Co-design and development of the sit-stand *e*-guide: An *e*-training program for the optimal use of sit-stand workstations

Haroun Zerguine [a,*], Genevieve N. Healy [b,c,d], Ana D. Goode [b], Alison Abbott [e], Venerina Johnston [a,f]

[a] *The University of Queensland, School of Health and Rehabilitation Sciences, St Lucia, Brisbane, QLD, Australia*
[b] *The University of Queensland, School of Human Movement and Nutrition Sciences, St Lucia, Brisbane, QLD, Australia*
[c] *Baker Heart and Diabetes Institute, Melbourne, VIC, Australia*
[d] *Curtin University, School of Physiotherapy and Exercise Science, Perth, WA, Australia*
[e] *Workplace Health and Safety Queensland, Office of Industrial Relations, Queensland Government, Brisbane, QLD, Australia*
[f] *University of Southern Queensland, School of Health and Medical Sciences, Ipswich, QLD, Australia*

ARTICLE INFO

ABSTRACT

This paper describes the co-design and development process of an evidence-informed *e*-training program (Sit-Stand *e*-Guide) to support the safe and optimal use of sit-stand workstations from ergonomics and behavioural change perspectives. Using an instructional system design process, supported by a participatory design approach, data was collected through three workshops with workplace consumers (staff [n = 5] and managers [n = 5]), and subject matter experts (n = 5). Content and learning activities were developed based on behaviour change principles and optimal pedagogy. Key topics identified for the *e*-training were sedentary behaviour and health; workstation set-up; and strategies for behaviour change. Learning activities (scenarios and reflection) to enhance knowledge retention and skills implementation and an interactive one-page guide on completion were included in the *e*-training. The relevance and usefulness of the training prototype were reviewed through one-to-one think-aloud sessions with the workshop consumers (n = 5) and external health and safety professionals (n = 5) receiving positive feedback. The Sit-Stand *e*-Guide is readily available for workplace implementation and evaluation. This paper serves as a practical guide for future training development.

1. Introduction

Sit-stand workstations (SSWs) are one of the most effective workplace interventions in reducing prolonged sitting at work, particularly when their use is combined with training/education to raise awareness and build a supportive culture for change (Parry et al., 2019; Shrestha et al., 2018). SSWs interventions have been found to be successful in increasing postural variability and decreasing short-term low back discomfort (Agarwal et al., 2018; Ognibene et al., 2016) and offering benefits for cardio-metabolic risk indicators when used more than 3 months (Winkler et al., 2018), without negatively impacting productivity (Gao et al., 2018; Peterman et al., 2019; Shrestha et al., 2018). However, negative outcomes, such as increased discomfort of the right forearm and wrist (Ebara et al., 2008), or exposure to risks of prolonged standing (Chau et al., 2014), have been reported when support such as education/training is not provided.

Training is defined as any strategy consisting of knowledge, skills and behaviours that aim to facilitate the learning of specific competencies (Robson et al., 2010). Workplace interventions that used SSWs have varied considerably in format and duration of training/education provided on the use of the workstation. Specifically, training has ranged from simple brief instructions (e.g., 2-min verbal instruction on its use (Alkhajah et al., 2012)), to face-to-face training (e.g., demonstration of workstation setup delivered by the manufacturer (Graves et al., 2015)), through to extensive education (e.g., 3-h training with opportunities to apply the skills and tips to maintain skills delivered by the researcher (Riddell and Callaghan, 2020)). Although interventions that included SSW training have been effective for most outcomes measured, evidence suggests that the type of training and support provided to SSW users influences the extent to which the desired behaviour changes are achieved (Chambers et al., 2019). Notably, outside of the research context, the provision of training for SSWs within organisations seems to be

---

limited (Zerguine et al., 2021). Moreover, existing online office ergonomics training programs have several design weaknesses and content limitations on SSWs, with the large majority mainly focusing on the workstation adjustment for standard desks (Zerguine et al., 2023). Thus, it is important to explore ways to achieve optimal use not only from a physical ergonomics perspective (workstation adjustment), but also from a behaviour change perspective with consideration of appropriate strategies to achieve the desired sit/stand behaviour change. It is also important for users to understand why (from a health and wellbeing perspective) regularly shifting between the sitting and standing options is important. Development of training that covers all of these aspects would be of value, with workplace decision-makers and managers identifying a need for such evidence-informed, readily accessible training to enhance the appropriate use and uptake of SSWs within their organisation (Hall et al., 2019; Zerguine et al., 2022).

One approach to facilitate accessibility is through online learning. Online learning or e-learning is defined as a mechanism to provide education using technology, usually via the Internet, and is becoming commonly used in health sciences (Clark and Mayer, 2016). This type of education delivery is more accessible than face-to-face delivery and also more readily enables the learner to control their own learning path and pace of learning (Kala et al., 2010). These features are particularly salient for workplaces when the COVID-19 pandemic and associated restrictions resulted in many workplaces pivoting to allow workers to work from home, with almost 70% of Australian workers wanting to continue this arrangement to a certain capacity after the pandemic (Melbourne Institute Applied Economic and Social Research, 2020). Further, recent data from the Australian Bureau of Statistics (2022) showed that work-related online learning has increased from 19% in 2016–2017 to 55% in 2020–2021, such that online learning is becoming the most common delivery mode for workplace training. Other potential advantages of e-learning over other training methods include flexibility in time and location of delivery, personalised instruction, and the ability to regularly update content, ensuring the availability of the latest evidence (Cook, 2007; Vaona et al., 2018).

Instructional system design approaches can help in the systematic planning and development of online training programs (Khalil and Elkhider, 2016). Specifically, instructional system design models translate the fundamental principles of learning into a procedural framework for producing educational resources and fostering a learning environment to achieve desired outcomes (Cook, 2007). Several instructional system design models have been developed but the majority of these models are variations of the original ADDIE (Analyse, Design, Develop, Implement and Evaluate) model. This model offers a systematic, dynamic and flexible process for designing an efficient learning program through these five phases (Gibbons et al., 2014). The ADDIE model is being increasingly adopted within corporate training (Association for Talent Development, 2020) and has been shown to be effective in creating efficient and high-quality e-learning programs (Khalil and Elkhider, 2016; Patel et al., 2018). The ADDIE model uses a behavioural approach, with a focus on achieving specific learning outcomes and behavioural change by considering the different learning theories, as well as the learner's needs and environment (Allen, 2006). Participatory design/co-design is integrated throughout the process to ensure that subject matter experts, learners (end-users) and developers work together through open collaboration to produce a learning program that addresses learners' needs (Zamenopoulos and Alexiou, 2018). Although the ADDIE model is widely used for the development of training programs, the actual process of collecting and synthesising the information from the various stakeholders, and the types of co-design activities conducted, are less commonly described in the literature (McIver et al., 2015). Studies often report the evaluation phase of training programs with minimal information provided on the foundation and development of the training, which is a critical part to the success of any training program (Radianti et al., 2020). Therefore, this paper aims to describe the co-design and development process of the Sit-Stand e-Guide through

the Analysis, Design and Development phases of the ADDIE model. The Sit-Stand e-Guide as an outcome of this process is a high-quality evidence-informed e-training program to educate and upskill employees on the potential health benefits and appropriate use of SSWs. The findings from this paper are intended to provide context and background to the activities and material presented in the Sit-Stand e-Guide program, as well as showcase the process through which this information was collected, synthesised, and integrated into the training. To the authors' knowledge, this is the first paper that thoroughly reports on the process of co-design and development of a training program based on an instructional system design process and participatory approach.

2. Methods

This research is part of a larger project that aimed to understand and support the use of SSWs in workplaces (Zerguine, 2023). The methodology was based on the instructional system design process described in the ADDIE model supported with a participatory design approach. This paper presents the first three phases: Analysis, Design and Development, with the Implementation and Evaluation phases reported separately. Ethical approval to conduct this study was obtained from The University of Queensland ethical committee (approval number: 2021/HE001776).

2.1. Study location/hosting organisation

This study was conducted in collaboration with a local municipal organisation that recently moved into a new purpose-built building furnished with SSWs. The organisation approached the research team with an interest in collaborating on this project. A discussion was initiated with a meeting at the hosting organisation, with the researchers presenting the phases and plans for this study. Senior members of the organisation's health and safety team, with the support of the organisation's senior leaders, showed a keen interest in the study and identified a liaison team to assist with participant requirements and steps required in the project. Participants were not reimbursed for their participation and were given time off from work to attend the meetings.

2.2. Participants

To meet the needs of consumers, several groups of participants were included in the different phases of this study (Fig. 1):

- *Office/computer workers - end-users (n = 5):* this group included staff from the hosting organisation with regular (at least three days a week) access to a SSW, either at the office or at home.
- *Supervisors/Managers (n = 5):* this group included individuals who had roles in leading/supervising teams or with occupational health and safety roles within the hosting organisation.
- *Subject Matter Experts - SMEs (n = 5):* this group included researchers/academics, a professional ergonomist, and senior occupational health and safety managers from the industry. Their areas of expertise included but were not limited to, sedentary behaviour, ergonomics, health and safety, research implementation, and/or instructional design.

End-users and supervisors/managers were recruited through an onsite liaison at the organisation who sent a targeted email to potential participants across several departments at the organisation. Target participants were selected purposively through discussion with the liaison team to ensure a representative sample of males and females, ages, roles and tenure with the business. Selected participants were then contacted to confirm their participation. SMEs were represented by the research team and their network to recruit professional ergonomists and senior occupational health and safety managers.

ADDIE Phase	Type of involvement of SMEs (academic and/or industry)	Analysis, Design and Development Steps	Type of involvement of consumers (end-users & supervisors)
ANALYSE	Workshop to identify what needs to be included and required resources	**Step 1:** Identification of the learning needs, learning outcomes, and training structure	Workshops to understand consumers' needs and preferences
DESIGN	Iterative feedback to build the content and learning activities that aligns with consumers needs	**Step 2:** Development of content and storyboard	-
DEVELOP	Instructional designer to create the learning activities	**Step 3:** Creation of the *e*-training program	-
	"Think aloud" sessions to gain feedback on the training content & presentation	**Step 4:** Revision of the *e*-training program	"Think aloud" sessions to gain feedback on the training content & presentation
	Instructional designer to action changes on the learning activities	**Step 5:** Implementation of final changes to the *e*-training program	-

Fig. 1. Steps undertaken for the development of the Sit-Stand *e*-Guide training program based on the ADDIE model. The involvement of stakeholders and subject matter experts is identified for the relevant steps.

2.3. Procedure

SMEs and consumers (staff; managers/supervisors) provided input at multiple planned stages across the analysis, design and development phases (Fig. 1). A series of workshops and iterative feedback sessions were undertaken to inform the design and development and ensure the *e*-training program meets its objectives. The peer-reviewed literature was regularly consulted throughout the process to ensure the program included contemporary evidence and information. The responsibility for this task was shared among the research team members with each contributing based on their specific areas of expertise; HZ (health, safety & ergonomics), VJ (ergonomics & musculoskeletal injury prevention), GNH (sedentary behaviour), AG (behaviour change). The team compiled relevant content, ensuring that all information added to the training was supported by research evidence. The content and supporting evidence were regularly discussed among the research team.

2.3.1. Step 1: identification of the learning needs, learning outcomes, and training structure

Three workshops were conducted in this step, one with each of the three participant groups. All workshops were facilitated by the primary researcher (HZ) and up to five participants to ensure effective group dynamics and communication. The consumer workshops were conducted face-to-face in the meeting room of the hosting organisation. The room was equipped with a large whiteboard, and participants were provided with coloured spot notes and markers. The workshop activities were listed on the whiteboard before the arrival of attendees. The first workshop ran for 90 min and was represented by end-users (n = 5; 3 females, 2 males) who included staff with SSWs representing four different departments/divisions at the organisation: customer services, libraries, property services, and management and compliance. The second workshop ran for 105 min and involved managers and supervisors (n = 5; 1 female, 4 males): the health and safety manager, the injury management partner, the compliance team leader, the recruitment coordinator and the people and culture manager. Participants worked at the organisation between 4 and 15 years. All participants were provided with an information sheet to enable informed signed consent prior to participation. Each workshop included three main activities aimed at understanding the desired outcomes, content and learning experiences for the training (Table 1). For each activity, participants were asked to brainstorm responses and write them on the spot notes. The researcher (HZ) led the discussion by prompting questions and writing keynotes on the whiteboard. At the end of each activity, participants were asked to

Table 1
Workshop guide summary with consumers (end-users and supervisors) and SMEs.

End-users	Managers/supervisors	SMEs
Introductory and opening statement	**Introductory and opening statement**	**Introductory and opening statement**
-Overview of the project	-Overview of the project	-Overview of the virtual whiteboard (how it is used)
- Brief instruction on the co-design approach	- Brief instruction on the co-design approach	
ACTIVITY 1 – Desired outcomes	**ACTIVITY 1 – Desired outcomes**	**ACTIVITY 1 – Desired outcomes**
Aim: *To understand what employees would like to achieve from the sit-stand training module, and what they deem successful*	*Aim:* *To understand what managers would like to achieve from the sit-stand training, and what they deem successful*	*Aim:* *To understand the intended end goal of the training program*
	-What does success look like for you?	-What do employees and workplaces need to know, understand, and be able to do by the end of the module? (Knowledge, skills, and behaviour)
-What would you like to get out of this training?	- How could this success be measured?	
- How to ensure this is achieved?	Wrap-up/reflection	
Wrap-up/reflection		Wrap-up/reflection
ACTIVITY 2 – Desired content	**ACTIVITY 2 - Desired content**	**ACTIVITY 2 – Acceptable evidence**
Aim: *To explore what content employees would like to see in the training module to achieve their goals (to identify the main topics to be included)*	*Aim:* *To explore what content managers would like to see in the training module to achieve their goals (to identify the main topics to be included)*	*Aim:* *To understand how we will be able to determine if the desired results occurred*
		-What assessment/ evaluation tools will be used?
-What information would you like to see in the training module?	-What information would you like to see in the training module?	Wrap-up/reflection
Wrap-up/reflection	Wrap-up/reflection	
ACTIVITY 3 – Learning experience	**ACTIVITY 3 – Learning experience**	**ACTIVITY 3 – Learning experience**
Aim: *To explore employees' preferences in the style, length, visuals, and learning activities of the training module.*	*Aim:* *To explore managers' preferences in the style, length, visuals, and learning activities of the training module.*	*Aim:* *To explore what learning activities need to be included.*
-How would you like to see the training module?	-How would you like to see the training module?	-How would the learning activities be delivered to achieve the desired outcomes?
Wrap-up/reflection	Wrap-up/reflection	Wrap-up/reflection
END session	**END session**	**END session**

stick their spot notes on the whiteboard and were then given the chance to look over all the notes and reflect on anything that could be added.

The third workshop was conducted online via the Zoom platform with the SMEs represented by the research team (n = 5) and lasted for 2 h. A backward design approach was used to identify the desired outcomes and learning assessment/evidence of learning. This was then used to design an instructional plan and activities. This approach is commonly used with SMEs to design training content and materials with clear and concise goals (Wiggins et al., 2005). This workshop differed from consumers' workshops in that it focused on exploring the acceptable evidence (Activity 2) instead of exploring the desired content. A visual collaboration software tool (Miro) was used to allow the research team to brainstorm using digital spot notes.

Hard-copy workshop guides were used to facilitate the three workshops. All workshops were recorded and transcribed by the primary researcher (HZ). A combination of qualitative thematic and content analysis techniques was used to identify patterns from both the verbal discussion during the workshop and the items listed in the spot notes or written on the whiteboard. This multimodal approach to data collection ensured a holistic and nuanced exploration of the data, facilitating the identification of key themes, patterns, and insights. Data was then summarised and tabulated. The findings were compared and discussed with the research team to ensure the content covered all consumers' needs. Examples from the workshops are presented in **Supplemental Material 1**.

2.3.2. Step 2: development of content and storyboard

After identifying consumers' needs and key components of their desired content; the creation of a storyboard was initiated. At first, the results from the workshops were mapped, categorised, and discussed with SMEs to identify the key modules of the training program. A brainstorming session was then conducted to identify the learning objectives and topics to be covered under each module. *Sit-Stand e-Guide* was chosen as the name of the *e*-training program. The learning objectives were created to target the different cognitive domains of Bloom's taxonomy (knowledge, comprehension, application, analysis, synthesis and evaluation) (Adams, 2015). A storyboard was created outlining the detailed content, type of learning activities, and presentation and visuals (e.g., images, animation, video). An example from the storyboard is presented in **Supplemental Material 2**.

The development process also incorporated principles from various learning theories, such as behaviourism, cognitivism, and constructivism (Ertmer and Newby 2013). For instance, behaviourism guided the inclusion of reinforcement elements in the form of positive feedback within the *e*-training modules. Cognitivism influenced the emphasis on structuring content to align with the participants' mental processes, ensuring the acquisition of knowledge and comprehension. Further, constructivism was implemented by encouraging active learning through interactive elements and collaborative activities, fostering a learner-centred approach.

The storyboard underwent iterative cycles of review and feedback from SMEs on the quality of content, the language, the type of learning activities and feedback, and the visual presentation. These review cycles aimed to ensure that all information provided in the training was based on the latest evidence and that the content meet consumers' needs. To cater for different learning styles, the materials were presented in a variety of media, including video, text and animation. The researcher (HZ) wrote a script to create an illustrative video on creating SMART (Specific, Measurable, Achievable, Relevant and Time-bound) goals on the use of SSWs for the training program (https://vimeo.com/823244413).

2.3.3. Step 3: creation of the e-training program

Once the storyboard was finalised, the module was created by the researcher (HZ) using the Articulate Rise authoring tool (Articulate, 2021). Support was sought from an external learning designer,

specifically when developing embedded activities through Articulate Storyline (e.g., sitting calculator) and creating the illustrative video on SMART goals. During the creation of the Sit-Stand *e*-Guide, several features of the learning activities and content presentation were taken into consideration. These features were based on optimal pedagogical practices to enhance knowledge retention and skills implementation from the training by providing workplace examples, scenarios and reflection activities (Khalil and Elkhider, 2016). Further, the learning activities encouraged key Behavioural Change Techniques (BCTs) (Michie et al., 2013), including self-monitoring, goal setting and action planning which have been shown to be effective in online Physical Activity and sedentary behaviour change interventions (Schroé et al., 2020). Other commonly used BCTs for online applications of sedentary behaviour such as prompts/cues, information about health consequences, feedback on the behaviour and instructions on how to perform the behaviour were also used (Dunn et al., 2018).

2.3.4. Step 4: revision and fine-tuning of the e-training program

The prototype of the training went through extensive rounds of review and feedback with SMEs, and changes were implemented repeatedly. Once the working prototype was deemed ready, consumers (three end-users and two managers) from the workshops in step 1, four external occupational health and safety supervisors, and the furniture procurement manager at a large academic institution were invited to complete the training and provide feedback. The "think aloud" technique (Nielsen et al., 2002) was used in one-on-one online sessions via the Zoom platform with each of the consumers and the occupational health and safety supervisors. This method enables an understanding of how the user reacts to the training in real-time. Specifically, participants were provided with a link to the training program and asked to access the link and share their screen. Participants were asked to complete the training while continuously sharing their thoughts aloud on each part of the training. Feedback was sought around the general features and content, language, design, functionality, ease of use, and length of completion. All sessions were recorded, with notes also taken during the session.

2.3.5. Step 5: implementation of final changes to the e-training program

Changes and modifications were iteratively incorporated with the learning designer when required. The final version of the *e*-training module was then imported to a website domain to facilitate users' access to the *e*-training in preparation for the implementation and pilot-test evaluation phases.

3. Results

3.1. Workshops with consumers (end-users and supervisors)

● **Desired training outcomes**

Both staff and supervisors indicated that the desired training outcomes were mainly to improve their knowledge of sedentary behaviour and the benefits of SSWs, and to develop practical skills in the use of SSWs (Table 2). In addition, employees indicated they would like tips and strategies to help them change their sitting behaviour and use the standing option of the desk more regularly. Supervisors indicated they would like to see their staff using their SSWs and become more independent in troubleshooting any issues that arise from using their desks thus reducing reliance on management.

● **Desired training content**

The main desired content identified from the consumer workshops was information on the health benefits of using SSWs; optimal sit/stand recommendations; the different influences on sitting behaviour; learning how to adjust the workstation; and, strategies to use SSWs more regularly (Table 2). Although there was an agreement between

Table 2
Summary of the desired training outcomes, content and learning experience from supervisor/managers and end-users.

Supervisors/Managers	End-users
DESIRED TRAINING OUTCOMES	
-Improved employee knowledge of sedentary behaviour and workstation set-up	-Building practical skills in setting up SSW
-A safe and healthy work environment (e.g., fewer discomfort complaints, fewer injuries, employees enjoying the workspace)	- Developing knowledge of the benefits of SSWs
-Increased use of SSWs	- Using the SSW
-Employees choose their own strategies to break sitting habits and use the desk more often	- Being aware of the recommended time limits of sitting and standing
-Employees troubleshooting problems with their SSW.	- Being aware of safety issues and other hazards with SSWs.
Indicator of success	
- Tracking training completion rates	- Confident in setting up my workstation correctly
- Pre- and post-training surveys satis-faction and applying skills	- Having a resource or an information sheet at the end of the training
- Tracking the number of ergonomics assessments requested by staff after the training	Having strategies to remember to use my SSW.
- Audit/observation (e.g., no. Of people standing and sitting, correct workstation adjustment).	
DESIRED TRAINING CONTENT	
- Health benefits of reducing sitting time and the value of using SSWs.	- Health benefits of using SSWs
- Optimal setup of SSWs when sitting or standing (chair, desk, monitors)	- Instructions on workstation set-up
- Recommendations on sit/stand time	- Strategies/prompts to stand up (e.g., apps, computer prompts, reminders)
- Common issues with SSWs (e.g., leaning on the desk, antifatigue mats, slouching when sitting)	- Recommendations sit/stand time (frequency and duration)
- Facts, statistics, and myth-busting	- Specific instructions for people with different health conditions (e.g., low back pain, neck pain)
- Responsibilities and troubleshooting when discomfort arise	- Cultural and psychological factors relating to standing at work
	- Minimising information on legislative requirements
	- Content from a validated source (e.g., research, experts).
TRAINING LEARNING EXPERIENCE	
Structure	*Structure*
- Modules split up: Knowledge (why?) – Equipment and behaviour (what/how?) – Responsibility (who?)	- Modules/topics: workstation set-up – prompting strategies to use the desk
Interactivity	*Interactivity*
- Scenarios and practical trial sessions: users practice and apply while learning (e.g., workstation set-up)	- Puzzles and scenarios (e.g., drag items)
- Reflection activities (e.g., questions/quizzes)	*Look and feel*
Look and feel	- A mix of images, GIFs, and diagrams
	- Optional videos
- A mix of images, animations, diagrams, and infographics	- Use of humour and cartoons
- Limit long videos.	- Use of simplified plain language (e.g., avoiding technical language, limiting acronyms)
- Culturally inclusive: considering diversity in age, gender, and ethnicity.	*Length*
Length	- Two versions:
−30–45 Min (3 modules x ~15min each)	• Short version with essentials - what do they need to know/do? (~5min) - desk setup, strategies to use the desk.
Printable	• Long version with details and evidence (~15–20min) – includes benefits and troubleshooting
- Certificate of completion	*Printable*
- Summary and strategies to implement	- Summary and checklist (for self-check).
- Workstation set-up & sit/stand time.	

supervisors/managers and staff end-users on the main content areas, supervisors also highlighted the need for a section on troubleshooting potential issues and discomfort that may arise while using SSWs. End-users, conversely, highlighted the importance of the quality of the content included in the training, in particular, that it should come from reputable sources.

- **Learning experience**

Consumers (end-users and supervisors) indicated several similarities in preferences in terms of structure, interactivity, look and feel, length and printable output (Table 2). Specifically, both groups wanted the training to be structured in modules, and both agreed on having SSW set-up as a separate module. Supervisors highlighted the need for a knowledge component and end-users indicated they would like a section on strategies to help them use the standing option of SSWs. In terms of interactivity and look and feel, both groups suggested the use of diagrams and a mix of images and animations, with scenarios and interactive activities to engage users with the training. The suggested duration of the training varied between employees preferring shorter training (15–20 min) compared to supervisors (30–45 min). Both supervisors and end-users desired a summary print-out at the end of the training with strategies to help them use the SSWs more often.

3.2. Workshop with subject matter experts

SMEs identified four key outcomes that end-users should be able to complete by the end of the training program: (1) identify the risk of prolonged sitting at work; (2) appropriately adjust their workstation when sitting or standing; (3) identify and choose their optimal sit/stand time; and, (4) choose and apply strategies to sit less and use their SSW to alternate between sitting and standing postures. The need for using knowledge checks, surveys, and interactive activities throughout the training to help end-users achieve their goals was also identified, along with learning activities that provided end-users with opportunities to apply their skills and reflect on their sitting and standing time. Fig. 2 presents a summary of key elements that emerged from the workshops with SMEs.

3.3. Structure of the sit-stand e-guide

The Sit-Stand *e*-Guide consists of four modules (Table 3) to meet the following seven learning objectives that employees will be able to achieve by the end of the training:

1. Describe the potential risks of prolonged sitting and standing.
2. Describe the potential benefits of sit/stand postural shifts and active breaks.
3. Adjust their sit-stand workstation for sitting or standing optimal comfort.
4. Identify and apply an optimal sit/stand time.
5. Develop SMART goals to sit less and be more active at work.
6. Select behaviour change strategies to achieve identified SMART goals.
7. Solve common sources of discomfort that may arise from desk use.

The first module contributed to learning objectives 1 and 2 and aimed to provide knowledge and background on the impact of prolonged sitting and standing and the importance of sitting less at work. The second module targeted learning objectives 2 and 3 and aimed to assist users in adjusting their SSWs for optimal sitting or standing comfort with strategies to help increase their sit/stand postural shifts and use their desks. In the third module, users were guided to develop SMART goals in using their SSW and taking regular breaks at work. They were then provided with different strategies to help them achieve their goals targeted in learning objectives 5 and 6. Module four included
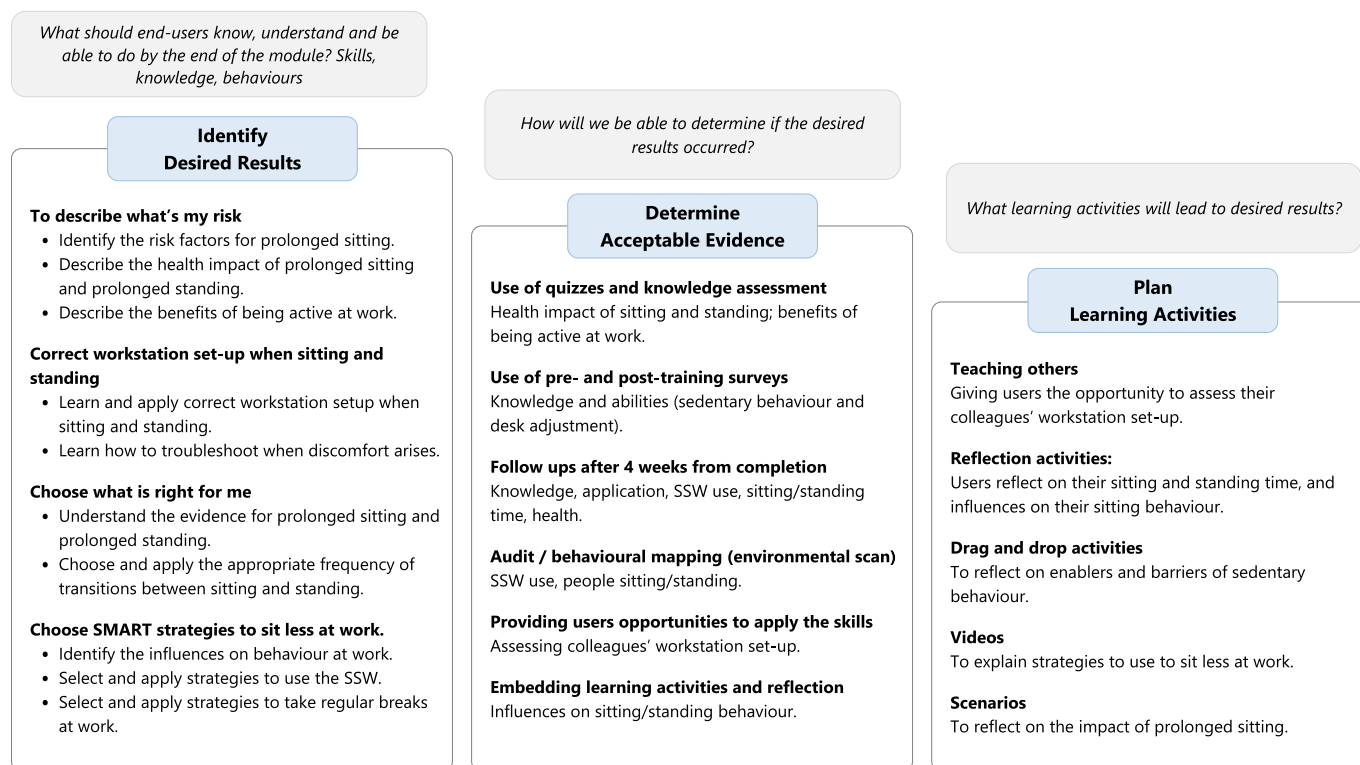
Fig. 2. Summary of the workshop with SMEs based on the elements of the backward design approach.

Table 3
Sit-Stand *e*-Guide modules and learning objectives.

Sit-Stand *e*-Guide modules and topics	Learning objectives
Overview (~1–2 min)	-
• Learning objectives	
• Audience	
Module 1: Sedentary behaviour - Health and wellbeing at work (~10–15 min)	1,2
• What is sedentary behaviour?	
• How does sitting affect your body?	
• Does standing help?	
• What about physical activity?	
• How to stand up and sit less at work?	
Module 2: Sit-stand workstation set-up (~10–15 min)	3,4
• Learn about your sit-stand workstation	
• Adjust your sit-stand workstation	
• Tips for using your sit-stand workstation	
Module 3: Strategies for behaviour change (~10–15 min)	5,6
• Recognise the influences on behaviour at work	
• Explore the influences of sedentary behaviour in your workplace	
• SMART Goals	
Module 4: Troubleshooting/Hazards/Further information (~5–10 min)	7
• Troubleshoot when discomfort arises	
• Responsibilities and considerations	
• Common issues at the workplace	
• Pros and cons of each type of sit-stand desk	
• Myths	
Thank you (~1–2 min)	-
• Download the Sit-Stand interactive PDF Guide	

information to assist users in addressing any discomfort that may arise from their SSWs (learning objective 7). Each module could be completed within 10–15 min.

Several features of the Sit-Stand *e*-Guide were developed based on the BCT taxonomy (Michie et al., 2013). For example, an embedded activity of the "sitting behaviour calculator" was added in Module 1 to help employees reflect on their accumulated sitting time with feedback providing their average sitting time. Videos in Module 2 were added to demonstrate to employees how to set up the different elements of their workstations with a suggestion to check their colleagues' workstations. Examples of features implemented in the Sit-Stand *e*-Guide based on the BCT taxonomy can be found in **Supplemental Material 3**. Furthermore, at the end of the training, users were able to download the Sit-Stand PDF guide file developed based on several BCTs, including goal setting and action planning (Michie et al., 2013). The purpose of this guide is to support users in achieving sustainable sit/stand behaviour change at work and using their SSW safely and more effectively. This interactive one-page guide contained input fields, drop-down menus and tick boxes to help users develop two SMART goals: (1) using their SSW; and (2) taking regular active breaks (Fig. 3), with these strategies drawn from previous research (Brakenridge et al., 2022; Dunstan et al., 2013; Healy et al., 2020). Users were able to select up to three strategies from each list to apply to their work. The Sit-Stand PDF Guide also included a summary of instructions for adjusting the workstation in the sitting and standing position.

3.4. Think aloud sessions

Overall, consumers and occupational health and safety supervisors provided very positive feedback on the Sit-Stand *e*-Guide during the think-aloud sessions. Participants valued the content supported by research evidence, the structure of the modules and the activities included. A few participants identified some wording and typographical errors. Some participants suggested new content to be added: e.g., the use of laptops, disadvantages of desktop converters, and evidence on

Fig. 3. Sit-Stand interactive PDF Guide.

anti-fatigue mats. Technical malfunctions in the sitting activity were noted during one session, where participants did not receive the relevant feedback after entering the total time spent sitting. Feedback from these sessions was summarised and changes and rectifications were implemented (**Supplemental Material 4**).

4. Discussion

This paper detailed the iterative co-design and development of an evidence-based *e*-training program (Sit-Stand *e*-Guide) to support the optimal use of SSWs and sit/stand behaviour among desk-based workers. The program was developed following an instructional system design process based on the ADDIE model. A participatory design approach was used, and input was obtained from consumers (end-users and supervisors) and SMEs (researchers and professionals) through all the Analysis, Design and Development phases reported in this paper. The instructional system design process and the iterative involvement of consumers and SMEs are critical in developing successful training programs, but this process is rarely described in the literature. An example of a study that described this process was the development of an internet-based consumer resource for people with low back pain (Hodges et al., 2020). However, for office workers, studies that used online training programs tended to largely focus on the evaluation phase without clear details on the development process of such training (Zerguine et al., 2023). Therefore, this paper serves as a guide for developing future corporate training programs. Further, to the researchers' knowledge, this is the first *e*-training program that involved consumers and researchers to address the use of SSWs from both physical ergonomics and behavioural change perspectives. The Sit-Stand *e*-Guide as an outcome of this study filled the key evidence gaps identified in previous research (Zerguine et al., 2021, 2022).

The analysis phase of the development process of the Sit-Stand *e*-Guide identified consumers' needs for this training program and the online delivery was viewed as the most appropriate and feasible delivery mode given its inherent flexibility and accessibility. This delivery mode aligned with workplace furniture-purchasing decision-makers preferences for such training in previous research (Zerguine et al., 2021). Further, COVID-19 forced many workers to work from home, and organisations have extensively used online training to support their workers (Reznik et al., 2021; Xiao et al., 2021). Despite the advantages that e-learning offers, a critical aspect that may challenge its success is users' engagement with the content and the application of skills gained from the training. To overcome these barriers, during the design phase of the Sit-Stand *e*-Guide, principles of learning design and pedagogical best practices were used in this study to build a solid foundation for the *e*-training. These principles were described as fundamentals in developing instructional strategies that ensure learning effectiveness (Khalil and Elkhider, 2016; McIver et al., 2015). Further, based on consumers' needs, the Sit-Stand *e*-Guide used a variety of learning strategies (e.g., scenarios; reflection activities) and various visual and interactive features such as videos, additional resources, and hyperlinks to engage the learner. Previous research showed that when learners are highly engaged in their learning, critical thinking is improved and motivation to apply newly acquired knowledge to real-life situations is enhanced (Carini et al., 2006; Lee et al., 2019; Mohamad et al., 2020).

The use of the co-design approach played a fundamental role throughout the development steps of the Sit-Stand *e*-Guide, with the involvement of multiple stakeholders in the design and decision-making. This approach is increasingly being recognised as best practice, both for the development of learning materials, as well as for translating evidence into practice (Könings et al., 2017; Sanders and Stappers, 2008; Vaughn and Jacquez, 2020). Further, it is increasingly recognised that for training to be effective and sustainable across diverse users, it is essential to engage end-users in the design process (Cober et al., 2015). Involving end-users at the early stage of product development helps in understanding their needs and preferences in relation to content and

presentation, and can help ensure that the training developed is fit for purpose (Khalil and Elkhider, 2016).

One of the challenges of co-design is promoting a way to have a shared vision and mutual understanding among all stakeholders and balancing the varied expertise of participants to reach a general agreement on different aspects of the training (e.g., content, length, presentation) (Penuel et al., 2007). In the case of this study, a strong overlap between supervisors' and end-users desired content was observed during the workshops. Employees tended to focus more on developing their skills on the adjustment of SSWs as the main part of the training (physical ergonomics aspect), while supervisors seemed to be more interested in enhancing the use of the standing option of the desk (behavioural aspect) and supporting employees to troubleshoot any issues with their desk. Although both aspects are important to support the optimal use of SSWs (Chambers et al., 2019), the differences in focus might be due to supervisors having a workplace vision to support increased activity at the workplace and support employees to sit less and move more at work for their health and well-being, while employees tend to focus on the most proximal impact of the training (e.g., knowing how to correctly set up their SSW). These findings regarding desired content also aligned strongly with the desired goals from the training that participants revealed during the workshops, where employees' goals were mainly to improve skills in adjusting their desks, while supervisors' goals primarily targeted increased use of the standing option and improving employees' wellbeing.

Differences in preferred training length were observed, with end-users indicating a preference for a shorter length of training (15–20 min) compared to supervisors (30–45 min). Although shorter training sessions (ranging from a few minutes to around 20 min) have been associated with higher user engagement and knowledge retention (Clark and Richard, 2016), the recommended length for e-learning is argued in the literature and can vary depending on the nature of the content, learning objectives, target audience, and the instructional design principles used (Allen, 2016). For the Sit-Stand *e*-Guide, a balance was necessary to ensure the inclusion of the substantial content required for comprehensive training that was requested from the end-users and identified by the SMEs. The three main modules of the *e*-training were each 10–15 min long and module 4 (troubleshooting, hazards and further information) was made optional for employees to accommodate their needs. In the "think aloud" sessions, users appreciated the content and the length of the *e*-training.

4.1. Strengths and limitations

A strength of this study was the use of the instructional system design model (ADDIE) to guide the development process of the training program, with a co-design/participatory design approach embedded through all steps. Consumers (end-users and supervisors/managers) and academics and professionals were involved iteratively and collaboratively to develop both the training content and user experience. This approach helped in identifying consumers' needs and building the content along with subject matter experts to meet users' preferences. Further, the training used various learning strategies supported by BCTs and the best-practice pedagogical principles to enhance engagement and learning transfer. Uniquely, the Sit-Stand *e*-Guide includes both ergonomics and behavioural change elements for enhancing appropriate usage. A novel feature of this training is the provision of a take-home PDF guide on completion of the training to help users implement their learning to achieve their goals.

Although the training was developed based on stakeholders' needs, the consumers were from one large workplace and therefore the training may not translate to other workplaces where work demands and corporate culture may vary. Notably, consumers from the hosting organisations all worked with an electric height adjustable desk, and their experience may only be limited to this workstation type. Potentially, information specific to other models of SSW such as desktop convertors

or manual adjustable desks may have been missed. The discussions with SMEs have, however, ensured that all types of SSWs were considered in the final training content. Further, due to time constraints, participants provided feedback on the prototype of the training in think-aloud sessions, but not on the storyboard. In addition, although consumers who participated in the workshops included end-users, supervisors and managers from different roles and responsibilities, the sample size may not be representative of all workers. Therefore, an important step is to validate this *e*-training program and explore its usefulness and effectiveness with another sample of workers across the hosting organisation, and broadly across diverse workplaces and workers.

5. Conclusion

This paper provided a comprehensive description of the co-design and development of the Sit-Stand *e*-Guide following an instructional system design process. End-users, managers and supervisors and SMEs were involved in an iterative process. The outcome of this paper was a novel evidence-based *e*-training program (Sit-Stand *e*-Guide) produced based on the needs of consumers covering both physical ergonomics and behavioural change perspectives in supporting the optimal use of SSWs. The Sit-Stand *e*-Guide has been implemented and evaluated within the organisation as the two final steps of the ADDIE model, with findings shown to be highly acceptable and effective (Zerguine, 2023).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.apergo.2023.104207.

References

Adams, N.E., 2015. Bloom's taxonomy of cognitive learning objectives. J. Med. Libr. Assoc. 103 (3), 152–153. https://doi.org/10.3163/1536-5050.103.3.010.

Agarwal, S., Steinmaus, C., Harris-Adamson, C., 2018. Sit-stand workstations and impact on low back discomfort: a systematic review and meta-analysis. Ergonomics 61 (4), 538–552. https://doi.org/10.1080/00140139.2017.1402960.

Alkhajah, T.A., Reeves, M.M., Eakin, E.G., Winkler, E.A.H., Owen, N., Healy, G.N., 2012. Sit–stand workstations: a pilot intervention to reduce office sitting time. Am. J. Prev. Med. 43 (3), 298–303. https://doi.org/10.1016/j.amepre.2012.05.027.

Allen, M., 2016. Seven simple success strategies. In: Michael Allen's Guide to e-Learning, pp. 95–107. https://doi.org/10.1002/9781119176268.ch7.

Allen, W.C., 2006. Overview and evolution of the ADDIE training system. Adv. Develop. Hum. Resour. 8 (4), 430–441. https://doi.org/10.1177/1523422306292942.

Articulate, 2021. *Articulate Storyline 360 [E-learning software]*. https://articulate.com/360.

Association for Talent Development, 2020. 2020 State of the Industry: Talent Developmenet Benchmark and Trends. https://www.td.org/research-reports/2020-state-of-the-industry.

Australian Bureau of Statistics, 2022. Work-Related Training and Adult Learning, p. 4234.0. Australia. https://www.abs.gov.au/statistics/people/education/work-related-training-and-adult-learning-australia/latest-release.

Brakenridge, C.J., Gardiner, P.A., Grigg, R.V., Winkler, E.A.H., Fjeldsoe, B.S., Schaumberg, M.A., Owen, N., Eakin, E.G., Biddle, S.J.H., Moodie, M., Daly, R.M., Green, D.J., Cohen, N., Gray, L., Comans, T., Buman, M.P., Goode, A.D., Nguyen, P., Gao, L., Dunstan, D.W., 2022. Sitting less and moving more for improved metabolic and brain health in type 2 diabetes: 'OPTIMISE your health' trial protocol. BMC Publ. Health 22 (1), 929. https://doi.org/10.1186/s12889-022-13123-x.

Carini, R.M., Kuh, G.D., Klein, S.P., 2006. Student engagement and student learning: testing the linkages. Res. High. Educ. 47 (1), 1–32. https://doi.org/10.1007/s11162-005-8150-9.

Chambers, A.J., Robertson, M.M., Baker, N.A., 2019. The effect of sit-stand desks on office worker behavioral and health outcomes: a scoping review. Appl. Ergon. 78, 37–53. https://doi.org/10.1016/j.apergo.2019.01.015.

Chau, J.Y., Daley, M., Srinivasan, A., Dunn, S., Bauman, A.E., van der Ploeg, H.P., 2014. Desk-based workers' perspectives on using sit-stand workstations: a qualitative analysis of the Stand@Work study. BMC Publ. Health 14 (1), 752. https://doi.org/10.1186/1471-2458-14-752.

Clark, R.C., Mayer, R.E., 2016. E-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning. John Wiley & Sons.

Clark, R.C.M., Richard, E., 2016. Engagement in e-Learning. In: E-Learning and the Science of Instruction, pp. 219–238. https://doi.org/10.1002/9781119239086.ch11.

Cober, R., Tan, E., Slotta, J., So, H.-J., Könings, K.D., 2015. Teachers as participatory designers: two case studies with technology-enhanced learning environments. Instr. Sci. 43 (2), 203–228. https://doi.org/10.1007/s11251-014-9339-0.

Cook, D.A., 2007. Web-based learning: pros, cons and controversies. Clin. Med. 7 (1), 37–42. https://doi.org/10.7861/clinmedicine.7-1-37.

Dunn, E.E., Gainforth, H.L., Robertson-Wilson, J.E., 2018. Behavior change techniques in mobile applications for sedentary behavior. DIGITAL HEALTH 4, 2055207618785798. https://doi.org/10.1177/2055207618785798.

Dunstan, D.W., Wiesner, G., Eakin, E.G., Neuhaus, M., Owen, N., LaMontagne, A.D., Moodie, M., Winkler, E.A.H., Fjeldsoe, B.S., Lawler, S., Healy, G.N., 2013. Reducing office workers' sitting time: rationale and study design for the Stand up Victoria cluster randomized trial. BMC Publ. Health 13 (1), 1057. https://doi.org/10.1186/1471-2458-13-1057.

Ebara, T., Kubo, T., Inoue, T., Murasaki, G., Takeyama, H., Sato, T., Suzumura, H., Niwa, S., Takanishi, T., Tachi, N., Itani, T., 2008. Effects of adjustable sit-stand VDT workstations on workers' musculoskeletal discomfort, alertness and performance. Ind. Health 46 (5), 497–505. https://doi.org/10.2486/indhealth.46.497.

Ertmer, P.A., Newby, T.J., 2013. Behaviorism, cognitivism, constructivism: comparing critical features from an instructional design perspective. Perf. Improvement Qrtly 26, 43–71. https://doi.org/10.1002/piq.21143.

Gao, L., Flego, A., Dunstan, D.W., Winkler, E.A., Healy, G.N., Eakin, E.G., Willenberg, L., Owen, N., LaMontagne, A.D., Lal, A., 2018. Economic evaluation of a randomized controlled trial of an intervention to reduce office workers' sitting time: the'Stand up Victoria'trial. Scand. J. Work. Environ. Health 44 (5), 503–511. https://doi.org/10.1016/j.jval.2018.07.655.

Gibbons, A.S., Boling, E., Smith, K.M., 2014. Instructional design models. In: Spector, J. M., Merrill, M.D., Elen, J., Bishop, M.J. (Eds.), Handbook of Research on Educational Communications and Technology. Springer New York, pp. 607–615. https://doi.org/10.1007/978-1-4614-3185-5_48.

Graves, L.E.F., Murphy, R.C., Shepherd, S.O., Cabot, J., Hopkins, N.D., 2015. Evaluation of sit-stand workstations in an office setting: a randomised controlled trial. BMC Publ. Health 15 (1), 1145. https://doi.org/10.1186/s12889-015-2469-8.

Hall, J., Kay, T., McConnell, A.K., Mansfield, L., 2019. Implementation of sit-stand desks as a workplace health initiative: stakeholder views. Int. J. Workplace Health Manag. 12 (5), 369–386. https://doi.org/10.1108/IJWHM-02-2019-0026.

Healy, G.N., Goode, A.D., Abbott, A., Burzic, J., Clark, B.K., Dunstan, D.W., Eakin, E.G., Frith, M., Gilson, N.D., Gao, L., Gunning, L., Jetann, J., LaMontagne, A.D., Lawler, S. P., Moodie, M., Nguyen, P., Owen, N., Straker, L., Timmins, P., Winkler, E.A.H., 2020. Supporting workers to sit less and move more through the web-based BeUpstanding program: protocol for a single-arm, repeated measures implementation study. JMIR Res Protoc 9 (5), e15756. https://doi.org/10.2196/15756.

Hodges, P.W., Setchell, J., Nielsen, M., 2020. An internet-based consumer resource for people with low back pain (MyBackPain): development and evaluation. JMIR Rehabil Assist Technol 7 (1), e16101. https://doi.org/10.2196/16101.

Kala, S., Isaramalai, S.-a., Pohthong, A., 2010. Electronic learning and constructivism: a model for nursing education. Nurse Educ. Today 30 (1), 61–66. https://doi.org/10.1016/j.nedt.2009.06.002.

Khalil, M.K., Elkhider, I.A., 2016. Applying learning theories and instructional design models for effective instruction. Adv. Physiol. Educ. 40 (2), 147–156. https://doi.org/10.1152/advan.00138.2015.

Könings, K.D., Bovill, C., Woolner, P., 2017. Towards an interdisciplinary model of practice for participatory building design in education. Eur. J. Educ. 52 (3), 306–317. https://doi.org/10.1111/ejed.12230.

Lee, J., Song, H.-D., Hong, A.J., 2019. Exploring factors, and indicators for measuring students' sustainable engagement in e-learning. Sustainability 11 (4).

McIver, D., Fitzsimmons, S., Flanagan, J., 2015. Instructional design as knowledge management: a knowledge-in-practice approach to choosing instructional methods. J. Manag. Educ. 40 (1), 47–75. https://doi.org/10.1177/1052562915587583.

Melbourne Institute Applied Economic & Social Research, 2020. Taking the Pulse of the Nation: Melbourne Institute's Survey of the Impact of COVID-19 in Australia. htt

ps://melbourneinstitute.unimelb.edu.au/_data/assets/pdf_file/0003/3504612/T aking-the-Pulse-of-the-Nation-14-18-September.pdf.

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., Eccles, M.P., Cane, J., Wood, C.E., 2013. The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. Ann. Behav. Med. 46 (1), 81–95. https://doi.org/10.1007/s12160-013-9486-6.

Mohamad, N.I., Ismail, A., Ahmad, N.N., Mohamad, N.M., Ibrahim, N.S., 2020. Role of online training content in enhancing job motivation. Int. J. Emerg. Technol. 11 (3), 1027–1032.

Nielsen, J., Clemmensen, T., Yssing, C., 2002. *Getting Access to what Goes on in People's Heads? Reflections on the Think-Aloud Technique* Proceedings of the Second Nordic Conference on Human-Computer Interaction. Aarhus, Denmark. https://doi.org/10.1145/572020.572033.

Ognibene, G.T., Torres, W., von Eyben, R., Horst, K.C., 2016. Impact of a sit-stand workstation on chronic low back pain: results of a randomized trial. J. Occup. Environ. Med. 58 (3), 287–293. https://doi.org/10.1097/jom.0000000000000615.

Parry, S.P., Coenen, P., Shrestha, N., O'Sullivan, P.B., Maher, C.G., Straker, L.M., 2019. Workplace interventions for increasing standing or walking for decreasing musculoskeletal symptoms in sedentary workers. Cochrane Database Syst. Rev. 2019 (11) https://doi.org/10.1002/14651858.CD012487.pub2.

Patel, S.R., Margolies, P.J., Covell, N.H., Lipscomb, C., Dixon, L.B., 2018. Using instructional design, analyze, design, develop, implement, and evaluate, to develop e-learning modules to disseminate supported employment for community behavioral health treatment programs in New York state. Front. Public Health 6, 113. https://doi.org/10.3389/fpubh.2018.00113.

Penuel, W.R., Roschelle, J., Shechtman, N., 2007. Designing formative assessment software with teachers: an analysis of the co-design process. Res. Pract. Technol. Enhanc. Learn. (RPTEL) 2 (1), 51–74. https://doi.org/10.1142/S1793206807000300.

Peterman, J.E., Healy, G.N., Winkler, E.A., Moodie, M., Eakin, E.G., Lawler, S.P., Owen, N., Dunstan, D.W., LaMontagne, A.D., 2019. A cluster randomized controlled trial to reduce office workers' sitting time: effect on productivity outcomes. Scand. J. Work. Environ. Health 45 (5), 483–492. https://doi.org/10.5271/sjweh.3820.

Radianti, J., Majchrzak, T.A., Fromm, J., Wohlgenannt, I., 2020. A systematic review of immersive virtual reality applications for higher education: design elements, lessons learned, and research agenda. Comput. Educ. 147, 103778 https://doi.org/10.1016/j.compedu.2019.103778.

Reznik, J., Hungerford, C., Kornhaber, R., Cleary, M., 2021. Home-based work and ergonomics: physical and psychosocial considerations. Issues Ment. Health Nurs. 1–5. https://doi.org/10.1080/01612840.2021.1875276.

Riddell, M.F., Callaghan, J.P., 2020. Ergonomics training coupled with new sit-stand workstation implementation influences usage. Ergonomics 1–31. https://doi.org/10.1080/00140139.2020.1859138.

Robson, L., Stephenson, C., Schulte, P., Amick, B., Chan, S., Bielecky, A., Wang, A., Heidotting, T., Irvin, E., Eggerth, D., Peters, R., Clarke, J., Cullen, K., Boldt, L., Rotunda, C., Grubb, P., 2010. A systematic review of the effectiveness of training & education for the protection of workers. Toronto: Institute for Work & Health. National Institute for Occupational Safety and Health (NIOSH), Cincinnati, OH, pp. 2010–2127.

Sanders, E.B.N., Stappers, P.J., 2008. Co-creation and the new landscapes of design. CoDesign 4 (1), 5–18. https://doi.org/10.1080/15710880701875068.

Schroé, H., Van Dyck, D., De Paepe, A., Poppe, L., Loh, W.W., Verloigne, M., Loeys, T., De Bourdeaudhuij, I., Crombez, G., 2020. Which behaviour change techniques are effective to promote physical activity and reduce sedentary behaviour in adults: a factorial randomized trial of an e- and m-health intervention. Int. J. Behav. Nutr. Phys. Activ. 17 (1), 127. https://doi.org/10.1186/s12966-020-01001-x.

Shrestha, N., Kukkonen-Harjula, K.T., Verbeek, J.H., Ijaz, S., Hermans, V., Pedisic, Z., 2018. Workplace interventions for reducing sitting at work. Cochrane Database Syst. Rev. (6) https://doi.org/10.1002/14651858.CD010912.pub4.

Vaona, A., Banzi, R., Kwag, K.H., Rigon, G., Cereda, D., Pecoraro, V., Tramacere, I., Moja, L., 2018. E-learning for health professionals. Cochrane Database Syst. Rev. 1, Cd011736. https://doi.org/10.1002/14651858.CD011736.pub2.

Vaughn, L.M., Jacquez, F., 2020. Participatory research methods–Choice points in the research process. Journal of Participatory Research Methods 1 (1). https://doi.org/10.35844/001c.13244.

Wiggins, G., Wiggins, G.P., McTighe, J., 2005. Understanding by Design. Association for Supervision and Curriculum Development.

Winkler, E.A.H., Chastin, S., Eakin, E.G., Owen, N., Lamontagne, A.D., Moodie, M., Dempsey, P.C., Kingwell, B.A., Dunstan, D.W., Healy, G.N., 2018. Cardiometabolic impact of changing sitting, standing, and stepping in the workplace. Med. Sci. Sports Exerc. 50 (3) https://doi.org/10.1249/MSS.0000000000001453.

Xiao, Y., Becerik-Gerber, B., Lucas, G., Roll, S.C., 2021. Impacts of working from home during COVID-19 pandemic on physical and mental well-being of office workstation users. J. Occup. Environ. Med. 63 (3), 10.1097%2FJOM.0000000000002097.

Zamenopoulos, T., Alexiou, K., 2018. Co-design as Collaborative Research. Connected Communities Foundation Series.

Zerguine, H., 2023. Understanding and Supporting the Uptake and Use of Sit-Stand Workstations. https://doi.org/10.14264/74e93ff [Doctoral Thesis: The University of Queensland]. https://www.researchgate.net/publication/371870927_Underst anding_and_supporting_the_uptake_and_use_of_sit-stand_workstations.

Zerguine, H., Goode, A.D., Abbott, A., Johnston, V., Healy, G.N., 2022. Factors impacting workplace investment in sit-stand workstations from the perspective of purchasing decision-makers. Appl. Ergon. 98, 103558 https://doi.org/10.1016/j.apergo.2021.103558.

Zerguine, H., Healy, G.N., Goode, A.D., Zischke, J., Abbott, A., Gunning, L., Johnston, V., 2023. Online office ergonomics training programs: a scoping review examining design and user-related outcomes. Saf. Sci. 158, 106000 https://doi.org/10.1016/j.ssci.2022.106000.

Zerguine, H., Johnston, V., Healy, G.N., Abbott, A., Goode, A.D., 2021. Usage of sit-stand workstations: benefits and barriers from decision makers' perspective in Australia. Appl. Ergon. 94, 103426 https://doi.org/10.1016/j.apergo.2021.103426.