feedback may not be suitable for everyone. A longitudinal study, conducted before the pandemic, found that some participants experienced discomfort when they noted a discrepancy between their own judgement of sleep and activity levels and the measurements sourced from a wearable tracker. There were also individual differences in people's willingness to trust technology over their own experience [44].

While greater awareness of their activity levels, and education about the need to stay active, could help remote workers feel less guilty about taking time away from work to tend to chores, home workers also need periods of time where they can disconnect from both their work responsibilities and personal responsibilities. Many workers with caring responsibilities felt that their life in lockdown was a constant marathon of tasks, with little to no time for rest available. Research shows that for a break to be restful, it should also involve an opportunity to rest mentally. Throughout the day, workers deplete their personal resources by focusing on tasks and aligning their behaviour with organisational expectations [24]. Work breaks can only facilitate recovery when employees spend them on activities that make lesser

demands on them than work does [63]. Our findings suggest that, although tending to personal responsibilities at home may involve physical activity, it does not allow workers to recover lost resources and in fact places an additional burden on them, and therefore time spent tending to urgent chores or dedicated to caring responsibilities should not be perceived as a work break. Our findings demonstrate that when conducting research into break taking among remote workers, it is important to pay attention to the difference between active breaks and active distractions.

## 10 DESIGN GUIDELINES TO SUPPORT RESTFUL ACTIVE BREAKS FOR HOME WORKERS

### 10.1 Balancing collaboration and flexibility

When studying home workers' ability to take active breaks during the workday, it is important to consider the new challenges that arise when workers have more flexible schedules, and these schedules may differ between different team members. As has been highlighted in previous research [16], working remotely can be associated with benefits such as flexibility, but it also has its downsides such as the transfer of responsibilities for managing the workday schedule and introducing boundaries between professional and personal time to the worker. During the pandemic, neophyte home workers struggled to establish new routines and temporal boundaries between work and time off. The attention of workers, and their use of technology, focused on demonstrating to their line managers and colleagues that they were present and productive.

Embracing a more asynchronous way of working, where work can be accomplished collaboratively without the need for individual team members to work at the same time, could help remote teams remain productive while being able to manage their personal lives. Nevertheless, we observed that, during the pandemic, some workers shifted to asynchronous working patterns while others tried to maintain schedules similar to those they were accustomed to in the offices. This caused many people to feel a constant expectation of availability from managers, co-workers and customers. Workers also lacked confidence to switch off, which interfered both with their ability to rest and ability to accomplish tasks. As people continue working on different schedules, with some working from home and others returning to offices, it will be important to design ways of remote collaboration that can, on the one hand, enable flexibility but, on the other, provide some boundaries. Even when working flexibly, it may be necessary to introduce periods of rest during which workers are able to fully disconnect; these could be, for example, periods during which workers do not receive messages. Such boundaries could be helpful for new remote workers who, with greater flexibility, feel the pressure to demonstrate availability rather than organising their days to prioritise task completion and recovery.

Difficulties with taking breaks also point to a broader issue of inability to effectively organise one's workday when working remotely. This suggests that new remote workers require planning tools [1] that help them to better understand how to realistically plan and execute their tasks when working from home.

### 10.2 The role of social norms

Based on the findings from this study, we identify three elements that appear necessary to support successful active breaks for neophyte home workers.

**First, initiating an active break requires a convincing *prompt*, that reminds workers of the need to take a break and replaces the absent office-specific cues such as seeing one's colleagues go on a break.** A prompt could be combined with a message that reminds workers of the value of active breaks in preventing back pain, and in supporting productivity. Reflecting on work in offices, our participants emphasised the role of routines formed with co-workers, which supported them in taking regular breaks, not only through habit but also through social

accountability. In a remote or hybrid setting, digital planning tools could be used to find break slots that work well for several employees, who could then form a break group and keep one another accountable, even if breaks are taken separately. Based on a three-week-long study with women who wanted to increase their physical activity, Consolvo et al. [14] list supporting social influence as one of the four key design requirements for technologies encouraging physical activity. Additionally, personalisation may improve the acceptance of technology-mediated break-taking interventions, with research suggesting that inflexible social norms dictating when breaks should be taken may not work well [30]. Our findings demonstrate that remote workers often juggle different personal and professional responsibilities. These workers need tools that enable them to work asynchronously and at the same time build and sustain social norms around taking breaks during their workday.

**The second element that is necessary to support active breaks is *justification*; workers need not only to be reminded to take a break, but also be able to justify a break to themselves and to others.** In the office, these justifications tend to be naturally embedded into the workers' physical environment. Seeing colleagues leave for a break not only prompts people to take a break themselves but also, importantly, signals that taking a break is socially acceptable. This demonstrates that not only social accountability (as discussed above) but also favourable social norms are needed for creating break-taking habits. Remote workers need to feel that taking a break is accepted, or indeed encouraged, both by their colleagues and, perhaps most crucially, by their employer. However, the absence of visual cues and diminishment in non-work-related conversation with colleagues appear to have caused a complete breakdown of social norms around break-taking among the newly remote workers in our study.

We found that perception of break acceptability while working remotely can be negatively impacted by excessive connectedness, with some participants reporting the need to be continuously available as well as increased online monitoring as barriers to stepping away from the desk. Encouraging physically active breaks among remote workers requires the disruption of the newly formed social norm of constant availability that appears to increase the time spent in sedentary positions in front of the computer. When creating remote and hybrid workflows and environments, designers need to factor in prompts that remind workers to take physical breaks from the work-stations, while also signalling the social acceptability of doing so.

When designing technology that aims to encourage break-taking among remote employees, it is crucial to shift the responsibility to decide whether a break is allowed away from the worker. Our findings suggest that, often, an employee needs to receive a signal that a break if acceptable before undertaking it. Therefore, simply reminding them of a need to take a break, for example by using a personal tracker, without creating social norms that promote break-taking, may not be effective. In fact, such an individualised approach is likely to be a source of stress. Respondents in this study reported how, when facilitation of breaks is the responsibility of employees, it becomes effortful; for example, workers had to undertake the mental labour of figuring out whether and for how long breaks were allowed. The Trades Union Congress warns against an individualised approach towards workplace well-being, as it can put too much responsibility on the individual to develop resilience rather than addressing the underlying causes of ill health among employees and creating better work conditions [13]. Technologies that use social elements to encourage physical activity in the remote/hybrid workplace should communicate about break-positive social norms among colleagues (e.g., informing workers that their colleagues are currently on a break) as well as enabling the employer to communicate break acceptability. The latter could take the form of, for example, the employer taking initiative to encourage workday step challenges [27], in a way adapted to suit the asynchronous nature of remote work.

**The third element that we see as important for establishing restorative physically active breaks among remote workers is that at least some of the active breaks should also enable home workers to *disconnect***

**from other responsibilities at home such as chores or childcare, so that they can recover depleted personal resources, both physical and mental.** Tools that support regular and frequent breaks could help home workers carve out time away from work more consistently. Designers developing these tools need to remember, however, that active distractions and active breaks are two different categories. Recreating social norms and social accountability, present at the office, could also be key in helping home workers establish break-taking routines [69]. Home workers with caring responsibilities are especially in need of social norms around break-taking, as these could help alleviate the always-on culture of remote offices and introduce the temporal boundaries particularly needed by those juggling multiple responsibilities. It may be useful for designers to develop specialist tools and features for remote workers with caring responsibilities that would allow them to establish flexible social norms collaboratively.

Designers face a challenge: the more asynchronous nature of remote work could make it difficult for remote teams to organically develop social norms around break-taking. The introduction of rigid norms by employers, on the other hand, could be perceived as invasive and incompatible with the home environment. Remote collaboration tools should instead create flexible norms that remind workers of the social acceptability of taking breaks. For example, messaging tools could be programmed to delay communication sent during mealtimes. Similarly, team members could be encouraged to use a Pomodoro style timer that signals opportunities for breaks throughout the day [26]. In the same way that work breaks, as emphasised by our participants, are expected in an office because other people take them, developing habits collectively could help home workers both expect and execute breaks at home. Optional classes, breakout rooms, or accountability systems could also be useful in developing such habits. Creating social norms and social accountability could be key in helping home workers establish break-taking routines [69].

### 10.3 Creating new opportunities for active breaks during the workday

Our findings suggest that, as many of our participants struggled with back pain resulting from prolonged sedentariness while working from home, remote workers need tools that encourage activities incorporating movement into their workdays. The ability to take regular breaks and stand up from the workstation is key to preventing the negative impact of excessive sitting. However, with the move of many previously-offline activities online (e.g. online meetings eliminating the need to walk to a different building or room), it may not be enough to solely encourage physical activity during breaks. Workers should be additionally encouraged to use remote work technology in ways that take them away from a sedentary workstation. Virtual meeting tools, now commonly used to facilitate video conferencing, should be adapted to facilitate audio-only meetings with seamless transitions between different speakers and voice-only note-taking so that remote teams can engage in 'walking calls'. Researchers have argued for a need for increased acceptability of walking meetings facilitated by technology, in the context of the Covid-19 pandemic and transition to working from home [29]. This should remain an important consideration for many employers as offices adapt to the hybrid model. Similarly, there is a need to extend the current approaches to micro tasking [3], such that they allow incorporation of physical activity into completion of short tasks; this could involve, for example, dictation tools that facilitate micro writing tasks while walking. Such approaches could help challenge the perception that workers have, as demonstrated in this study, of work being typically bound to sedentariness.

Finally, physical activity could also be incorporated into efforts to facilitate social cohesion between members of remote or hybrid teams, for example through digital games that encourage movement. Research shows that playing digital computer games together can be more effective at developing social trust between members of virtual teams than traditional icebreakers [60]. Employers could encourage workers to play collaborative digital games involving physical activity during lunch breaks to help prevent back pain later in the day.

## 11 CONCLUSION

This study explored physically active break-taking among newly remote workers during the Covid-19 pandemic. We found that the sudden shift to home working eliminated many of the opportunities that allowed workers to take spontaneous active breaks in the office, as well as many of the routines that teams physically present in the same office had established around break-taking. At the same time, the suboptimal work-stations at home and the prolonged workday resulting from removal of temporal and spatial boundaries between professional and personal time, increased the need for physically active breaks. We contribute to our understanding of remote work by identifying the online tools that may facilitate physically active breaks among remote workers, while still allowing for the asynchronous nature of remote offices. We point to a need for tools that help remote workers establish flexible social norms, and tools that inject bursts of physical activity into work tasks. Crucially, we have identified the distinction between physical breaks and physical distractions, as two distinct design categories. As many people may continue working in a remote or hybrid manner during and beyond the pandemic, it will be increasingly important to ensure that remote working tools facilitate not only task completion and productivity but also breaks that are both physically and mentally restful and restorative.

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