Study Protocol for The National Implementation Trial of the Web-Based BeUpstanding™ Program Supporting Workers To Sit Less and Move More: Single-Arm Repeated Measures

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Abstract

Background: The online BeUpstanding™ Champion Toolkit was developed to support work teams in addressing the emergent work health and safety issue of excessive sitting. It provides a step-by-step guide and associated resources that equip a workplace representative — the "champion" — to adopt and deliver the eight-week intervention program (BeUpstanding) to their work team. The evidence-informed program is designed to raise awareness of the benefits of sitting less and moving more, build a supportive culture for change, and encourage staff to take action to achieve this change. Work teams collectively choose the strategies they want to implement and promote to stand up, sit less and move more, with this bespoke and participative approach ensuring the strategies are aligned with the team's needs and existing culture. BeUpstanding has been iteratively developed and optimised through a multi-phase process to ensure that it is fit-for-purpose for wide-scale implementation.

Objectives: To describe the current version of BeUpstanding, and the methods and protocol for a national implementation trial.

Methods: The trial will be conducted in collaboration with five Australian workplace health and safety policy and practice partners. Desk-based work teams from a variety of industries will be recruited from across Australia via partner-led referral pathways. Recruitment will target sectors (small business, rural/regional, call centre, blue-collar, and government) that are of priority to the policy and practice partners. A minimum of 50 work teams will be recruited per priority sector with a minimum of 10,000 employees exposed to the program. A single-arm repeated measures design will assess the short-term (end of program) and long-term (nine months post-program) impacts. Data will be collected online via surveys and toolkit analytics, and by the research team via telephone calls with champions. The RE-AIM Framework will guide the evaluation, with assessment of: the adoption/reach of the program (the number and characteristics of work teams and participating staff); program implementation (completion by the champion of core program components);

effectiveness (on workplace sitting, standing and moving); and, maintenance (sustainability of changes). There will be an economic evaluation of the costs and outcomes of scaling up to national implementation, including intervention affordability and sustainability.

Results: Funded June 2018, original protocol approved by IRB on the 9th Jan 2017 with national implementation trial consent and protocol amendment approved 12th March 2019, start date of trial 12th June 2019. As of December 2019, 45 teams have been recruited into the trial.

Conclusions: High levels of sitting are associated with premature mortality and increased chronic disease risk. The BeUpstanding program is designed to support desk workers to stand up, sit less and move more through context-specific strategies that encourage regular postural transitions. The implementation and multi-method evaluation of BeUpstanding will provide the practice-based evidence needed for informing the potential broader dissemination of the program.

Trial registration: ACTRN12617000682347 (https://www.anzctr.org.au/Trial/Registration/TrialReview.aspx?id=372843&isReview=true). Prospectively registered on 12th May, 2017; last updated 11th June, 2019.

Keywords:

Implementation trial; workplace; sitting; health promotion; activity; health and safety; public health; occupational; evaluation; web-based

Contributions to the literature

- Too much sitting is now recognised as an important contributor to premature mortality and chronic disease risk with the desk based workplace identified as a key setting to address this common behaviour.

- The BeUpstanding program, delivered through an online toolkit using a “train-the-champion” approach, is designed to support desk-based workers to stand up, sit less, and move more for their health and wellbeing.
- This national implementation trial will evaluate research questions important for informing potential wide-scale dissemination of the BeUpstanding program; namely, who takes part in the program, how the program was delivered, did the program work (and for whom did it not work), and how much did it cost.

Introduction

A growing body of recent evidence links high volumes of sitting time to risk of major chronic diseases and premature mortality [1]. Only very high volumes of moderate to vigorous intensity physical activity (≥60 minutes per day), which are achieved by <5% of the population, have been seen to attenuate the risk of death associated with high sitting time, according to a recent meta-analysis using data from over one million adults [2]. Correspondingly, the national physical activity and health guidelines have a dual message of move more *and* sit less [3].

Sitting time can be strongly contextually driven, dictated by the environmental and social settings in which it occurs [4]. For many working adults, the majority of daily sitting time is accrued in the occupational environment [5], with desk workers spending on average 70–80% of their working day sitting [6]. Much of this sitting time is accrued in prolonged, unbroken bouts of 30 minutes or longer [6]: a pattern that potentially places them at increased risk for poor cardio-metabolic [7 8] and musculoskeletal [9] health. Since the proportion of industry sectors that involve desk-based work has increased substantially in recent decades, with further increases forecast [10], the desk-based workplace has been identified as a key setting in which to target reductions in prolonged sitting time [11]. The relevance for occupational health and safety, as well as for public health, of addressing this behaviour is reflected in Safe Work Australia's acknowledgement of prolonged workplace sitting as an emergent work health and safety issue [12].

Within this context, the Stand Up Australia collaborative research program was developed [13]. Its aim was to understand how to reduce prolonged sitting time in the workplace and the benefits that may ensue, with the explicit intention of informing translation into practice. A series of pragmatic, researcher-led intervention trials, with participant numbers ranging from 32 to 231, assessed the effectiveness of different strategies (organisational, environmental, individual; alone or in combination) to support workers to stand up, sit less, and move more in the workplace, with a

particular focus on the desk-based workplace [6 14-18]. This Stand Up Australia program of research demonstrated that it is feasible and acceptable to introduce strategies within desk-based workplaces to create a dynamic work environment (which encourages more movement, more often), and to do so without detrimentally impacting on productivity [19]. Such strategies can lead to reductions in workplace sitting time that are substantial (e.g., >1.5 h per 8 h at the workplace [14]) and sustained (≥12 months [6]). These findings have further been corroborated by other research groups [20 21], and supported by several systematic reviews [22-26]. With a body of evidence on the feasibility and benefits of reducing workplace sitting time, there is now a strong demand for advice, assistance and support in implementing evidence-based strategies into policy and practice. However, tools and resources to support such implementation at scale do not exist. To meet this appetite, the BeUpstanding Champion Toolkit was developed collaboratively, based on evidence from Stand Up Australia and the broader sedentary behaviour and health research field.

The no-cost, online BeUpstanding Champion Toolkit [27] provides a step-by-step implementation guide and associated multi-media resources to enable a workplace champion to deliver the intervention program (BeUpstanding) within their own work team, independent of input from external expert stakeholders (i.e., researchers) [13]. In line with better practice [28] and existing frameworks for program delivery [29], the program is underpinned by: a participative and collaborative approach; tailoring of strategies to the organisation; visible organisational support for the program; a strong evaluation framework; and, communication of program outcomes, including through automated reports. The program allows for repeated delivery, with champions encouraged to continue to make sustainable changes and build on previous success within their work teams. However, in a key distinction from the researcher-led Stand Up Australia interventions, BeUpstanding was designed specifically for deilvery by workplace champions (i.e., dedicated staff members). A “train-the-champion” approach was used as workplace champions have been shown to be critical to the success of workplace interventions, acting as role models and drivers for staff

participation and work team change [30-32]. This approach also facilitates wide-scale delivery as the workplace (rather than the research team) are responsible for program delivery.

The translation of what has been learned from the Stand Up Australia intervention trials to the BeUpstanding program has involved multiple, iterative phases [13]. These phases have been underpinned by the key principles guiding dissemination of broad-reach health behaviour programs [33], including partnerships with key stakeholders, ensuring fit of the progam with the organisational goals, integration of outcomes important to informing funders and advancing science, systematic tracking of the resources needed for implementation and intervention, and the maintenaince of program fidelity while being flexible and responsive. Central to this has been the development of the technology platform underpinnning the toolkit. This platform has not only enabled the evaluation of the effectiveness of the program but has also facilitated insights into the levels of engagement with the program components.

Phase 1, described in detail elsewhere [13], involved initially creating BeUpstanding from the Stand Up Australia interventions. This development occurred in close collaboration with government occupational health, safety and wellbeing partners to ensure strong alignment with existing workplace health, safety and wellness frameworks. It was also developed with consideration of the partner requirements (optimisation criteria [34]) that the program have the following attributes: low cost or no cost to workplaces; feasible for workplaces to deliver; scalable; and, compatible with existing programs, including the frameworks and language used. These considerations, and the learnings from the preceding trials, collectively led to the “train-the-champion” approach, the use of an online toolkit, and the framing of the intervention around the three stages commonly used in government workplace health, safety and wellbeing programs (i.e., “Plan, Do, Review”). The low cost/no cost requirement also meant that sit-stand workstations, which have been shown to

effectively reduce workplace sitting (particularly when part of a multi-component approach) [35], are not a core component or requirement for participation in the program.

Phase 2 involved a quantitative and qualitative evaluation of a small-scale pilot of the beta (test) version of the toolkit [36]. Seven teams of workers in mostly desk-based occupations were included, collectively covering diverse sectors: blue- and white-collar sectors; government and non-government; metropolitan and regional; and small, medium and large organisations. Overall, the pilot phase demonstrated that the BeUpstanding Champion Toolkit (beta version) was feasible and acceptable for use by workplace champions, and that the program delivered through the toolkit was effective at raising awareness, building a supportive work team culture, and reducing workplace sitting time [36 37]. The piloting of the toolkit showed an average reduction in self-reported workplace sitting time of 34 minutes per 8-hour workday (95% CI -51 min to -14 min) following approximately three months of intervention. This level of effect on sitting time has previously demonstrated significant improvements in some indicators of cardio-metabolic health [38]. Champions typically spent 30 minutes to one hour per week on the program during this pilot phase [36]. Notably, interviews with the workplace champions 12 months after initial implementation found that teams continued to support the strategies, including through policy development (e.g., centralised printers) and dedicated resource funding (e.g., purchase of sit-stand desks) [37].

The learnings from Phase 2 then informed the optimisation of the toolkit (Phase 3) to ensure it was fit-for-purpose for an implementation trial. Phase 3 included: the development of an online, user-friendly on-boarding system (to both promote the toolkit and enable champions to sign up for the toolkit) using human-centred design principles [39]; enhanced backend capacity of the toolkit (to facilitate multiple simultaneous users); development of an embedded survey management and data collection system; and, enhanced graphic design.

This updated version was tested via a "soft launch" of the program, with over 100 champions enrolling in the program during this period (September 2017 to May 2019). Several key learnings were gained from these early adopters. First, despite the minimal promotion during the soft launch, there was strong uptake of the program, with champions enrolled from throughout Australia and across multiple sectors. This provides strong indication that there is an industry need for a program such as BeUpstanding. Second, workplaces were at different stages of readiness, with some champions wanting only to use select program materials (e.g., posters) to help raise awareness of the importance of sitting less and moving more, while others were ready to run the full program. Third, there was wide variation in how champions engaged with the toolkit, measured by the number of logons, with some champions repeatedly logging on throughout the program and others logging on rarely and/or infrequently. Finally, we found that while the toolkit was designed well for delivery by a single champion to their team of workers, it was not sufficiently flexible for larger organisations with large workplaces. It was identified that in a number of instances there was a combined team formed of several teams led by champions who each adopted more nuanced roles (such as oversight without necessarily directly intervening on staff). Adaptations to the toolkit were made accordingly to suit a range of toolkit user roles.

These key learnings, which were complemented by discovery interviews and in-depth case studies with select participants (chosen to capture insights across sectors, locations, organisational size, and toolkit engagement), were used to inform further optimisation of the program and toolkit and the protocol development for the national implementation trial of the BeUpstanding program (Phase 4). Adaptions were done taking into account considerations from multiple perspectives, including the end users, the partners, the researchers, and financial constraints [34 40]. The aims of this paper are to describe the current version of the BeUpstanding program and the methods and protocol for evaluating the BeUpstanding program in the context of a national implementation trial.

Table 1: Phases, steps, champion tasks, supporting resources and rationale for the steps of the BeUpstanding Champion Toolkit

Phase	Steps	Champion Tasks	Supporting Resources	Rationale of Step
Plan ≈1–2 months (variable)	**Step 1:** Getting support from management	1 Make a case for BeUpstanding 2 Formalise management's commitment in writing	- Business case template - Sample policy - Journey map	- To build the business case for running the program and formalise management commitment (if required)
	Step 2: Needs assessment	2.1 Conduct a workplace audit* 2.2 Conduct a staff survey*	- Staff email templates and posters - Links to workplace audit & staff survey - Audit report and links to staff survey results	- To help the champion: assess their current workplace environment and existing policies; and, identify available resources and facilities and opportunities to support staff to stand up, sit less and move more. - To assess the need for BeUpstanding and provide a baseline to be able to measure any changes arising from the program in terms of staff behaviours, attitudes, beliefs, and health, productivity and wellbeing indicators.
	Step 3: Preparing for the program	3.1 Create & maintain a support network 3.2 Hold a wellbeing committee workshop 3.3 Hold a staff consultation workshop* 3.4 Promote BeUpstanding strategies*	- Wellbeing committee member invitation template/video/ staff consultation planning tool - BeUpstanding Powerpoint presentation for staff workshop - BeUpstanding staff information video - Strategy survey and associated poster generation	- The wellbeing committee (recommended 3-6 members; mix of management and general staff; fortnightly meetings) is intended to provide support to the champion in implementing the BeUpstanding program. - The staff consultation workshop (or equivalent) is designed to create ownership of the program and strategies by the workteam, and ensure everyone has the same base level of knowledge regarding the benefits of sitting less & moving more. - The online strategy survey enables data collection of the team strategies chosen and promotional support for these strategies via the generation of a customised poster.
Do ≈8 weeks	**Step 4:** Putting it into practice	4.1 Set an action plan & launch 4.2 Promote with posters and health information* 4.3 Promote with email reminders to staff* 4.4 Encourage change champions, and celebrate success	- Action plan example & template - BeUpstanding posters - No/low-cost tips & tools - Recommended emails and additional email guide/templates - Change champion guide	- To support champions to put their BeUpstanding strategies into practice through highlighting key activities and people involved, resource requirements, and the program timeline including evaluation tasks and tools. - To raise awareness, build culture, and encourage action around standing up, sitting less, and moving more.
Review ≈1 month	**Step 5:** Evaluation	5.1 Do follow-up staff survey* 5.2 Do program completion survey* 5.3 Where to from here	- Links to follow-up surveys and staff survey results - Team performance report, completion certificate	- To support the champion and the work team to evaluate and reflect on their progress and plan for sustainability.

* Steps marked as critical within the toolkit (core components)

The BeUpstanding Program

The BeUpstanding program is designed to be implemented within a workplace (broadly, defined as from one organisation, with the same workplace policies) by a champion to their work team (co-located members of the workplace) of which the champion is also a member. Larger workplaces may run BeUpstanding by having several champions deliver the intervention to their teams concurrently. For the purposes of accrual targets and statistical analyses these multiple teams are counted as one combined 'team'. There are three phases to the program (Plan, Do, Review) and five steps as part of the BeUpstanding program (Table 1). Each step has associated tasks for the champion to complete, noting that not all tasks may be relevant for all champions, due to their workplace and/or work team requirements. The toolkit provides information ("training") on the purpose of each step and task, as well as resources to support the implementation of each task. As part of the implementation trial, champions will receive further training via coaching calls. The most critical step of the program is the staff workshop (Step 3.3). This step is designed to get everyone in the work team on board in terms of why and how the team can BeUpstanding together. In line with participatory design principles [41], work teams are encouraged to collectively choose three strategies to stand up, sit less and move more to implement, which best suit their team's needs and existing culture. Some strategy suggestions, according to the hierarchy of control [42], are provided within the toolkit (Table 2 shows a modified version of this resource). Staff members may choose to implement more than the three team strategies. Alternate suggestions for raising awareness and enabling this collective decision making are provided when running the workshop with all staff at the same time is infeasible (e.g., due to shift work). Champions are encouraged to run the BeUpstanding program for eight weeks from the launch, sending emails and rotating posters on a weekly basis for the first four weeks and fortnightly for the second four weeks with the posters and emails organised according to the recommended schedule. Collectively, the workshop, posters and emails are designed to raise awareness of the benefits of sitting less and moving more, build a supportive culture for change, and encourage participants to take action to achieve this change. Due to the participative nature of

choosing the strategies, and the ability of the champion to tailor the emails, the actual intervention program is bespoke for each work team. The champion is responsible for running and evaluating the program, which includes sending all staff in their work team links to the online evaluation surveys (Task 2.2; Task 5.1). Champions are also encouraged to hold staff events (e.g., a lunchtime walk; wear your sneakers to work day), and to celebrate and promote individual and whole-of-team success. All staff in the work team will potentially be exposed to the intervention messages (posters, emails); and, all staff can choose their level of involvement with both the strategies and the evaluation components. The toolkit encourages champions to run BeUpstanding (or components of thereof) with their team on an annual basis.

Table 2: Suggested team-level strategies to BeUpstanding according to the Hierarchy of Control (adapted from Resource 3.2 in www.beupstanding.com.au).

Hierarchy of Control	**Strategies**
Elimination	Use technology (e.g., voice recognition software) to eliminate prolonged sedentary tasks
Substitution (Re-design)	Enable internal stair access and workplace re-design to facilitate more movement where possible
	Move water, bins and printers away from desks
	Install height-adjustable workstations
	Provide designated standing areas (e.g., in tea rooms, meetings rooms)
	Provide facilities such as showers and lockers to encourage active transport and physical activity
	Use phone support accessories (e.g., headphones, speaker phones) to facilitate standing during phone-based tasks
Administration	Create a walking track around workplace
	Encourage workers to leave desks during breaks
	Provide organisational support for flexible hours for lunch breaks to encourage physical activity (e.g., gym visits)
	Encourage face-to-face interaction with colleagues
	Stand up and move around when taking a phone call (where possible)
	Undertake walking meetings
	Conduct standing meetings
	Encourage staff to regularly walk to top up water glass/bottle
	Use signage (e.g., posters) to support BeUpstanding messages
	Use computer software to prompt breaks from sitting
	Provide physical prompts at desk to stand regularly (e.g., stickers)
	Leave desk in standing position when leaving workspace (if using height-adjustable workstations)
	Conduct daily group activity sessions
	Undertake a team challenge (e.g., 10000 steps challenge)

227

228 ***BeUpstanding intervention messages and behavioural targets***

229 The program's behavioural targets are to achieve an even 50:50 split between sitting and non-sitting
230 (i.e., upright) activities at work, and to alternate posture at least every 30 minutes between sitting
231 and upright (or vice versa)— consistent with public-, occupational-, and clinical- guidelines [43-45].
232 To support these targets, the BeUpstanding intervention messages are to "Stand Up, Sit Less, Move
233 More". "Stand Up" is a prompt to break up long periods of sitting; "Sit Less" is a prompt to reduce
234 overall sitting time throughout the day by swapping some sitting with either standing or moving;
235 and, "Move More" is a prompt to increase physical activity (primarily opportunistic, incidental
236 activity) throughout the day. Increased activity and decreased sitting are primarily targeted through
237 organisational, environmental, and social approaches. Messaging throughout the resources
238 encourages regular postural shifts and reminders to "listen to your body" in recognition that there
239 are also adverse outcomes associated with prolonged, unbroken standing [46-48]. No specific
240 individual-level support for staff is provided through the toolkit.

241 ***BeUpstanding website***

242 The BeUpstanding program is delivered via the BeUpstanding Champion Toolkit hosted on the
243 BeUpstanding website [27]. The website is hosted, maintained and updated by project staff, with all
244 data stored in a secure, cloud-based system (Microsoft Azure) that is backed up weekly to the
245 University of Queensland servers (lead investigator team). The toolkit itself is powered through a
246 bespoke platform that includes in-built systems which facilitate survey design, project management,
247 and user tracking, enabling the research team to readily track a champion's progress and
248 engagement through the program, as well as collect survey-based data. In addition to the toolkit, the
249 BeUpstanding website (freely available) also includes: pages on the business case and associated
250 promotional materials for running the BeUpstanding program; the evidence-base supporting the
251 BeUpstanding program; a checklist to ensure program readiness; a link to the BeUpstanding blog and
252 social media; a frequently asked questions section; and, details on the investigators and partners.

Champions are encouraged to visit the blog via monthly e-newsletters for the latest research evidence and tips for running the program.

Methods and protocol for the national implementation trial of BeUpstanding

Aims and research questions

The aim of this study is to evaluate the BeUpstanding program in the context of a national implementation trial. The research questions to be answered are those important to informing the dissemination (Phase 5)[13]: in particular, who takes part in the program, how the program was delivered, did the program work (and for whom did it not work), and how much did it cost? The RE-AIM Framework (reach, effectiveness, adoption, implementation, maintenance) [49] will be used to guide the evaluation, with assessment of: the **adoption/reach** of the program (the number and characteristics of work teams and participating staff); program **implementation** (completion by the champion of core program components); **effectiveness** (on workplace sitting, standing and moving); and, **maintenance** (sustainability of changes). The implementation trial is funded by a National Health and Medical Research Council (NHMRC) of Australia Partnership Project Grant (#1149936), which includes cash and/or in kind support from the five partners (see below). Ethical approval was gained by The University of Queensland Human Research Ethics Committee (approval #2016001743). The trial was prospectively registered on the 12th May, 2017 (ACTRN12617000682347), prior to the soft launch of the program, and last updated on the 11th June, 2019.

Study design

A single-arm design will be used to evaluate the BeUpstanding program, with repeated cross-sectional evaluations at pre-program (0 weeks), end-of-program (≈8 weeks; primary endpoint), and at 9 months post-program (≈12 months post sign-up). Repeated cross-sectional evaluations provide

a flexible evaluation protocol [50] that can assess change within retained members of the baseline survey cohort over time, as well as more general time trends (owing to both changes over time within participants as well as some fluidity in work team membership, such as due to workforce turnover).

Study eligibility and accrual targets

Based on data reported by the champion as part of the online registration process, eligible Australian based work teams will be those who had not run the BeUpstanding program previously with: a minimum of five staff; job roles or tasks that predominantly involve desk-based work; and, a staff member willing to perform the duties of a workplace champion. Champions must also be planning to run the program within the recruitment window. For large organisations, including those located across numerous sites, multiple work teams from the one organisation will be eligible to participate. These will be treated as a single combined 'team' when the intervention is concurrent and within a workplace as per the criteria; otherwise separate teams will be permitted to participate. Each champion will invite all employees within their work team to participate in the program and its evaluation. All workers invited will be considered eligible unless they indicate within the staff survey that they are unable to currently walk or stand for at least 10 minutes without an assistive device or requiring assistance from another person. Accrual targets have been set at ≥50 work teams per priority sector and ≥10,000 staff exposed to the program in total (see sample size). Performance against these accrual targets will be reviewed at the quarterly steering committee meetings, with the promotion and marketing plan adapted as required to ensure targets are met.

Study partners and promotion

The implementation trial will be conducted in partnership with five Australian workplace health and safety policy and practice organisations: Safe Work Australia, Comcare, Queensland Office of Industrial Relations, The Victorian Health Promotion Foundation (VicHealth), and Healthier

Workplace Western Australia. These organisations are responsible for developing, implementing and/or promoting Australian workplace health and safety policy. Each partner has committed to endorse and promote the toolkit across their relative jurisdictions. Desk-based employees from a wide cross-section of industries will be targeted, inclusive of sectors collectively identified as priorities by the partners (small business, regional, call centre, blue-collar, and government). To ensure efforts are coordinated, a detailed action-mobilisation plan will be developed with the partners. The plan, which will include an annual promotional "push" via an awareness raising event, will build on and coordinate with existing communication channels and resources from the partners and participating institutes, including social media, web links, email listservers, newsletters, workplace health promotion and occupational health networks, conferences, and workshops.

Study protocol for the implementation trial

The BeUpstanding website [27] is designed for workplace champions, however, anyone can freely sign up to use the BeUpstanding Champion Toolkit via the registration survey (sign up form) on the BeUpstanding website. At signup, a user identifier is generated, and a welcome email is automatically sent that includes details regarding the implementation trial. To unlock the toolkit contents, the user is required to complete the champion profile survey, and is asked to nominate their intended role as a toolkit user (which might be a workplace champion, or another non-delivery role, such as senior decision maker, interested staff member etc.). Following completion of this survey, champions with work teams that appear eligible for the implementation trial will be invited via a phone call from the research team to participate in the implementation trial, with recruitment continuing until accrual targets are met. This phone call with the champion will be used to: confirm the eligibility of the work team for involvement in the implementation trial; ascertain from the champion the likely readiness of the work team to participate in the program; and, confirm the contact details of the workplace champion (and an alternate contact). Those eligible and indicating interest in trial participation will be sent additional information on trial participation requirements,

namely: confirmation of organisational support to run the five-step BeUpstanding program; and, commitment to the implementation trial evaluation components. The champion's electronic consent to the trial will be required prior to implementation trial enrolment.

Data collection

Outcome and process data, as well as the characteristics of the workplaces, champions, and staff taking part in the implementation trial will be collected via the dedicated, stand-alone BeUpstanding website (Registration Survey, Champion Profile Survey, Workplace Audit, Staff Surveys (baseline; end program; maintenance), Strategy Survey; Program Completion Survey; toolkit analytics) and by the project manager (implementation checks, qualitative interviews), as outlined in Figure 1**.** Champions will be required to provide informed online consent for their data to be used by the research team prior to completing the Champion profile survey with further consent required to participate in the implementation trial. Staff will be required to provide informed consent for their data to be used by the research team prior to completing each of the staff surveys. Data for staff is anonymous; however, to enable participants to be tracked across data collection points, each staff survey includes three questions designed to generate a unique (but anonymous) identifier for the staff participant when used in combination with the champion ID: day of the month they were born on; first letter of mothers first name; and, last three digits of their mobile number.

The promotional activities undertaken by partners will be recorded at the six-weekly partner meetings, with their impact on registrations tracked through the analytics in the toolkit website. The promotional pathways will be tracked through URL identifiers; Google Analytics; and via champion self-report through the champion profile survey. Factors potentially influencing uptake and engagement with the program (e.g., number of teams within a workplace participating in the program) will also be tracked via the registration survey and implementation checks. To ensure

minimum data accrual targets are met, the project manager will follow up with champions (via email/ phone) where necessary to encourage and support data collection.

The project manager will have a minimum of five telephone contacts with the champion across the implementation trial evaluation: (1) recruitment; (2) confirmation of consent and explanation of next steps; (3) as soon as possible following the staff workshop; (4) at the end of the program; and, (5) nine months after the end of the program. Focus groups will be undertaken with a sub-sample of consenting staff from participating teams (n≈15) at the end of the program to assess their perspectives on the processes and outcomes of the program. A mix of teams who made small/no, midrange, and large improvements, and from different sectors, will be purposively sampled, with focus groups conducted either in person or online via a virtual meeting room.

Table 3: Outcomes, measures and assessment tools of the BeUpstanding implementation trial according to the RE-AIM framework

RE-AIM DIMENSIONS	COLLECTION METHOD / ASSESSMENT TOOLS
Adoption by Teams	
Champions registering for BeUpstanding (n)	Registration (sign up) survey
Champions unlocking the toolkit (n)	Champion profile survey
Characteristics of champions and their organisations and their work teams (including size of organisation and number of staff)	Champion sign on, Champion profile survey; workplace audit
Reasons for taking up the program	Champion profile survey
Champions eligible and enrolling in implementation trial (n, % of eligible)	Champion profile survey
Champion withdrawals from implementation trial (n) and reasons for withdrawal	Implementation check
Reach of Staff in Teams	
Staff in work team (n as reported by champion)	Champion profile survey; implementation check
% of staff in work team that participate in choosing BeUpstanding strategies	Strategy survey; implementation check
n (%) participation in staff surveys	Staff surveys (champion-reported n for %)
Characteristics of staff taking part in the evaluation	Staff surveys
Implementation	
Completion rates	Toolkit analytics; implementation check
Engagement with the program	Toolkit analytics, implementation check; program completion survey
Strategies chosen by work team	Strategy survey; implementation check
Sit less, move more strategies (staff)	Staff surveys
Barriers and enablers to implementation	Implementation check
Effectiveness	
Workplace sitting and activity	Staff surveys
Activity preference alignment	Staff surveys
Organisational social norms	Staff surveys
Enablers to sitting less and moving more	Staff surveys; staff focus groups*
Perceived barriers to sitting less and moving more	Staff surveys; staff focus groups*
Work performance and engagement	Staff surveys
General health	Staff surveys
Adverse / unintended consequences (end program only) for champions and staff	Implementation check; staff follow-up survey; program completion survey
Costs to deliver the BeUpstanding program	Program completion survey; implementation check
Program satisfaction and perceived impact (end program only) for champions and staff	Follow-up staff survey, program completion survey, implementation check, staff focus groups*
Maintenance	
Self-reported workplace sitting time collected 9-months after end-of program	Staff maintenance survey
Use of activity policies and practices	Staff maintenance survey, champion interviews

* in a sub-sample only

Outcomes and measures

Outcomes and measures are shown in Table 3, along with the relevant RE-AIM indicators and measurement tools. As adoption logistically occurs prior to reach, RE-AIM is reported as ARIEM.

Adoption

Work team characteristics to be measured include organisational size; workplace location (postcode); industry; and, team size. Team size is asked initially on the registration survey and confirmed by the project management team. Team size is visibly displayed on the feedback reports (staff surveys reports; performance completion reports) for champions, and champions have the opportunity to modify their team size within their individual profile page. To assess eligibility and inform accrual targets, information on sector, job roles, and proportion of the team undertaking desk based work will also be assessed. To understand the health and wellbeing culture of the work team, champions will be asked if their team is currently participating in any other workplace wellness/health promotion programs; the everyday interest of the team in health and wellbeing (1=non-existent [no-one interested] to 5=very high [all/nearly all interested]); the team's motivation to sit less and move more at work (1=non-existent [no-one motivated] to 5=very high [all/nearly all motivated]); and, their team's level of stress (1=minimal/no stress to 5=severe stress). Workplace readiness for change will be assessed via the context, change efficacy, and change-related effort subscales of the Workplace Readiness Questionnaire [51]. The workplace audit, which was adapted from the Checklist of Health Promotion Environments at Worksites (CHEW) [52], will be used to capture information on office layout, availability of height adjustable desks, the physical environment (e.g., access to public transport; centrally located bins), and the cultural/policy environment (e.g., flexible work options).

Champion characteristics to be measured include: sex; age (years); job classification (employee; team leader/middle management; senior management/executive); and, job title (open ended). Champions will also be asked if they have a Health and Safety role in their workplace whether they

have done any training in workplace health programs before, and whether they have delivered and/or evaluated a workplace health program before, with responses of yes, no and unsure for each item. Champions will be asked what they hope to achieve with the program, and also to describe their current workplace culture in terms of sitting, standing and moving (including any potential barriers and enablers to change).

Reach

The extent of participation of staff in the various BeUpstanding activities will be determined from the champion-reported team size, and champion reported numbers or percentages participating in BeUpstanding events (e.g., wellbeing committees; staff information workshop; launch party). Staff characteristics to be collected via the staff survey include: age, sex; education; job classification; work hours; and, the number of days in the last week where they had done a total of 30 minutes or more of physical activity which was enough to raise their breathing rate [53]. Staff will also have the option to enter data about their post-schooling education qualifications; whether they speak a language other than English at home; their home postcode; their height (cm); weight (kg); smoking status; and, the number of times per week they usually did vigorous activity, walking, and other moderate-intensity activity [54]. The size and characteristics of teams taking part compared to the broader organisation will be compared using champion-reported data collected via sign on and the Champion Profile Survey.

Implementation

The primary implementation outcome is program completion. At a minimum, successful completion is considered as completing all the core elements of the program (Table 1). Secondary implementation outcomes are: engagement with the program (assessed through, for example, the number of logons to the toolkit, duration of using the toolkit, duration of running the program, and use of program materials); barriers and enablers to implementation; and, costs of implementation (including time taken by the champion to plan, deliver and evaluate the program including gaining management support; see economic evaluation). Strategies chosen by the work team to

BeUpstanding will be considered at a basic descriptive level (number of strategies chosen; frequency of certain strategies chosen) and according to the hierarchy of control (Table 2). Other factors tracked will include adaptions made (and desired) to the program materials by the work teams; and, participation by champions in activities to support engagement/implementation (e.g., workshops for champions; champion forums).

Effectiveness

Workplace sitting and activity: The primary effectiveness outcome is self-reported workplace sitting time. This will be measured by the Occupational Sitting and Physical Activity Questionnaire (OSPAQ) [55], which asks about the percentage of time on a typical workday in the last seven days spent sitting, standing, walking, and/or in heavy labour or physically demanding tasks. As such, it will also capture key secondary activity outcomes concerning time spent in other active behaviours at work: standing; walking; heavy labour; and, moving (i.e., walking + heavy labour). Measures from the OSPAQ have acceptable reliability and validity against posture-based activity monitors [56], and are responsive to change [56]. Participants will also be asked to estimate how many breaks from sitting they typically took in each hour while at work (six response options from 0 to 5 or more; [57]) and the percentage of their sitting time at work they think is accrued in prolonged, unbroken, continuous bouts of 30 minutes or more (whole percentage from 0 to 100). This latter question was developed for the BeUpstanding study to capture change in prolonged sitting time. Unpublished testing within one of the early adopting workplaces (a call centre; n=28 participants), showed acceptable test-retest reliability (r = 0.74, 95% CI 0.51 to 0.87) and criterion validity (r = 0.54, 95% CI 0.20 to 0.76) against workplace sitting in bouts of ≥30 minutes as recorded by the activPAL3 [58].

Activity preference alignment: Participants will be asked “if you were given a choice at work, what percentage of the time would you want to spend: sitting, standing, moving”. Activity preference alignment at work will be calculated as the absolute value of the difference between their preferred behaviour and their self-reported behaviour. The alignment scores for sitting, standing and moving

each theoretically range from 0 (desired and performed are exactly the same) to 100 (desiring 100% and doing 0% or vice versa) [36].

Organisational social norms: In line with the measure used in the pilot study [36], staff will be asked on a 5-point Likert scale (1=strongly disagree to 5=strongly agree) the extent to which they agree or disagree with five statements regarding control of how much they sit and stand at work; how much their organisation is committed to supporting staff choices to sit, stand and move at work; whether management is supportive if they want to stand and move more at work; whether management "walks the talk" when it comes to modelling standing and moving more at work; and, whether their work team has a culture that supports standing and moving. These five items will be used to create an "organisational social norms" score.

Enablers to sitting less and moving more: Staff will be asked (yes/no) whether they believe that too much sitting is detrimental to their health and wellbeing; whether a dynamic work environment is beneficial to their productivity; whether they want to sit less at work; and whether they have access to a height-adjustable desk. These four items will be used to create an "enablers score".

Perceived barriers to sitting less and moving more: Participants will be asked on a 5-point Likert scale (1=strongly disagree to 5=strongly agree) the extent to which they agree or disagree with seven statements regarding perceived barriers to sitting less and moving more at work: I am too busy to sit less at work; I worry that I would be perceived as being unproductive if I sat less at work; I need new equipment (e.g., desk or headphones) to support me to sit less at work; the tasks I have to do in my job prevent me from being able to sit less at work; I worry that I would be perceived as "weird" if I sat less at work; my health prevents me from standing and moving more at work; and, I need prompting to remember to sit less at work. Scores from these items will be used to create a "barriers

score". Participants will also be asked an open ended question on any other factors that are preventing them from being able to sit, stand, or move at their desired levels at work.

Use of activity-promoting strategies: Participants will be provided with a menu of common strategies that have been used to promote standing up, sitting less and moving more in the desk-based environment inclusive of those promoted in the BeUpstanding resources [15 18 59], and will be asked on a 5-point Likert scale to indicate the extent to which they used these strategies (never, rarely, sometimes, often, very often/always, not applicable). Scores from these items will be used to create a "strategy use score".

Work performance indicators: Self-rated job performance [60] and job satisfaction [61] will be measured using single-item 7-point Likert scales. Participants will also be asked to rate on a 5-point scale (1=not at all to 5=extremely) the extent in the last week at work that they felt productive, creative, and part of a team. They will also be asked the number of days in the last four weeks (0-28 days) that they have stayed away from work for more than half the day because of health problems [62].

Perceived health status: Musculoskeletal symptoms in the last week will be measured using 3-items adapted from the Nordic Musculoskeletal Questionnaire [63 64] to assess the level of discomfort in (1) upper back, neck, shoulders, elbows, wrists or hands; (2) lower back; and, (3) hips, thighs, buttocks, knees, ankles or feet. Each item will be assessed on an 11-point scale, from 0 (no discomfort at all) to 10 (severe discomfort). Current physical and mental health will each be rated on a single 5-point scale (1=poor to 5=excellent) [65, 66]. To provide an indication of current stress and energy levels, participants will also be asked to rate on a 5-point scale (1=not at all to 5=extremely) the extent in the last week at work that they felt stressed, alert, energetic, and creative.

Adverse events: The experience of any adverse events associated with program participation will be asked of both champions and staff.

Program satisfaction and feedback: Feedback on the BeUpstanding program will be sought from both champions and staff using fixed-option questions and qualitatively, via open ended questions and qualitative interviews (in a subsample). Questions will cover program awareness, enjoyment, satisfaction and potential for improvement. At the end-of-program, the staff survey will gather staff perceptions of the impact of the BeUpstanding program (negative impact; no/minimal impact; or, positive impact) on five success dimensions: the culture in their work team around sitting, standing and moving; their knowledge of the benefits of sitting less; their attitudes towards sitting, standing and moving; their awareness of their sitting behaviour; and, their activity outside of work. Champions will be asked to report, using a 5-point Likert scale (1=not at all to 5=complete success), their perception of the extent to which the program: raised awareness of the benefits of sitting less in the team; built a culture in their work team that supports sitting less and moving more; and, reduced the amount their team engaged in prolonged, unbroken sitting time. Adaptions and modifications to the program or program resources by the champions will be collected and recorded through the scheduled implementation checks.

Maintenance - understanding sustainability

At post-program assessment (≈9 months after the 8-week program completion), champions will be interviewed to understand current workplace policies and practices related to sitting less and moving more, and ongoing or new BeUpstanding strategy use. All staff will be sent the maintenance survey (a repeat of the baseline staff survey) to understand the sustainability of any changes.

Economic evaluation

The economic evaluation will address the costs and outcomes of scaling up to national implementation, including intervention affordability and sustainability. The economic analysis will be undertaken from a societal perspective, but with the major focus on a workplace perspective

(covering both costs and benefits to employers and employees). The study design lends itself to a cost-outcome description, since a full economic evaluation such as cost-effectiveness analysis would require a control arm. The primary economic analysis will be comprised from the analyses of costs, outcomes, and the relationship between costs and outcomes. Detailed pathway analysis will be used to identify all resource use associated with the intervention delivery. The intervention will be assumed to be operating in steady state (i.e., up and running at its full effectiveness potential); all costs associated with pre-planning and development will be excluded. Included costs will relate to workplace recruitment (promotion events, social media, newsletters, etc.) and intervention delivery (such as the staff workshop, posters, conduct of toolkit components, champion time, meetings of staff wellbeing committees, maintenance of website, etc.). Data on the strategies adopted by individual work teams (including estimated costs) will be collected via the implementation checks. All resources will be valued in Australian dollars for the 2019 reference year. The economic outcomes for the implementation study will be presented as total costs, average costs per work team, and per work team of different size. Analysis of who incurs the associated costs (government, employers, individual employees, research team) will be undertaken to assess intervention affordability and sustainability.

Data analyses

Adoption, reach and implementation outcomes will be described overall and within each priority sector. Effectiveness outcomes will also be evaluated overall and within each priority sector, with all work teams that are located in multiple sectors (e.g., regional, small businesses) examined as part of every sector to which they belong. Effectiveness outcomes collected at end-of-program only from champions and/or staff (e.g., satisfaction) will be described. Effectiveness of the intervention on the primary outcome and secondary outcomes (continuous) collected repeatedly in the staff surveys will be assessed using mixed models that account for non-independence in the form of individuals with repeated observations (baseline, end-of-program, post-program) and 'team' clustering. The primary

endpoint is end-of-program (≈8 weeks). The pragmatic aspects of the champion-led collection of anonymous data from staff within a workplace means the staff surveys will be sent out to all staff who are team members at the time in a repeated cross-sectional fashion. Most are likely a core cohort sent all surveys (not known to the research team) who may respond to none or any number of the three surveys. Additionally, some team members will be added or lost with workforce turnover. Accordingly, the evaluation will consist of assessing both changes within baseline responders who are followed up over time, and, since this may be a select motivated subset, also assessing time trends in all evaluable cases (responders to any survey). Time trends will be considered both unadjusted and adjusting for potential compositional differences between responders at each assessments (due to variations in team membership with workforce turnover as well as who responds to each survey). To evaluate sensitivity of conclusions to missing data handling, multiple imputation analyses will also be performed. Team-level variation in effectiveness will be considered. If applicable, then program engagement, characteristics of the work teams and workplace champions, and the timing (month/year) of the intervention will be explored as reasons for the differential effectiveness.

Qualitative data from the focus groups with staff (effectiveness – barriers, enablers and satisfaction) and semi-structured interviews with champions (maintenance – use of policies and practices) will be audio-recorded and transcribed verbatim. Data from focus groups and champion interviews will be analysed separately. Consistent with recognised guidelines for qualitative data analyses [67], two members of the research team will independently code each transcript, where deductive codes will be identified based on the a priori constructs of interest (barriers, enablers, satisfaction). Further, all transcripts will be read to look for emergent themes (inductive coding). Initial codes will be grouped together into sub-themes and overarching themes and relevant data to each theme collated. The coding frameworks developed by the research team members will then be compared for similarities

or differences. Any discrepancies will be discussed with at least one other team member for consensus of the coding framework.

Sample size for primary effectiveness outcome

For the primary effectiveness outcome (work sitting), the minimum difference of interest (MDI) will be 20 min/8 h at work, which is equivalent to 2/3 of the effect in the pilot (30 min/8 h) [36], and what we might expect to see maintained in the long-term [6]. Calculations using the GLIMMPSE software (version 2.2.8) indicate the study requires 47-62 teams to detect a change of this magnitude with 80-90% power and 5% two-tailed significance. Calculations assume, based on the pilot and early BeUpstanding data, an average of five workers per team will provide data (after attrition), SD = 90, r = 0.5, and intra-cluster correlation=0.1. Thus, to provide an adequate sample size to test effectiveness within every priority sector and overall, at least fifty work teams per priority sector will be recruited, with no fixed upper limit to recruitment within these priority sectors or other sectors.

Results

Funding for the trial is the 1st June 2018 to 31st May 2021. The protocol for the data collection was originally approved by the IRB on the 9th January 2017, with the national implementation trial consent and protocol amendment approved on the 12th March 2019. The start date for the trial was the 12th June, 2019. As of December 2019, 48 teams have been recruited into the trial.

Discussion

Desk-based workers spend on average an estimated 70-80% of their workday sitting [6], putting their present and future health and productivity at risk. This novel implementation trial in work teams of desk-based workers across Australia will determine whether the BeUpstanding Champion

603 Toolkit is a feasible, effective, safe and economical resource for sustainably reducing workplace
604 sitting. The multi-level and mixed-method evaluation will also enable examination of the predictors
605 of success across a wide range of employment sectors, including sectors that have been underserved
606 and under-researched. Through explicit consideration of a wide range of potential benefits and
607 possible adverse events, it should be possible in the future to provide many of the answers to
608 questions and concerns that could arise during more-widespread adoption. Findings will provide the
609 fundamental practice-based evidence needed to inform workplace health, policy and practice on
610 effective and sustainable ways to promote more movement and less sitting without compromising
611 productivity or worker health. These practice-based findings will also inform the potential for
612 broader dissemination of the toolkit, providing an opportunity to advance the translational evidence
613 base. Importantly, as the program is freely available with no upper limit to enrolment, there is the
614 opportunity to compare outcomes and engagement of those recruited into the implementation trial
615 compared to those participating in the BeUpstanding program but not taking part in the trial.
616
617 As an implementation study, there are some inherent limitations. The use of a single group, pre-post
618 study design is primary among these. A randomised controlled trial (RCT) design was considered, as
619 this design would provide more robust effectiveness outcomes. However, an RCT would not provide
620 better data for the reach, adoption and implementation outcomes. It was also unclear how to
621 conduct an RCT while preserving the key intervention model being tested of a workplace champion
622 delivering and evaluating the intervention, particularly given the BeUpstanding toolkit is already live
623 and freely available. Experience from the pilot and early adopters Phases (Phases 2 and 3) led us to
624 expect that we would not be able to recruit champions willing to act as controls and complete all the
625 evaluation, but receive none of the intervention (even if they received a delayed intervention). Even
626 the evaluation requires a reasonable amount of effort on the part of the workplace champion:
627 researchers have no contact with the staff. Anyone can sign up to the toolkit (including potential
628 control organisations) meaning contamination would be very difficult to control in those who sign up

and are allocated to the control arm. We would also need to expend significant resources tailoring the toolkit to perform the evaluation but not the delivery intervention functions for those champions whose teams were allocated to a control condition. Therefore, on balance, it was considered that the pre-post design was the most appropriate to evaluate the implementation trial.

Providing a menu of options and supporting work teams to participatively choose which intervention strategies will work best for them is a key strength of the program, with findings likely to provide key insights into possible higher order strategies to effectively support workers to sit less and move more [68]; but, this approach does mean that findings across work teams will not necessarily be directly comparable. It also means that strategies known to successfully achieve shifts in workplace sitting time, such as the use of sit-stand workstations as part of a multi-component approach [35], will not necessarily be implemented by work teams. Further, for some individuals, the strategies chosen by the team to BeUpstanding may not be appropriate for them personally. However, the primary questions to be answered are about the uptake, implementation and costs of wide-scale implementation, and the outcomes that can be achieved in this context; questions that are being answered through RE-AIM - a widely used framework for understanding dissemination [49]. Further strengths of the study include its pragmatic design. The toolkit readily facilitates uptake and delivery with minimal follow-up required from stakeholders. The program is also designed to be easily integrated into existing wellness, health and safety initiatives. This presents an innovative model that has a high likelihood of being able to be generalised more broadly. Importantly, all five industry partners are ideally suited to use trial findings to directly shape and deliver national and international workplace policy and practice.

Declarations

1) **Ethics approval and consent to participate**
   - Ethical approval was gained by The University of Queensland Human Research Ethics Committee (Approval number 2016001743). All participants will provide informed consent to participate.
2) **Consent for publication**
   - Not applicable
3) **Availability of data and material**
   - Not applicable
4) **Competing interests**
   - The BeUpstanding toolkit includes paid consultancy options offered by The University of Queensland that are in addition to the free program reported on within this manuscript. All proceeds generated through the paid options are returned to the research program.
5) **Funding**

   - The implementation trial is funded by a National Health and Medical Research Council (NHMRC) of Australia Partnership Project Grant (#1149936) with partner funding provided by Safe Work Australia, Comcare, Queensland Office of Industrial Relations, VicHealth, and Healthier Workplace Western Australia.
   - The NHMRC had no role in the design of the study and collection, analysis, and interpretation of data or in writing the manuscript.
   - The partners were directly involved in the co-design of the study and the proposed measures, and are included as co-authors or in the acknowledgement section as appropriate.
   - GNH is supported by an NHMRC Career Development Fellowship (#108029); BC is supported through an NHMRC Early Career Fellowship (#1107168); DWD is supported through an NHMRC Senior Research Fellowship (NHMRC APP1078360) and the Victorian Governments Operational Infrastructure Support Program; AG and EW are supported through an NHMRC Centre for Research Excellence Grant on Sitting Time and Chronic Disease Prevention—Measurement, Mechanisms and Interventions (#1057608); JB. JJ, and LU are supported by an NHMRC Partnership Project Grant (#1149936); LG is supported by an Alfred Deakin Postdoctoral Research Fellowship, Deakin University; NO is supported by an NHMRC Senior Principal Research Fellowships (#1003960).

6) **Authors' contributions**
   - GNH and AG are primarily responsible for the development and optimisation of the BeUpstanding program. The following authors (GNH, AG, AA, JB, DD, EE, NG, LG, AL, MM, NO, LS, PT) received funding for the implementation trial. All authors contributed to the study design and methods for the implementation trial. All authors reviewed and provided feedback for this manuscript.
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